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Puerto Rico Aqueduct and Sewer Authority

FISCAL YEAR 2018 CONSULTING ENGINEER'S REPORT FOR THE PUERTO RICO AQUEDUCT AND SEWER AUTHORITY

To satisfy the requirements of Section 7.07 of the 2012 Master Agreement of Trust by and between PRASA and Banco Popular de Puerto Rico as Trustee; and the requirements between PRASA, the Government of Puerto Rico and the Puerto Rico Fiscal Agency and Financial Advisory Authority

August 2018

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ACRONYMS AND ABBREVIATIONS

ABT	Additional Bonds Test
ACA	Asset Condition Assessment
AMR/AMI	Automatic Meter Reading and/or Advanced Metering Infrastructure
AOP	All Other Perils
ASD	Automatic Shutdown
AWWA	American Water Works Association
B	Billion
BOR	Broker of Record
CAA	Coefficient of Annual Adjustment
CAGR	Compound Annual Growth Rate
CT	Contact Time
CBA	Collective Bargaining Agreement
CCL	Contaminant Candidate List
CER	Consulting Engineer’s Report
CGI	Commonwealth Guaranteed Indebtedness
CIP	Capital Improvements Program
CSO	Commonwealth Supported Obligations
CSWO	Combined Sewer Overflow
CWA	Clean Water Act
DBP	Disinfection Byproducts
DBPR	Disinfection Byproducts Rule
DI	Ductile Iron
DSC	Debt Service Coverage
ECRC	Environmental Compliance and Regulatory Charge
DMR	Discharge Monitoring Report
EPC	Energy Performance Contract
EPL	Excess Employment Practices Liability

ERS	Employee Retirement System
ESCO	Energy Service Companies
FEMA	Federal Emergency Management Agency
FOA	Fiscal Oversight and Support Agreement
FOG	Fats, Oil and Grease
FRP	Fiberglass Reinforced Plastic
FY	Fiscal Year
GDB	Government Development Bank for Puerto Rico
GIS	Geographic Information System
gpm	gallons per minute
GWUDI	Groundwater Under the Direct Influence of Surface Water
HAA	Haloacetic Acid
HIEPAAA	Hermandad Independiente de Empleados Profesionales de la Autoridad de Acueductos y Alcantarillados
ILI	Infrastructure Leakage Index
IMP	Integrated Maintenance Program
KPI	Key Performance Indicators
kWh	Kilowatt-Hour
LOC	Line of Credit
LTCP	Long-Term Control Plan
M	Million
M&V	Measurement and Verification
MAPFRE	MAPFRE PRAICO Insurance Company
MARSH	Marsh Saldaña
MAT	Master Agreement of Trust
MCC	Motor Control Center
MDT	mobile data terminal
MG	Million Gallons
MGD	Million Gallons per Day

NMC	Nine Minimum Controls
NPDES	National Pollutant Discharge Elimination System
NRDC	Natural Resources Defense Council
NRW	Non-Revenue Water
OCIP	Owner Controlled Insurance Program
O&M	Operation and Maintenance
OMB	Office of Management and Budget
OSHA	Occupational Safety and Health Administration
OTC	Operator Training Center
P3	Public Private Partnership
PAN	Programa de Asistencia Nutricional
PMC	Program Management Consultant
PML	Probable Maximum Loss
PO	Purchase Order
PPA	Power Purchase Agreement
PRASA	Puerto Rico Aqueduct and Sewer Authority
PRDOH	Puerto Rico Department of Health
PREPA	Puerto Rico Electric Power Authority
PRFAFAA	Puerto Rico Fiscal Agency and Financial Advisory Authority
PROMESA	Puerto Rico Oversight, Management, and Economic Stability Act
PRPB	Puerto Rico Planning Board
PWS	Potable Water Systems
RBC	Rotating Biological Contactor
RD	Rural Development
RWI	Raw Water Intakes
R&R	Renewal and Replacement
RFP	Request for Proposal
SAP	Systems, Applications, and Products in Data Processing
SCADA	Supervisory Control and Data Acquisition

SDWA	Safe Drinking Water Act
SEC	Securities and Exchange Commission
SIR	Self-Insured Retention
SIRE	“Sistema Integrado de Resultados”
SRF	State Revolving Funds
SSO	Sanitary Sewer Overflow
SSOMP	Sewer System Operation & Maintenance Plan
SSSEP	Sanitary Sewer System Evaluation Plan
STS	Sludge Treatment System
SWTR	Surface Water Treatment Rule
TANF	Programa de Asistencia Temporal para Familias Necesitadas
TOC	Total Organic Carbon
TTHM	Total Tri-halomethane
UIA-AAA	Unión Independiente Auténtica de la Autoridad de Acueductos y Alcantarillados
U.S.	United States
USCOE	U.S. Corp of Engineers
USDA	U.S. Department of Agriculture
USDOJ	U.S. Department of Justice
USEPA	U.S. Environmental Protection Agency
UV	Ultraviolet
VFD	Variable Frequency Drive
WPS	Water Pump Station
WST	Water Storage Tank
WTP	Water Treatment Plant
WWPS	Wastewater Pump Station
WWTP	Wastewater Treatment Plant

DISCLAIMER

This Consulting Engineer's Report (CER) considers the six-year financial projections and Capital Improvements Program (CIP) included in the Puerto Rico Aqueduct and Sewer Authority's (PRASA) 2018 Re-Certified Fiscal Plan dated August 1, 2018 (PRASA's Revised Fiscal Plan).The financial projections and CIP presented herein do not consider any revisions made by PRASA after August 1, 2018.

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Arcadis is required to make disclosures stating the limitations of the work contained within the FY2018 CER and its use. In accordance with the Securities Exchange Act of 1934, the following disclosure statements are incorporated into the 2018 CER prepared by Arcadis. This 2018 CER was prepared by Arcadis for PRASA; hereinafter referred to individually as the "Authorized Recipient."

In the performance of its services on behalf of PRASA and any Authorized Recipient, Arcadis is (a) not recommending any action on behalf of the Authorized Recipient to municipal financial products or the issuance of municipal securities; (b) is not acting as a municipal advisor to the Authorized Recipient, and does not owe a fiduciary duty to the Authorized Recipient pursuant to Section 15B of the Securities Exchange Act of 1934, as amended by the Dodd-Frank Wall Street Reform and Consumer Protection Act, with respect to the information and material prepared in connection with this scope of work; and (c) acting for its own interests. PRASA shall engage a registered municipal advisor and shall discuss any information and material prepared in connection with this document with any and all internal and external registered municipal advisors and other financial advisors and experts who the Authorized Recipient deems appropriate before acting on this information and material.

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Arcadis devoted effort in the construction and preparation of this document is consistent with (i) the degree of care and skill ordinarily exercised by members of the same profession currently practicing under same or similar circumstances and (ii) the time and budget available for its work in its efforts to endeavor to ensure that the data contained in the 2018 CER is accurate as of the date of its preparation. This document was based on estimates, assumptions and other information developed by Arcadis from its independent research effort, general knowledge of the industry, and information provided by and consultations with the Authorized Recipient and the Authorized Recipient's representatives and consultants. No responsibility is assumed for inaccuracies in reporting by the Authorized Recipient, the Authorized Recipient's agents and representatives, or any third-party data source used in preparing or presenting this study. Arcadis assumes no duty to update the information contained in the 2018 CER unless it is separately retained to do so pursuant to a written agreement signed by Arcadis and PRASA.

This opinion is based upon information provided by, and consultations with, PRASA. Arcadis did not independently verify the accuracy of the information provided by PRASA and others in creating this opinion; however, Arcadis's opinion is based upon the supposition that such sources are reliable, and the information obtained therefrom is appropriate for the analysis undertaken and the conclusions reached. To the extent, the information provided to Arcadis by PRASA and others is not accurate, or not inclusive of all details, the conclusions and recommendations contained in the opinion may vary, and are subject to change. Arcadis assumed and assumes no responsibility for inaccuracies in reporting by PRASA or any third-party data source used in preparing such opinion.

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Arcadis relied on assumptions, forecasts, data and statistics provided by PRASA, its other consultants, and published industry references. Arcadis reviewed the PRASA-prepared forecast over a future six-year period of time and "forward-looking statements." These statements relate to Arcadis's expectations, beliefs, intentions, or strategies regarding the future. These statements may be identified by the use of

words like "anticipate", "believe", "estimate", "expect", "intend", "may", "plan", "project", "will", "should", "seek", and similar expressions. The forward-looking statements reflect Arcadis's views and assumptions with respect to future events as of the date of this document and are subject to future economic conditions and other risks and uncertainties. Actual and future results and trends could differ materially from those set forth in such statements due to various factors, including, without limitation, those that will be discussed in this 2018 CER. These factors are beyond Arcadis's ability to control or predict. Accordingly, Arcadis makes no warranty or representation that any of the projected values or results contained in this document will actually be achieved.

This 2018 CER summarizes the work completed up to the date of issuance and is based on PRASA's Fiscal Plan as certified on August 1, 2018 for its financial portion. Changed conditions occurring or becoming known after such date could affect the material presented and the conclusions reached herein to the extent of such changes. Arcadis has no responsibility for updating this report for changes that occur after the date of the report.

This document is qualified in its entirety by, and should be considered in light of, these limitations, conditions and considerations.

EXECUTIVE SUMMARY

E.1. Introduction

Arcadis Caribe, PSC (Arcadis), has been retained by the Puerto Rico Aqueduct and Sewer Authority (PRASA) as its Consulting Engineer to assist in the preparation of the Consulting Engineer's Report (CER) to satisfy the reporting requirements specified in Section 7.07 of the 2012 amended and restated Master Agreement of Trust by and between PRASA and Banco Popular de Puerto Rico as Trustee, as further amended, (the MAT or 2012 MAT), and the requirements between PRASA, the Government of Puerto Rico and the Puerto Rico Fiscal Agency and Financial Advisory Authority (AAFAF, by its Spanish acronym) as Fiscal agent to PRASA. Pursuant to Act 21 of 2016 and amended by Act 2 of 2017, AAFAF was established as an independent public corporation and governmental instrumentality that assumed all fiscal agency responsibilities previously assigned to the Government Development Bank (GDB). AAFAF also acts as financial advisor and reporting agent of the Government of Puerto Rico and its public corporations, including PRASA.

As required by Section 7.07 of the MAT, unless the Senior Bonds have been rated investment grade by at least two Rating Agencies for 24 consecutive months, the Consulting Engineer shall prepare a CER to document the current condition and changes, if any, in PRASA's operation and the performance of the water and wastewater systems (the System). Also, PRASA must maintain a continuous disclosure policy with its Fiscal Agent and satisfy certain reporting requirements throughout the fiscal year (FY). To comply with this reporting requirements, Arcadis has prepared this CER for FY2018 (2018 CER). The submittal of this report was delayed due to the impact of Hurricanes Irma and Maria (the 2017 hurricanes) on the island and PRASA's on-going efforts during FY2018 to complete a Fiscal Plan as required by PROMESA and to be certified by the Financial Oversight and Management Board (the Oversight Board or FOMB).

On September 6 and 20, 2017, Puerto Rico was directly impacted by Hurricanes Irma and María. Hurricane Irma impacted PRASA's infrastructure and significantly damaged the electric power grid supporting water and sewer infrastructure, causing widespread disruption of service to customers throughout the island. Hurricane María hit Puerto Rico on September 20, 2017 as a Category 4 hurricane and struck across the entire length of the island materially impacted most of PRASA's infrastructure. High-level winds and above-average precipitation caused great devastation throughout Puerto Rico. Many of PRASA's assets were severely impacted and were left in need of repair or replacement.

E.2. Puerto Rico's Current Fiscal Situation

Since FY2016, Puerto Rico has been facing an economic crisis that has severely impacted its residents. The ongoing recession is a result of several factors: negative economic growth, increased poverty levels, and declining population and labor participation rates that have negatively impacted PRASA's finances. In addition to the economic framework that has been experienced in Puerto Rico over the past several years, like many other municipal water and wastewater utilities around the world, PRASA is facing several major challenges including service affordability, aging infrastructure, high volume of non-revenue water (NRW), regulatory mandates, and increasing renewal and replacement (R&R) needs. The fiscal situation has been further exacerbated by the devastation caused by the 2017 hurricanes.

To recover its credibility from investors and ensure financial markets restructure its debt, the Government has focused on fiscal responsibility efforts by passing Act 3 of 2017 (Act 3-2017) which requires that all governmental instrumentalities (i.e. utilities, government agencies, and public corporations such as PRASA) implement measures to reduce its expenses. Temporary measures included for fiscal control and economic restructuring are focused on decreasing payroll costs and include: freezing of salaries and vacant positions, reduction of appointed positions by 20%, and elimination of all extraordinary payments and bonuses.

On April 29, 2017, Act 26 (Act 26-2017) was enacted to ensure compliance with the Government's Fiscal Plan, followed by approval and certification by PROMESA's FOMB on May 13, 2017. Among other measures, Act 26-2017 requires all marginal benefits to be the same for all employees of the Government of Puerto Rico including all public agencies, instrumentalities and public corporations such as PRASA. Under the Act some payroll benefits are also reduced.

The Oversight Board shall oversee the development of budgets and fiscal plans for Puerto Rico's Central Government and its instrumentalities, including PRASA. Also, it may issue subpoenas, certify voluntary agreements between creditors and debtors, seek judicial enforcement of its authority, impose penalties, and enforce territorial laws prohibiting public sector employees from participating in strikes or lockouts. PROMESA also provides Puerto Rico's Government and its instrumentalities two distinct restructuring tools to address the island's fiscal crisis known as Title III and Title VI. Title VI of PROMESA focuses exclusively on restructuring the financial debt and relies on a voluntary group action mechanism to bind dissenting creditors to the agreement of the debtor and requires a supermajority of its creditors to restructure the debt. Whereas Title III of PROMESA is an in-court proceeding that follows a similar framework as a municipality bankruptcy under Chapter 9 of the Bankruptcy Code but is broader in scope.

PRASA's Revised Fiscal Plan dated August 1, 2018, which covers the forecast period from FY2018 through FY2023, was developed to ensure compliance with PRASA's mission. That is, the provision of quality water and sewer services at an affordable cost to its customers. As presented: "PRASA's Revised Fiscal Plan provides for a safe, reliable and high-quality drinking water and wastewater treatment services to its customers to comply with federal environmental regulations, protect public health, safeguard environmental quality, and avoid potential penalties and criminal charges. It also provides for the required investment for the necessary infrastructure to ensure compliance with required standards while promoting much-needed economic growth throughout the island, the timely execution and implementation of its measures, and PRASA's long term financial self-sustainability." In an effort to pursue the above-mentioned vision and achieve the long-term fiscal sustainability, PRASA's has identified three key focus areas: 1) reduction of Non-Revenue Water (NRW), 2) Capital Improvements Program (CIP) oriented towards preserving and improving water quality and 3) resiliency improvements to reduce infrastructure vulnerability against natural disasters, guaranteeing revenue stability and reducing operating expenses.

PRASA's Revised Fiscal Plan includes: 1) a summary of the current financial situation and the actions already being taken by PRASA to improve its revenues, better control its expenses, fund the CIP and meet all debt service obligations; 2) baseline financial projections to present the initial financial need if no action is taken; 3) key efforts and new initiatives to reduce the estimated financial need (gap); 4) the governance and implementation of PRASA's Revised Fiscal Plan; and 5) key risks and mitigation strategies to ensure the execution of a viable fiscal plan.

In the aftermath of the September 2017 hurricanes PRASA worked diligently to restore service to its customers and in the assessment of damages. Resulting from this endeavor, $769M in estimated cost for damages to their assets as included in PRASA's Revised Fiscal Plan. Besides the physical damages impact to the assets owned by PRASA, the hurricanes also adversely impacted PRASA's finances, including $340M in revenue reduction and $265M in incremental expenses.

PRASA's six-year CIP has been restructured to optimize the use of FEMA funding and to ensure consistency with PRASA's long-term goals, and was updated to: 1) incorporate the impact of Hurricanes Irma and María, assuming assets will be restored to the prior-hurricane condition; 2) reflect a 25% reduction in investment related to the elimination and postponement of projects, as well as adjustments performed to original estimates and timing; 3) reprioritize non-regulatory compliance projects to give higher priority to efficiency projects; 4) further extend regulatory compliance timeframes so that PRASA can better coordinate capital spending to achieve other outcomes within the timeframe; and 5) address long-term infrastructure rehabilitation and replacement by increasing the amount of investment in capital renewal including buried infrastructure.

E.3. Organizational Updates and Changes

PRASA is organized into five operational Regions (North, South, East, West and Metro) and is managed by an Executive Management Team that provides the day to day management oversight and coordination for all institutional activities. It is supported by various departments in the organization including, but not limited to finance, human resources, customer services, purchasing and logistics, and information systems.

The current organization has been able to operate, manage and maintain the System, despite recent major challenges. Key PRASA leadership includes its Executive President, Strategic and Corporate Planning Vice President, Operations Vice President, Administration Vice President and Infrastructure Executive Director, as well as the five Regional Executive Directors and Department Directors.

The following material changes were reported by PRASA during FY2018 and the first quarter of FY2019 regarding its organization and changes in leadership and management: Mr. Yoniel Arroyo resigned as Vice-President of Administration effective May 4, 2018 and Keralia Moreda, Esq. was appointed as Interim Administration Vice-President; Eng. Roberto Guzmán resigned his position as Executive Director of the East Region under the Voluntary Pre-Retirement Program and Eng. Enrique Rosario was appointed as Interim Executive Director; Mrs. Glorimar Chiclana was appointed as Human Resources Interim Executive Director to replace Mrs. Aida Márquez, who was appointed as Executive Assistant.

PRASA's Governing Board, as restructured following Act 68-2016, is composed of eight members, which include:

- Four independent directors appointed by the Governor of Puerto Rico, comprising of:
    - One engineer licensed to practice in Puerto Rico with ten years of practice experience
    - One authorized legal advisor with at least ten years of experience in Puerto Rico and admitted to practice in the Government
    - One member with a wide knowledge and experience in the field of corporate finance

  - One professional with expertise in any fields related functions delegated to PRASA
- One AAFAF representative as per Act 2-2017
- One private citizen representing the Authority's customers
- Two ex-officio members, the Executive Director of the Association of Mayors and the Executive Director of the Federation of Mayors

Note that currently, PRASA's Governing Board has two consumer representatives since they were selected prior to the enactment of Act 68-2016 and their current term expires on June 2020. The consumer representative is elected for a three-year term through a public selection process under the jurisdiction of and directed by the Puerto Rico Department of Consumer Affairs. Board members serve staggered terms: two members shall hold office for five years and two members for six years. As the terms of office of the four Board members appointed by the Governor expire, the Governor shall appoint their successors following the same candidate identification mechanism. None of the members appointed by the Governor may hold such office for more than three terms.

The following material changes as it relates to PRASA's Governing Board were reported by PRASA during FY2018 and the first quarter of FY2019: Hector J. del Río Jiménez, Esq. replaced Mr. Reinaldo Paniagua, as President of the Governing Board, Mr. Gerardo Lorán Esq. named as Interim Vice-President, and three of the four vacant Directors position were appointed. One remains vacant (Independent Director with expertise in any fields related functions delegated to PRASA).

In FY2018, PRASA's customer accounts per employee ratio (466) remained within the industry's range and improved to above the median (447); this can be attributed to the reduction of staff by 7.8%. Although PRASA has reduced staff levels below the optimum staffing level stipulated by the Executive Management Team, its staffing mix is not yet optimal. For example, PRASA continues to struggle to fill key staffing needs in the Operations Department (i.e. operators for treatment facilities, system maintenance personnel and meter readers). PRASA must consider the impact of the employee retirement programs and population migration which will continue to affect not only its existing staff, but also its ability to recruit capable replacement workforce. Filling certain vacant position could help PRASA reduce overtime costs and address System Operation and Maintenance (O&M) needs. To the extent that PRASA is able to accelerate its staff management plan, additional cost efficiencies could be achieved.

PRASA's Executive Management Team continues to work on the revision of an updated Strategic Plan that is aligned with and supports the objectives included in PRASA's Revised Fiscal Plan and in the Government of Puerto Rico's "Plan para Puerto Rico". Key Performance Indicators (KPIs) and metrics are also under revision.

E.4. Condition of System

PRASA owns a large variety of assets, including land, buildings, dams, wells, water and wastewater treatment facilities and pump stations, ocean outfalls, buried infrastructure, vehicles, equipment, and water meters. During FY2018, Arcadis assessed the condition of PRASA's System through an inspection program that included a selection sample of the major elements of the System. The purpose of these assessments was to identify the overall condition of the facilities to determine if they were being operated and maintained in a manner to achieve their operating goals, and to evaluate if PRASA's CIP is aligned

with identified needs. Facilities were rated based on their condition as unacceptable, poor, adequate, or good.

Due to the massive impact caused by Hurricanes Irma and María, in lieu of the typical asset condition assessment performed in previous years, Arcadis visited all water treatment plants (WTPs), active raw water intakes (RWIs) and wastewater treatment plants (WWTPs) to perform damage assessments of the facilities. These assessments were conducted from October 2017 thru December 2017. Subsequently, Arcadis also evaluated the compliance performance results for all PRASA WTPs and WWTPs for the period of January 2017 through December 2017. In addition, between February and May of 2018 Arcadis performed asset condition assessments of all the regulated dams as well as a sample of auxiliary facilities (about 7% of wells, tanks, and pump stations). In total, 415 facilities were assessed out of the 3,958 facilities that comprise the System.

On average, the condition of PRASA's regulated dams is rated as adequate. However, the Cidra dam, was degraded to poor. Cidra, is utilized by PRASA as a raw water source and represents a high hazard in the event of an uncontrolled release of impounded water or in the ability to provide constant quality drinking water. Las Curías dam which had improved to adequate in 2016, dropped to poor, due primarily to excessive vegetation on the embankments and abutments, excessive aquatic vegetation in the reservoir, seepage along the downstream slope, and the gate in the outlet works tower that was stuck open. PRASA's dams weathered Hurricane María from September 2017 without major damage, although several experienced downstream erosion and material sedimentation, reducing their storage capacity. Therefore, it is recommended to perform underwater inspections at several dams, such as Loíza, La Plata, and Toa Vaca to investigate for scour at the concrete/foundation rock contact or stilling basin. Finally, addressing the priority items indicated in PREPA's inspection reports and the additional observations made by Arcadis included in the asset conditioning report, could give the dams a higher level of safety, and would help maintain the physical conditions of the structures so that they can continue serving the water supply system needs.

PRASA operates 113 WTPs where it treats raw water from reservoirs, rivers, and groundwater, to produce potable water for its customers. The WTP facilities range in size from several thousand gallons per day up to 100 million gallons per day (MGD). The total potable water production from WTPs for FY2017 and FY2018 was approximately 455 MGD and 466 MGD, respectively.

In FY2018, as agreed with PRASA, the WTPs and WWTPs were not evaluated following the approach used by Arcadis in past asset condition assessments. Instead the post-Hurricane María damage assessments were used to provide an opinion of the state of these assets. Facilities were rated based on the damage cost estimates with values ranging to indicate a High (Over $5M), Medium (Between $1M to $5M) or Low (Under $1M) level of damages. A total of 114 WTPs (including the now closed Vega Baja Urbana WTP) were inspected. Three WTPs, Santiago Vazquez (Superaqueduct) WTP (North Region), Santa Isabel (Utuado) WTP (North Region) and Sergio Cuevas WTP (Metro Region) suffered High levels of damages estimated at $12M, $5.8M and $5.5M, respectively. Another nine WTPs suffered Medium level of damages. The WTPs of the North Region were impacted the most with damages estimated at about $30M, followed by the East Region with $17M, then the Metro Region with $11M, and finally the South and West Regions with $8M and $6M, respectively. Regarding the compliance criteria of the 114 WTPs evaluated, 85 (74.5% of all WTPs) were rated as good overall, 28 WTPs (24.5% of all WTPs) were

rated as adequate and one WTP (1% of all WTPs) was rated as poor. No facility was rated as unacceptable.

PRASA should continue to standardize processes and provide additional tools and training to operators regarding process controls and actions to facilitate and improve plant operations and performance, as well as, optimize O&M expenses. Also, PRASA should consider operational improvements including new process equipment and process automation considering that operators continue to depend on manual operations for several processes, a practice that has been found to be inefficient.

PRASA currently operates 51 WWTPs. The facilities range in size from several thousand gallons per day up to 80 MGD. The island-wide design treatment capacity is approximately 403 MGD and the treated wastewater for FY2017 and FY2018 was approximately 220 MGD and 206 MGD, respectively. In level of treatment, PRASA has seven plants designed to provide tertiary or advanced treatment, 38 plants are designed to provide secondary treatment, and the remaining six facilities (which account for 230 MGD of treatment capacity) provide primary treatment only under existing 301 (h) waivers with the United States Environmental Protection Agency (USEPA). All 51 WWTPs were inspected between October and December 2017 as part of the recovery efforts for asset damages. Only one WWTP, Humacao WWTP had a High level of damages ($9.8M); while 19 WWTPs had Medium level of damages. The WWTPs of the East Region were the most impacted with damages estimated at about $26M, followed by the North Region with $19M, then the West Region with $11M and finally the South and Metro Regions with $7M and $6M, respectively.

Arcadis identified at least six WWTPs that were affected by significant flooding due to their location in flood susceptible areas. These are: San Sebastián WWTP (West Region), Dorado WWTP (North Region), Toa Alta WWTP (North Region), Ciales WWTP (North Region), Corozal WWTP (North Region) and San Sebastián (Old) WWTP (West Region). The entire extent of the damages on these facilities could not be captured because of the lack of emergency power generators to test the equipment when the visits were performed, but it is reasonable to assume that most of the equipment that was flooded was either damaged or their operational life expectancy was reduced. In addition to the previously mentioned facilities, the Guayanilla WWTP (South Region) suffered a landslide due to its proximity to a river which eroded part of the perimeter fence. The Camuy-Hatillo WWTP (North Region) was also affected by significant erosion caused by rising ocean’s tides. This facility is of concern because the erosion is advanced and if not addressed promptly, some of the treatment units may suffer material damages.

Regarding compliance criteria, the overall rating decreased significantly since the previous inspection. Of the 51 WWTPs evaluated, 19 WWTPs (37% of all WWTP) were rated as good, 30 WWTPs (59% of all WTPs) were rated as adequate and two of the WWTPs (4% of all WTPs) were rated as poor. No facilities were rated as unacceptable.

Future regulations may require additional capital improvements to comply with more stringent levels of NPDES discharge parameters as per new WWTP’s NPDES permits based on Water Quality Certificate and agreements in the 2015 USEPA Consent Decree, e.g. stricter residual chlorine fecal coliforms parameters for WWTPs with ocean outfalls and phosphorous and nitrogen limits. At the issuance process for an updated NPDES permit, PRASA is requesting interim limits for nitrogen and phosphorus limits until the capital project(s) for said facility are completed. Project completion terms are subject to the prioritization system, availability of funds, and reactivation of PRASA’s CIP. The effects of these and other future regulations will not be known until PRASA performs data collection and studies to determine what,

if any, additional CIP projects will be needed. Notwithstanding the impact of future regulations, capital improvements are needed to modernize PRASA's infrastructure, prevent further deterioration, protect public health, safeguard environmental quality, allow continued economic development and help bring the System into sustained compliance with all regulatory requirements.

PRASA owns and operates over 3,000 ancillary facilities. There was a decrease in the overall score for water storage tanks, water pump stations (WPSs) and wells compared to 2017 results. A three-year inspections trend shows continuing deterioration of the condition of these assets that will continue if CIP or R&R investments are not made. Similarly, the WPSs and water storage tanks decreased in overall score from 2017, receiving a significant lower rating this year. While there was no scoring change for wastewater pump stations (WWPSs) compared to 2017, rating continues to be in the lower end of adequate. Furthermore, 40% of the visited WWPSs have recorded overflows during the evaluation period. Prompt identification and actions enabled by remote monitoring should help PRASA mitigate overflows in the System, and adding pre-treatment (screens, comminutors) to WWPS which receive vast amounts of solids would help lessen overflows by preventing clogging. Notwithstanding, most of the deficiencies noted can be addressed through PRASA's R&R program and may not require major capital improvements. Note, however, that implementation of PRASA's R&R program also depends on PRASA's ability to identify and obtain funding sources. In addition, future regulatory requirements may require either the implementation of significant capital improvements to include and achieve additional treatment capabilities at well facilities, or the closure of certain wells.

As the System normalizes and funding sources are identified, PRASA expects to continue with its efforts to improve leak detection and monitoring practices and aggressively address leak occurrences to reduce its volume of non-revenue water (NRW). PRASA continues conducting periodic water audits which are used to implement the necessary controls and develop action items to address NRW. This has helped drive the reduction in the volume of water production, water losses, and in NRW reported by PRASA. Since FY2012, PRASA's NRW levels have declined. In FY2018, of the total 507 MGD produced, approximately 314 MGD was NRW (62.1%). Of this amount of NRW, 308 MGD (98.1%) was due to water losses (both apparent and real) and 6 MGD was due to unbilled authorized consumption. Of the total amount of water losses in FY2018, approximately 40 MGD (13%) was due to apparent (commercial) losses, while approximately 268 MGD (87%) was due to real (physical) losses.

Some of the actions and projects to be implemented by PRASA to achieve additional reductions in NRW and water losses as included in PRASA's Revised Fiscal Plan are: 1) the Public Private Partnership (P3) project for metering system modernization and customer service optimization and enhancement; and 2) Physical Losses Reduction initiatives. Furthermore, the provision of meters to measure the water discarded as part of the System's programmed drains will allow PRASA to separate that water from the actual NRW from unbilled authorized consumption, commercial (apparent) losses and physical (real) losses. Nevertheless, significant capital investments and R&R funded budgets are required to accelerate the NRW program and address leak occurrences in both a corrective and preventive manner. Furthermore, PRASA is currently redefining the NRW goals and metrics.

PRASA's goal is to reduce the System's total water production per year down to 450 MGD by FY2020. Also, in compliance with Act 68-2016, by FY2019 PRASA must reduce its NRW volume by 5% or 15 MGD as compared to FY2016.

The number of sanitary overflows continues to be high compared to U.S. benchmarks. PRASA has continued to improve its response time and attention/repair effectiveness to minimize the duration of these overflow events and their environmental impact. PRASA intends on implementing sanitary sewer evaluations and repair plans to reduce levels of infiltration and inflow (I/I) that must be treated in their WWTPs when funds becomes available. The progress of this initiative has been affected as well by the ongoing fiscal situation.

E.5. O&M Practices and Strategic Plan

Arcadis assessed the adequacy of PRASA's O&M practices based on compliance with regulatory requirements, interviews with PRASA personnel, and facility observations by field inspectors obtained through the 2018 asset condition assessment effort previously described. In addition, data was gathered as part of the damage assessment conducted between October 2017 and May 2018, during the recovery efforts after the 2017 hurricanes. Overall, Arcadis found PRASA's O&M practices to be adequate. However, process control continues to be a challenge in treatment facilities.

Although, Hurricane María impacted PRASA's infrastructure, most of the facilities have been brought back to operational status and, in the short term, continue to serve their intended purpose of providing potable water supply and treating wastewater. Furthermore, the 2017 hurricanes have affected the conditions of PRASA's facilities and so it becomes more imperative that projects necessary to address the damages and improve conditions are implemented to guarantee the production of safe drinking water and treatment of wastewater in compliance with applicable regulations.

PRASA's FY2018 O&M expenses prior to expected reimbursement from the September 2017 hurricanes is approximately $867M, of which $779M are directly related to the O&M of the System. The other $88M were related to commercial activities and provision of customer services, including but not limited to staffing and operation of customer service offices island-wide; meter reading; connection and disconnection services; invoice preparation, printing and distribution; customer service call centers; and water meter purchases, amongst others. PRASA estimates that during FY2017 approximately 73% of its System O&M budget ($569M) was allocated to the water system and the remaining 27% ($210M) to the wastewater system. As presented in Table ES-1, PRASA's FY2018 O&M budgets are favorably comparable to the median benchmark results published by the American Water Works Association in 2018[1].

Table ES-2 presents a summary of PRASA's KPIs goals and results. In FY2018, PRASA achieved a compliance score of 29% of its KPIs on an island-wide basis. As previously mentioned, PRASA had a challenging year as a consequence of Hurricanes Irma and María. Considering that most of PRASA facilities are PREPA dependent for electrical power, the collapsed power and communication system posed a major challenge for PRASA to restore and sustain operations, let alone achieve KPI targets. This effect is reflected on the results for almost all Fiscal Health, Operational Efficiency and Organizational Transformation KPIs. Overtime, budget compliance, billings vs. collections, quality compliance, billing adjustments, vehicle availability, repair time for equipment, leaks and overflows, preventive vs. corrective maintenance ratio, employee training, absenteeism and complaints in customer service (per 1000 active

[1] Source: 2017 AWWA Utility Benchmarking: Performance Management for Water and Wastewater.

accounts), are amongst the KPIs directly impacted by the recent Force Majeure events. These are key areas that PRASA should continue to work on going forward.

Table ES-1. PRASA Metrics vs. Water/Wastewater Utilities Benchmarks

Benchmark Category	2017 AWWA Benchmarks[1]			PRASA[2]
	Top Quartile	Median	Bottom Quartile	
Water O&M Cost per Account	$305	$461	$673	FY2010: $292 FY2011: $309 FY2012: $321 FY2013: $357 FY2014: $350 FY2015: $338 FY2016: $315 FY2017: $319 FY2018: $461
Water O&M Cost per MG Processed	$1,869	$2,437	$3,443	FY2010: $1,555 FY2011: $1,702 FY2012: $1,777 FY2013: $1,991 FY2014: $1,993 FY2015: $2,061 FY2016: $2,100 FY2017: $2,100 FY2018: $3,074
Water O&M Cost per 100 miles of pipe	$2,110,898	$2,791,010	$4,256,500	FY2014: $2,948,365 FY2015: $2,840,100 FY2016: $2,639,588 FY2017: $2,652,680 FY2018: $3,855,281
Wastewater O&M Cost per Account	$258	$355	$508	FY2010: $214 FY2011: $225 FY2012: $236 FY2013: $199 FY2014: $192 FY2015: $184 FY2016: $198 FY2017: $194 FY2018: $275

Benchmark Category	2017 AWWA Benchmarks[1]			PRASA[2]
	Top Quartile	Median	Bottom Quartile	
Wastewater O&M Cost per MG Treated	$1,484	$2,298	$3,482	FY2010: $1,949 FY2011: $2,067 FY2012: $2,151 FY2013: $1,692 FY2014: $1,628 FY2015: $1,646 FY2016: $2,106 FY2017: $1,848 FY2018: $2,798
Wastewater O&M Cost per 100 miles of pipe	$1,821,849	$2,593,715	$3,542,244	FY2014: $2,418,931 FY2015: $2,335,669 FY2016: $2,526,535 FY2017: $2,745,356 FY2018: $3,509,624

[1] Source: 2017 AWWA Utility Benchmarking: Performance Management for Water and Wastewater.
[2] Includes total operation and maintenance costs, less depreciation and costs related to customer (commercial) services. PRASA reported values include payroll and related, power, chemicals, Superaqueduct O&M contract fee, insurance and other expenses, less capitalized operating expenses.

Table ES-2. FY2018 KPI Goals and Results

Strategic Plan Initiative	Key Performance Indicator	FY2018 Goals	Results as of June 2018
Fiscal Health	Employees per Connection	3.34 or less Employees per 1,000 connections	2.21
	Overtime	Reduce to 7% or Below	11.1%[6]
	Budget Compliance (Excludes Electricity Costs)	Below 100%	101.5%[6]
	Collection vs. Billings	Increase to 96% or Above	81.2%[6]
Operational Efficiency	Compliance - Water System	Increase to 99% or Above	98.4%[6]
	Compliance - Wastewater System	Increase to 97% or Above	95.0%[6]
	Billing Adjustments	Reduce to 2% or Below	6.0%[6]
	Complaints in Customer Service (per 1000 Actives Accounts)	Reduce to 16.7 or Below	14.0
	Monthly Average of Customers with Service Interruptions (as a Percentage of Total Customers)[1]	Reduce to 5% or Below	35%[6]
	Customer Service Attention Time (Commercial Office)	Maintain below 30 min.	27:06 min
	Vehicle Availability	Increase to 92% or Above	62.0%[6]
	Average Processing Time of Purchase Orders[2]	Less than 40 days	-
	Preventive vs. Corrective Maintenance Ratio	Increase to 80%	75.5%[6]
	Average Time for Equipment Repairs	Less than 25 days	39.54 days[6]
	Reported Leaks	Reduce to 4,598 monthly	3,769
	Reported Overflows	Reduce to 2,298 monthly	1,948
	Repair Time for Leaks	Reduce to 53.0 hrs.	108.2 hrs.[6]
	Repair Time for Overflows	Reduce to 32.0 hrs.	60.4 hrs.[6]
	Average Water Production (MGD)[3]	Reduce to 505 MGD	507 MGD

Strategic Plan Initiative	Key Performance Indicator	FY2018 Goals	Results as of June 2018
	Percent of NRW[3]	Reduce to 53.2%	62.1%
Infrastructure and Sustainability	Energy Consumption (Annual)[2]	Reduce to 660.34 MkWh	-
	Project Progress (CIP)[4]	Greater or equal to 0.9	-
	Cost Performance (CIP)[4]	Greater or equal to 0.9	-
Organizational Transformation	Training (Cumulative Hours per Employee)[5]	More than 25 hrs. per year	9.2 hrs.[6]
	Unplanned Work Effectiveness (Absenteeism)	Reduce to 2 days	2.57 days[6]
	Planned Work Effectiveness	Reduce to 10%	2.2%

[1] The Monthly Average of Customers with Service Interruptions (as a Percentage of Total Customers) does not include the first two quarters of FY2018 to exclude the service interruptions due to Hurricanes Irma and María. Also, this indicator was not evaluated for the first three months of FY2016 due to the rationing plan in effect during these months.
[2] This KPI was not measured or available due to the impact of Hurricane María.
[3] The Percent of NRW KPI is only measured annually and island-wide.
[4] Due to the suspension of the CIP, the Project and Cost Performance KPIs for FY2018 are not being measured.
[5] This KPI does not include the first two quarters of FY2018 to exclude impacts due to Hurricanes Irma and María.
[6]These KPIs results were all adversely impacted by the 2017 hurricanes.

PRASA's Operational Initiatives are well developed and address critical aspects of PRASA's operation such as NRW, operational efficiency, and revenue stream diversification. During FY2018, PRASA's main O&M efforts and practices were focused on the reestablishment of the System in the aftermath of Hurricanes Irma and María. FY2018 O&M investments and key PRASA initiatives have been delayed by PRASA's ongoing fiscal situation and have either fallen behind on their intended implementation schedule, have been postponed indefinitely, or were cancelled by PRASA. PRASA must prioritize efforts to reactivate other initiatives, such as the Comprehensive Energy Management Program and must continue to identify and implement further optimization opportunities that can provide increased revenues and cost savings.

E.6. Capital Improvement Program and Regulatory Compliance

PRASA has developed a CIP to improve and maintain its water and wastewater infrastructure. The CIP's main objectives are to maintain, modernize and simplify the Systems to achieve operational efficiency; protect public health; and safeguard environmental quality while enabling continued economic development and meeting all regulatory requirements. The CIP is a dynamic program that evolves and undergoes revisions as needs and sources of funds are identified, and as projects transition from planning to design, construction and startup phases. In the past, the CIP has been funded with external financing from bond issuances and federal assistance in accordance with standard utility financing practices. Bond financing of long-term capital improvements is consistent with PRASA's mission and results in lower, more affordable water rates than would be possible if these investments were to be paid

on a current basis (i.e., from Operating Revenues). Between 2005 and 2016, PRASA invested approximately $3.7 billion in its CIP, with the intention of bringing the System into compliance and catch-up with capital needs that had been lacking in prior years. PRASA's Revised Fiscal Plan and public policies endorsed by its Governing Board include a tapered transition of financing the CIP with bonds to partially self-financing from PRASA revenues. PRASA's CIP includes projects that cover major capital improvements identified throughout PRASA's five Operational Regions as well as island-wide initiatives such as technological advancements, telemetry, preventive maintenance, meter replacement, R&R to the System and Emergency/Permanent Work projects identified under the recovery efforts after the 2017 hurricanes.

As of today, PRASA's CIP continues on hold, except for some R&R projects and the initial bidding of some emergency projects. Given the delays in the issuance of new revenue bonds and the resulting suspension of the CIP projects, PRASA accumulated an outstanding debt of more than $150 million owed to its CIP contractors and suppliers. As of June 2018, outstanding debt with contractors had been reduced to approximately $6M and as of the date of this Report, PRASA paid off all outstanding payments due to contractors and consultants. The suspension of CIP projects may have both a short and possible long-term effect on PRASA and Puerto Rico's economy. There is a strong concern that the lack of capital investment will lead to short-term infrastructure degradation impacting the O&M expenses, which could lead to a critical situation. Also, PRASA could once again be subject to significant non-compliance events with regulatory mandates or administrative orders and increasing construction costs. In the long-term, the cost of capital projects may also increase as vendors may price-in the risks associated with delays in payment or non-payments to contracted projects.

As required by PRASA's Governing Board, PRASA's Infrastructure Department must annually submit for its approval an updated five-year CIP plan. However, PRASA's Revised Fiscal Plan includes a modified six-year CIP covering the planning period from FY2018 through FY2023 which includes all adjustments resulting from negotiations with Regulatory Agencies, Emergency/Permanent Work projects, and the necessary investment to reflect PRASA's infrastructure current needs to ensure adequate operation and sustainability of the System. Therefore, CIP discussions presented in this 2018 CER refer to the six-year CIP as included in PRASA's Revised Fiscal Plan certified in August 2018. The approval and execution of this six-year CIP is contingent upon funding availability and allocation.

CIP projects, as recently redefined in PRASA's Revised Fiscal Plan, are classified into the following mandatory and non-mandatory categories: Mandatory Compliance (2015 USEPA Consent Decree projects, 2006 PRDOH Drinking Settlement Agreement projects, Civil Actions, Administrative Orders, and other mandatory projects); Non-Mandatory Compliance; Non-Mandatory Renewal and Replacement; Non-Mandatory Quality and Growth; Non-Mandatory Other; Non-Mandatory Structure. Projects are further classified as either water or wastewater system projects. Water system projects include projects for improvements or construction of new facilities regarding water supply, water distribution, WTPs, WPSs, water storage tanks, amongst others. Wastewater system projects include projects for improvements or construction of new facilities regarding wastewater collection, WWTP, WWPSs, amongst others. In addition to project classification, CIP projects are ranked according to a prioritization score. This score is the result of the weighted sum of the evaluation criteria adopted in PRASA's Master Plan and negotiated with Regulatory Agencies. Four main criteria were selected to prioritize CIP projects: Regulatory Compliance (40%), Quality of Service and Reliability (30%), Operational Efficiency and Improvements (20%), and Population Impacted by Project (10%).

The implementation schedule of future projects, currently not included in PRASA's six-year CIP, will be subject to the prioritization system and PRASA's financial capacity. PRASA has also indicated that upon reactivation of the CIP, they will pursue immediate restoration of all infrastructure damaged by the 2017 hurricanes, address needs to assure continued compliance with Regulatory Agencies, and reactivate projects that were in construction but were suspended in 2016.

PRASA's complex and large System requires significant investments to maintain the condition of its infrastructure. The six-year CIP for FY2018 through FY2023, as included in PRASA's Revised Fiscal Plan, amounts to $1,966.5M.

PRASA's six-year CIP consists of a total of 390 projects. As of August 1, 2018, 22% of the projects have not started, 71% are in the pre-construction stage (planning, design and bid), and 3% are in the construction and/or closeout stages but were interrupted by the suspension of the CIP. The remaining 4% are projects already in operation. Also, PRASA has identified a total of 157 projects under the Emergency/Permanent Work category that shall have priority once the CIP is reactivated. Out of these 157 projects, there is an island-wide project that includes budget to account for those facilities that were impacted by the 2017 hurricanes, but no assessment or cost estimates had been developed by the time of the CIP approval. This project will eventually result in several projects once additional assessments and studies are performed. In addition, PRASA identified a total of 31 projects that shall also have priority. These include 18 terminated construction projects and 13 other critical projects that were either in the planning, design or bid phases during the suspension of the CIP. As stated by PRASA, the execution and reactivation of the CIP will not take place until the debt renegotiation or appropriate funding is identified.

The planned CIP along with the O&M initiatives are generally in alignment with the System needs. However, there may be additional R&R and CIP needs to address: 1) buried infrastructure improvements including, but not limited to, additional wastewater collection system repairs or improvements that PRASA may be required to implement to bring these into compliance, and 2) future regulations that may impact PRASA's System. The impact of these future regulations may require significant operational and capital investments. As the impact of future regulations becomes more defined, CIP modifications will be required to adequately accommodate resulting needs.

In FY2015 the last two tasks of the Master Plan Update were completed; Task 3: CIP Reconciliation, and Task 4: Prioritization and Scheduling. PRASA's objective was to gather the resulting projects from the Master Plan Update and consolidate it with the CIP. Furthermore, PRASA's intention is to continuously revise the Master Plan to maintain its CIP updated with and in alignment with the System needs. Additional modifications to PRASA's Master Plan may be warranted as conversations with Regulatory Agencies continue, additional regulatory requirements and needs arise, and PRASA Systems' needs change. Key recommendations from the Master Plan are included in the six-year CIP.

Finally, as reported on previous CERs, PRASA completed a Vulnerability Study and Adaptation Plan for its entire infrastructure in compliance with the February 2013 Executive Order signed by the Governor of Puerto Rico at the time. The Climate Change Vulnerability Study findings and the strategies selected in the Adaptation Plan shall be further assessed and CIP projects shall then be developed. These projects will follow the same guidelines set in the prioritization system. Currently, PRASA's six-year CIP does not include projects or studies for addressing identified climate change vulnerabilities or adaptation actions.

E.7. Insurance Program

To meet the requirements of the MAT as it relates to PRASA's insurance program, Arcadis reviewed PRASA's current insurance coverage and determined its adequacy considering the type and value of PRASA's fixed assets. Also, provided are some outstanding recommendations to PRASA's insurance coverage from a previous evaluation made by MARSH Saldaña, Inc. (MARSH) and validated or commented on by AON, PRASA's Broker of Record (BOR) in FY2016. The BOR for FY2017 and FY2018, Lone Star Insurance Producers, LLC (Lone Star), was consulted to verify if the recommendations were addressed in the policy renewals or if they were not adopted. For the incoming fiscal year (FY2019) PRASA has decided to change its BOR from Lone Star to Goas & Associates, Inc (GOAS). They were consulted as well to verify if the recommendations were addressed in the FY2019 policy renewals.

Furthermore, the policies for FY2019 have suffered changes, in some cases significant changes in coverage and primarily in premiums (Property Insurance), as an effect of the upshot of the 2017 hurricanes. Besides Irma and María, insurance companies may have dealt with other catastrophic events impacting the Caribbean and the United States, as last hurricane season was extremely active. The vast damages and losses suffered by the insured has, in turn, directly impacted the insurance market. Therefore, the tendency on the insurance market has been for providers to increase their premiums and have stricter subscription guidelines and risk assessments.

As previously indicated, Puerto Rico was devastated by Hurricanes Irma and María, and then hit again with an extreme rain event. Consequently, PRASA was adversely impacted and implementation of the Property Insurance Policy was warranted and put forth. After performing a preliminary assessment of damages, PRASA estimated damages at approximately of $769M. When considering the Business Interruption (Revenue Reduction) and incremental expenses components, the estimates increase to approximately $1.4B without including resiliency or build back better projects. PRASA is in the process of finalizing the full assessments and estimates of damages for all assets in order to present the Insurance claims. PRASA is performing these assessments for three 2017 events, Hurricane Irma, Hurricane María and post hurricane heavy rains. PRASA can claim up to the limit of $300M for each event. The claim amounts would be verified, accepted, or adjusted by the Insurance company. As a result and triggered by the claims resulting from the damages caused by the 2017 hurricanes there are significant changes to the FY2019 Property policy coverage and premiums. The only local insurance company to participate in this policy was MAPFRE, to pursue better probabilities for similar coverages the account was placed in the London markets (International). The result was a 42% participation by MAPFRE and 58% by London and International Markets. The premium for coverage under this policy tripled, increasing to $16,112,931. The market cited the recent losses, damages, actual state of the infrastructure and the uncertainty of actual values, as well as the indeterminate value and risk exposure of underground assets as reasons for the dramatic increase. Besides the increase in premium, another important change in the Property Policy is that the deductible quadrupled to $100M, which makes the deductible 33% of the total claim that can be reimbursed by the Insurance compared to the 8% figure in the FY2018 Property Policy. In addition, the definition for Flood in the first layer changed to exclude damages by "wind driven water". Finally, the $25,000 deductible for the "Boiler and Machinery" is eliminated and is subject to the $100M Policy deductible.

In the opinion of Arcadis, the insurance program covering PRASA's exposures to risks of accidental property and liability losses arising from on-going operations provides reasonable coverage. However, several recommendations to PRASA's insurance program are provided.

Particularly, PRASA should address the following key recommendations:

1. Conduct a PML Study considering new CAT Modellings and parameters, especially after the lessons learned in the aftermath of the 2017 hurricanes.
2. PRASA should consider establishing a fund to cover possible financial losses from any future catastrophic or any non-catastrophic, peril that might affect infrastructure and operations and, therefore, impose an unexpected financial burden.
3. Consideration to Cyber Security Coverage, which is excluded under all current PRASA's Insurance Programs. Also, complete a self-assessment to determine potential areas of weakness as compared to international standards and to determine the potential frequency and severity of a breach.
4. Consideration to Terrorism Coverage, which is excluded under all current PRASA's Insurance Programs.
5. Consideration for the next Crime Policy renewal - the Knowledge or Discovery of Loss clauses should be renegotiated to specifically identify positions triggering knowledge of incidents, in order to minimize the risk of claim declines by the carrier for late reporting.
6. Consideration to broaden Drive Other Car coverage to include both Physical Damage and Medical Payments coverage.

E.8. System Assets and Financial Analysis

As of June 30, 2018, PRASA had an estimated total book value of fixed (capital) assets of approximately $6,766M. Additionally, PRASA has approximately $320.7M of assets that are identified as "Work in Progress". Including land and other non-depreciable assets, as of June 30, 2018, the book value of PRASA's total fixed assets amounts to $6,370M (net of accumulated depreciation).

Arcadis reviewed the financial information provided by PRASA as included in PRASA's Revised Fiscal Plan, which is summarized in Exhibit 1 and provided at the end of this Section. This section summarizes Arcadis's review and provides an assessment of PRASA's financial condition, particularly as it relates to assessing PRASA's financial preliminary results for FY2018 and the reasonableness of PRASA's assumptions in the preparation of the five-year financial projections (the forecast period or the Forecast) from FY2019-FY2023, to assess the sufficiency of the revenues necessary to support the projected operations and capital costs as shown in Exhibit 1; including O&M expenses, debt service payments, and required deposits in compliance with the MAT (as amended) and the 2012 FOA. Additionally, the Forecast illustrates the anticipated DSC, for the forecast period.

The following information, provided by PRASA, was reviewed:

- MAT and FOA, as amended and restated
- Sixth Supplemental Agreement of Trust
- PRASA's FY2018 preliminary financial results

- PRASA's FY2019 Annual Budget as amended and approved by PRASA's Governing Board on January 22, 2019 under Resolution 3105
- PRASA's Revised Fiscal Plan (dated August 1,2018), including revenue and expense projections
- Debt service schedules for all currently outstanding debt service and DSCs.
- The amount received and expected to be received from PRASA's insurance company and the Federal Emergency Management Agency (FEMA) as a result of the impacts from the 2017 hurricanes.

The Forecast presents PRASA's estimate of the expected results of operations and DSC for the forecast period. Thus, the Forecast reflects PRASA's judgment, based upon present circumstances, as to the most likely set of conditions and course of action. However, there will usually be differences between forecasted and actual results, because events and circumstances frequently do not occur as expected, and those differences may be material.

The Operating Revenues (presented on a cash basis as required by the MAT) include Service Revenues (net of subsidies), incremental revenues from the rate increase, adjustments for billings not collected accounts, revenues from operational initiatives including the Revenue Optimization Program, other sources of revenues such as interest income, developer fee contributions, fines, reconnecting charges, bulk water sales, new revenue from PRASA's Revised Fiscal Plan initiatives and Insurance reimbursement from revenue loss. Operating Revenues also include transfers to and from the Rate Stabilization Account but exclude funds from the Budgetary Reserve Fund, General Fund Grants/Appropriations/Contributions or special assignments from the Central Government.

The FY2018 preliminary projections totaled $952.7M. Operating Revenues are projected to range from $1,016.7M in FY2019 up to $1,192.1M in FY2023. This Forecast includes key assumptions including:

- Projected macroeconomics indicators provided by the Central Government. As of the Forecast period, PRASA included a reduction in Base Fee and Services Charges (net of subsidies) of 3.4% for FY2020 (considering the effects of the hurricanes) and an average reduction of 6% for FY2021 and thereafter;
- Impact of existing laws and subsidies;
- Adjustment for billing not collected accounts; and
- Additional revenues from PRASA's Revised Fiscal Plan Revenue Enhancing Initiatives.

The projected Operating Revenues for FY2018 through FY2023 include additional revenues to be generated from annual rate increases to be implemented in each year as required by the Oversight Board. PRASA expects to obtain a total of approximately $495.4M additional revenues by FY2023 from the annual rate increases. The following annual rate increase per customer type shall be applied effective January 1st, 2018 and every July 1st of each year thereafter through FY2022.

Table ES-3. PRASA's Revised Fiscal Plan Proposed Annual Rate Increase by Customer Type

Customer Type	Annual Rate Increase
Residential	2.5%
Commercial	2.8%
Industrial	3.5%
Government	4.5%

The Operating (Current) Expenses projections (presented on an accrual basis as required by the MAT), include Payroll and Benefits costs, as well as Electric Power, Chemicals, Maintenance and Repair, Insurance, among others. Expenses take into consideration the conditions of current labor legislation and the projected savings to be achieved from implementation of PRASA's Revised Fiscal Plan Expense Reduction Initiatives. Note that for certain expense categories, PRASA has assumed that expenses will increase year-over-year at an assumed rate of inflation. Following AAFAF's guidelines, PRASA has assumed that the inflation rate will be on average about 1.45% for the Forecast period (FY2019 through FY2023), that is from 1.5% in FY2019 to 1.4% in FY2023, as applied for the Government's Fiscal Plan and adopted by other agencies and public corporations. However, Puerto Rico's inflation rate during the last quarter of FY2018 remained above the FY2019 projected rate[2].

PRASA's preliminary Operational Expenses for FY2018, on an accrual basis and net of (i) capitalized expenses, (ii) PRASA's Revised Fiscal Plan expenses reduction initiatives, (iii) the impact of the 2017 hurricanes and (iv) expected FEMA reimbursements totaled $656M. Operating expenses are projected to range from $691.6M in FY2019 up to $665.1M in FY2023.

FY2018 senior and senior subordinated debt service obligations totaled $232.2M, of which $230.8M were senior lien obligations, and $1.4M were senior subordinated obligations. PRASA made payments for Commonwealth Guaranteed Indebtedness (CGI) debt based on the current forbearance agreements and did not make payments for Commonwealth Subordinated Obligations (CSO) debt. Total budgeted debt service payments as per current amortization schedules (currently under restructuring) were approximately $321.6M for FY2018 and PRASA paid $254.4M after eliminating the CSO payments and the reduction of the CGI debt service as a result of the forbearance agreements in place during the year, as explained below.

On June 30, 2016 PRASA entered into forbearance agreements with both (i) the United States Department of Agriculture (USDA) for the Rural Development Funds and (ii) the Puerto Rico Infrastructure Financing Agency (PRIFA), the Environmental Quality Board (EQB) and the Department of Health (DOH) (all three for the State Revolving Funds (SRFs)), which continue to be extended. The forbearance agreements grant PRASA a reduction of principal and interest on both programs of approximately $60M per year ($58.1M expected for FY2018), which was reduced from the total FY2018 CGI debt service leaving a balance to be paid in FY2018 projected at $22.3M. The payment of the balance owed since June 30, 2016 is expected to be included as part of a potential debt restructuring.

[2] Source: Trading Economics (https://tradingeconomics.com/puerto-rico/inflation-cpi/forecast)

No funds were deposited in the CSO Account during FY2018, and accordingly, no funds were transferred by PRASA to the Trustee of the PFC Bonds for the payment of debt service that was due on the PFC Bonds as this debt is payable solely from legislative appropriations. In FY2018, PRASA did not make any payments due under the Term Loan. However, this debt is payable from any Surplus Fund under the MAT. Finally, as communicated by the Trustee via letter dated December 5, 2018, as of November 30, 2018, the Commonwealth Payments Fund deficiency was approximately $136.1M. Nevertheless, such deposit and payment shortfalls are not considered to be an Event of Default under the MAT given that they are covered by the forbearance agreements. In FY2019, PRASA is projecting deposits to the Commonwealth Payments Fund to cover CGI debt in the amount of $81.7M, prior to the impact of the ongoing debt restructuring. In future years, PRASA is projecting deposits to the Commonwealth Payments Fund to cover CGI debt in the amount of $80.7M in FY2020 up to $88.0M in FY2023. This excludes any CSO debt payments due of $9M which PRASA has assumed will not pay going forward as it is a PFC debt.

Projected financial and DSC results are included in Exhibit 1 and reflect PRASA's Revised Fiscal Plan. The DSC results for the forecast period have been calculated using the Rate Covenant requirements per the MAT, as amended, and debt service obligations per amortization tables. Despite PRASA's projected additional revenues, cost savings, new federal funds, and proposed rate increases, the Forecast reflects a total deficit of $424.4M (FY2019 to FY2023). Annual deficits range from $28.6M in FY2022 up to $200.0M in FY2020. PRASA plans to bridge this gap with a debt restructuring and/or by identifying and securing additional revenue sources or financing.

While PRASA's Operating Revenues are projected to be sufficient to meet Senior Lien Debt service payments and meet Rate Covenant debt service coverage (DSC) requirements for Senior Lien Debt, PRASA's Authority Revenues are not sufficient to meet All Obligations per the MAT which include the payment of the CGI debt service obligations in full. Therefore, PRASA will not meet its Rate Covenant requirement of 1.0x coverage of its current obligations throughout the Forecast. To the extent that PRASA can re-negotiate and restructure existing debt obligations, its ability to meet the Rate Covenant requirements will improve. However, if this is not accomplished, PRASA will be forced to reduce its projected CIP investments or increase projected annual rate adjustments. Furthermore, PRASA must consider the overall sustainability and affordability of its rates given the overall economic situation affecting Puerto Rico and recent trends affecting customer consumption profiles.

PRASA is assuming that it will restructure part (or all) of its existing debt service to reduce obligations over the Forecast period. Because negotiations with bondholders both at the Senior lien level and with federal agencies (CGI level) are ongoing and confidential, at this time there is no additional information available to determine the reasonableness of this assumption.

The following events could have material negative effects on PRASA's Forecast which would further exacerbate PRASA's financial situation going forward:

- Lower revenues or savings achieved, or timeliness of PRASA's Revised Fiscal Plan initiatives.
- Higher impact from Hurricanes Irma and María on revenue, expenses or damages on PRASA infrastructure (continuing under revision and refinement by PRASA).
- Lower funding than expected from insurance or FEMA proceeds.

- Higher overtime expenses than currently planned as a result of further delays in filling vacant positions.
- Higher energy costs as a result of or higher PREPA electric costs (per kWh) and/or lower savings achieved through its Comprehensive Energy Management Program.
- Higher expense costs as a result of not eliminating the Christmas bonus or reducing the pension costs.
- Higher annual inflation rates.
- Higher capital costs due to lower supply of professional and construction workforce, and higher materials and parts costs.

E.9. Conclusions

In preparation of this Report and the conclusions contained herein, Arcadis has relied on certain assumptions and information provided by PRASA with respect to the conditions which may exist or events which may occur in the future. Arcadis believes the information and assumptions are reasonable but has not independently verified information provided by PRASA and others. To the extent that actual future conditions differ from those assumed herein or provided by others, the actual results will vary from those forecasts.

Arcadis has made several considerations and assumptions (as provided throughout this Report); some of the most notable are as follows:

1. Arcadis has made no determination as to the validity and enforceability of any contracts, agreements, existing laws, rules, or regulations applicable to PRASA and its operations. However, for purposes of this report, Arcadis has assumed that all such contracts, agreements, laws, rules and regulations will be fully enforceable in accordance with their terms.
2. PRASA will continue the current policies of employing qualified and competent personnel; properly operating and maintaining the System in accordance with generally accepted industry practices; and of operating the System in a prudent and sound businesslike manner.
3. The proposed CIP reflects the general needs of the System, the CIP will be largely implemented as planned and reflected in this report, and PRASA will make modifications to the CIP investment forecast if the overall System condition is negatively affected by the investment levels projected in future years.

Set forth below are the most relevant opinions which Arcadis has reached regarding the review of PRASA's System, CIP and financial projections as per PRASA's Revised Fiscal Plan.

1. PRASA has reached below the optimum staffing level stipulated by the Executive Management Team but its staffing mix is not yet optimal. For example, PRASA continues to face challenges in filling critical operational staff needs in its Operations Department (i.e., plant operators, System maintenance staff and meter readers), which results in overtime hours, delayed repairs or deficient services. PRASA shall further assess its staff mix and implement a more targeted training program to allow internal staff re-assignments thereby decreasing existing staffing needs. Furthermore, to the

extent that PRASA is able to accelerate its staff management plan, additional cost efficiencies could be achieved.

2. PRASA continues to assess administrative and operational performance, and to implement organizational and policy changes, focusing on customer service, System performance, and budget controls. KPI and metrics being measured, along with stronger management oversight continue to contribute to operational and organizational improvements .

3. Arcadis visited a total of 415 facilities throughout PRASA's five Operational Regions. All WTPs and WWTPs and active RWIs were visited between October 2017 and December 2017 to assess damages as part of the recovery efforts after the 2017 hurricanes. Subsequently, the eight PRASA-owned regulated dams and 101 ancillary facilities were also visited and assessed between February and May of 2018.

   Overall, the condition of PRASA's regulated dams is rated as adequate. The dams weathered Hurricanes Irma and María without major damage, although several experienced downstream erosions. The Cidra dam and Las Curías dam were rated as poor. Addressing the priority items indicated in PREPA's inspection reports and the additional observations made by Arcadis in the asset condition report, could give the dams a higher level of safety, and would help maintain the physical conditions of the structures so that they can continue serving the water supply system as expected. It is also recommended that PRASA perform underwater inspections at several dams, such as Loíza, La Plata, and Toa Vaca to investigate for scour at the concrete/foundation rock contact or stilling basin.

   The damage assessments and cost estimates for WTPs show that facilities in the North, East and Metro Regions were the most affected by the 2017 hurricanes. Most of the facilities have been brought back to operational status and are expected to continue to serve their intended purpose of providing potable water supply in compliance with applicable regulations. However, given the suspension of the CIP, reduction in the R&R program, and ongoing fiscal challenges faced by PRASA, the condition of the WTPs has been declining over the last few years. Also, even though the WTPs are performing better with respect to compliance with limits of the Safe Drinking Water Act and effluent discharge parameters, PRASA must continue to implement corrective measures to mitigate the production of disinfection by-products. Additionally, upgrades and/or improvements to the sludge treatment systems in WTPs are necessary to meet the permanent limits established under existing permits.

   The damage assessments and cost estimates for WWTPs show that facilities in the North, East, and West Regions were the most affected. PRASA should verify the flood zone levels at all WWTPs to identify vulnerabilities of assets in these facilities and determine if the potential flood risks merit mitigation actions. Compliance with Clean Water Act and effluent discharge parameters has decreased significantly since the previous inspection. Also, it was noted that several facilities are still operating with interim limits or were only being monitored. Additionally, there was missing Discharge Monitoring Report (DMR) information after Hurricane María. Moreover, PRASA must plan and make the necessary improvements to meet permanent limits or negotiate with USEPA an extension of the interim limits.

Finally, as it pertains to the ancillary assets, there was a decrease in overall score for water storage tanks, WPS and wells. Since 2015, these facilities have been showing a deterioration trend in asset condition that will continue unless CIP or R&R investments are made. In addition, future regulatory requirements may require either the implementation of significant capital improvements to include and achieve additional treatment capabilities at well facilities, or the closure of certain wells.

Although the overall rating of WWPSs remained as adequate, about 40% of the visited facilities had recorded overflows during the evaluation period. Prompt identification and actions enabled by remote monitoring will help PRASA mitigate overflows in the System, and adding pre-treatment (screens, comminutors) to facilities which receive vast amounts of solids could help lessen overflows. Most of the deficiencies noted can be addressed through PRASA's R&R program and may not require major capital improvements. Note, however, that implementation of PRASA's R&R program also depends on PRASA's ability to identify and obtain funding sources.

4. The extent of damages to PRASA's buried infrastructure caused by the September 2017 hurricanes is uncertain. Additional evaluations and assessments will be required to identify rehabilitation and replacements needs of lateral (pipe) assets. The number of water leaks and sanitary overflows continue to be high when compared to U.S. benchmarks. However, PRASA has continued to improve its response time and attention/repair effectiveness. PRASA is implementing sanitary sewer evaluations and repair plans to reduce levels of infiltration and inflow (I/I) that must be treated in their WWTPs. However, the progress of this initiative has been affected as well by the ongoing fiscal situation.

   PRASA continues conducting periodic water audits, which are used to develop action items to address NRW. This has helped drive the reduction in the volume of water production, water losses, and in NRW reported by PRASA since 2014. However, most of PRASA's O&M efforts in FY2018 were dedicated to recovery activities. Planned O&M investments and key PRASA initiatives have been impacted (behind schedule, postponed or cancelled) by the ongoing fiscal situation and by the 2017 hurricanes.

   PRASA is currently redefining the NRW goals and metrics to phase out calculations that still use estimation methods, moving towards use of real measurements. Furthermore, the provision of meters or other mechanisms to measure the water discarded as part of the programmed drainages will further improve accounting for the volume of NRW in the System. Additionally, the Physical Losses Reduction initiatives along with the PRASA's P3 project will further support PRASA's efforts to reduce NRW. Lastly, significant capital investments and R&R funded budgets are required to accelerate the NRW program and address leak occurrences in both a corrective and preventive manner.

5. Except for buried infrastructure improvement needs, PRASA's six-year CIP along with the O&M initiatives are in alignment with the System needs and adequately addresses all mandated requirements of existing consent decrees and agreements with Regulatory Agencies. The six-year CIP, which includes 390 projects, also includes funding for minor repair projects and PRASA's R&R program. PRASA must maintain an adequate level of R&R spend to maintain and renovate the System: U.S. industry guidelines recommend that assets, particularly buried infrastructure, be replaced at a rate of approximately 1% of total assets (within an asset class) annually. Future regulations and additional regulatory requirements are expected to require minor process changes

and, in some cases major capital improvements such as construction of new treatment processes and intensive repair programs. Thus, CIP modifications will be required to adequately accommodate resulting needs; however, any additional CIP needs will be subject to PRASA's prioritization system and implementation schedules will depend on its financial capacity.

Furthermore, PRASA six-year CIP, is mainly composed of Emergency/Permanent Works identified after the impacts of Hurricane Irma and María, and R&R projects. Together, these account for 70% of the total forecasted expenditures. Although historically the majority of PRASA's CIP investment (about 60%) was allocated to mandatory and compliance driven projects, the six-year CIP includes approximately $163.7M (9% of planned investments) for Mandatory Compliance projects. This reduction is due to the extensive renegotiation process that PRASA and the Regulatory Agencies entered to modify certain requirements of the existing consent decrees and agreements in order to re-align compliance priorities and, in turn, help alleviate PRASA's financial burden.

6. The insurance program covering PRASA's exposures to risks of accidental property and liability losses arising from on-going operations provides reasonable coverage. Also, the Owner Controlled Insurance Program (OCIP) covering PRASA's exposures to risks of accidental property and liability losses arising from construction activities provides reasonable coverage. PRASA should address the following key recommendations:

    - Conduct a PML Study considering new CAT Modellings and parameters. Specially after the lessons learned in the aftermath of the 2017 hurricanes.
    - PRASA should consider establishing a fund to cover possible financial losses from any future catastrophic or any non-catastrophic, peril that might affect infrastructure and operations and, therefore, impose an unexpected financial burden.
    - Consideration to Cyber Security Coverage, which is excluded under all current PRASA's Insurance Programs. Also, complete a self-assessment to determine potential areas of weakness as compared to international standards and to determine the potential frequency & severity of a breach.
    - Consideration of Terrorism Coverage, which is excluded under all current PRASA's Insurance Programs.
    - Consideration for the next Crime Policy renewal - the Knowledge or Discovery of Loss clauses should be renegotiated to specifically identify positions triggering knowledge of incidents, in order to minimize the risk of claim declines by the carrier for late reporting.
    - Consideration to broaden Drive Other Car coverage to include both Physical Damage and Medical Payments coverage.

9. PRASA's Forecast (see Exhibit 1) reflects the Financial Plan submitted to and certified by the Oversight Board. Despite PRASA's projected additional revenues, cost savings, new federal funds, and proposed rate increases, the Forecast reflects a total deficit of $424.4M (FY2019 to FY2023). Annual deficits range from $28.6M in FY2022 up to $200.0M in FY2020. PRASA plans to bridge this gap with a debt restructuring and/or by identifying and securing additional revenue sources or financing.

While Operating Revenues are projected to be sufficient to meet Senior Lien Debt service payments and meet Rate Covenant DSC requirements for Senior Lien Debt, Authority Revenues are not sufficient to meet All Obligations per the MAT which include the payment of the CGI debt service obligations in full. Therefore, PRASA will not meet its Rate Covenant requirement of 1.0x coverage of its current obligations throughout the Forecast. To the extent that PRASA can re-negotiate and restructure existing debt obligations, its ability to meet Rate Covenant requirements will improve. However, if this is not accomplished, PRASA will be forced to reduce its projected CIP investments or increase projected annual rate adjustments. Furthermore, PRASA must consider the overall sustainability and affordability of its rates given the overall economic situation affecting Puerto Rico and recent trends affecting customer consumption profiles.

The following events could have material negative effects on PRASA's Forecast which would further exacerbate PRASA's financial situation going forward:

- Lower revenues or savings achieved, or timeliness of PRASA's Revised Fiscal Plan initiatives.
- Higher impact from Hurricanes Irma and María on revenue, expenses or damages on PRASA infrastructure (continuing under revision and refinement by PRASA).
- Lower funding than expected from insurance or FEMA proceeds.
- Higher overtime expenses than currently planned as a result of further delays in filling vacant positions.
- Higher energy costs as a result of or higher PREPA electric costs (per kWh) and/or lower savings achieved through its Comprehensive Energy Management Program.
- Higher expense costs as a result of not eliminating the Christmas bonus or reducing the pension costs.
- Higher annual inflation rates.
- Higher capital costs due to lower supply of professional and construction workforce, and higher materials and parts costs.

The probability of PRASA meeting its Forecast is conditioned on the following key assumptions:

1. **PRASA's ability to maintain its Service Revenues, billings, and collections in a continuing challenging economic environment** – Continued uncertainty and strain on the economy, population shifts, and changing consumption patterns could continue to cause further declines in PRASA's billings (reflected in lower Service Revenues than budgeted) and collections (reflected in higher Adjustment for Uncollectibles).
2. **PRASA's ability to implement the necessary annual rate increases** – PRASA is projecting to implement annual modest rate increases that will generate about $495.4M between FY2018 and FY2023. Although now bound to PRASA's Revised Fiscal Plan, the actual amount of the rate increases will depend on PRASA's financial results, planned CIP investments, customer base and consumption trends, among others.
3. **PRASA's ability to continue to successfully implement PRASA's Revised Fiscal Plan initiatives** – PRASA's Forecast includes certain revenue enhancing and cost reduction initiatives

under PRASA's Revised Fiscal Plan. Any changes to the funding, framework and execution of these initiatives would significantly alter PRASA's projected financial results. Although PRASA has made a commitment to implement the initiatives described in this Report, there is a possibility that the projected results and, more specifically, the timing of those results may not be achieved.

4. **PRASA's permanent debt restructuring** – PRASA will have to restructure its current outstanding debt to reduce its forecasted annual deficits. PRASA continues to work with federal entities to negotiate a permanent restructuring of both Rural Development (RD) Funds debt with the United States Department of Agriculture (USDA) and State Revolving Funds (SRF) debt with the United States Environmental Protection Agency (USEPA) and has engaged in negotiations with Senior bondholders. However, due to the confidentiality nature of this conversations, there is insufficient information available to determine if PRASA will be successful in either of these efforts.

EXHIBIT 1

	PRASA FINANCIAL FORECAST PRO FORMA[a] ($, Thousands)	FY2018 PRELIMINARY	FY2019 ANNUAL BUDGET	FY2020 PROJECTION	FY2021 PROJECTION	FY2022 PROJECTION	FY2023 PROJECTION
OPERATING REVENUES							
1.	Service Revenues (Base Fee and Service Charges, Net of Subsidies) [b]	$929,514	$1,032,851	$1,091,660	$1,115,657	$1,141,979	$1,169,723
2.	Transfer from Rate Stabilization Account	-	-	-	-	-	-
3.	Net Additional Billings from On-Going Initiatives	-	-	-	-	-	-
4.	Adjustment for Billings Not Collected (Net of Collections from Prior Years)	(86,529)	(82,956)	(98,173)	(79,641)	(61,595)	(43,666)
5.	Other Income (Miscelaneous/Special Assessments/ZumFiber-PRASA Holdings)	1,696	2,000	2,000	2,000	2,000	2,000
6.	Revised Fiscal Plan - Revenue Enhancing Initiatives [c]	58,000	14,800	(1,500)	25,900	51,100	64,000
7.	Insurance Reimbursement from Revenue Loss	50,000	50,000	-	-	-	-
8.	**Total Operating Revenues [Sum Lines 1-7]**	**$952,681**	**$1,016,695**	**$993,987**	**$1,063,916**	**$1,133,484**	**$1,192,057**
ADDITIONAL REVENUES							
9.	Transfer from Budgetary Reserve Fund	-	-	-	-	-	-
10.	General Fund Grants/Appropriations/Contributions	-	-	-	-	-	-
11.	Reimbursements to the Authority Revenues [e]	-	-	-	-	-	-
12.	**Total Other Sources of Revenue [Sum Lines 9-11]**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
13.	**Total Authority Revenues [Line 8 + Line 12]**	**$952,681**	**$1,016,695**	**$993,987**	**$1,063,916**	**$1,133,484**	**$1,192,057**
OPERATING EXPENSES							
14.	Payroll and Benefits	$315,555	$335,167	$337,515	$336,893	$340,302	$344,704
15.	Electric Power	101,901	140,187	131,044	129,590	129,081	128,575
16.	Maintenance and Repair	45,086	48,108	48,822	49,518	50,232	50,935
17.	Chemicals	24,931	33,190	33,627	34,106	34,598	35,082
18.	Insurance	7,546	19,100	19,522	19,800	20,086	20,367
19.	Other Expenses	150,292	153,188	151,465	153,624	155,841	158,020
20.	Revised Fiscal Plan - Cost Saving Initiatives [d]	(3,082)	(13,400)	(30,000)	(31,700)	(32,800)	(35,400)
21.	Capitalized Operating Expenses	(9,680)	(26,970)	(26,714)	(26,771)	(27,015)	(27,294)
22.	**Total Operating Expenses [Sum Lines 14-21]**	**$632,549**	**$688,570**	**$665,280**	**$665,060**	**$670,326**	**$674,989**
ADDITIONAL EXPENSES							
23.	Hurricane Impact on OPEX	234,800	29,858	-	-	-	-
24.	Expected FEMA Reimbursements [f]	(211,300) [f]	(26,872) [f]	-	-	-	-
25.	**Total Additional Expenses [Line 23 + Line 24]**	**$23,500**	**$2,986**	**$0**	**$0**	**$0**	**$0**
26.	**Total Operating Expenses [Line 22 + Line 25]**	**$656,049**	**$691,556**	**$665,280**	**$665,060**	**$670,326**	**$674,989**
DEPOSITS							
27.	Deposit to the Senior Bond Fund	$230,788	$230,790	$230,791	$230,790	$230,789	$230,788
28.	Deposit to the Senior Debt Service Reserve Fund	1,387	-	-	-	-	-
29.	Deposit to the Senior Subordinate Bond Fund	-	-	-	-	-	-
30.	Deposit to the Senior Subordinate Debt Service Reserve Fund	-	-	-	-	-	-
31.	Deposit to the Subordinate Bond Fund	-	-	-	-	-	-
32.	Deposit to the Subordinate Debt Service Reserve Fund	-	-	-	-	-	-
33.	Deposit to the Current Expense Fund	-	-	-	-	-	-
34.	Deposit to the Operating Reserve Fund	38,400	30,754	33,100	35,000	1,600	1,800
35.	Deposit to the Capital Improvement Fund (Net of Projected New Federal Funds) [e]	71,100	26,230	184,200	140,700	171,300	296,700
36.	Deposit to the Construction Fund	-	-	-	-	-	-
37.	Deposit to the Commowealth Payments Fund [g]	22,317 [g]	37,227 [g]	80,651 [g]	87,967	88,079	88,023
38.	Deposit to the Surplus Fund	-	-	-			
39.	Deposit to the Rate Stabilization Account	-	-	-	-	-	-
40.	**Total Deposits [Sum Lines 27-39]**	**$363,992**	**$325,001**	**$528,741**	**$494,457**	**$491,768**	**$617,311**
41.	**Net Authority Revenues After Obligations and Deposits [Line14-Line 26-Line 40]**	**($67,360)**	**$137**	**($200,034)**	**($95,601)**	**($28,610)**	**($100,242)**
DEBT SERVICE PAYMENTS DUE							
40.	Senior (S)	$230,788	$230,790	$230,791	$230,790	$230,789	$230,788
41.	***DS Coverage Required = 2.50***	***4.13***	***4.41***	***4.31***	***4.61***	***4.91***	***5.17***
42.	Senior Subordinated (SSUB)	1,387	-	-	-	-	-
43.	***DS Coverage Required = 2.00***	***4.10***	***4.41***	***4.31***	***4.61***	***4.91***	***5.17***
44.	Subordinated (SUB)	-	-	-	-	-	-
45.	***DS Coverage Required = 1.50***	***4.10***	***4.41***	***4.31***	***4.61***	***4.91***	***5.17***
46.	Commonwealth Guranteed Indebtedness (CGI)	22,317 [h]	37,227 [g]	80,651	87,967	88,079	88,023
47.	Commonwealth Supported Obligations (CSO)	- [h]	- [h]	- [h]	- [h]	- [h]	- [h]
48.	Debt Not Covered Under the MAT	-	-	-	-	-	-
49.	**Total Debt Service Including Debt Not Covered Under the MAT, Net of Existing Deposits**	**$254,492**	**$268,017**	**$311,441**	**$318,757**	**$318,868**	**$318,811**
	DS Coverage on All Obligations (Coverage Required = 1.00)	***0.93***	***1.00***	***0.83***	***0.92***	***0.98***	***0.92***
RATE STABILIZATION ACCOUNT BALANCE							
50.	**Rate Stabilization Account Balance, ending balance**	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

[a] *Numbers may not add up due to rounding.*

[b] *Includes additional revenues from rate increases and elecronic bill discount intiatives of the Fiscal Plan.*

[c] *Projected additional revenues from initiatives included in Revised Fiscal Plan: P3 Project, Government Collections, New Disconnection Fee, and Adjustment Policy Revision.*

[d] *Projected expense reductions from initiatives included in Revised Fiscal Plan: Pension Reduction, Christmas Bonus Elimination, Physical Losses Reduction and Other Expense Reductions.*

[e] *Amount to be deposited from PRASA Authority Revenues.*

[f] *Amount to be deposited from FEMA funding reimbursement. FEMA funds shall be deposited to the credit of the Current Expense Fund as they are used to reimburse PRASA for Current Expenses.*

[g] *Debt service due on USDA RD bonds and USEPA SRF loans per amortization schedule. PRASA will seek to restructure and reduce its CGI obligations.*

[h] *Not all budgeted funds were deposited in the Commonwealth Guaranteed Indebtness Account during FY2018 for payment of the Commonwealth obligations of PRASA included in the CGI for the payment of debt service that was due since a forebearance period was granted by USDA and USEPA on RD and SRF loans, respectively. No funds were deposited in the Commonwealth Supported Obligations Account during FY2018 for payment of the Puerto Rico Public Finance Corporation (PFC) debt included in the CSO; and, accordingly, no funds were transferred by PRASA to the trustee of the PFC Superaqueduct Bonds for the payment of debt service that was due in FY2018. Per the MAT, this is not considered an Event of Default and as per Section 5.02(c), any deficiency in the amounts required to be deposited into the Commonwealth Payments Fund to pay for the CGI or the CSO shall not be cumulative and shall be deemed to be eliminated upon interest or principal payment date.*

1 INTRODUCTION

1.1 Introduction and Purpose

Arcadis Caribe, PSC (Arcadis) has been retained by the Puerto Rico Aqueduct and Sewer Authority (PRASA) as its Consulting Engineer to assist in the preparation of a Consulting Engineer's Report (CER) to satisfy the reporting requirements specified in Section 7.07 of the 2012 amended and restated Master Agreement of Trust by and between PRASA and Banco Popular de Puerto Rico as Trustee (2012 MAT), and the requirements between PRASA, the Government of Puerto Rico and the Puerto Rico Fiscal Agency and Financial Advisory Authority (AAFAF, by its Spanish acronym). AAFAF was established as an independent public corporation and governmental instrumentality that assumed all fiscal agency responsibilities previously assigned to GDB. AAFAF also acts as financial advisor and reporting agent of the Government of Puerto Rico and its public corporations, including PRASA.

1.2 Consulting Engineer's Report Requirement

As required by Section 7.07 of the MAT, unless the Senior Bonds have been rated investment grade by at least two Rating Agencies for 24 consecutive months, the Consulting Engineer shall prepare a CER to document the current condition and changes, if any, in PRASA's operation and the performance of the water and wastewater systems (the System). Also, as required in Section 3.5 of the 2012 FOA, PRASA must maintain a continuous disclosure policy with its Fiscal Agent and satisfy certain reporting requirements throughout the fiscal year. Among these reporting requirements is the preparation and filing of a report prepared by the Consulting Engineer. As a result of the credit downgrades of PRASA's bonds to non-investment grade level in FY2013 and FY2014, and in compliance with the MAT, Arcadis prepared this CER for FY2018 (2018 CER or the Report). The submittal of this report was delayed due to the impact of Hurricanes Irma and Maria (the 2017 hurricanes) on the island on September 2017 and PRASA's on-going efforts during FY2018 to complete a Fiscal Plan as required by Puerto Rico Oversight, Management, and Economic Stability Act (PROMESA) and to be certified by the Financial Oversight and Management Board (the Oversight Board or FOMB).

1.3 Conventions

PRASA's fiscal year begins on July 1st and ends June 30th. Throughout this 2018 CER, fiscal year is identified as "FY" followed by the calendar year in which the fiscal year ends, i.e., FY2018 is the fiscal year from July 1, 2017 through June 30, 2018.

1.4 Acronyms

A listing of acronyms or abbreviations of terms used in this report is included in the Table of Contents.

2 PUERTO RICO'S CURRENT FISCAL SITUATION

2.1 Overview

Since FY2016, Puerto Rico has been facing an economic crisis that has caused severe hardships to its 3.2 million residents as presented in Figure 2-1. This current economic landscape, highlighted by negative economic growth, increased poverty levels while declining population and labor participation rates have, in turn, negatively impacted PRASA's finances.

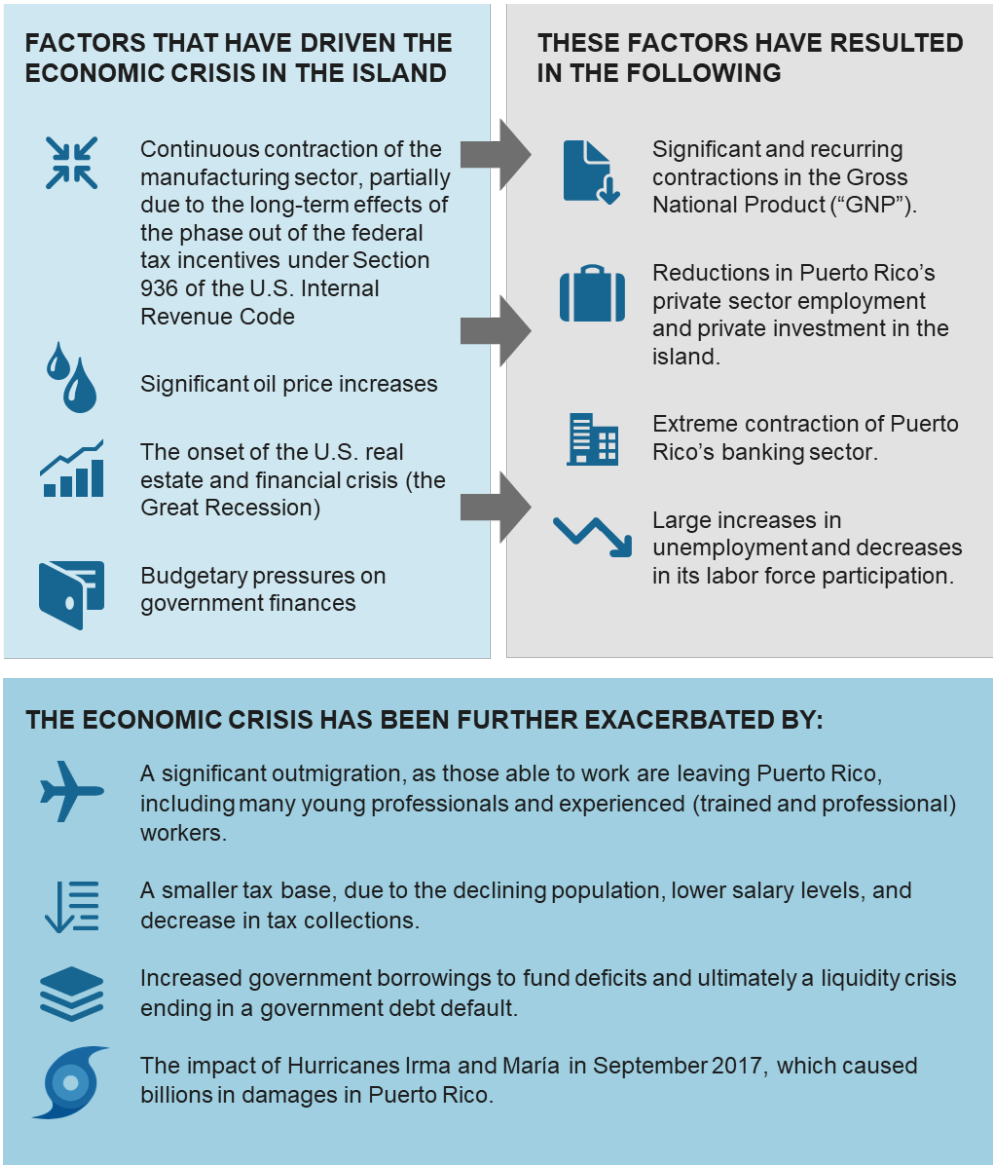

Figure 2-1. Economic Crisis Driving Factors and Effects

Over the past several years, the Government of Puerto Rico has been struggling with their financial situation. As a result, PRASA has also been adversely affected. Like many other municipal water and wastewater utilities around the world, PRASA faces several major challenges including service affordability, aging infrastructure, high volume of non-revenue water (NRW), regulatory mandates, and increasing capital investments and renewal and replacement (R&R) needs.

The high costs of infrastructure repairs combined with the lack of customer understanding of the value of water services (as an essential service, the public resists paying for higher service rates), makes it very difficult for water and wastewater utilities to achieve a break-even operation while maintaining affordable service rates. Because of the complexity of the System it operates, PRASA has inherently high operating costs and a significant need for capital investments with limited financial resources.

To remain consistent with its mission of providing service at an affordable cost, PRASA externally funded its Capital Improvement Program (CIP) through revenue bonds and federal assistance in accordance with standard utility financing practices. The CIP is a dynamic program that evolves and undergoes revisions as needs and sources of funds are identified, and as projects transition from planning through design, construction and startup phases. The CIP's main objectives are to recover the System after the 2017 hurricanes, maintain, modernize and simplify the System to achieve operational efficiency, protect public health and safeguard environmental quality, while enabling continued economic development and striving for resiliency. Therefore, consistent with standard practice, PRASA's current rate structure was designed primarily to cover operational expenses and debt service, and only a limited maintenance budget. PRASA successfully completed two bond transactions, in 2008 and 2012, issuing over $3 billion (B) in revenue bonds mainly to fund its CIP.

Despite the Government's fiscal situation, during 2015, PRASA looked to issue additional revenue bonds. However, the conditions for the bond issuance were not favorable and PRASA had to postpone it. The Government's fiscal situation and ratings downgrades by the Rating Agencies had a major impact on PRASA, as each downgrade also resulted in a downgrade for PRASA's bonds, thereby limiting its ability to access the capital markets to obtain financing to cover its immediate CIP related expenses. PRASA used operating revenues to cover expenses related to its CIP projects for some time. Nevertheless, in FY2016, after expending its surplus operating income and reserves to cover a portion of its unfunded CIP, PRASA was forced to essentially postpone or terminate the execution of all CIP projects.

Since FY2013, PRASA has had no access to the capital markets and, as a result, more than 140 infrastructure projects, at an estimated cost of $600 million (M) were suspended and eventually cancelled. As a result, thousands jobs were lost and roughly $150M was owed to CIP contractors and consultants. However, as of June 30, 2018, outstanding debt with contractors had been reduced to approximately $6M and as of the date of this Report, PRASA paid off all outstanding payments due to contractors and CIP consultants.

2.2 Puerto Rico Oversight, Management and Economic Stability Act (PROMESA)

On May 25, 2016, the United States (U.S.) Congress enacted Puerto Rico Oversight, Management and Economic Stability Act, also known as PROMESA. PROMESA addresses Puerto Rico's debt by establishing an oversight board, a process for restructuring debt, and expedited procedures for approving

critical infrastructure projects. The Oversight Board established under this Act oversees the development of budgets and fiscal plans for Puerto Rico's Central Government and its instrumentalities, including PRASA. Also, it may issue subpoenas, certify voluntary agreements between creditors and debtors, seek judicial enforcement of its authority, impose penalties, and enforce territorial laws prohibiting public sector employees from participating in strikes or lockouts. The board's responsibilities include:

- Certifying fiscal plans for entities designated as “covered entities” by the Oversight Board as well as the Government’s Fiscal Plan
- Approving annual budgets
- Enforcing budgets and ordering any necessary spending reductions
- Reviewing laws, contracts, rules, and regulations for compliance with the fiscal plan

PROMESA also provides Puerto Rico’s Government and its instrumentalities two distinct restructuring tools to address the island’s fiscal crisis known as Title III and Title VI. Title VI of PROMESA focuses exclusively on restructuring the financial debt and relies on a voluntary group action mechanism to bind dissenting creditors to the agreement of the debtor and requires a supermajority of its creditors to restructure the debt. Whereas Title III of PROMESA is an in-court proceeding that follows a similar framework as a municipality bankruptcy under Chapter 9 of the Bankruptcy Code but is broader in scope. Title III incorporates the bankruptcy cram down power, which allows for a plan of adjustment (to be approved by only a single impaired class) for nonconsenting classes of claims.

PRASA currently has not filed for either of these restructuring tools, nor has there been a request to do so by the Oversight Board or the Central Government.

Pursuant to the Oversight Board request/mandate for the submission of a Fiscal Plan, on December 22, 2016, PRASA submitted its draft version. On February 21, 2017 and April 28, 2017, revised versions of the Fiscal Plan were resubmitted addressing revisions requested by the Oversight Board and its consultants. On the latter date, PRASA’s Fiscal Plan was certified by the Oversight Board as modified by the following three amendments to be addressed by PRASA:

- Include multi-year permanent rate increases that are distributed broadly across all customer types and categories, including residential, taking into consideration income of such customers. Increases must be a preapproved measure effective from January 2018 through at least the following five years and be supported by a commitment from PRASA to a detailed implementation plan and schedule to be developed. The rate increase must be directed to achieve a structural balance and funding capital expenditure needs pre-debt service.
- Update the existing analysis of the impact of the rate increase by customer type and category to reflect the updated rate proposal.
- Include the updated electricity savings in line with PREPA’s Fiscal Plan and confirm the status of PREPA’s involvement in, and collaboration with, the hydroelectric initiative.

On May 28, 2017, PRASA submitted to the Oversight Board a revised final version of its Fiscal Plan, which was subsequently certified on August 25, 2017. However, as a result from the hurricanes that impacted Puerto Rico on September 2017, discussed in more detail in the following section, the Oversight

Board requested PRASA to revise and update its August-version certified Fiscal Plan to account for the financial impacts in its projections.

PRASA updated its Fiscal Plan considering the best available information at the time regarding client consumption trends, active accounts, collection rates, and macroeconomic indicators, among other factors. The revised Fiscal Plan was submitted on January 24, 2018 for the Oversight Board's initial review and re-certification. After several revisions and substantial deliberations, PRASA's New Fiscal Plan (also referred to as the Initial Fiscal Plan) was re-approved and re-certified on April 19, 2018. Afterwards, however, the Oversight Board certified a revised version of the Central Government's Fiscal Plan (the Revised New Fiscal Plan for Puerto Rico) dated June 29, 2018 and required PRASA to make corresponding changes in PRASA's FY2019 Annual Budget (certified by the Oversight Board on June 30, 2018) and forecast period. The revisions included, but were not limited to, the incorporation of new macroeconomic assumptions as reflected in the Central Government's Revised New Fiscal Plan for Puerto Rico, and changes related to the electricity rates, among other revenue and expense projections adjustments.

On August 1, 2018, pursuant to 201(e)(2) of PROMESA, the Oversight Board developed and certified a revised version of PRASA's New Fiscal Plan (PRASA's Revised Fiscal Plan) and submitted it to the Puerto Rico Governor and Legislature. Nonetheless, after such certification, PRASA identified major comments to the revisions made and, as a result, has engaged in discussions with the Oversight Board which, as of the submittal of this Report are still ongoing. As such, for the purposes of the Report and the analysis included herein, Arcadis has used PRASA's Revised Fiscal Plan (August 1, 2018 version). Nevertheless, as further noted in Section 8; further modifications and a future re-certification by the Oversight Board are likely.

PRASA's Revised Fiscal Plan covers a period of six years, starting on FY2018, and has been developed to promote PRASA's mission which is to deliver high quality drinking water and sanitary sewer service at the lowest possible cost. It provides for the required investment for the necessary infrastructure to ensure compliance with required standards while promoting a much-needed economic growth throughout the island, the timely execution and implementation of its measures, and PRASA's long-term financial self-sustainability plan.

PRASA's Revised Fiscal Plan outlines cash management levers that will be used to improve PRASA's liquidity, including but not limited to increasing revenues, decreasing expenses, increasing collections and securing federal funding from the disaster relief. PRASA's management identified several new efforts and initiatives that could provide additional financial benefits. The initiatives in PRASA's Revised Fiscal plan include, among others, the implementation and execution of a Public-Private Partnership Project for the optimization of PRASA's metering system and the improvement of its customer service activities (the P3 Project), reduction of NRW, rate increase, electronic bill discount, government accounts collections, pension/labor reform (not agreed by the Government of Puerto Rico), and restructuring of its debt.

2.3 Impact of Hurricanes Irma and María on September 2017

On September 6 and 20, 2017, Puerto Rico was directly impacted by Hurricanes Irma and María, respectively. Both Hurricanes had a significant impact on the electric power infrastructure, which in turn

affected the continuity of water and sewer services to numerous customers throughout the island. The Hurricanes materially impacted most of PRASA's infrastructure island-wide.

Overall, PRASA's operational revenues and financial impacts were mainly a consequence of the following:

1. significantly lower customer consumption (PRASA's service was recuperated at 90% by November 2018, essentially 2 months after the events);
2. higher rate of uncollectible on regular accounts (residential, commercial, and industrial customers) and government accounts;
3. lower revenues from other services and fees (i.e., disconnection/reconnection fees); and
4. higher expense costs to normalize operations and to address response and recovery needs (i.e., diesel costs for generators operation, security, chemicals and overtime).

Many of PRASA's assets were severely impacted and in need of repair or replacement. PRASA reacted promptly and soon began assessing physical damage and implementing emergency replacement and construction projects to restore services to its clients as soon as possible. Communications and access challenges were some of the difficulties that PRASA encountered during the recovery efforts after the September 2017 Hurricanes impact. In addition, the availability of construction materials, generators and diesel were among other hindrances adversely impacting the recovery process. Nevertheless, PRASA worked diligently and was able to restore service to most of the customers within 2 months of the Hurricanes impact.

As part of PRASA's recovery efforts, PRASA engaged Arcadis, under an emergency work order, to conduct an initial (fast-paced) assessment on the condition of PRASA's facilities, including water treatment plants (WTPs), wastewater treatment plants (WWTPs), raw water intakes (RWIs), wells, dams, water pump stations (WPSs), wastewater pump stations (WWPSs), water storage tanks (WSTs), and water and wastewater pipelines. The purpose of this assessment was to:

1. evaluate the existing condition of the facilities after Hurricane María,
2. identify repair and replacement needs,
3. prioritize needs,
4. develop the scope of work definition for each assessed asset, and
5. develop cost estimates to restore facilities to pre-storm conditions

As included in PRASA's Revised Fiscal Plan, infrastructure damages were estimated at $769M, which considers a projection for potential additional unidentified damages of ancillary facilities not visited, buried assets and emergency work costs incurred by PRASA to restore the System. However, the infrastructure damages estimate only considers repairing and replacing the System to exactly (or similar to) its condition prior to the hurricanes, thereby excluding the implementation of any resiliency projects to mitigate or reduce future risks related to hurricanes or other natural disasters. Assuming the CIP is activated in 2019, the identified repair projects are expected to be completed by FY2022. To increase the System resilience, PRASA estimates that it will require at least $3.7B in additional infrastructure projects, which includes a total of 39 resiliency projects identified by PRASA most of which are presented in the Government's "Build Back Better" report. The damages and estimated costs of PRASA's assets are discussed in more detail in Section 4.

Besides the physical damages impact to the assets owned by PRASA, the hurricanes also adversely impacted PRASA's finances. As included in PRASA's Revised Fiscal Plan, PRASA estimates a total of approximately $1.4B as the preliminary net impact resulting from both Hurricanes, which includes revenue reduction ($340M), incremental expenses ($265M), and infrastructure damages ($769M). The total impact considering resiliency projects is estimated at over $5.0B. However, there are still uncertainties regarding the full extent of damages caused by the hurricanes as a significant portion of PRASA's infrastructure are buried, underground assets.

PRASA insurance proceeds are expected to reimburse PRASA for a significant portion of the damages suffered, with Federal Emergency Management Agency (FEMA) providing funding for damages not compensated by insurance coverages. Included within these expected recoveries would be a portion of the revenue reduction estimates and the incremental operating expenses such as, but not limited to, business interruption, and costs for diesel and purchase/rental of emergency (power) generation units (EGUs).

2.4 PRASA's Fiscal Plan

On August 1, 2018, the Oversight Board certified PRASA's Revised Fiscal Plan which was developed to ensure compliance with PRASA's mission and in strict alignment with Oversight Board recommendations and requirements. Despite the multiple fiscal challenges faced by PRASA, before and after the past year's hurricane season, its mission of delivering quality water and sewer services at an affordable cost to customers, still remain. In an effort to pursue the above-mentioned vision and in order to achieve the long-term fiscal sustainability, PRASA's has identified three key focus areas which include: 1) reduction of NRW, 2) CIP oriented towards water quality and 3) resiliency improvement to reduce the infrastructure vulnerability against natural disasters, guaranteeing revenue stability and reducing operating expenses.

PRASA's Revised Fiscal Plan incorporates the financial projections based on the best current estimated impacts of Hurricanes Irma and María. Although PRASA, to its best effort, has accounted for R&R costs to address potential damages of ancillary facilities and buried infrastructure not yet thoroughly assessed; PRASA acknowledges that estimated costs could eventually suffer modifications as additional, more certain information becomes available.

PRASA's Revised Fiscal Plan includes: 1) a summary of the current financial situation and the actions already being taken by PRASA to improve its revenues, better control its expenses, fund the CIP and meet all debt service obligations; 2) baseline financial projections to present the initial financial need if no action is taken; 3) key efforts and new initiatives to reduce the estimated financial need (gap); 4) the governance and implementation of PRASA's Revised Fiscal Plan; and 5) key risks and mitigation strategies to ensure the execution of a viable PRASA's Revised Fiscal Plan.

PRASA's Revised Fiscal Plan includes its CIP to cover a six-year period from FY2018 to FY2023 (the six-year CIP). However, approval by PRASA's Governing Board depends on the identification of funding sources to cover all required expenditures. PRASA's six-year CIP has been restructured to optimize the use of FEMA funding and to ensure consistency with PRASA's long-term goals. It was updated to: 1) incorporate the impact of Hurricanes Irma and María, assuming assets will be restored to the prior-hurricane condition; 2) reflect a 25% reduction in investment related to the elimination and postponement of projects, as well as adjustments performed to original estimates and timing; 3) reprioritize non-

regulatory compliance projects to give higher priority to efficiency projects; 4) further extend regulatory compliance timeframes so that PRASA can better coordinate capital spending to achieve other outcomes within the timeframe; and 5) address long-term infrastructure rehabilitation and replacement by increasing the amount of investment in capital renewal including buried infrastructure.

PRASA's Revised Fiscal Plan is discussed in more detail in Section 8.

3 ORGANIZATIONAL UPDATES AND CHANGES

3.1 Introduction

As shown in Figure 3.1, PRASA is organized into five operational Regions (North, South, East, West and Metro), as a result of the enactment of Act No. 92 on March 31, 2004 (Act 92-2004).

Figure 3-1. PRASA Regions

PRASA is managed by an Executive Management Team that provides the day to day management oversight and coordination for all institutional activities. It is supported by various departments in the organization including, but not limited to, finance, customer services, and information systems. Figure 3-2 shows PRASA's current organization.

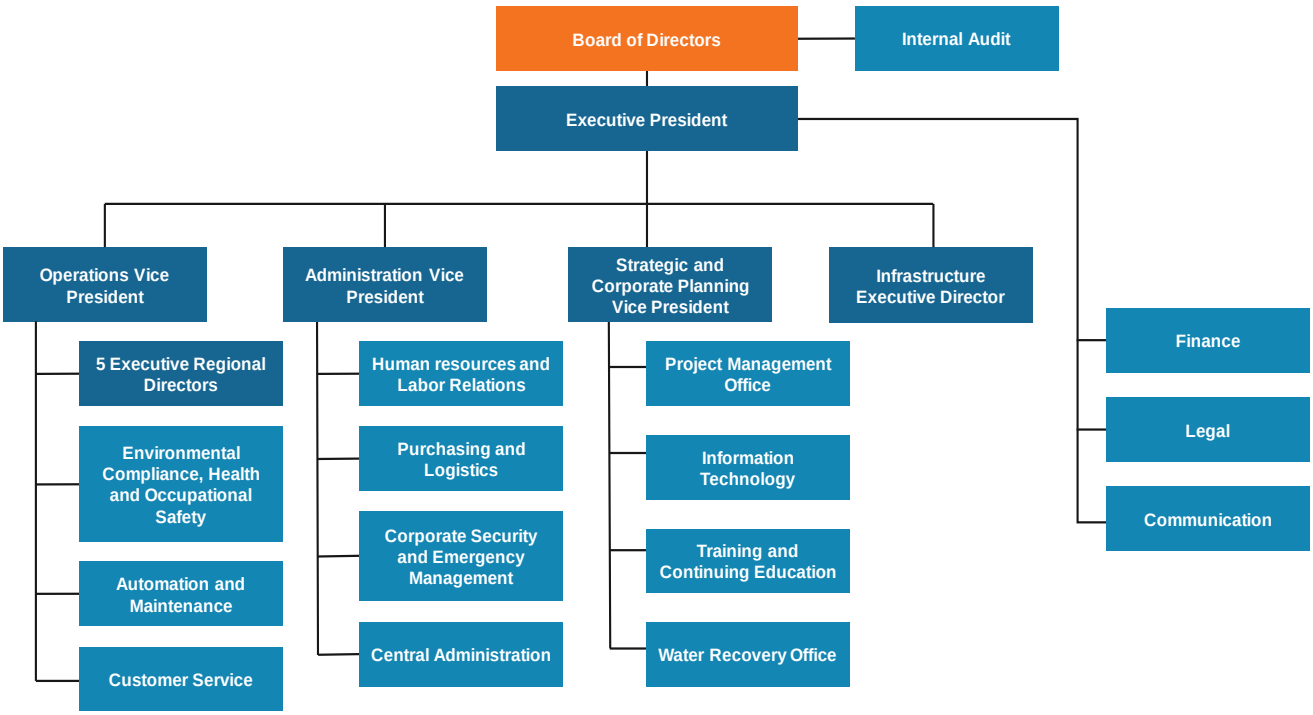

Figure 3-2. PRASA current Legislated and Executive Management Structure

3.2 Updates and Changes in PRASA's Organization and Management

3.2.1 Board of Directors (Governing Board)

As presented in Table 3-1 and as restructured following Act No. 68 of 2016 (Act 68-2016), PRASA's Governing Board, is composed of eight members, which include:

- Four independent directors appointed by the Governor of Puerto Rico, comprising of:
  a. One engineer licensed to practice in Puerto Rico with ten years of experience
  b. One authorized legal advisor with at least ten years of experience in Puerto Rico and admitted to practice in the Government
  c. One member with a wide knowledge and experience in the field of corporate finance
  d. One professional with expertise in any fields related functions delegated to PRASA
- One AAFAF representative as per Act 2-2017
- One private citizen representing the Authority's customers
- Two ex-officio members, the Executive Director of the Association of Mayors and the Executive Director of the Federation of Mayors

Currently, PRASA's Governing Board has two consumer representatives since they were selected prior to the enactment of Act 68-2016 and their current term expires in June 2020. However, after their term ends, PRASA's Governing Board will have only one consumer representative per Act 68-2016.

Table 3-1. PRASA's Governing Board Members as of July 31, 2018

Name	Board Position	Position Description	Term Ends
Héctor J. del Río Jiménez, Esq.	President	Independent Director/Finance	July 12, 2022
Gerardo Lorán Butrón, Esq.	Interim Vice President	AAFAF Representative	Ex Officio
Memphis Cabán Rodríguez, PE	Director	Independent Director/ Engineering	July 12, 2021
Alberto J. Catañer Padró, Esq.	Director	Independent Director/Legal	July 12, 2021
Vacant	Director	Independent Director	
Gretchen Hau, Esq.	Director	Executive Director of the Mayors Association	Ex Officio
Isabelo Molina Hernández	Director	Executive Director of the Mayors Federation	Ex Officio
Héctor Sánchez Cardona, P.E.	Director	Consumer Representative	June 19, 2020
Félix Aponte Ortiz, PhD.	Director	Consumer Representative	June 19, 2020

As of the date of this Report, there is one vacant position on PRASA's Governing Board awaiting appointment: a professional (Independent Director) with expertise in any fields related functions delegated to PRASA. Per Act 68-2016, the designation of a substitute shall be made within six months after the vacancy occurs. Except for the consumer representative, the AAFAF Representative and the Executive Directors of the Association of Mayors and the Federation of Mayors, all other members of the Board are named by the acting Governor of Puerto Rico, with the advice and consent of the Senate of the Government of Puerto Rico.

Directors appointed by the Governor shall be selected from a list of at least ten candidates to be prepared by a recognized executive search firm, according to objective criteria that considers the professional and educational backgrounds of the candidates. The consumer representative will be elected through a public selection process under jurisdiction of and directed by the Puerto Rico Department of Consumer Affairs and shall serve for a three-year term. Finally, the Governor designated or elected board members shall serve for staggered terms: two members shall hold office for five years and two members for six years. As the terms of office of the four Board members appointed by the Governor expire, the Governor shall appoint their successors for five-year terms, following the same candidate identification mechanism. None of the members appointed by the Governor may hold such office for more than three terms.

PRASA's Governing Board is responsible for making or approving all major decisions taken by PRASA, including overall institutional policies, PRASA's strategies and programs, executive and key management manpower recruitments and removals, approval of union contracts, professional services contracts beyond the limits accorded to the Executive President, and all contract changes that are beyond the limits accorded to the Executive President.

PRASA's Governing Board is assisted by an Internal Audit Unit which is responsible for conducting internal audits for the Board, and by a Board Secretary, who maintains Board records, among other responsibilities.

The following material changes as it relates to PRASA's Governing Board were reported by PRASA during FY2018 and the first quarter of FY2019: Hector J. del Río Jiménez, Esq. replaced Mr. Reinaldo Paniagua, as President, Mr. Gerardo Lorán Esq. named as Interim Vice-President, and three of the four vacant Directors position were appointed. One remains vacant (Independent Director with expertise in any fields related functions delegated to PRASA).

3.2.2 Executive Management Team

Since the enactment of Act 68-2016, PRASA has gone through some management changes at many levels of its organization including the executive level. A summary of PRASA's key Executive Management Team as of the date of this Report, including previous positions held and years of experience, is presented in Table 3-2.

Table 3-2. PRASAs Executive Management (as of June 30, 2018)

Name	Current Role	Term Ends	Prior Role	Experience Total/PRASA
Eng. Elí Díaz Atienza	Executive President	February 2022	Private Sector	13 years / 1 year
Eng. Doriel Pagán	Operations Vice President	Indefinite[2]	Executive Director North Region	27 years / 25 years
Eng. Ryan Arrieta	Strategic and Corporate Planning Vice-President	Indefinite[2]	Private Sector	18 years / 1 year
Keralia Moreda, Esq.	Interim Administration Vice-President	Indefinite[2]	Private Sector	13 years / 1 year
Mr. Efrain Acosta	Executive Director of Finance	Indefinite[2]	Deputy Exec. Director of Finance PRIDCO	40 years / 14 years
Eng. José J. Rivera	Interim Executive Director for Infrastructure[1]	Indefinite[2]	Auxiliary Director for Engineering	21 years / 7 years
Eng. Roberto Martínez	Executive Director Metro Region[1]	December 2019	Deputy Exec. Director Metro Region	31 years / 25 years
Eng. José Rivera	Interim Executive Director North Region[1]	Indefinite[2]	Toa Alta Area Director	21 years / 19 years
Eng. Héctor Gierbolini	Executive Director South Region[1]	February 2019	Preventive Maintenance Manager South Region	23 years / 23 years

Name	Current Role	Term Ends	Prior Role	Experience Total/PRASA
Eng. Enrique Rosario	Interim Executive Director East Region[1]	Indefinite[2]	Deputy Exec. Director East Region	20 years / 10 years
Eng. Joel Lugo	Interim Executive Director West Region[1]	Indefinite[2]	Executive Director West Region	19 years / 19 years

[1]Legislated positions.
[2]Indefinite, as per amended Act 40-1945 (Act 15-2013), which allows Executive Management members to be named as Interim, with no definite term of service.

The following material changes were reported by PRASA during FY2018 and the first quarter of FY2019 regarding its organization and changes in leadership and management: Mr. Yoniel Arroyo's resigned as Vice-President of Administration effective May 4, 2018 and Keralia Moreda, Esq. has been appointed as Interim Administration Vice-President; Eng. Roberto Guzmán resigned his position as Executive Director of the East Region under the Voluntary Pre-Retirement Program and Eng. Enrique Rosario was appointed as Interim Executive Director; Mrs. Glorimar Chiclana was appointed as Human Resources Interim Executive Director to replace Mrs. Aida Márquez, who was appointed as Executive Assistant.

3.2.3 Staffing Profile

PRASA's existing staff is categorized into five primary categories described below:

- Appointed Employees: This category includes the executive staff, deputy and department directors, area directors and administrative assistants that provide support to key management personnel of the utility.
- Management Employees: These employees manage the day-to-day operations of the utility. They hold management positions both in the central and regional offices.
- HIEPAAA Employees (*Hermandad Independiente de Empleados Profesionales de la Autoridad de Acueductos y Alcantarillados*): These employees are the unionized professional staff that includes accountants, engineers, insurance specialists, project inspectors, and surveyors.
- UIA-AAA Employees (Unión Independiente Auténtica de la Autoridad de Acueductos y Alcantarillados): These employees are the unionized plant and system operators, maintenance and support staff, meter readers, customer service specialists, and administrative assistants.
- Temporary Employees: These employees are those that are hired and classified as temporary until formally assigned to a regular position. New hires are placed in a 90-day probationary period. They do not have full benefits during the probationary period. If still employed after probationary period, they either become full-time employees or their temporary employment contract is renewed.

At the end of FY2018, PRASA had a total staff of 4,625, of which 335 are pre-retired under Act 211-2015, as further discussed below. Overall, staff was reduced by 7.8% from FY2017 to FY2018. Based on the total number of working employees for FY2018, the ratios of service accounts (counting the water service

and sanitary sewer service for the same client, as two separate accounts)[3] to employees was 466, which represents an increase of 8.4% compared to FY2017 which was 430. Current industry for combined utilities operations averages range from 366 to 604, with a median of approximately 447 customer accounts employee[4]. PRASA's customer account per employee ratio falls within the top quartile for the industry.

Table 3-3 shows the staff levels by staff category over the last five fiscal years. Since FY2010, PRASA has implemented staff reduction initiatives, such as early retirement, re-training existing staff from overstaffed positions to reduce the need for new hires and using staff attrition as a means to reduce staff levels.

Table 3-3. Staff Levels

End of FY	Appointed Employees	Management Employees	HIEPAAA Employees	UIA-AAA	Temporary Employees	Pre-Retired Employees	Total Employees
2014	170	1,004	153	2,565	1,198	-	5,090
2015	161	1,011	155	2,635	1,027	-	4,989
2016	159	1,188	149	3,293	9 (UIA)	-	4,798
2017	163	1,195	141	3,146	9 (UIA)	-	4,654
2018	154	1,058	117	2,952	9 (UIA)	335	4,625
5-year CAGR	**-2.44%**	**1.32%**	**-6.49%**	**3.58%**	**-70.56%**	**N/A**	**-2.37%**

Source: PRASA Human Resources Department

The net reduction of employees reflect the effects of the Hurricanes Irma and María on PRASA's headcount. PRASA received many resignations from employees that were, for the most part, either emigrating from Puerto Rico or hired into new jobs. Approximately, 164 employees resigned between the months of September 2017 through June 2018. In addition to these resignations, another 193 employees resigned, as a result of the following two government-related programs: 1) Voluntary Pre-Retirement Program as stipulated under Act 211-2015 and 2) ERS[5] Voluntary Transition Program as stipulated under the Administrative Orders OA-2017-5 and OA-2018-5.

The Voluntary Pre-Retirement Program remains an option for PRASA to reduce costs and increase savings. The program seeks to reduce the workforce progressively and voluntarily, thus allowing for the economy to undergo a transition process. This may reduce expenses such as payroll and benefits but requires that the Office of Management and Budget (OMB) evaluate and certify that employees eligible for the program and under consideration represent savings for PRASA. Besides the reduction of expenses, Act 211-2015 stipulates that positions that become vacant upon implementation of the

[3] By the end of FY2018 PRASA had a total 1,235,291 active accounts, 1,234,895 water accounts and 764,165 wastewater accounts. Combined water and wastewater accounts are applied as two separate accounts.
[4]Source: 2017 AWWA Utility Benchmarking: Performance Management for Water and Wastewater.
[5] Employees Retirement System of the Government of Puerto Rico.

retirement program be eliminated, and that agencies take administrative or operational measures to restructure in the absence of these positions. However, OMB may authorize to re-staff the position, if certified to be critical, and in accordance with the plan submitted by the agency. As it pertains to PRASA, some of the eligible employees currently occupy positions that are managerial or supervisory, which may create organizational challenges. PRASA submitted to OMB approval of a total of 351 employees eligible for the pre-retirement program, of which 335 were approved.

As a result of the fiscal crisis and the hurricanes impact, which exacerbated such crisis, AAFAF on behalf of the Puerto Rico Government circulated an Administrative Order (OA-2017-5) on November 7, 2017, which created the ERS Voluntary Transition Program intended to create an alternate program for eligible employees under the ERS. On April 18, 2018 a second Administrative Order (OA-2018-5; amended on June 29, 2018 as OA-2018-9) was circulated extending the program to a second phase, and on October 23, 2018, a new Administrative Order (OA-2018-13; amended on November 15, 2018 as OA-2018-14) further extended the program to a third phase. Employees will have until November 30 and December 15, respectively to enroll in the programs. Eligible employees who avail from the program and voluntarily resign to their position shall receive economic incentives consisting of six-months salary as well as a medical plan incentive and payout of unused vacation leaves up to 60 days. During the first phase of the program, a total of approximately 107 PRASA employees applied of which 58 were approved and voluntarily resigned by June 30, 2018. No employees retired on the second phase. Following material changes for the third phase, 92 employees were eligible and were approved of which 41 employees resigned effective November 30, 2018 and 51 resigned effectively December 31, 2018.

PRASA's revised optimum staffing level to operate and maintain the System, and effectively manage the utility, as presented in PRASA's Revised Fiscal Plan, stands at approximately 4,900 employees. As shown in Table 3-3, at the end of FY2018, PRASA's working staff totaled 4,625 employees (of which 335 are pre-retired), which is significantly under PRASA's goal. However, this does not translate into PRASA achieving an optimum staff mix as there are critical staff needs that must be addressed.

As of August 31, 2018, PRASA's hiring plan focused mainly on employing personnel for the departments that had been impacted the most by the Voluntary Pre-Retirement, ERS Voluntary Transition Program and general employee resignations, which include: Customer Service, Maintenance and Operations Departments. Staffing needs identified include, but are not limited to: field workers, customer service representatives and office workers for the Customer Service Department; supervisors and electromechanics for the Maintenance Department; and WWTP operators, WWTP and WTP supervisors, services coordinators, assistant directors, laboratory assistants, and sanitary sewer workers for Operations Department. The deficit in operations personnel has forced the Operations Department to incur in overtime hours to operate facilities, thus impacting payroll metrics. Also, contributing to the operation personnel deficit is the freezing of vacant positions as required by laws (Act 3-2017, Act 26-2017) that came into effect during FY2016 and FY2017 further discussed below. PRASA intends to keep identifying candidates and following hiring procedures to further optimize its staff and address needs in key areas.

3.2.4 Labor Relations

After the commencement of the elected government on January 2017, several laws that affect PRASA's labor relations came into effect. These laws are Act No. 3 of January 23, 2017 (Act 3-2017) and Act No.

26 of April 27, 2017 (Act 26-2017). These laws have supremacy over any other law or agreement regarding the same matters. The aspects of these laws that affect PRASA are discussed in the following sections.

3.2.4.1 Act 3 of 2017 – "Ley para Atender la Crisis Económica, Fiscal y Presupuestaria para Garantizar el Funcionamiento del Gobierno de Puerto Rico"

The Government of Puerto Rico, through the enactment of Act 3-2017, declared a fiscal emergency and required that its instrumentalities (i.e., utilities, government agencies, and public corporations such as PRASA) implement certain measures to reduce its expenses. Act 3-2017 has primacy over any other previous law and will remain in place until June 30, 2021 or until certain economic and financial conditions are met. Act 3-2017 requires, among others, the following measures (note that not all of these measures are applicable to PRASA as a public corporation of the Government of Puerto Rico):

1. No increase in economic benefits to employees (except minimal exceptions).
2. No liquidation of vacation days
3. No liquidation of sickness days unless employee leaves public service
4. Suspension of non-economic clauses under previous agreements that have an economic impact on the operations budget of the entity
5. No negotiation of labor union agreements during the effectiveness of this act, until the end of this act.
6. Freezing of vacant positions until June 30, 2017
7. No creation or renovation of terms for career positions
8. Appointed positions will be reduced by 20%
9. Reduction of 10% of half of the operational costs of FY2016-2017
10. No funding for travelling outside Puerto Rico unless otherwise approved by the Secretary of Government.
11. No cellular phones or technological services will be provided
12. Reduction of energy consumption by 5% each year.
13. Reduction of potable water consumption by 5% each year.
14. Reduction by 10% of Contracted services
15. Purchase costs shall be reduced by 5% for FY2016-2017. Except for Purchase Orders (POs) with previous written authorization by the OMB Executive Director.

According to this act, any agreement between PRASA and both UIA-AAA and HIEPAAA unionized personnel that has expired or expires during the period of effectiveness of this law shall be extended until June 30, 2021 in terms of its non-economic clauses and those clauses not affected by Act 3-2017. As per Article 14 of Act 3-2017 those non-economic clauses that have a direct or non-direct economic impact on PRASA's operational budget, shall be suspended. Two explanatory letters, CC 144-17 and 145-17, from

OMB were circulated clarifying Article 14, which state that those benefits and economic compensations to the employee as of the time of approval of Act 66-2014, shall be maintained.

Even though these measures may represent operational savings for PRASA, some of them affect PRASA's revenues, such as measure 13 listed above. This measure requires that all agencies, instrumentalities and public corporations under the executive branch reduce its potable water consumption by 5%, which would in turn result in a revenue reduction for PRASA. This Act also requires that PRASA comply with certain progress reporting requirements to the House of Representatives, the Senate of Puerto Rico and the Office of the Governor of Puerto Rico, that lists all implemented measures and the results obtained. Stricter measures are stipulated in the later approved Act 26-2017, discussed in more detail in the next section.

3.2.4.2 Act 26 of 2017 – Fiscal Plan Compliance Law

To assure the compliance of the Government with the approved Fiscal Plan, Act 26-2017 was enacted. Act 26-2017 prevails over any previous law. This law covers several aspects of the Government of Puerto Rico in general; however, the clauses applicable to PRASA are listed below:

1. Marginal benefits standardization for all public service employees of the Government of Puerto Rico, including public corporations (Article 2.04 of Act 26-2017).
2. No temporary employment (derogation of Act 89-2016).
3. Revision to Mandatory Insurance Fee every two years (Amendment to Article 3 of Act 253-1995).
4. Additional Service Charge on Mandatory Vehicle Insurance (Amendment to Article 7 of Act 253-1995).
5. Transfer of remaining funds at the end of the FY of all government agencies, instrumentalities, and public corporations to the General Fund.

Measure 1 in the list above standardized the marginal benefits of all government employees. Article 2.04 of Act 26-2017 affects the following marginal benefits:

- Vacation License: accumulation rate and maximum accumulation (depending on applicability of Act 8-2017: Human Resources of the Government of Puerto Rico Transformation and Administration Act)
- Sickness License: accumulation rate and maximum accumulation (depending on applicability of Act 8-2017: Human Resources of the Government of Puerto Rico Transformation and Administration Act)
- Maternity License
- Paternity License
- Breastfeeding Special License
- Unpaid Licenses
- Special Licenses
- Holidays
- Standardization of Holidays (15 holidays)

- Uniform Medical Insurance Employer Contribution (minimum of $100 contribution)
- Only one bonus: Christmas bonus ($600 per year)
- Overtime Compensation at a maximum of 1.5 times
- Vacations and Sickness Days Liquidation (no liquidation at the end of the year)

This measure reduces operational costs in terms of payroll and benefits, specifically in the vacation, sickness, and overtime compensations, and in the Christmas Bonus.

Measures 3 and 4 as listed above may also have an impact on fleet operational cost, since they represent a potential increase in the payment of the mandatory vehicle insurance. These increases are not known yet but are already approved by law. Lastly, Measure 5, as listed above, requires that all public corporations, agencies, and instrumentalities of the Government of Puerto Rico transfer their surplus revenue funds to the State General Fund to comply with the approved Fiscal Plan. Table 3-4 below compares and summarizes both Acts 3 and 26 of 2017 in terms of the effects these enacted laws have on PRASA.

Table 3-4. Impacts of Acts 3 and 26 of 2017 on PRASA

Category	Act 3-2017	Act 26-2017
Economic Benefits	• There will be no increase in economic benefits and no extraordinary monetary compensations as per Act 66-2014. Collective Agreements that have not expired to the date of approval of this law will be extended as stipulated on Article 8 of Act 66-2014.	• Marginal benefits will be the same for all employees of the Executive Branch, including all agencies, instrumentalities, and public corporations of the Government of Puerto Rico, except for the University of Puerto Rico.
	• Vacations accumulated in excess of 60 days shall be used within 6 months after the end of the natural year, otherwise the excess will be lost. Vacation accumulated days up to the date of approval of this law shall be retained by the unionized and non-unionized employee, but accumulated excess shall not be liquidated monetarily.	• Vacations shall be accumulated up to a maximum of 60 days at the end of each natural year. All employees will have the right to enjoy 15 days of vacation each natural year, for which no less than 10 days shall be enjoyed consecutively. If deemed necessary a public corporation shall concede vacations up to a maximum of 50 days in a year to those employees that have accumulated vacation days.
	• Sickness days' accumulation in excess prior to the approval of this act and during the approval of this act will be frozen to the salary of June 30, 2014. Monetary liquidation will only be performed when the employee leaves public service.	• Accumulation of sickness days will be at a rate of 1.25 days per month of service for those employees contracted prior to Act 8-2017. For those contracted after Act 8-2017 the accumulation rate will be 1 day per month. Sickness days shall be accumulated up to a maximum of 90 days per natural year and no monetary liquidation is accepted.

Category	Act 3-2017	Act 26-2017
	• The Christmas bonus will be of $600 each year for all employees of the Central Government and Public Corporations. • All public corporations shall suspend, during the effectiveness of this act, all non-economic clauses under the labor agreements that have a direct or indirect economic impact in the operation of the public corporation. Non-economic clauses with economic impact are defined under Act 66-2014.	• The Christmas bonus will be of $600 each year for all employees of the Central Government and Public Corporations.
Negotiation of Collective Agreements	• Those agreements that expire before the approval of this act or that expire during the term of this act will only be extended in terms of non-economic clauses that are not affected by this act until June 30, 2021. • At the end of the term of this law the labor unions that by July 1st, 2014 were represented in the Executive Branch of the Government will be able to negotiate new collective agreements.	• This law has supremacy over any collective agreement or contractual letter that interferes with the dispositions in this law.
Employment Positions	• All vacant positions that were generated prior or during the effectiveness of this act will remain vacant until June 30, 2017. Vacant positions cannot be filled without the previous authorization of the OMB Director. • No new career, regular, and transitory or irregular positions will be created or renewed, unless previously approved by the OMB Director. • Appointed positions will be reduced by 20%.	
Operational Costs	• Reduction of 10% of half of the operational costs of FY 2016-2017. • The use of public funds for travelling out of Puerto Rico is prohibited unless such travels are necessary for the adequate performance of such entity or	• Mandatory Vehicle Insurance Fee will potentially increase, due to additional service fee and fee revision every two years. This will be reflected in the operation and maintenance costs of PRASA's fleet. • All government instrumentalities, agencies and public corporations of the Executive Branch, except for the University of Puerto Rico, shall transfer a specific amount, as stipulated by the designated committee,

Category	Act 3-2017	Act 26-2017
	that was previously approved by the Secretary of Government.	from the surplus revenue at the end of each economic year to the State General Fund.
	• No public funds will be used for the payment of cellphones or technological services. • Energy consumption shall be reduced at least by 5% each year. The energy consumption of FY 2015-2016 shall be used as baseline for the calculation of the annual reduction. • Potable Water Consumption shall be reduced by 5% each year. The potable water consumption of FY 2015-2016 shall be used as baseline for the calculation of the annual reduction. • Contract Agreements of Professional or Bought Services shall be reduced by at least 10% compared to FY 2015-2016. • Contract Agreements of professional services of more than $10,000 in the same FY shall be previously authorized by the Governor or a representative.	
Purchase Costs	• All purchase costs shall be reduced by 5% for FY 2016-2017.	
Quarterly Report	• All entities of the Executive Branch shall prepare a report that lists and details all the taken measures and the corresponding results. The first report shall be submitted 90 days after the approval of this act.	

3.2.5 Training

PRASA continues to offer various training programs to its employees to improve work management and productivity. Training topics range from technical-oriented seminars to conflict resolution and team building sessions. During FY2018, PRASA offered over 46,446 training hours to its employees; this represents an average of approximately 15.66 hours per trained employee for FY2018, down from 27 hours per trained employee in FY2017.

Overall, about 69% (2,966) of the total employees participated in training activities offered by PRASA during FY2018. PRASA intends to continue to invest in personnel training to increase work ownership and productivity levels. Also, PRASA is reducing training contracts and preparing its own employees to handle those duties whenever possible. Furthermore, PRASA is working to establish a digital platform, using the free open-source “Moodle” to incorporate trainings via internet. PRASA’s training staff is

targeting to incorporate about 11 courses to the digital platform by January 2019 and striving to have around 30 by Summer 2019. Lastly, PRASA continues to support training and certification of its treatment plant operators, in compliance with requirements established by Regulatory Agencies. Table 3-5 presents a summary of the number of operators by the type of license they hold.

Table 3-5. Operator Licensing FY2018

Facility	In Training	Type I	Type II	Type III	Type IV	Total
Water	22	44	90	267	51	474
Wastewater	1	12	26	94	15	148
Total	**23**	**56**	**116**	**361**	**66**	**622**

3.3 Conclusions

The current organization continues to operate and manage the System, despite the hard challenges faced in FY2018. Although PRASA staff levels are under the established target level, its staffing mix is not yet optimal as many critical technical and operations positions are currently vacant. For example, PRASA continues to lack adequate personnel in the Operations Department, mostly operators for treatment facilities and meter readers. PRASA needs to balance the employees with skill sets to fill technical and operator needs while achieving an optimum staffing level. Also, it must consider the impact of the employee retirement programs and population migration which will continue to affect not only its existing staff but also its ability to recruit capable replacement workforce.

PRASA's Executive Management Team continues to assess administrative and operational performance, and to implement organizational and policy changes, focusing on customer service, System performance, and budget controls. Further focus and additional investment in workforce development are required. However, the digital platform may help reduce cost for trainers and allow for more efficient and timely training, which could further support workforce development.

4 CONDITION OF SYSTEM

4.1. Introduction

PRASA is a public utility responsible for the production and distribution of potable water and collection, treatment, and disposal of a large portion of domestic and industrial pretreated wastewaters in Puerto Rico. PRASA serves a population of approximately 3.2 million residents[6] plus approximately 5 million visitors annually. PRASA can be considered a monopoly since it is the only water and wastewater utility in Puerto Rico, providing 96% of water and 59% of wastewater service to Puerto Rico's population. While this is positive in terms of sales of services it also makes PRASA a critical entity for the well-being of Puerto Rico. The effective operation of this vital public service is essential to the health and economic prosperity of Puerto Rico and its citizens.

PRASA provides water and wastewater service throughout the island, which has an approximate area of 3,535 square miles. Because Puerto Rico is an island with varied topography, isolated demographic distributions, and a diverse mix of users, PRASA has a somewhat decentralized system of water sources, treatment systems and delivery systems. Therefore, PRASA has many more treatment facilities than most utilities serving a similar number of customers, this results in a higher degree of diversity in PRASA's assets in terms of size, treatment technologies, and age when compared to systems in the U.S. and Canada, which tend to have more centralized systems with larger regional facilities. These facts add complexity to the management of the System and have historically contributed to higher operation and maintenance (O&M) costs compared to other utilities serving similar populations.

Based on the data obtained from PRASA's water and wastewater infrastructure geodatabase latest update (July 2018), PRASA owns and operates: eight dams, 113 WTPs, 141 active RWIs, 51 WWTPs, 276 wells, 977 WPSs, 1,552 WST, 839 WWPSs, and more than 20,000 miles of water and wastewater pipelines island-wide[7].

In FY2018, Arcadis assessed the condition of PRASA's System through an inspection program of a sample of facilities that included a selection of the major elements of the System. Due to the significant impact caused by Hurricanes Irma and María, Arcadis visited all (100%) of WTPs, RWIs, and WWTPs to perform a damage assessment of the facilities in lieu of the typical asset condition assessment performed annually. Arcadis also evaluated the compliance performance results for all PRASA WTPs and WWTPs for the period from January 2017 through December 2017.

In addition, Arcadis conducted asset condition assessments of the regulated dams as well as a sample of auxiliary facilities. The purpose of these inspections, performed between February and May of 2018, was to identify the overall condition of the facilities to determine if they are being operated and maintained in a manner to achieve their operating goals, and to determine if PRASA's CIP is aligned with its System needs. This section presents a summary of Arcadis' inspection results, findings and recommendations

[6] Source: U.S. Census Bureau as of July 1, 2018.
[7] Source: PRASA Geographical Information System (GIS), updated July 2018, considers elimination of Vega Baja WTP and RWIs.

regarding PRASA's System based on the condition of the assets inspected during FY2018 and detailed in the FY2018 Asset Condition Assessment (ACA) Report.

4.2. Facility Inspections

A summary of the facilities assessed during FY2018 and included in the Report is presented in Table 4-1. In total, 415 facilities were visited out of a total of 3,958 facilities that comprise the System. Inspected facilities include dams, all WTPs, WWTPs and active RWIs, and a selection of wells, WPSs, water storage tanks, and WWPSs. All regulated dams (100%) owned and operated by PRASA were inspected, due to the value of importance of these individual assets. Also, 100% of the WWTPs and WTPs, including their RWIs were inspected after Hurricane María to assess damages and develop preliminary cost estimates of damages. Finally, a small portion (about 7% in total) of the wells, weirs, pump stations and storage tanks (ancillary facilities) were inspected considering the lower risk impact these assets have on the System. It should be noted that no inspections were performed on the following assets: buried infrastructure, meters, ocean outfalls, buildings, land, and other ancillary facilities. Nevertheless, based on data provided by PRASA, a high level discussion of the state of PRASA's buried infrastructure is provided in a later section of the Report.

Table 4-1. Percent of Assets Inspected by Asset Category

Asset Category	Total PRASA Facilities[1]	Inspections Performed	
		Quantity	Percent
Regulated Dams	8	8	**100**
Water Treatment Plants	114	114	**100**
Wastewater Treatment Plants	51	51	**100**
Raw Water Intakes	141	141	**100**
Wells	276	20	**7.3**
Water Pump Stations	977	31	**3.2**
Water Storage Tanks	1,552	30	**1.9**
Wastewater Pump Stations	839	20	**2.4**
Total	**3,958**	**415**	**10.5**

[1]Data obtained from the latest update of PRASA's water and wastewater infrastructure GIS Geodatabase as of July-2018, including active RWIs.

4.2.1. Inspections Methodology

Inspections were performed throughout PRASA's five Operational Regions: East, Metro, North, South, and West. Table 4-2 shows the number of facilities inspected within each Region. It should be noted that the total number of inspections performed in the Metro Region is lower than those performed in the other Regions because it has fewer, but larger WTPs and WWTPs. Nevertheless, it was inspected in a manner consistent with the other Regions.

Table 4-2. Summary of Inspections by Region

Asset Category	East	Metro	North	South	West	Total
Regulated Dams	3	2	1	1	1	**8**
Water Treatment Plants	30	7	31	30	16	**114**
Wastewater Treatment Plants	13	3	15	11	9	**51**
Raw Water Intakes	38	11	36	38	18	**141**
Wells	5	3	4	4	4	**20**
Water Pump Stations	6	6	6	6	7	**31**
Water Storage Tanks	6	6	6	6	6	**30**
Wastewater Pump Stations	4	4	4	4	4	**20**
Total	**105**	**42**	**103**	**100**	**65**	**415**

For the FY2018 asset condition assessments, the post-Hurricane María damage assessments were leveraged to form an opinion of the condition (defined under the damages/condition criteria) of PRASA's WTPs, WWTPs, and RWIs. Arcadis also assessed the Regulatory Compliance data for these treatment facilities for the period from January 1, 2017 to December 31, 2017 to determine the degree to which the performance of the asset complies with its permit limits and regulatory requirements. Specifically, Arcadis evaluated the Safe Drinking Water Act (SDWA) parameters results for all 114 WTPs visited (including the now closed Vega Baja Urbana WTP) and for the potable water distribution system, as well as the National Pollutant Discharge Elimination System (NPDES) effluent parameters of all WTPs and WWTPs.

The selection of the assets to visit after Hurricane María was coordinated with PRASA's Infrastructure Department, considering the information provided by the Operational Regions. From October 2017 through December 2017 Arcadis completed a total of 330 inspections with 318 assessment forms prepared. The remaining12 facilities either did not suffer damages or no form was required because information was obtained from an already identified and ongoing PRASA emergency repair project.

Arcadis prepared construction cost estimates for these facilities contingent to the following assumptions and considerations:

- Rough estimates were prepared in 2018 U.S. dollars (excluding inflation costs and adjustments for time) and were based on limited information provided by PRASA personnel and gathered during the site assessments and rely on observations and experience of Arcadis technical personnel.
- Estimates were prepared based on a 3-5% project definition, or a Class 4 rough estimate which represents an accuracy of +50%/-30% as defined by the Association for the Advancement of Cost Engineering International (AACEI).

- Uncovered damages or damages that buried infrastructure (including water meters) could have suffered were not visually inspected.
- Estimates reflect construction and repairs necessary to attain pre-hurricane conditions. Estimates exclude resiliency or mitigation improvements.
- Arcadis effort is consistent with (i) the degree of care and skill ordinarily exercised by members of the same profession currently practicing under same or similar circumstances and (ii) the time and budget available for its work in its efforts to endeavor to ensure that the data presented is accurate as of the date of its preparation.

Table 4-3 shows assumptions that were considered for soft costs or additional project costs required to execute a project and which need to be included in the budget. These costs amounted to 60% of construction costs, which was added to the net construction cost estimates for each facility.

Table 4-3. Additional Project Costs Considered in Damage Assessment Rough Estimates

Item	Description	% of Construction Cost
Planning	Cost related to planning studies such as preliminary engineering reports, feasibilities studies, modeling, etc.	2.50%
Studies	Studies required for the design of the projects such as land surveying, geotechnical study, etc.	1.75%
Design	Design engineer fees	11.00%
Project Management	Design and construction project management	6.50%
Inspection	Inspection fees during the project construction	3.00%
Design Services During Construction (DSDC)	Design engineer services during the project construction	1.75%
Contingencies	Design, construction, inspection and SDC contingencies	15.00%
Administrative	General administrative cost	12.00%
Insurance	PRASA's Insurance Program	2.00%
Interest	Cumulative interest during the project financing period	4.50%
	Total	**60.00%**

Arcadis observed different levels and modes of damages within each facility visited, varying from removal of debris, process equipment, emergency generators, electrical equipment and components, controls, structural steel roof, panels and frame (sludge drying beds or SDBs, polymer storage, etc.), site infrastructure, concrete roof sealing, office/operator materials, laboratory equipment, security fences and gates, flooded intakes, and excess sedimentation at retention lagoons, among others. In addition, source of the damages were identified, whether it was caused by flooding, by direct wind impact, or by a combination of wind and rain. However, in order to have quantifiable criteria to determine level of impact, Arcadis utilized the cost estimate amounts prepared for the damages assessments to determine the extent of damages/condition at each WTP and WWTP.

Therefore, facilities were classified according to a defined value range to indicate a High, Medium or Low level of damage as follows:

- High level of damages: Over $5M
- Medium level of damages: Between $1M to $5M
- Low level of damages: Under $1M

Dams and ancillary facilities were inspected using an inspection form developed by Arcadis, that includes scoring criteria and criteria weighting customized for each specific asset category. The Operational Areas visited were Arecibo & Toa Alta (North Region), Guayama & Coamo (South Region), Cayey & Humacao (East Region), Aguadilla & Mayagüez (West Region), and Bayamón & Carolina (Metro Region). Since Carolina only had one well, an additional well was visited in the Cayey Operational Area. The purpose of the site visits was to determine the current state of repair and operation of the asset as influenced by the hurricanes, age, historical maintenance and operating environment.

The evaluation criteria include the following:

- Regulatory Compliance – degree to which the performance of the asset is in compliance with its permit limits and regulatory requirements.
- Operations / Process Control – degree to which asset condition and features allow it to be operated and controlled to meet its performance objectives.
- Equipment / Maintenance – assessment of the adequacy of the maintenance practices and the condition of the facility.
- Staffing / Training – assessment of the adequacy of facility staffing coverage and training.

Within each of the evaluation criteria, the asset inspected was assigned a numerical score between 0 and 3. An overall facility rating was then determined based on the calculation of a weighted average of the ratings for each criterion. Typically for WTPs and WWTPs, a weighted average is used per equipment listing in the inspection form to account for the importance of critical equipment, then the average of each equipment rating was considered for the overall facility rating. However, this year the WTPs and WWTPs were evaluated in terms of compliance and condition considering the damages suffered from the impact of Hurricanes Irma and María. The general interpretation of the numerical ratings is described below and in more detail in each of the different asset category sections of the Report.

Rating	Range
• Good (Most of the criteria are adequately addressed)	2.5 – 3.0
• Adequate (Many of the criteria are adequately addressed)	1.5 – 2.4
• Poor (Many of the criteria are not adequately addressed)	0.5 – 1.4
• Unacceptable (Most of the criteria are not adequately addressed)	0.0 – 0.4

An overview of the results of the inspections for each asset category is discussed in the following section.

4.2.2. Inspection Results

4.2.2.1. Hurricane Damages to PRASA Facilities

The total estimated damages for the facilities visited amounted to $257M, which included 100% of the WTPs, WWTPs, and RWIs. Arcadis extrapolated the cost estimates for visited ancillary facilities assuming that 40% of ancillary facilities island-wide that were not visited would require some level of repair. This percentage was determined considering the input provided by PRASA's Operations Department field staff who performed System checks after the hurricanes. Considering these assumptions and the data gathered by Arcadis staff, the total extrapolated cost of damages for all PRASA assets was estimated at approximately $630M. Figures 4-1, 4-2, and 4-3 provide a summary of assets visited by Arcadis, assessments performed and total estimated damages by Region for assets visited by Arcadis, and percentage of total estimated damages by asset type.

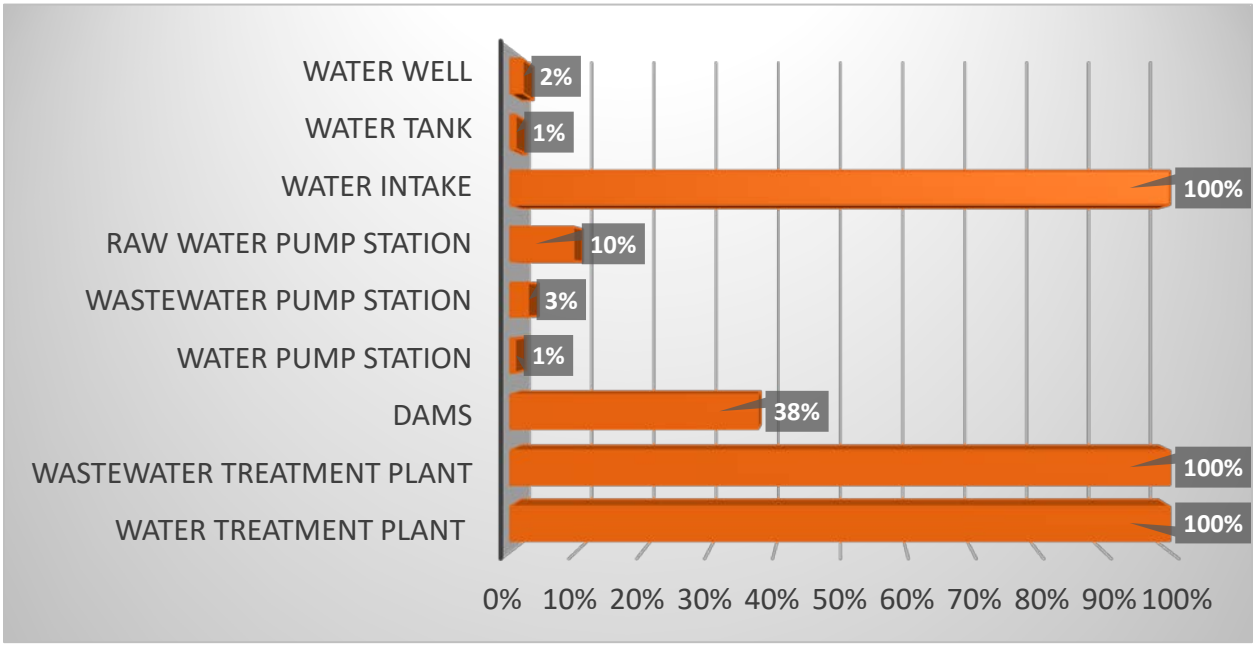

Figure 4-1. Percent of Asset Visited for Damage Assessment

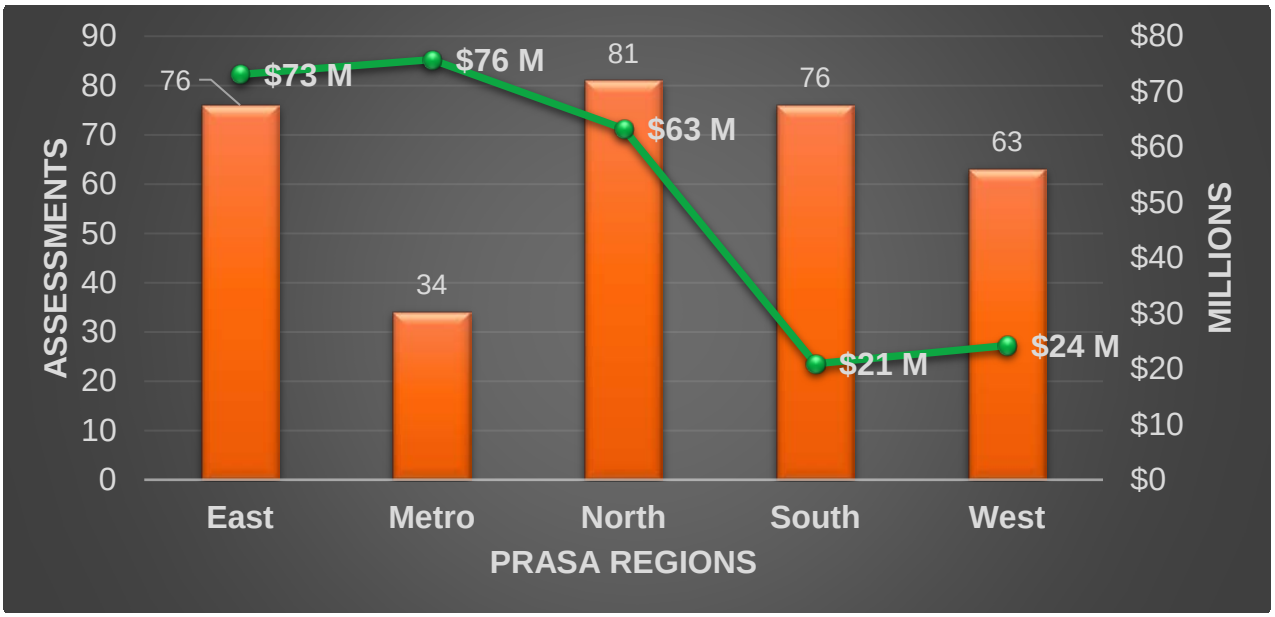

Figure 4-2. Distribution of "Rough Cost Estimates"& Assessments by PRASA Region

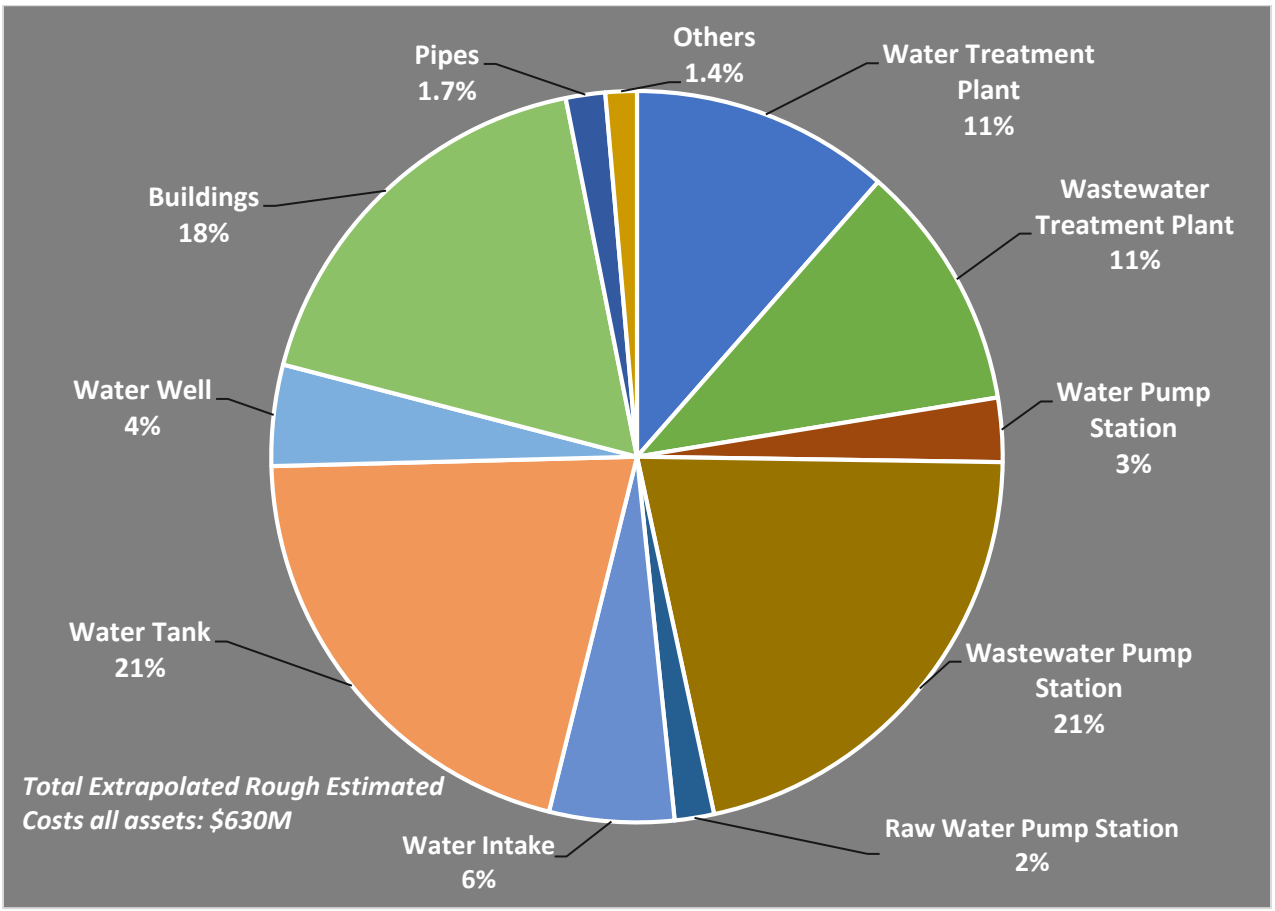

Figure 4-3. Percent of Estimated Repair Costs by Asset Type ($, US)

PRASA used the information provided by Arcadis as a basis for reporting their asset damages. In order to account for the uncertainty of potential damages to its buried infrastructure, PRASA increased the cost estimate to $769M as presented in PRASA's Revised Fiscal Plan and six-year CIP.

4.2.2.2. Regulated Dams

All PRASA's regulated dams, a total of eight, were inspected between February 26 and March 2, 2018. Regulated dam structures are under the jurisdiction of the Dam Safety Unit of the Puerto Rico Electric Power Authority (PREPA). PREPA administers the Dam Safety Program in association with the Department of Natural and Environmental Resources (DNER), Puerto Rico Planning Board (PRPB), PRASA, and public sector appointees by the Governor. PREPA's Dam Safety Unit performed inspections from 2009-2017 of seven PRASA regulated dams creating summary reports that addressed the dam structure, appurtenant works, operations and safety for each facility. Arcadis utilized their previous 2016 Dam inspections (FY2015 CER), PREPA's available inspection reports and PRASA's latest Inspection and Follow-up Reports in preparation for the independent visual inspections and evaluations of the dam structures.

Table 4-4 presents the comparison of the average rating of the facilities by each category evaluated. The overall average rating of each evaluation criteria for facilities inspected in each year are also presented. Overall, all eight dams received an adequate rating. However, as shown in Table 4-4, results are lower than in previous inspections continuing a negative trend in the conditions of these assets.

Table 4-4. Dams - Comparison of Average Inspection Results for 2008-2018

Criteria	2008[1]	2009[2]	2010	2012	2014	2016	2018	Change 2016 to 2018
Regulatory Compliance	2.2	2.2	2.2	2.3	2.3	2.3	1.9	**-0.4**
Operations/Process	2.2	2.1	2.1	2.2	2.1	2.1	2.0	**-0.1**
Equipment/Maintenance	2.3	2.2	2.3	2.3	1.8	1.9	1.6	**-0.3**
Staffing/Training	2.1	2.1	2.3	2.3	2.4	2.4	2.2	**-0.2**
Overall	**2.3**	**2.1**	**2.3**	**2.3**	**2.1**	**2.1**	**1.8**	**-0.3**

[1] Based on seven facilities (excludes Río Blanco Dam).
[2] Río Blanco Dam, under construction at the time, was included in inspections.

In comparison to the 2016 inspections, there was a decrease in rating in all criterion but more significant in the Regulatory Compliance and Equipment/Maintenance criterions with a reduction of 0.4 and 0.3, respectively. Two dams, Cidra and Las Curías, received an overall rating of poor while the rest received an overall rating of either adequate or good. La Plata Dam's overall rating dropped from 2.0 to 1.6 but is still within the lower range of adequate. However, without attention to identified issues or improvement in maintenance practices, the condition of this asset could fall in the poor range. In addition, four dams (Cidra, Isabela, La Plata, and Las Curías) received a poor rating in the Equipment/Maintenance category. The Cidra Dam and La Plata Dam also had a poor rating in the Regulatory Compliance category. Lastly, the Cidra Dam scored poorly on Operation / Process Controls category.

PRASA's dams after the 2017 hurricanes experienced downstream erosions and increase in sedimentation within reservoirs, further reducing their storage capacity. Underwater inspections should be

conducted at several dams, such as Loíza, La Plata, and Toa Vaca to investigate for scour at the concrete/foundation rock contact or stilling basin.

In general, all the dams were reported to have an Emergency Action Plan (EAP); however, the EAPs are not consistently kept at the site, nor emergency numbers visibly posted at the site. Five of the dams were reported to have an O&M Manual; however, only Toa Vaca had it on site, while the other four dams did not. Fajardo, Isabela and Río Blanco reported to not have an O&M Manual. In addition, the knowledge and application of the O&M Manual appeared to vary by site. Based on discussion with PRASA staff we understand that at least for some dams, maintenance is conducted and documented by the Preventive Maintenance Department.

These facilities do not have comprehensive surveillance and monitoring plans (SMPs) and it is recommended that these be developed and used by PRASA. SMPs summarize all types of inspections, frequencies, involved personnel, types of instrumentation, measurement frequency, data collection methods, data processing and reporting for each dam. SMPs should be tailored to the critical potential failure modes for the dam. Based on the SMP, a surveillance and monitoring report should be prepared annually. This annual report summarizes data found from the surveillance and monitoring program. The annual report publishes plots of instrumentation data and overall condition of the dam based on the surveillance and monitoring program. Both the SMP and the annual report should be available for inspectors to review.

4.2.2.3. Water Treatment Plants

PRASA currently operates 113 WTPs where it treats raw water to produce potable water for its customers. PRASA's WTPs treat raw water from different sources: 22 are served from reservoirs, 91 from rivers and one from groundwater. The WTPs range in size from several thousand gallons per day up to 100 million gallons per day (MGD). The total potable water production from WTPs for FY2017 and FY2018 was approximately 455 MGD and 466 MGD, respectively.

A total of 114 WTPs (including the now closed Vega Baja Urbana WTP) were assessed. Each site visit consisted of a thorough site inspection and an interview with the operator, plant supervisor or designated personnel. The information obtained was based on the information provided by the PRASA representatives that participated in the site visit and the observations made by the Arcadis inspector during the assessment after the hurricanes. Arcadis also evaluated the regulatory compliance with SDWA and NPDES.

Table 4-5 presents a list of typical damages observed during inspections and their source.

Table 4-5. Typical Damages to WTP by Source

Direct Wind Impact	Flooding	Wind/Rain
Window, doors, roll-up doors, louvers, A/C units & compressors. Also, EGUs doors and louvers	EGUs, Transformers, Motor Control Center (MCC), Power Substation, pump motors at several RWIs	Roofs sealing causing infiltration, acoustic ceiling, Office equipment and laboratory equipment
Site: Power Poles, Lighting Poles, cables, luminaries, lamps, chain link fences & gates	Control Panels at several RWIs and WTPs	Pumps and pump motors, electrical actuators, control panel door and electrical components

Direct Wind Impact	Flooding	Wind/Rain
Dosing pumps & systems, instrumentation/monitoring equipment, chemical application pipelines	RWIs/weirs structure	Polymer containers & product loss
Telemetry/communication antennas & system, windsocks, safety shower, chlorine alarm		Mechanical screens, valves, sludge drying beds(SDBs) filter media
Sludge drying beds(SDBs) translucent panels, frames and beams, steel roof for chemical/polymers		Excess sedimentation on retention lagoons
Access hatches, auto samplers		Building paint

Table 4-6 provides a summary of the cost estimates of damages by Operational Region. The North Region WTPs suffered the greatest amount of damages (in aggregate), estimated at $30M. The East Region follows with $17M, then the Metro Region with $11M, and finally the South and West Regions with $8M and $6M, respectively. However, the Metro Region WTPs were the most affected with an average of $1.6M in assessed damages per facility, followed closely by the North Region WTPs with an average of $1M in assessed damages per facility.

Table 4-6. WTPs – Estimated WTP Damages by Region

Region	WTPs	Overall Damages ($, millions)[1]	Average Damages per WTP ($, millions)[1]
North	31	$30	$1.0
East	30	$17	$0.6
Metro	7	$11	$1.6
South	30	$8	$0.3
West	16	$6	$0.4
Totals	**114**	**$72**	

[1]Values are rounded.

Three WTPs had a High level of damages: Santiago Vazquez (Superaqueduct) WTP (North Region), Santa Isabel (Utuado) WTP (North Region) and Sergio Cuevas WTP (Metro Region); while nine suffered Medium level of damages. These are:

- El Yunque WTP (East Region)
- Comerío WTP (East Region)
- Canóvanas Nueva WTP (Metro Region)
- Guaynabo Los Filtros WTP (Metro Region)

- Roncador WTP (North Region)
- Almirante Sur WTP (North Region)
- Vega Baja Urbana WTP (North Region)
- Miradero WTP (West Region)
- Humacao WTP (East Region)

Table 4-7 highlights the key damages and observations for the facilities classified under the High and Medium level of damages.

Table 4-7. Observations on High & Medium Level Damages WTPs

WTP	Damage Level	Observations
Santiago Vázquez / Superaqueduct (North Region)	High	The estimated damages for this facility were approximately $12M, although close to $6M were estimated for dredging the three lagoons, including accumulation of sediments and vegetative materials; dewatering dike area; and hauling & disposal for all three lagoons. Other damages observed include roof delamination, roof sealing, metal roof replacement, chain link fence replacement, telemetry antenna, lighting pole & fixture, among other minor impact damages. No major damage to equipment was reported.
Santa Isabel (Utuado) (North Region)	High	The estimated damages for this facility were approximately $5.8M. Repairs to two access road areas were estimated around $3M. Other damages within the facility included: the EGU, power & communications lines, Electrical substation pole (50kva transformers), luminaries, telemetry antenna, potable water system pump control panel, among other lesser impact damages.
Sergio Cuevas (Metro Region)	High	The estimated damages for this facility were approximately $5.5M. About $1.5M going for replacement of filters console control panel (24 units). Another major damage was the replacement of the filters control valves (28). Other damages within the facility included: Aerators & Sediment Basin PLC control panel, exterior lighting poles, telemetry antenna, birds control net, chain link fence, removal of debris, carpet, acoustic ceiling, roof ceiling a/c ducts, among other lesser impact damages.
El Yunque (East Region)	Medium	The estimated damages for this facility were approximately $2.8M. Replacement of a 1,000KW EGU, concrete poles & lighting fixtures, chain link fence and translucent roof for the sludge drying beds were of major cost impact. Other damages within the facility included: a/c units' replacement, acoustic ceiling, roof sealing, security cameras, backwash tank lids (5), among other lesser impact damages.

WTP	Damage Level	Observations
Comerío (East Region)	Medium	The estimated damages for this facility were approximately $2.1M. Replacement of 24" Ø potable water pipeline, 225KVA electrical substation replacement at RWI and 18" Ø raw water pipeline were of major cost impact. Other damages within the facility included: MCC and variable frequency drive (VFD) pumps at RWI, 105kW EGU, distribution pumps 100 HP motors and polymer loss among others.
Canóvanas Nueva (Metro Region)	Medium	The estimated damages for this facility were approximately $2.1M. Replacement of 1,000 KW EGU, 300 and 200 HP distribution pump motors, sedimentation area fiberglass reinforced plastic (FRP) poles & fixtures replacement, polymer loss and chain link fence replacement were of major cost impact. Other damages within the facility included: power poles & lines, raw water flow meter, filters #1-8 control panels, sludge drying bed translucent roof, among other lesser impact damages.
Guaynabo Los Filtros (Metro Region)	Medium	The estimated damages for this facility were approximately $2.0M. Replacement of the sludge drying beds translucent roof and erosion control (landslide) for the Aguas Buenas RWI were the major cost components. Other damages within the facility included: wood & metal roof for gazebo, solar panels, concrete poles & fixtures, distribution tank metal roof & siding, 30 ft of ductile iron (DI) distribution pipe, chlorine mix tank hatch, telemetry & communications antennas, chain link fence and removal of debris, among other lesser impact damages.
Roncador (North Region)	Medium	The estimated damages for this facility were approximately $1.6M. Replacement of RWI access road, removal of debris and replacement of WTP access road were the major cost components. Other damages within the facility included: Sedimentation basin control panels (2), turbidimeter and chlorine monitor analyzer among other minor impact damages.
Almirante Sur (North Region)	Medium	The estimated damages for this facility were approximately $1.5M. Replacement of the sludge drying beds translucent roof, 150 KW EGU (WTP) and a 125KW EGU (RWI) were the major cost components. Other damages within the facility included: filter media, sludge pump, tube settlers, current streaming monitor, chlorine monitoring analyzer, aerator, polymer loss, control panels for STS, thickener and WTP intake, among other lesser impact damages.
Vega Baja Urbana (North Region)	Medium	The estimated damages for this facility were approximately $1.3M. Replacement of ultraviolet (UV) system, two 750gpm RWI pumps and 250 mts of chain link fence were the major cost components. Other damages within the facility included: UV system control panel, RWI pumps MCC, pH & chlorine monitor

WTP	Damage Level	Observations
		analyzers, bisulfite pump and its control panel, turbidimeter, blowers control panel, polymer tanks and spyder system control panel among other lesser impact damages.
Miradero (West Region)	Medium	The estimated damages for this facility were approximately $1.2M. Replacement of sludge drying beds translucent roof and 95 mts of chain link fence were the major cost components. No major damage to equipment was reported. Other damages within the facility included: secondary polymer aluminum roof, lighting pole & fixture and removal of debris among other minor impact damages.
Humacao (East Region)	Medium	The estimated damages for this facility were approximately $1.03M. Disinfection system damages accounted for 34% of the facility damages. These were to the polymer tanks, loss of polymer and phosphate, auto samplers, metering pumps, sampling station A/c, windows and metal door, among others. Also, there were damages to: chain link fence, lighting poles & fixtures, roof sealing, among other lesser impact damages.

The WTPs received an overall combined score of 2.7 in Regulatory Compliance. The evaluated SDWA and STS's NPDES compliance records for WTPs show only 31 WTPs (27% of all WTPs) were 100% compliant. For the evaluated period:

- 85 WTPs (74.5% of all WTPs) were rated as Good in this evaluation criteria, with 93% compliance on average.
- 28 WTPs (24.5% of all WTPs) were rated as Adequate in this evaluation criteria, with 73% compliance on average.
- One WTP, Ponce Nueva WTP (South Region), (1% of all WTPs) was rated as Poor. This facility had significant violation on the following SDWA parameters: Turbidity, Total Organic Carbon (TOC), Total Tri-halomethane (TTHM) and Haloacetic Acids (HAA).
- There were no WTPs rated as Unacceptable under the Regulatory Compliance criteria.

Notwithstanding the average of regulated compliance parameters that received good rating, it is important to note that several compliance parameters are currently being measured against interim limits or were being monitored only, which consequently did not adversely affect the compliance rating. Furthermore, of the 28 facilities rated as Adequate, five were rated below 2.0 and if unattended, could fall to a Poor or Unacceptable rating in the future considering reported exceedances in TTHMs, HAAs, TOC and various NPDES parameters during the period of evaluation. These facilities were:

- Enrique Ortega-La Plata WTP (Metro Region)
- Coto Laurel WTP (South Region)
- Ponce Vieja WTP (South Region)
- Aguadilla WTP (West Region)

- Guajataca WTP (West Region)

In general, TTHMs, HAAs and Turbidity, were the parameters with more non-compliance events reported. PRASA has developed an action plan to address exceedances to TTHM and HAA, which consists of, but is not limited to, the combination of the following corrective measures: elimination/reduction of pre-chlorination; increasing frequency of process tanks/systems wash; more frequent drainage of systems; change in coagulants; hydraulic modeling to reduce retention time in tanks; and lowering pH, among others. This conscientious effort to reduce Disinfection By-products (DBPs) in the System has improved compliance performance with SDWA parameters. Regarding Turbidity exceedances, most were attributed to changes in the raw water characteristic and challenges in chemical treatment (polymers) not being able to treat as efficiently. PRASA is changing the polymer brand, which is helping to lower the Turbidity spikes.

Regarding NPDES compliance, even though regulatory compliance results during the evaluation period were favorable, results might be misleading since several parameters include interim limits or are only being monitored and do not impact the scoring. The parameter with most significant violations was residual chlorine. In addition, several facilities lack STS or have an STS that has been out of service for an extended period. It is recommended that the STS be repaired or new treatment systems may need to be constructed to achieve compliance with the NPDES parameters, as required by the 2015 USEPA Consent Decree.

Furthermore, Arcadis identified at least one WTP, Vega Baja Urbana (North Region), that was affected by significant flooding due to its location in flood susceptible areas. However, this WTP has been closed.

4.2.2.4. Wastewater Treatment Plants

PRASA currently operates 51 WWTPs. The facilities range in size from several thousand gallons per day up to 80 MGD. The island-wide design treatment capacity is approximately 403 MGD and the treated wastewater for FY2017 and FY2018 was approximately 220 MGD and 206 MGD, respectively. In level of treatment, PRASA has seven plants designed to provide tertiary or advanced treatment, 38 plants are designed to provide secondary treatment, and the remaining six facilities (which account for 230 MGD of treatment capacity, approximately 57 percent of PRASA's island-wide treatment capacity) provide primary treatment only under existing USEPA 301 (h) waivers.

All 51 WWTPs were inspected as part of the recovery efforts for asset damages. Each visit consisted of a thorough site inspection and an interview with the operator, plant supervisor or designated personnel. Therefore, the assessment was at least in part based on the information provided and understanding of the person that was being interviewed. As previously mentioned, the WWTPs were evaluated in terms of the regulatory compliance and condition opinion based on the damages (in US dollars) caused by the impact of the September 2017 Hurricanes.

Table 4-8 presents a list of typical damages observed during inspections and their source.

Table 4-8. Typical Damages to WWTPs by Source

Direct Wind Impact	Flooding	Wind/Rain
Window, doors, roll-up doors, louvers, A/C units & compressors. Also, EGUs doors and louvers	EGUs, Transformers, MCC, Power Substation, control panels.	Roofs sealing causing infiltration, acoustic ceiling, building fixtures
Site: Power Poles, Lighting Poles, cables, luminaries, lamps, chain link fences & gates	Pumps, pump motors, electrical grinders and other major equipment at flooded WWTPs (e.g. cloth filters, UV disinfection system, floating aerators/mixers, etc.)	Pumps and pump motors, comminutors, control panel doors and electrical components
Clarifiers/Biofilters Rake system	Sludge drying beds(SDBs) filter media, biofilter plastic media, level sensors	Polymer containers & product loss
Dosing pumps & systems, instrumentation/monitoring equipment, chemical application pipelines	Office furniture, phones, kronos, computers, printers, microwave, file cabinets, laboratory equipment, maintenance equipment	Belt filter press
Telemetry/communication antennas & system, windsocks, safety shower, chlorine alarm	Dechlorination equipment, scum pumps, extractors	Buildings inside/outside paint
Sludge drying beds(SDBs) translucent panels, frames and beams, steel/metal roof for chemical/polymers.	Erosion	
Access hatches, auto samplers		

Table 4-9 provides a summary of the costs estimates of damages by Operational Region. The East Region WWTPs suffered the greatest amount of damages (in aggregate), estimated at $26M. The North Region follows with $19M, then the West Region with $11M and finally the South and Metro Regions with $7M and $6M, respectively. However, the Metro and East Regions were the most affected with an average of $2.0M in assessed damages per facility, followed by the North and West Regions with an average of $1.3M and $1.2M, respectively, in assessed damages per facility. The Region with the least amount of damages per facility was the South Region with approximately $0.64M per facility.

Table 4-9. WWTPs – Estimated WWTP Damages by Region

Region	WWTPs	Overall Damages ($, millions)[1]	Average Damages per WTP ($, millions)[1]
East	13	$26	$2.0
North	15	$19	$1.3

Region	WWTPs	Overall Damages ($, millions)[1]	Average Damages per WTP ($, millions)[1]
West	9	$11	$1.2
South	11	$7	$0.64
Metro	3	$6	$2.0
TOTALS	**51**	**$69**	

[1]Values are rounded.

Only one WWTP had a High level of damages, the Humacao WWTP (East Region). The following 19 WWTPs had Medium level of damages:

- Aibonito WWTP (East Region)
- Arecibo (Islote) RWWTP (North Region)
- Vieques WWTP (East Region)
- Ciales WWTP (North Region)
- Barceloneta WWTP (North Region)
- Yabucoa WWTP (East Region)
- Comerío WWTP (East region)
- Toa Alta WWTP (North Region)
- Ponce RWWTP (South Region)
- Caguas WWTP (East Region)
- San Sebastián WWTP (West Region)
- San Germán WWTP (West Region)
- Dorado WWTP (North Region)
- Carolina RWWTP (Metro Region)
- Guayama WWTP (South Region)
- Bayamón RWWTP (Metro Region)
- Puerto Nuevo RWWTP (Metro Region)
- Naranjito WWTP (North Region)
- Río Grande Estates WWTP (East Region)

Table 4-10 highlights the key damages and observations for the facilities classified under the High and Medium level of damages.

Table 4-10. Observations on High & Medium Level Damages WWTPs

WWTP	Damage Level	Observations
Humacao (East Region)	High	The estimated damages for this facility were approximately $9.8M, although close to 53% were estimated for the sludge drying beds (SDBs) translucent roof replacement. Other major damages observed include replacement of 800 KW EGU and of three 100 HP effluent pumps. Lesser damages within the facility included: biofilters 1 & 2 repairs (motor, leveling, plastic plates, steel tensors), clarifiers 1 & 2 skimmer arms, 244 mts of chain link fence, exterior lighting (60 led lamps), auto sampler, six extractor fans for EGU

WWTP	Damage Level	Observations
		room and three for secondary clarifier pump room, and aeration control system for lift station among others.
Aibonito (East Region)	Medium	The estimated damages for this facility were approximately $4.8M. Replacement of the sludge drying beds translucent roof accounted for 56% of the cost impact. Another major damage was the Clarifiers 1 & 2 sludge collecting mechanism. Other damages within the facility included: trickling filer gyrating arm, lighting poles & fixtures, removal of debris, bar screen control panel, telemetry antenna, electric gate and loss of polymer, among other lesser impact damages.
San Sebastián (West Region)	Medium	Facility flooded. The estimated damages for this facility were approximately $4.6M, although close to 21% were estimated for sludge drying beds filter media & roof panels; and primary biofilters plastic media. Other major damage were replacement of two blowers & control panels at the influent station; three blowers at digesters; 400 KW EGU, automatic transfer switch and dry-type transformer; Electrical wiring (flooded); and 500 mts of chain link fence. Other damages within the facility included: three primary clarifier sludge pumps & control panels, submersible influent pump #3 and control panel, hydraulic comminutor, mini-loader, 2-ton cylinder balance system, two dosing pump skids, effluent flow meter, three secondary clarifier sludge pumps, secondary biofilters submersible recirculation pump, three raw sewage drainage pumps, and office furniture & equipment, among other impact damages.
Arecibo (Islote) (North Region)	Medium	The estimated damages for this facility were approximately $4M. Replacement of four 10 MGD 125 HP influent pumps and two mechanical screens were 39% of the cost impact. Replacing a 1,000 mts of chain link fence accounted for another 8%. Other damages within the facility included: influent channel liner, two influent pit sump pumps, 42" Ø piping at headworks, degritters control panel, removal of debris, belt filter press (BFP) control panel, roll-up door, 10 power line poles, 10 lighting poles & fixtures, sludge drying beds roof panel and beams, among other lesser impact damages. Although the two degritters were not included in the damages estimate, since they were out of service before the hurricanes, it is worth noting its replacement for improving the operation of the WWTP.
San Germán (West Region)	Medium	The estimated damages for this facility were approximately $3.4M, although close to 60% was estimated for the SDBs translucent roof replacement. Other damages within the facility included: oxidation ditch aerators roof covers, 100 mts of chain link fence, automatic valve actuator at effluent pit, 5-ton A/C unit, 10 security cameras, and removal of debris, among other lesser damages.
Vieques (East Region)	Medium	The estimated damages for this facility were approximately $3.2M, although close to 53% was estimated for the SDBs translucent roof replacement. Other damages within the facility included: 150 KW EGU, 183 mts of chain link fence, UV control panel, caustic soda application control panel, septage

WWTP	Damage Level	Observations
		pumps control panel and removal of debris, among other lesser impact damages.
Dorado (North Region)	Medium	Facility flooded. The estimated damages for this facility were approximately $3M. Replacement of the dewatering area metal roof structure, erosion control near Rotating Biological Contactors (RBCs), replacement of 750 KVA electrical substation and replacement of the 450 KW EGU were 33% of the cost impact. Other damages within the facility included: 40 HP influent pump, UV system lamps (120), three floating aerators, disc filters cloth membrane, 300 mts of chain link fence, three sludge pumps (dewatering), non-potable water (NPW) system, UV and filters control panels, two dosing pumps skids (Cl, bisulfite), secondary clarifier rake system control panel, effluent flow meter, MC and dry-type transformer at blower room, auto samplers, kronos and other office furniture and equipment, among others.
Ciales (North Region)	Medium	Facility flooded. The estimated damages for this facility were approximately $2.9M. Replacement for the SDBs translucent roof replacement and the 10-inch force main with supports and concrete bridge (crossing) replacement were 43% of the cost impact. Other major damages within the facility included: 600 KW EGU and power lines at WWTP site; and 400KW EGU, MCC and comminutor control panel at Dos Rios WWPS site.
Carolina (Metro Region)	Medium	The estimated damages for this facility were approximately $2.6M, although close to 42% was estimated for traveling (truss type) bridge #3 replacement, five retractable cables and five traveling bridges control panels. Other damages within the facility included: clarifier tank solids removal, two degritter system control panels, NPW bldg. roof isolation & sealing, headworks automatic sluice gate valve, 182 meters of chain link fence, telemetry system, polymer mixers control panel and removal of debris, among other lesser impact damages.
Barceloneta (North Region)	Medium	The estimated damages for this facility were approximately $2.3M. Replacement of 1800 KW EGU and two (100-ft diameter) primary clarifier rake mechanisms were 43% cost impact. Other damages within the facility included: dewatering/lab bldg. roof insulation, 212 mts of chain link fence, exterior lighting poles & fixtures (25), 100 mts of power lines, telemetry antenna, two 5-ton A/C units, roll-up doors and removal of debris, among other lesser impact damages.
Guayama (South Region)	Medium	The estimated damages for this facility were approximately $2.2M, although close to 44% was estimated for the replacement of two MIOX RIO oxidant systems. Other damages within the facility included: 329 mts of chain link fence, removal of debris, lighting poles & fixtures, sheet metal at chlorine bldg.., acoustic ceiling, 9.5-ton A/C unit, communications tower & telemetry system, among other lesser impact damages.
Yabucoa (East Region)	Medium	The estimated damages for this facility were approximately $2M. Replacement of the SDBs translucent roof and 400 KW EGU were 48% of the cost impact. Other damages within the facility included: five stainless

WWTP	Damage Level	Observations
		steel access hatches at holding tank, 11,800 ft^2 of exterior wall paint, 250 mts of chain link fence, roll-up door, electric gate and removal of debris, among other lesser impact damages.
Bayamón (Metro Region)	Medium	The estimated damages for this facility were approximately $1.8M. Replacement of the 1,315 mts of chain link fence and thirty lighting poles & fixtures were 36% of the cost impact. Other damages within the facility included: electrical substation repairs; MCC D & E inspection and repairs; VFD pump #2; pump#4 soft starter; light equipment are metal roof, walls and beams; degritter 15 HP motor; filter press metal roof; and removal of debris, among other lesser impact damages.
Comerío (East Region)	Medium	The estimated damages for this facility were approximately $1.7M, although close to 57% was estimated for the SDBs translucent roof & laterals replacement. Other damages within the facility included: 135 mts of chain link fence, lighting poles & fixtures and removal of debris, among minor impact damages.
Puerto Nuevo (Metro Region)	Medium	The estimated damages for this facility were approximately $1.6M. Replacement of the electrical substation switch gear, four 20-ton A/C units at VFD room and 2,620 ft^2 of louvers at EGU room were 27% of the cost impact. Other damages within the facility included: EGU battery chargers, roll-up door, six primary clarifiers control panel, six extractor fans, uninterrupted power supply (UPS) at VFD room entrance, thickener VFD pump#1, filter press compressor, ten lighting poles & fixtures, luminaries (30) and removal of debris, among other lesser impact damages.
Toa Alta (North Region)	Medium	Facility flooded. The estimated damages for this facility were approximately $1.5M. Replacement of 350 KW EGU stator and sludge drying beds translucent roof were 40% of the cost impact. Other damages within the facility were: two degritter control panels, blowers control panel, dewatering sludge pump & motor, chlorination equipment (gas feeders, ejectors, scales, switch-over, leak detectors, etc.), influent & effluent auto samplers and office furniture & equipment.
Naranjito (North Region)	Medium	The estimated damages for this facility were approximately $1.3M, although close to 44% was estimated for the SDBs translucent roof replacement. Other damages within the facility included: 250 KW EGU, telemetry line, main bldg. extractor fans, 185 mts of chain link fence, among other lesser impact damages.
Ponce (South Region)	Medium	The estimated damages for this facility were approximately $1.2M, although close to 38% was estimated for the 1,500 KW EGU replacement. Other damages within the facility included: three exhaust fans at influent pumps bldg., 244 mts of chain link fence, power cables, lighting poles & fixtures, soft starters for VFD effluent pumps #4 & 5, and removal of debris, among other lesser impact damages.

WWTP	Damage Level	Observations
Río Grande Estates (East Region)	Medium	The estimated damages for this facility were approximately $1.1M, although close to 56% was estimated for the SDBs translucent roof replacement. Other damages within the facility included: EGU repairs, telemetry antenna, influent auto sampler, blowers shed metal roof, RAS pumps control panel, among other lesser impact damages.
Caguas (East Region)	Medium	The estimated damages for this facility were approximately $1M. Replacement of 430 mts of chain link fence; and roof sealing, acoustic ceiling & laminated panels replacement at main bldg. were 31% of the cost impact. Other damages within the facility included: A/C conduits at main bldg., filter#7 electrical transmission, roll-up door, filter press covers, holding tank dome roof, primary clarifiers plates (odor control), among other lesser impact damages.

Furthermore, Arcadis identified at least six WWTPs that were affected by significant flooding due to their location in flood susceptible areas. These are: San Sebastián WWTP (West Region), Dorado WWTP (North Region), Toa Alta WWTP (North Region), Ciales WWTP (North Region), Corozal WWTP (North Region) and San Sebastián (Old) WWTP (West Region). The entire extent of the damages on these facilities could not be captured because of the lack of emergency power generators to test the equipment when the visits were performed; but it is reasonable to assume that most of the equipment that was flooded was either damaged or their operational life expectancy was reduced.

In addition, the Guayanilla WWTP (South Region) suffered a landslide due to its proximity to a river which eroded part of the perimeter fence. The Camuy-Hatillo WWTP (North Region) also was affected by significant erosion caused by rising ocean's tides. This facility is of concern because the erosion is advanced and if not addressed promptly, some of the treatment units may suffer material damages.

The WWTPs received an overall combined score of 2.3 in Regulatory Compliance. The evaluated NPDES compliance records for WWTPs show only four WWTPs (7.8% of all WWTPs) were 100% compliant. For the evaluated period:

- 19 WWTPs (37% of all WWTPs) were rated as Good.
- 30 WWTPs (59% of all WWTPs) were rated as Adequate.
- Two WWTPs (4% of all WWTPs) were rated as Poor: Camuy-Hatillo WWTP (North Region) and San Sebastián Nueva WWTP (West Region).
- Zero facilities were rated as Unacceptable under the Regulatory Compliance criteria.

Exceedances in fecal coliforms and to some degree Total Suspended Solids (TSS) and Biological Oxygen Demand (BOD) were attributed mainly to the effects of the 2017 hurricanes, as most exceedances occurred between October and December 2017. In addition, other issues observed during inspections were identified as contributing factors to the non-compliance with NPDES parameters, including: broken down chlorine application system and/or UV system; critical equipment failure, such as clarifiers (mainly outdated/damaged traveling bridges), sludge removal pumps, Rotating Biological Contactors (RBCs), and the aeration for a Sequencing Batch Reactors (SBR); the collapse of a sanitary

trunk sewer (e.g. Salinas-Guayama trunk sewer); and an entire train of a WWTP being out of service (diminishes the capacity of the plant to handle organics / sediments / nutrients).

As for residual chlorine, the limit of this parameter has been made more stringent at some facilities, which may be the cause for some of the reported exceedances. Also, there were operational failures with the adjustment of bisulfite doles that affect the residual chlorine. The latter can be corrected operationally, while the former may require investment for improvement to the disinfection or dechlorination systems.

For most WWTPs, the nutrient removal and aeration processes need to be evaluated to determine optimal operation. In addition, repairs to key equipment and improvements to outdated/damaged ones must be performed for WWTPs to operate properly and achieve compliance. PRASA staff at several WWTPs, including Aguas Buenas, Caguas and Cayey (all in the East Region), indicate that the facilities are not designed to meet the new stringent limits of phosphorous (P) or nitrogen (N), hence the need for upgrades in treatment level and/or equipment.

Furthermore, of the 30 facilities rated as Adequate, 11 were rated below 2.0 and if unattended, could fall to Poor or Unacceptable rating in the future. These were:

- Caguas WWTP (East Region)
- Río Grande Estates WWTP (East Region)
- Bayamon WWTP (Metro Region)
- Barceloneta WWTP (North Region)
- Corozal WWTP (North Region)
- Guayanilla WWTP (South Region)
- Ponce RWWTP (South Region)
- Isabela WWTP (West Region)
- Lajas WWTP (West Region)
- Maricao WWTP (West Region)
- San Germán WWTP (West Region)

4.2.2.5. Wells

PRASA has reported that it owns and operates 276 water wells, most of which deliver water directly into a distribution system with little or no treatment, except for disinfection by chlorination. PRASA's wells vary in size from 100 to 1,200 gallons per minute (gpm). The total potable water production from wells for FY2018 was approximately 49 MGD. A total of 20 wells (7% of total wells) from the Operational Areas of Carolina, Bayamón, Arecibo, Toa Alta, Cayey, Humacao, Guayama, Coamo, Aguadilla and Mayagüez were inspected in FY2018. Each assessment consisted of a site visit inspection and an interview with the designated personnel. The facilities were evaluated using the following criteria: facility specific and regional specific criteria. The facility specific evaluation criterion considers operations, process control and equipment aspects, which are related to a specific facility. The regional specific criterion considers maintenance aspects which are carried out either on a regional or operational area basis and, also, the

staffing and training aspects. Staffing and training were included to evaluate the adequacy of PRASA's assigned monitoring and operations personnel.

The inspection results for previous years were compared to the inspection results from the 2018 inspection to analyze condition changes. Table 4-11 illustrates the comparison of the average rating for 2008 through 2018 of all facilities using the overall rating since the equipment evaluation was merged with the operations/process control criterion. This merged criterion was scored using the same deductions and weighted score than previous asset condition assessment reports thus the impact on the overall score was not altered. Of the 20 wells inspected, 13 received a rating of Adequate, one received a rating of Good, and six were rated as Poor. Furthermore, it is important to point out that although the average overall rating was in the adequate range (score of 1.7), 11 (equivalent to 55% of the wells inspected) received an overall rating below 2.0 and if left unattended, their condition could deteriorate downgrading their rating to Poor or Unacceptable in the future.

The facilities rated Poor include: Levittown 4 well, Palo Seco 2 well, Santa Rosa well, Bateyes well, La Playita well and Laura well. Furthermore, the Santa Rosa Well, was evaluated in the 2016 Asset Condition Assessment. In the previous evaluation it was rated as adequate, while now it is rated Poor.

Table 4-11. Wells – Comparison of Average Inspection Results for 2008-2018

Criteria	2008	2009	2010	2012	2014	2015	2017	2018	Change 2018 vs. 2017
Overall	2.0	1.9	2.1	2.2	2.2	1.9	1.8	1.7	-0.1

In general, the average results decreased when compared to the 2017 results. Although most wells were generally observed to be in adequate condition, there were a number of factors that resulted in several wells receiving a lower score and rating. As noted, Levittown 4 well from the Bayamón Operational Area, La Playita well from the Cayey Operational Area, Paso Seco 2 well from the Coamo Operational Area, Laura well from the Humacao Operational Area, Bateyes well from the Mayagüez Operational Area, and Santa Rosa well from the Toa Alta Operational Area were found in detrimental condition.

In general, the facility specific deficiencies noted were due in part to deterioration in equipment conditions and due to the 2017 hurricanes impact. According to the inspection performed the most notable deficiencies were:

- 70% of the wells are not remotely monitored;
- 60% of the wells do not have adequately labeled or colored pipelines;
- 40% have entry points in the well head casing;
- 15% have the well head less than 12-inches from ground floor;
- 60% have corroded pipelines and fittings;
- 70% of the inspected wells do not have an EGU; and
- 30% of the wells had some type of leak.

The observed deficiencies in terms of the regional evaluations for Cayey, Coamo, Guayama and Bayamón Operational Areas for potable water systems were the following:

- Unavailability of O&M/vendor manuals
- Challenges in the parts procurement process
- Unavailability of written emergency handling procedures for the ancillary facilities
- Unavailability of as-built drawings
- Insufficient staff

The other Operational Areas evaluated, Arecibo, Toa Alta, Humacao, and Carolina had similar deficiencies, except for the Aguadilla and Mayagüez Operational Areas, which were rated as good.

The sample of wells average rating was Adequate. However, some of the wells presented a Poor to Unacceptable condition in the facility specific criteria. As much as 35% of the wells visited were rated as Poor/Unacceptable in the facility criteria and deterioration has been observed through the years since there has not been capital improvements works. Also, the degradation of the condition of facilities was exacerbated due to the immense destruction caused by the recent hurricanes. Nevertheless, for the time being, these wells are expected to continue to serve their intended function of supplemental water supply. One of the main concerns is the lack of backup power. This lack of backup power compromises the quality of service to PRASA's clients, making the potable water supply an intermittent one during events of electrical power problems. This issue was made even more evident during the recovery efforts after Hurricane María. Then again, most of the deficiencies noted could be addressed through PRASA's R&R program and may not require major capital improvements. Note, however, that financing of PRASA's R&R program has also been negatively affected given PRASA's fiscal situation.

Future regulatory requirements may require either the implementation of significant capital improvements to include and achieve additional treatment capabilities at well facilities, or the closure of certain wells. PRASA has continued its comprehensive island-wide study of all active groundwater wells where it is assessing source water protection and identify potential groundwater under the direct influence (GWUDI) of surface water. Currently, PRASA is performing Microparticulate Analysis (MPA) samplings to determine GWUDI classification in wells classified as having the potential of being GWUDI or inconclusive in the initial assessment. This effort is being performed in compliance with USEPA's Surface Water Treatment Rule (SWTR) and local regulations required by the PRDOH. The SWTR requires source protection, filtration and disinfection when surface water or GWUDI is used as a source for drinking water.

PRASA has completed five priority evaluations and has performed MPA in selected wells from priority one, two, three and four groups, to further evaluate the potential of a well of being GWUDI. Results of the GWUDI evaluations currently being conducted by PRASA should prove beneficial to identify additional needs in these facilities. As of the date of this report PRASA has completed four rounds of wet and dry sampling consisting of 66 wells, of which two have been identified as GWUDI.

4.2.2.6. Water Pump Stations

PRASA has reported that it owns and operates 977 WPSs. WPSs consist of two categories: 1) above ground pumps and 2) below ground pumps in vaults with heavy covers that cannot be readily removed by field inspectors, such as underground booster stations (these are not inspected). PRASA's WPSs vary in pumping capability from less than 100 gpm to over 9,000 gpm. A total of 31 above ground WPSs (3.2% of total WPSs) were inspected. Each assessment consisted of a site visit inspection and an interview with the designated personnel. The facilities were evaluated using facility specific criteria and regional specific

criteria, to have a better understanding about the facility's conditions, and obtain an overview of the maintenance, training and staffing practices of the regional/operational area. One criterion considers operations, process control, and equipment aspects which are related to a specific facility. The other criterion considers maintenance aspects, which are carried out either on a regional or operational area basis and, also, the staffing and training aspects. Staffing and training were included to evaluate the adequacy of PRASA's assigned monitoring and operations personnel.

The facility specific (operations/process control/equipment) criterion was assigned a weighting factor of 75%, while the regional specific (maintenance/training/staffing) criterion was assigned a weighting factor of 25%.

The average WPSs overall rating resulted in the adequate range with a rating of 1.7. No facility was rated Unacceptable under the operation/process control/equipment category. However, 11 facilities were rated as Poor under this category, these included:

- April Garden WPS (East Region, Humacao)
- Las Toronjas WPS (Metro Region, Bayamón)
- El Comandante WPS and Parcelas Campo Rico WPS (both from Metro Region, Carolina)
- Lomas 2 WPS, Winche WPS and Contorno WPS (from North Region, Toa Alta)
- Río Jüeyes WPS and Booster Paso Seco WPS (both from South Region, Coamo)
- Piedras Blancas 2 WPS and El Palmar WPS (both from West Region, Aguadilla)

Furthermore, it is important to point out that although the average overall rating was in the Adequate range, 20 (equivalent to 65% of the WPS inspected) received an overall rating below 2.0 and if left unattended, their condition could deteriorate downgrading their rating to Poor or Unacceptable in the future.

The inspection results for previous years were compared to the inspection results from 2018 inspection to analyze performance changes since the previous inspections. Table 4-12 illustrates the comparison of the average rating of all facilities by each category evaluated. The overall average rating of each evaluation criteria for 2008 through 2018 is also presented.

Table 4-12. WPSs – Comparison of Average Inspection Results for 2008-2018

Criteria	2008	2009	2010	2012	2014	2015	2017	2018	Change 2018 vs. 2017
Overall	2.2	2.2	2.3	2.4	2.2	2.2	2.3	1.7	-0.6

As shown in Table 4-12, the overall score decreased by 0.6, a significant difference compared to the 2017 results, as a consequence of the 2017 hurricanes impact and lack of recent investment.

According to the inspections performed, some of the most notable deficiencies are the following: lack of remote monitoring and emergency generator unit or they are damaged; lack of crane rails or a portable hoisting truck for the removal of pumps for maintenance purposes; facilities with non-operational equipment (pumps, flow meters, etc.); facilities were observed to have severe leakage issues; facilities with equipment corrosion and deteriorated concrete supports; lack of a flow meter.

The observed deficiencies in terms of the regional evaluations for Cayey, Coamo, Guayama and Bayamón Operational Areas for potable water systems were the following:

- Unavailability of O&M/ vendor manuals
- Challenges in the parts procurement process
- Unavailability of written emergency handling procedures for the ancillary facilities
- Unavailability of as-built drawings
- Insufficient staff

The other Operational Areas evaluated, Arecibo, Toa Alta, Humacao, and Carolina had similar deficiencies, except for the Aguadilla and Mayagüez Operational Areas, which were rated as Good.

The WPSs inspected degraded significantly although the overall average was in the Adequate condition range (1.7 score). Nevertheless, they are expected to continue to serve their intended function of delivering drinking water throughout the distribution systems. A total of 11 facilities (35.5% of the evaluated facilities) were rated as Poor. Also, the degradation of the condition of facilities was exacerbated due to the immense destruction caused by the recent hurricanes. The deficiencies noted are related to lack of features to optimize O&M practices, and condition of equipment of facilities. Other noted deficiencies, such as leaks, corrosion and overgrown vegetation can be addressed through routine maintenance or PRASA's R&R program and do not require major capital improvements. The most significant deficiency was observed to be the lack of an EGU and remote monitoring, followed by non-operational equipment, and third the lack of flow meters.

PRASA's Operational Regions previous efforts under the Integrated Maintenance Program (IMP) to install telemetry systems in all facilities to enable monitoring from the remote operating centers (ROCs) was affected by the 2017 hurricanes impact and then halted due to the recovery efforts but should continue once things are normalized. These highlighted deficiencies and others found, if left unattended, could compromise the continuous supply of potable water to PRASA's clients.

4.2.2.7. Wastewater Pump Stations

PRASA has reported that it owns and operates 839 WWPSs, these vary in pumping capability from less than 100 gpm to over 10,000 gpm depending on the population density and its proximity to the receiving WWTP. A total of 20 WWPSs (2.4% of total WWPSs) were inspected in FY2018. Each assessment consisted of a site visit inspection and an interview with the designated personnel. In general, the inspected facilities predominantly use wet pit type submersible pumps, although several dry pit type stations were also inspected. The facilities were evaluated using facility specific criteria and regional specific criteria, in order to have a better understanding about the facility's conditions and obtain an overview of the maintenance and staffing practices of the region/operational area. One criterion considers operations, process control and equipment aspects which are related and limited to a specific facility. The other criterion considers maintenance aspects, which are carried out either on a regional or operational area basis and, also, the staffing and training aspects. Staffing and training were included to evaluate the adequacy of PRASA's assigned monitoring and operations personnel.

The operations/process control/equipment criterion was assigned a weighting factor of 75%, while the maintenance/staffing criterion was assigned a weighting factor of 25%.

The average WWPSs overall rating for 2018 resulted in the lower end of the adequate range with an overall rating of 1.8. Furthermore, it is important to point out that although the average overall rating was in the Adequate range, six WWPSs (equivalent to 30% of WWPS inspected) received an overall rating below 2.0. As previously stated, the facility specific criterion accounts for 75% of the weighted factor, as it is the key criterion for assessing the condition of the wells. Therefore, highlighting this criterion, the WWPSs rating distribution for this evaluation period is as follows: two Unacceptable, six Poor, eight Adequate, and four Good. The facilities rated as Unacceptable and Poor under this criterion were:

Unacceptable:

- Branderi WWPS (South Region, Guayama)
- Candelero WWPS (East Region, Humacao)

Poor:

- Troncal Cayey WWPS (East Region, Cayey)
- Zona Industrial Humacao WWPS (East Region, Humacao)
- Costa de Oro WWPS (North Region, Toa Alta)
- Moca El Parque WWPS (West Region, Aguadilla)
- Concordia WWPS (West Region, Mayaguez)
- Sábalos WWPS (West Region, Mayaguez)

In addition to the facilities rated as unacceptable or poor, although rated as adequate, four facilities (equivalent to 20% of the WWPSs inspected) were below a 2.0 rating in the facilities criterion and, if left unattended, their condition could deteriorate downgrading their rating to Poor or Unacceptable in the future. These facilities were: Perez Matos WWPS (North Region, Arecibo), San Felipe WWPS (South Region, Guayama), Dorado Country Estates WWPS (North Region, Toa Alta) and Cruz Isleta WWPS (West Region, Aguadilla).

The inspection results for previous years were compared to the inspection results from 2018 to analyze the performance. Table 4-13 presents the comparison of the average rating of all facilities by each category evaluated. The overall average rating of each evaluation criteria for 2008 through 2018 is also presented.

Table 4-13. WWPSs – Comparison of Average Inspection Results for 2008-2018

Criteria	2008	2009	2010	2012	2014	2015	2017	2018	Change 2018 vs. 2017
Overall	1.7	2.0	2.0	2.1	2.3	2.4	1.8	1.8	0.0

The overall condition of WWPSs continue the same compared to the 2017 inspections. There has been no improvement, which can mostly be attributed to the lack of investment in improvement works the last few years due to the ongoing fiscal situation and the effects of the 2017 hurricanes.

In general, some of the most significant deficiencies encountered during the inspections revealed the following:

- 75% of the facilities visited do not have a remote monitoring system or it's out of service;
- 60% of the facilities have its exhaust fans operating in manual mode or damaged;
- 40% of the visited WWPSs had recorded overflows during the evaluation period;
- 40% of the facilities visited had a key equipment out of service (pump, comminutor);
- 30% of the facilities visited did not have an adequately clean bar screen or were not clear of floating debris;
- 25% of the facilities visited did not have an emergency generator unit or it was out of service;
- 25% of the pump stations visited could not handle peak flows; and
- 15% of the pump stations visited did not have elapsed time meters on panel.

In terms of the regional evaluations, the number of deficiencies found for the Arecibo, Toa Alta, Humacao and Cayey Operational Areas were the following:

- Challenges in the parts procurement processes; very slow
- Lack of procedure to prioritize repairs
- Unavailability of as-built drawings and O&M Manuals
- Insufficient staff
- Facilities are not visited in a daily basis and do not have an exterior alarm

The other Operational Areas evaluated, Aguadilla, Guayama, Bayamón and Carolina had similar deficiencies, except for the Coamo and Mayagüez Operational Areas, which were rated as good.

Overall, the WWPSs are in adequate to poor condition. Although the same overall average rating compared to FY2017, there were significantly more facilities rated poor in the facility criterion. In past years, there has been a trend on increase deterioration due to the lack of capital improvement invested, as a result of the fiscal situation. Furthermore, the fact that 40% of the visited facilities have recorded overflows during this evaluation period is of concern. This problem can be attributed to the fact that 75% of the facilities visited are not remotely monitored, most of the facilities visited did not have an exterior alarm, and 30% of the bar screens were not adequately cleaned, which may result in clogging of the entry way to the pump station. Having remote monitoring will help PRASA prevent overflows in the System and adding a comminutor (grinder type) to those facilities which receive vast amounts of solids would help maintain the entryway clear of debris. PRASA's Operational Regions will eventually continue their effort with IMP to install telemetry at all facilities to enable monitoring from the ROCs. This program, as most, was halted in FY2018, but should be continued as things begin to normalize.

4.2.2.8. Water Storage Tanks

PRASA has reported that it owns and operates 1,552 WSTs that vary in storage capacity (size) from 100 to 10,000,000 gallons. A total of 30 water storage tanks (2% of total WSTs) were inspected in FY2018. Each assessment consisted of a site visit inspection and an interview with the designated personnel. The facilities were evaluated using facility specific and regional specific criteria, in order to have a better understanding about the facility's conditions and obtain an overview of the maintenance and staffing practices of the region/operational area. One criterion considers operations, process control and equipment aspects which are related (limited to) a specific facility. The other criterion considers

maintenance aspects, which are carried out either on a regional or operational area basis and, also, the staffing and training aspects. Staffing and training were included to evaluate the adequacy of PRASA's assigned monitoring and operations personnel.

The facility specific (operations/process control/equipment) criterion was assigned a weighting factor of 75%, while the regional specific (maintenance/training/staffing) criterion was assigned a weighting factor of 25%.

The inspection results for previous years were compared to the inspection results from 2018 inspection to analyze performance changes since the previous inspections. The overall rating was in the adequate range, with an overall rating of 1.9. Table 4-14 illustrates the comparison of the average rating of all facilities by each category evaluated. The overall average rating of each evaluation criteria for 2008 through 2018 is also presented.

Table 4-14. Tanks – Comparison of Average Inspection Results for 2008-2018

Criteria	2008	2009	2010	2012	2014	2015	2017	2018	Change 2018 vs. 2017
Overall	1.9	1.6	1.6	1.9	2.4	2.3	2.4	1.9	-0.5

On average, overall ratings significantly decreased from the 2017 inspections. None of the facilities were rated Unacceptable but two were rated as Poor, Río Jüeyes Tank (South Region, Coamo) and Calbache-Barrero Tank (West Region, Mayagüez) and as much as 33% of the inspected tanks was rated below 2.0, which, if left unattended, their condition could deteriorate downgrading their rating to Poor or Unacceptable in the future. These facilities are:

- Bo. Cruz Tank (West Region, Aguadilla)
- Piedras Blancas 2 Tank (West Region, Aguadilla)
- El Comandante Tank (Metro Region, Carolina)
- Parcelas Campo Rico Tank (Metro Region, Carolina)
- Pedro Ávila Tank (East Region, Cayey),
- April Garden Tank (East Region, Humacao)
- Eagle View Tank and La Plena Tank (both from South Region, Guayama)
- Los Perros Tank (South Region, Coamo)
- Lomas 2 (North Region, Toa Alta)

In general, some of the most significant deficiencies encountered during the inspections revealed the following:

- 53% of the tanks visited did not have a local level indicator;
- 53% of the tanks visited do not have a remote monitoring system or it's out of service;
- 43% of the tanks visited do not have a high/low level alarm or it's out of service;
- 40% of the tanks inspected are not visited daily;

- 40% of the tanks visited had vents or float valve entrance not protected with insect screens;
- 30% of the tanks visited have deteriorated concrete walls, with cracks ranging from minor to severe degree;
- 27% of the tanks visited had roof defects;
- 23% of the tanks visited do not have adequately secured access hatches; and
- 17% of the tanks visited exhibited leaks ranging from minor to severe.

Even though not all tanks are visited daily, PRASA informs it is in compliance with the Tank Monitoring Program established in the 2006 PRDOH Settlement Agreement, as amended.

The observed deficiencies in terms of the regional evaluations for Cayey, Coamo, Guayama and Bayamón Operational Areas for WST were the following:

- Unavailability of O&M/vendor manuals
- Challenges in the parts procurement process
- Unavailability of written emergency handling procedures for the ancillary facilities
- Unavailability of as-built drawings
- Insufficient staff

The other Operational Areas evaluated, Arecibo, Toa Alta, Humacao, and Carolina had similar deficiencies, except for the Aguadilla and Mayagüez Operational Areas, which were rated as Good.

The water storage tanks are generally in adequate condition and are expected to continue to serve their intended function of providing potable water storage throughout the distribution systems. However, this year a significant drop in rating occurred and could be attributed to a combination of: 1) the fact that no capital improvement has been performed as a result of the fiscal situation and 2) the damage caused by the recent hurricanes in 2017.

The most significant deficiencies observed were lack of local level indicator, lack of remote monitoring, and lack of high/low level alarm. These deficiencies do not require significant capital upgrades, but rather a modification to O&M practices (e.g. removal of overgrown vegetation and periodic tank internal inspections) or can be addressed through PRASA's R&R program (e.g. repairs to tank hatches, vents, level alarms, and security fences). Deficiencies that could require capital upgrades, such as tank refurbishing, deteriorated concrete, and significant leakage through walls were observed in 30% of the visited tanks.

In addition, remote monitoring is recommended as an optimization measure and as a preventive measure against water losses in the distribution system; consequently, PRASA had started with this initiative, providing remote monitoring to those tanks that have been identified as critical in the distribution system. This initiative, as most, was affected by the 2017 hurricanes and then halted during the recovery efforts but should be continued as things begin to normalize.

4.3. Buried Infrastructure

Although buried infrastructure (i.e. water meters, water mains and distribution pipes, buried valves, sewer trunks and collection pipes, and manholes) was not inspected, the following sections provide some

discussion regarding indirect indicators of the condition of buried infrastructure. Since FY2005 PRASA has invested in and continues to develop and update its Geographical Information System (GIS) database to allow for a better control, record and management of its buried assets. Also, PRASA slowly continues with its buried infrastructure R&R program, mainly managed and implemented by the Operational Regions and as their assigned budget allows. R&R of distribution (water) and collection (wastewater) pipes, which targets pipe breaks and leak-prone areas, are identified by PRASA's Operational Areas and prioritized according to severity of the problem. Meter replacements are programmed and managed through PRASA's NRW Reduction Program.

4.3.1. Water Meters

PRASA owns over 1.4 million water meters ranging from 1/2 to 12 inches in diameter. PRASA has continued its meter replacement initiative under the Revenue Optimization Program. As reported by PRASA, about 724,000 small meters (1-inch in diameter or less) and over 5,300 large meters (greater than 1-inch in diameter) were replaced between FY2009-FY2018. However, due to PRASA's current fiscal situation the implementation of the initiatives included in the Revenue Optimization Program have been slowed down and meter replacements are on hold. About 14,516 small meters and 380 large meters were replaced during FY2018. These replacements were mainly due to maintenance, theft or special client requests.

PRASA is currently focusing its efforts in the planning and implementation of the recently approved and certified PRASA's Fiscal Plan. As part of PRASA's Fiscal Plan, one of the main initiatives is to implement a P3 Project to modernize PRASA's metering system, enhance customer service activities and customer satisfaction, improve billings and collections, and reduce NRW. Through this program, PRASA will reactivate its meter replacement initiative, utilizing advanced metering technology.

4.3.2. Water Distribution System

Based on the last published PRASA Accountability Report (first quarter of FY2016), PRASA owns over 14,753 miles of water pipelines, which include both transmission and distribution pipes with sizes ranging from two inches to 72 inches in diameter. As in previous years Arcadis did not inspect the water transmission and distribution system. However, it is reasonable to assume that a portion of the water distribution system will require structural repairs, as well as rehabilitation to reduce leakage.

4.3.3. Non-Revenue Water

NRW is water that has been produced but is not billed to customers. However, not all NRW is due to water losses. As shown in the water balance summary presented in Figure 4-4, NRW has three main components: unbilled authorized consumption, commercial (apparent) losses and physical (real) losses. Combined, commercial and physical losses make up the System's water losses. Unbilled authorized consumption is in turn composed of unbilled metered and unbilled unmetered consumption which includes water used by PRASA (measured and estimated) for operational and internal purposes and water used for firefighting. Examples include potable water service provided to PRASA's facilities, water used for washing and cleaning PRASA's tanks and sanitary pipelines, tanker trucks for communities with deficient water service, firefighter's usage, etc.

<table>
<tr><td rowspan="8">System Input Volume (Dispatched Water)</td><td rowspan="3">Authorized Consumption</td><td rowspan="2">Billed Authorized Consumption</td><td>Billed Metered Consumption</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="6">Non-Revenue Water</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="5">Water Losses</td><td rowspan="3">Commercial Losses (Apparent Losses)</td><td>Unauthorized Consumption (theft)</td></tr>
<tr><td>Customer Metering Inaccuracies</td></tr>
<tr><td>Data Handling (Billing) Errors</td></tr>
<tr><td rowspan="3">Physical Losses (Real Losses)</td><td>Main Line Leakage</td></tr>
<tr><td>Storage Tank Overflows</td></tr>
<tr><td>Service Connection Leakage</td></tr>
</table>

Source: American Water Works Association and International Water Association

Figure 4-4. Water Balance Summary

Table 4-15 provides a summary of key water distribution system metrics since FY2012, including current levels of water production, water losses, and NRW, as reported by PRASA.

Table 4-15. Water Losses and Non-Revenue Water

Fiscal Year	Total Water Production (MGD)[1]	Water Losses (MGD)	Non-Revenue Water (MGD)
FY2012	647	381	399
FY2013	617	354	363
FY2014	598	343	351
FY2015	557	299	307
FY2016	508	291	298
FY2017	507	293	299
FY2018	507	308	314
Difference FY2017-2018	**0**	**15**	**15**

Fiscal Year	Total Water Production (MGD)[1]	Water Losses (MGD)	Non-Revenue Water (MGD)
Cumulative Difference FY2012-2018	**-140**	**-73**	**-85**

[1]Includes a metering-error adjustment identified by PRASA in its water balance audits.

As shown in Table 4-15, from FY2012 to FY2018, PRASA reports to have reduced the amount (volume) of water produced (140 MGD reduction), amount of water losses (73 MGD reduction), and NRW (85 MGD reduction). PRASA attributes these reductions to the following main contributing factors: greater understanding and improvement of management practices regarding NRW and water losses, water system optimization measures, and corrections made in water production and data collection practices. In FY2018, of the total 507 MGD produced, approximately 314 MGD was NRW (62.1%), a slight increase over FY2017 results. Of this amount of NRW, 308 MGD (98.1%) was due to water losses (both apparent and real) and 7 MGD was due to unbilled authorized consumption. Of the total amount of water losses in FY2018, approximately 40 MGD (13%) was due to apparent (commercial) losses, while approximately 268 MGD (87%) was due to real (physical) losses.

Following the industry's recommended NRW data analysis and reporting, PRASA is reporting NRW in terms of volume reduced in its annual water audits, and no longer as a percentage of the water production. The American Water Works Association (AWWA) recommends not to use NRW as a percentage of water production as a performance indicator of NRW efforts because this method may show confusing and misleading results. NRW as a percentage of water production does not necessarily represent NRW performance efforts. For example, when comparing FY2016 and FY2015 results included in Table 4-15, the volume of water produced, volume of water losses and volume of NRW were all reduced. However, when calculated as percentage of volume of water produced, no reductions in water losses nor in NRW are obtained.

Since FY2012, PRASA began measuring the Infrastructure Leakage Index (ILI) which is an indicator that is used to measure the level of physical losses in the water distribution system. More specifically, the ILI is defined as the current annual real losses divided by the unavoidable annual real losses. The unavoidable annual real losses represent the lowest technically achievable annual real losses for a well-maintained, well-managed system and is the likely lower bound on water losses. As a performance indicator, the ILI represents a measure of the combined performance of three infrastructure management methods for real losses: the speed and quality of repairs, active leakage control, and asset management. Factors that affect the ILI include the pipe age and material, customer density, and system pressure. The ILI was introduced in 2000[8] and is also defined and calculated in AWWA's M36 Water Audits and Loss Controls manual. An ILI between 1 and 3 is considered excellent. U.S. utilities with combined operations currently measuring the ILI for their systems reported values ranging from 1.12 to 4.75, with a median of 2.14[9]. Globally, systems in developed countries report lower values of 5; while in developing countries, values range from 10 up to about 50. In FY2012, PRASA reported an ILI of about 18. However, since

[8] Source: Alegre, H. Hirner, W., Bapista, J., and Parena, R. (2000). "Performance indicators for water supply services" IWA Manual of Best Practices
[9] Source: 2017 AWWA Utility Benchmarking: Performance Management for Water and Wastewater

then, PRASA's ILI has reduced by about 40% with the last reported value of 10.7 in FY2017. FY2018 ILI was not reported by PRASA.

PRASA has been calculating these AWWA indicators (ILI and volume of commercial and physical losses per connections per day) as part of the annual water audit process. However, PRASA indicated that to do so, a high amount of estimation takes place, which may affect the validity of the results. Therefore, PRASA's NRW team is redefining the NRW goals and metrics and developing new initiatives to obtain more reliable results based on real data measurements (i.e. flow, tank water levels, systems' pressures).

PRASA attributes the reductions in NRW since FY2012 to the following main contributing factors and measures:

- Greater understanding and improvement of management practices regarding NRW and water losses.
- Improvements in data management and quality (better production measurement).
- Reduction in events and duration of water storage tank overflows.
- Reduction in the time to repair leaks.
- Leak detection with specialized equipment.
- Pressure management in the distribution system.

Notwithstanding the recent improvement in NRW, PRASA's level of NRW is still higher than the average utility benchmarks results. U.S. and Canada average results of apparent (commercial) losses per service connection per day and average results of real (physical) losses per service connection per day for utilities with combined (water and wastewater) operations range from 2.87 to 13.97 gallons (median of 7.29) and from 26.73 to 96.57 gallons (median of 38.67)[10], respectively.

PRASA recognizes that reducing its NRW and water losses volume and, in turn, its water production, will have positive effects on not only its operations, but also on its financial results (lower O&M expenses and higher revenues, for example), and on its sustainability practices. Therefore, reducing NRW is one of the top priorities and is one of the main objectives of PRASA's Revised Fiscal Plan.

As previously mentioned, PRASA has already experienced a decline in the reported NRW and water losses as compared to previous years. Some of the actions and projects to be implemented by PRASA to achieve the additional reductions in NRW and water losses as included in PRASA's Revised Fiscal Plan are: 1) the P3 Project, intended to reduce mostly commercial losses; and 2) Physical Losses Reduction initiatives. The P3 Project is primarily focused in the replacement of meters, installation of advanced metering technology and enhance customer service activities to, above all, identify unauthorized consumption and decrease commercial losses. The Physical Losses Reduction initiatives include continuing the water leak detection program, monitoring system pressure to optimize flows, reducing the time to repair leaks, and reducing the number of events and duration of water storage tank overflows by increasing the number of tanks connected to telemetry.

Additionally, PRASA's NRW office is focused in refining the validity and credibility of the data of the annual water audits and reducing NRW by among other measures, continuing the Revenue Optimization

[10] Sources: 2017 AWWA Utility Benchmarking: Performance Management for Water and Wastewater.

Program, installing flow meters at PRASA facilities to measure a more significant percentage of the authorized unbilled consumption, and reducing the unmetered production by installing additional flow meters at WTPs to adequately measure daily production to distribution flows. According to the FY2017 Water Balance Final Report, PRASA's goal is to reach a metered reading of 80% of the production supplied by FY2020. Measuring the most amount of water production increases the credibility of the results and decreases the probable over estimation of the NRW results. Nonetheless, as previously mentioned, PRASA is currently redefining the NRW goals and metrics and this is one particular goal under review. In addition, PRASA's Operational Regions plan to install meters to measure the water discarded as part of the System's programmed drainages implemented as part of the measures to meet compliance with DBP levels in the System.

It is important to highlight that in the aftermath of the hurricanes, both production and consumption significantly decreased given the unavailability of electric power in some facilities, and the migration of PRASA customers to the U.S. In January 2018, about 43% of the facilities operating with emergency generator units (EGUs) or were not operational. By June 2018 most facilities were operating once again receiving power from PREPA; however, there were still some facilities operating with EGUs which result in intermittent service due to the malfunctioning and overuse of the EGUs. Therefore, the FY2018 volume of NRW could vary from that reported by PRASA.

4.3.3.1. Leak Monitoring and Control

As shown in Table 4-16, leaks reported in FY2017 and FY2018, were 54,810 and 45,873, respectively. Table 4-16 also shows the average annual leaks occurrence per 100 miles of water piping. The total annual reported leaks for FY2018 decrease approximately 13% compare to FY2011 and 16% compared to FY2017. As for FY2017, there was a slight increase of about 3% in reported leaks when compared to FY2011, but there was a decrease of about 12% when compared to FY2016. The previous increasing trend observed over the past fiscal years has shifted for FY2017 and FY2018. Arcadis has not made an independent evaluation to identify the root causes of this recent decrease. For FY2018 part could be attributed to the 2017 hurricanes that impacted the island, a period when PRASA refocused efforts to recovery activities and other more critical matters.

Despite the recent decrease, PRASA's reported rate of leak occurrence continues to be extremely high compared to other utilities in the U.S. and Canada (average annual combined leaks and breaks per 100 miles are between 9.2 and 30.1)[11]. Although this high rate is not surprising, given the existing infrastructure's age, size, complexity, and significant changes in elevations of the System, it still

[11] Source: 2017 AWWA Utility Benchmarking: Performance Management for Water and Wastewater.

influences PRASA's NRW. Aging infrastructure is another contributing factor to the high rate of leaks in addition to the decrease of funding available for pipeline R&R.

Table 4-16. Reported Leaks from FY2011 to FY2018

Fiscal Year	Total Annual Reported Leaks	Annual Leaks per 100 miles Using 14,753 miles of Water Pipeline
2011	52,817	376[1]
2012	42,868	306[1]
2013	47,032	335[1]
2014	54,154	386[1]
2015	63,503	430
2016	62,079	421
2017	54,810	372
2018	45,873	311

Source: PRASA Systems, Applications, and Products in Data Processing (SAP) (Commercial) Database
[1]Water pipeline total length used for previous fiscal years (FY2011-FY2014) was 14,031 miles.

The average weekly reported and repaired leaks per fiscal year, as well as the percentage of repaired leaks with respect to the number of leaks reported in each fiscal year are shown in Figure 4-5. For FY2017 and FY2018, PRASA reports an average of leaks per week of approximately 1,034 and 882, respectively. Comparing the weekly reported leaks in each fiscal year, it can be observed that the weekly reported leaks decreased from FY2011 to FY2012. From FY2012 to FY2015, the weekly reported leaks increased approximately 5%, 15% and 17%, respectively. However, from FY2015 to FY2018, the weekly reported leaks decreased annually by approximately 4%, 10% and 15%. The same trend is observed with the weekly repaired leaks. Also, the percent leaks repaired increased to 99% on FY2017 and FY2018.

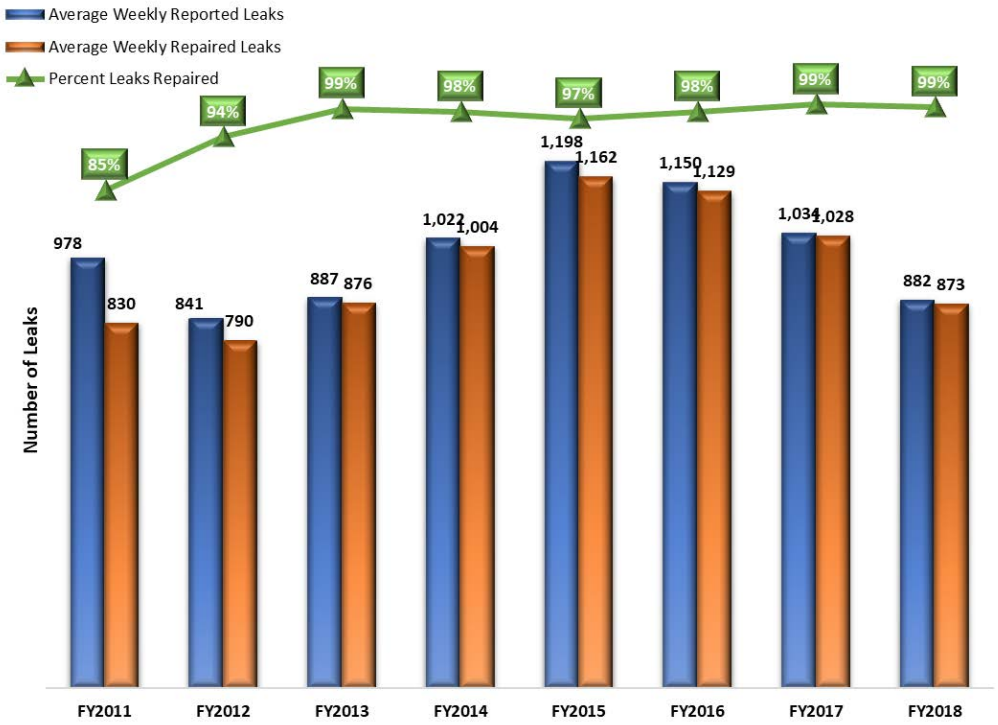

Figure 4-5. Island-Wide Weekly Average Leaks Reported and Repaired

Figure 4-6 shows the active leaks with duration greater than seven days before being repaired. As shown in the figure, despite experiencing a dramatic increase in FY2010 as a result of staffing and scheduling shortcomings, since FY2011 the number of leaks with duration greater than seven days was significantly reduced. In FY2015, there was a slight upturn in correlation with the increase in reported leaks as PRASA reported to have ended the fiscal year with a total of 3,049 pending leaks with duration greater than seven days and 62 weekly average pending leaks with duration greater than seven days. However, in FY2016 the number of leaks with duration greater than seven days was reduced to a total of 2,698 pending leaks with duration greater than seven days and 54 weekly average pending leaks with duration greater than seven days. Furthermore, in FY2017 the number of leaks with duration greater the seven days was significantly reduced to a total of 365 pending leaks with duration greater than seven days and 8.1 weekly average pending leaks with duration greater than seven days. However, the month of June 2017 data was not available. For FY2018, not enough data was obtained to generate a good trend for the year since the only data available was from March 2018 to June 2018. This was mostly due to the impact of the 2017 hurricanes and the recovery efforts, damage to the communications infrastructure and the fact that the responsible personnel were temporarily relocated to attend the more urgent recovery and restoration of the System.

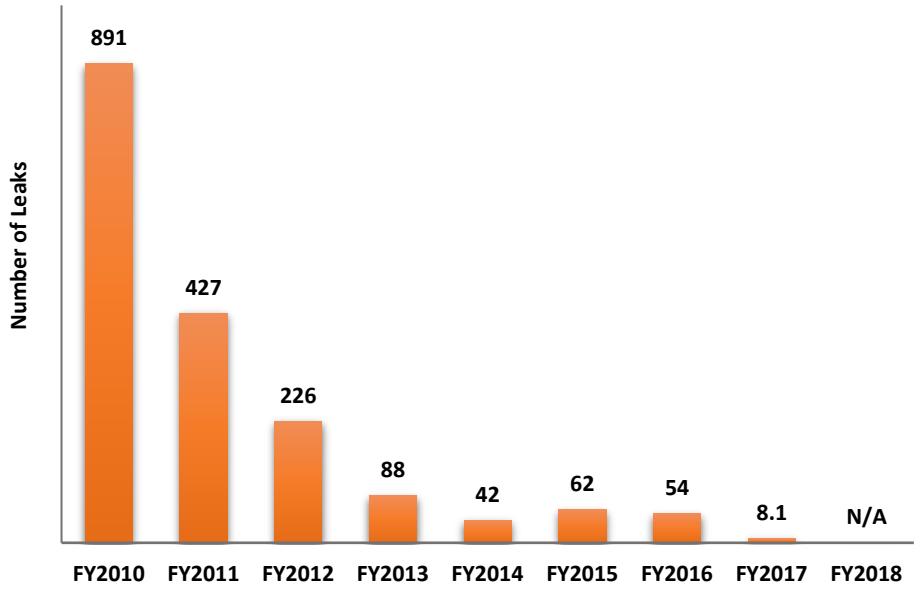

Figure 4-6. Island-Wide Weekly Average Pending Leaks with Duration >7 Days

Table 4-17 provides a summary of the average repaired leaks per working day and average backlog. Based on the weekly average pending leaks and weekly average pending leaks with duration greater than seven days, it can be observed that in FY2017 PRASA averaged a backlog of approximately 1.3 days of pending leaks and a backlog of approximately 0.04 days of pending leaks with duration greater than seven days. The average backlog days for pending leaks increased in FY2013 compared to FY2012 results, given the significant increase in the average weekly pending leaks from year to year. However, in FY2014 the average backlog days for pending leaks reduced by about 64% when compared to FY2013 results and on FY2015 and FY 2016 continued its improvement by reducing another 17% and 21% compared to FY2014 and FY2015, respectively. In FY2017, the average backlog days for pending leaks continued its declining trend by reducing another 13% compared to FY2016. This resulted in a significant improvement in the average backlog days for pending leaks greater than seven days, with a reduction of about 80% compared to FY2016 results. In FY2017, PRASA's effectiveness in repairing pending leaks in a timely manner has continued to improve year after year since FY2011.

Table 4-17. Annual Average Backlog of Pending Leaks

Fiscal Year	Average Weekly Pending Leaks	Average Weekly Pending Leaks >7 Days	Average Repaired Leaks per Working Day[1]	Average Backlog Days for Pending Leaks	Average Backlog Days for Pending Leaks >7 Days
2011	1,031	427	166	6.2	2.6
2012	611	226	158	3.9	1.4
2013	1,147	88	179	6.4	0.5

Fiscal Year	Average Weekly Pending Leaks	Average Weekly Pending Leaks >7 Days	Average Repaired Leaks per Working Day[1]	Average Backlog Days for Pending Leaks	Average Backlog Days for Pending Leaks >7 Days
2014	460	72	205	2.3	0.4
2015	434	62	232	1.9	0.3
2016	354	54	234	1.5	0.2
2017	263	8.1	210	1.3	0.04

[1]Assumes five working days per week. Source: PRASA SAP (Commercial) Database.

As of June 30, 2018, PRASA continued implementing the use of Mobile Data Terminals (MDT) in its repair crew vehicles. This technology allows PRASA to assign paper-less work plans to its repair crews and facilitates the geo-referencing of leaks for PRASA to analyze leak frequency and identify root causes. Finally, it provides better repair metrics measurement, as it will record on an hourly basis as opposed to daily as currently tracked by PRASA. PRASA expects to achieve faster repair response times and improve the repair lead and backlog times tracking.

Regarding water storage tank overflows issues, PRASA has been implementing continuous monitoring of water storage tanks across its operational regions as a measure to help control and minimize overflow (water losses) occurrences, as the fiscal situation allows. It is still PRASA's goal to reach 100% monitoring in water storage tanks. Finally, as a measure to help optimize the System's operation and reduce potential leaks through valves, PRASA has included its pressure regulator/sustaining valves in the IMP and has indicated that it is providing training to its employees to carry out the necessary maintenance activities.

4.3.4. Wastewater Collection System

Based on the latest published PRASA Accountability Report (first quarter of FY2016), PRASA owns approximately 5,994 miles of wastewater pipelines. Although the wastewater collection system was not inspected, it is reasonable to assume that a significant portion of the wastewater collection system will require some structural repairs, as well as rehabilitation (replacement) to reduce inflow and infiltration and overflow occurrences and to address the impact of the hurricanes.

4.3.4.1. Overflow Monitoring and Control

As shown in Table 4-15, PRASA indicates that overflows reported in FY2017 and FY2018 were 28,510 and 23,819, respectively. Data is not available regarding frequency of overflows in (a) combined sewer systems compared to separate systems or (b) dry weather overflows compared to wet weather overflows. Dry weather overflows are often caused by (a) insufficient cleaning and maintenance of the collection system, resulting in a buildup of roots or grease, restricting or blocking flow or (b) pump station failures due to old or insufficiently maintained equipment, poor design, or lack of reliable backup power supply. Wet weather overflows are an indicator of leaking sewers, storm water connections to sanitary sewer systems, or under-sized pipes or pump stations.

Table 4-18 also shows the average annual overflows occurrence per 100 miles of sewer. In FY2017 and FY2018, an average of 476 and 397 overflows per 100 miles of sewer were reported, respectively. There was an increase of total annual reported overflows of about 6% from FY2014 to FY2015 and about 6% from FY2015 to FY2016, which could be due to an increase in the actual number of overflows occurrences, an increase in the number of people reporting overflows (as a result of PRASA's communication initiatives and increased social media presence), the additional pipeline miles included in the analysis or a combination of the three. Again, Arcadis has not made an independent evaluation to identify the root causes of this increase. However, in FY2017, there was a decrease of 5% when compared to FY2016 reported overflows. Again, in FY2018 there was a decrease of 16% in reported overflows when compared to FY2017. Nevertheless, PRASA's reported rate of overflow occurrence continues to be extremely high compared to other utilities in the U.S. and Canada with combined operations (average annual overflows (non-capacity & capacity) per 100 miles are between 0.4 and 5.0 overflows[12]). However, this high rate is not surprising given the size and complexity of the System. Other contributing factors to this high rate of overflows include aging infrastructure and inadequate customer use (i.e., illegal connections and discharges).

Table 4-18. Reported Overflows from FY2011 to FY2018

Fiscal Year	Reported Overflows	Annual Overflows per 100 miles Wastewater Pipeline
2011	28,185	529[1]
2012	26,903	505[1]
2013	27,358	514[1]
2014	26,937	506[1]
2015	28,569	477[2]
2016	29,991	500[2]
2017	28,510	476[2]
2018	23,819	397[2]

Source: PRASA SAP (Commercial) Database
[1]Wastewater pipeline total length FY2011-FY2014) = 5,325 miles.
[2]Wastewater pipeline total length FY2015-FY2018) = 5,994 miles.

PRASA's average weekly reported and repaired overflows per fiscal year are shown in Figure 4-7. For FY2017 and FY2018, PRASA reports an average of approximately 538 and 458 overflows per week, respectively. Comparing the weekly reported overflows per each fiscal year, it can be observed that the reported overflows decreased in FY2012. However, in FY2013 there was a slight increase over the FY2012 results due to the increase in the number of reported overflows through the fiscal year. In FY2014, the average weekly reported overflows experienced a reduction of approximately 2% compared to FY2013 results, in FY2015 an increase of 6% was observed compared to FY2014 results and in FY2016 an increase of 5% was observed compared to FY2015 results. Conversely, in FY2017 a

[12] Source: 2017 AWWA Utility Benchmarking: Performance Management for Water and Wastewater.

decrease of 3% was observed when compared to FY2016 and continuing the decrease trend, a 15% drop from FY2018 to FY2017. However, FY2018's significant reported drop may be an outlier because of the lower reporting in the aftermath of the 2017 hurricanes. Also shown in Figure 4-7 is the percentage of repaired overflows with respect to the number of overflows reported in each fiscal year. PRASA's rate of repair of overflows has significantly improved since FY2011.

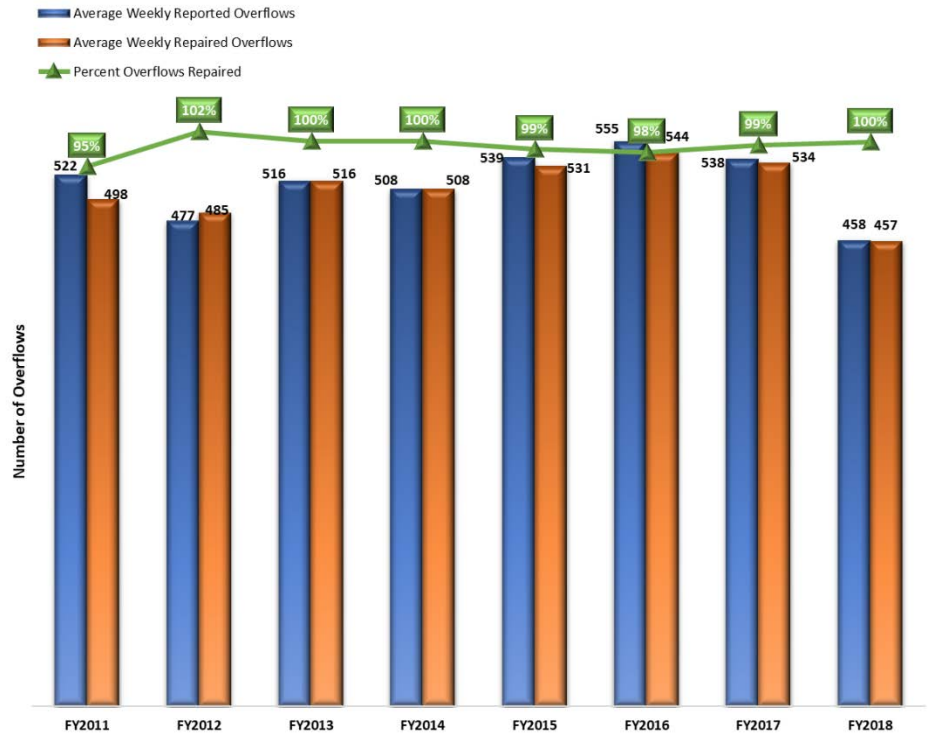

Figure 4-7. Island-Wide Weekly Average Overflows Reported and Repaired

Figure 4-8 shows the pending overflows with duration greater than seven days. As shown in the figure, the number of pending overflows with duration greater than seven days had been constantly decreasing since FY2010. In FY2016, however, there was an increase in the weekly average pending overflows with duration greater than seven days of about 30%. Conversely, in FY2017, there was a decrease of 62% in the weekly average pending overflows with duration greater than seven days. For FY2018, not enough data was obtained to generate a good trend for the year since the only data available was from March 2018 to June 2018. This was mostly due to the impact of the 2017 hurricanes and the recovery efforts, damage to the communications infrastructure and the fact the responsible personnel were temporarily relocated to attend the more urgent recovery and restoration of the System.

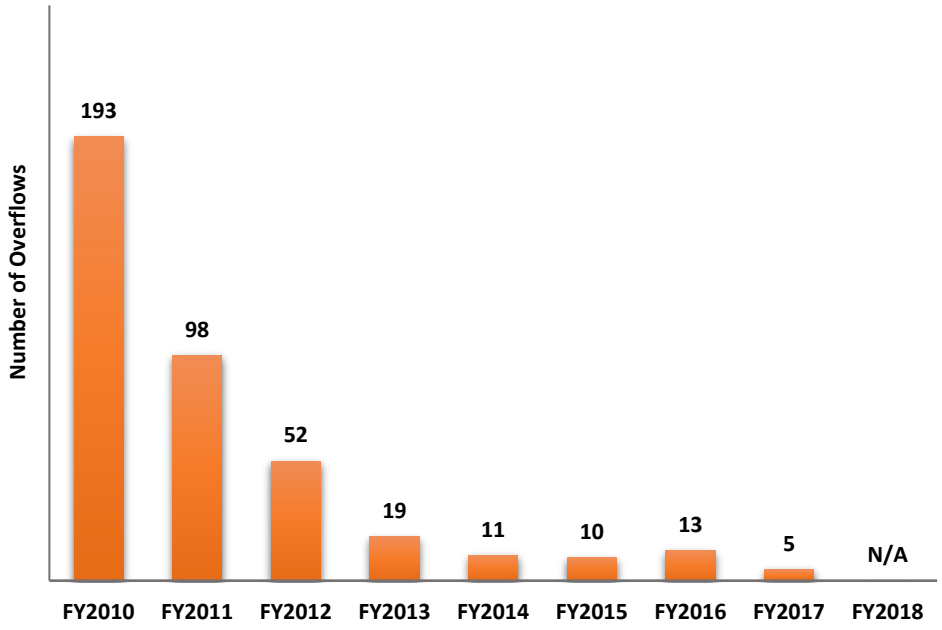

Figure 4-8. Island-Wide Weekly Average Pending Overflows with Duration >7 Days

Table 4-19 provides a summary of the average repaired overflows per working day and average backlog. As shown, the average weekly pending overflows decreased from FY2011 to FY2012. In FY2013 the average weekly pending overflows resulted in a small increase compared to FY2012 results. However, in FY2014, FY2015, FY2016 and FY2017, PRASA reported a new trend of decrease with 169, 108, 104 and 75 reported average weekly pending overflows, respectively. In FY2017, PRASA also improved its average backlog achieving approximately 0.7 days of pending overflows, although the backlog of pending overflows with duration greater than seven days slightly increased to 0.05. These results represent a reduction of about 22% and 58%, respectively, compared to FY2016 results. PRASA's effectiveness in repairing pending overflows in a timely manner has continued to improve year after year since FY2011, particularly those with duration greater than seven days, except for FY2016.

Table 4-19. Annual Average Backlog of Pending Overflows

Fiscal Year	Average Weekly Pending Overflows	Average Weekly Pending Overflows >7 Days	Average Repaired Overflows per Working Day[1]	Average Backlog Days for Pending Overflows	Average Backlog Days for Pending Overflows >7 Days
2011	350	98	100	3.5	1.0
2012	224	52	97	2.3	0.5
2013	295	19	105	2.8	0.2
2014	169	18	104	1.6	0.17

Fiscal Year	Average Weekly Pending Overflows	Average Weekly Pending Overflows >7 Days	Average Repaired Overflows per Working Day[1]	Average Backlog Days for Pending Overflows	Average Backlog Days for Pending Overflows >7 Days
2015	108	10	106	1.0	0.09
2016	104	13	113	0.9	0.12
2017	75	5	109	0.7	0.05

[1]Assumes five working days per week. Source: PRASA SAP (Commercial) Database.

As with leaks, PRASA expects to improve its sewer overflows response time and metrics tracking using the MDT technology currently being implemented across its operational regions. As previously mentioned, this technology allows PRASA to assign paper-less work plans to its repair crews and facilitates the geo-referencing of sewer overflows for PRASA to analyze overflow frequency and identify root causes. Also, PRASA began the Fats, Oils and Grease (FOG) Program in FY2018, which should have a positive impact on overflows. PRASA contracted a third-party consultant to perform site visit inspections at different commercial establishments to educate people on the Program with the intend that owners limit the discharge of fats, oils and grease into PRASA's wastewater network. As of June 30, 2018, over 10,000 inspections had been performed. However, during the period of September 2017 to February 2018, the Program inspections were suspended. Lastly, it is important to indicate that the aftermath of the 2017 hurricanes and the ongoing fiscal situation can adversely affect the KPIs for sewer overflow repairs and attention rates.

4.4. Conclusions

The condition of PRASA's facilities has continued to deteriorate because the lack of funding has significantly prolonged and adversely impacted the implementation of PRASA's CIP and key initiatives and has reduced R&R investments. Additionally, facilities were damaged during the 2017 hurricanes. Arcadis visited a total of 415 facilities throughout PRASA's five Operational Regions between October 2017 and May of 2018. In general, the condition of the facilities visited varied from those still in good condition to those requiring significant capital upgrades. Total damage assessments to PRASA's facilities were estimated by PRASA at approximately $769M. Most of the facilities have been brought to operational status and are expected to continue to serve their intended operational purpose.

Overall, a declining trend in asset conditions was observed across all asset classes, as a result of the suspension of the CIP since FY2016, reduction of the R&R program due to the fiscal situation and budget limitations, and further exacerbated by the 2017 hurricanes. PRASA must reactivate its CIP and R&R program to improve the performance of its facilities and slow down any further deterioration of equipment and/or life expectancy of these assets. Furthermore, PRASA should verify the flood zone levels at all raw water intakes and water treatment facilities to make sure that all assets at risk of flooding are identified and evaluated to determine if the potential risk merits a mitigation project. PRASA has submitted a list of projects for funding to FEMA and their insurance provider to partially fund repairs to its facilities.

Although WTPs are performing better with respect to compliance with limits of SDWA and effluent discharge parameters, PRASA needs to continue the implementation of the correctives measures to

mitigate the production of DBPs which continues to be a System challenge. Also, upgrades to existing STSs or construction of new systems may be necessary for PRASA to meet final NPDES discharge permit limits. Furthermore, future regulations may require additional capital improvements to achieve higher levels of treatment at certain facilities depending on the characteristics of the source water and the distribution system. The effects of these future regulations will not be known until PRASA performs data collection and studies to determine what, if any, additional capital improvements will be needed to comply with these future regulations. In addition, PRASA should continue to standardize processes and provide more tools and training to operators regarding process controls and actions to facilitate and improve plant operations and performance, as well as, optimize O&M expenses.

WWTPs are showing challenges to meet sustained compliance with applicable regulations. FY2018 were impacted by the 2017 hurricanes. Nevertheless, these compliance challenges will likely require additional assessments and facility improvements to bring the facilities back into full compliance with CWA requirements and NPDES permits. Furthermore, future regulations may require additional capital improvements to comply with sterner levels of NPDES discharge parameters as per new WWTP's NPDES permits based on Water Quality Certificate and agreements in the 2015 USEPA Consent Decree. For example, stricter residual chlorine fecal coliforms parameters for WWTPs with ocean outfalls and stringent P and N limits. The effects of these and other future regulations will not be known until PRASA performs data collection and studies to determine what, if any, additional capital improvements will be needed to comply with these future regulations. Notwithstanding the impact of future regulations, capital improvements are needed to modernize PRASA's infrastructure, prevent further deterioration, protect public health, safeguard environmental quality, allow continued economic development and help bring the WWTPs into compliance with all regulatory requirements.

Regarding the ancillary assets also showed a decline in their condition. Most of the deficiencies noted in the inspected facilities can be addressed through PRASA's R&R program and may not require major capital improvements. Note, however, that implementation of PRASA's R&R program also depends on PRASA's ability to identify and obtain funding sources. In addition, future regulatory requirements may require either the implementation of significant capital improvements to include and achieve additional treatment capabilities at well facilities, or the closure of certain wells.

PRASA continues conducting periodic water audits. This has helped drive the reduction in the volume of water production, water losses, and in NRW reported by PRASA since 2014. Leaks continue to be high when compared to U.S. benchmarks, and NRW reduction initiatives have been slowed down or suspended until funding sources are identified.

Although the number of sanitary overflows is also high compared to the U.S., PRASA has continued to improve its response time and attention/repair effectiveness to minimize the duration of these overflow events and their environmental impact. PRASA intends on implementing sanitary sewer evaluations and repair plans to reduce levels of infiltration and inflow (I/I) that must be treated in their WWTPs when funds become available.

Considering the size and complexity of the System, it is reasonable to state that the System will continue to require significant capital investments and continuous maintenance and repairs, in addition to the repair required after the 2017 hurricanes. Also, as the System continues to age and as new compliance regulations are implemented, an increase in the O&M budget may be necessary to address maintenance and repairs and compliance matters.

While PRASA has begun to identify the potential impact of new regulations, the full impact of future regulations and other regulatory requirements on PRASA's System are not known at this time. In some cases, future regulations and additional regulatory requirements are expected to require minor process changes and in other cases major capital improvements, such as construction of new treatment processes and intensive repair programs. However, as the impact of future regulations becomes more defined, CIP modifications may be required to adequately accommodate resulting needs. These CIP needs, as negotiated or as currently being negotiated with Regulatory Agencies, will be prioritized and implementation schedules will depend on PRASA's financial capacity.

5 O&M PRACTICES AND STRATEGIC PLAN

5.1 Introduction

Arcadis assessed the adequacy of PRASA's O&M practices based on compliance with regulatory requirements, interviews with PRASA personnel, and facility observations by field inspectors obtained through the damages and condition assessment efforts described in detail in Section 4. There were several WTP and WWTP facilities that reported exceedances in compliance treatment parameters during the evaluation period and/or lacked the appropriate operational tools (i.e., O&M manuals, process controls, and laboratory equipment). Despite some process control and minor compliance issues, the treatment facilities are generally delivering potable water and treating wastewater adequately. However, it is important to highlight that regulatory compliance results might be misleading, since there are several parameters with interim limits or some are only being monitored per consent decree and agreements with Regulatory Agencies. Also, for the period following the 2017 hurricanes, DMRs for WWTPs were missing and consequently, compliance results during this period is unknown. Also, there is still room for further improvement with respect to prioritization, scheduling, and execution of corrective and routine maintenance activities, and optimization and strengthening of the System (through permanent rehabilitation projects).

Although, the 2017 hurricanes impacted PRASA's infrastructure, most of the facilities have been brought to operational status and, at least in the short term, continue to serve their intended purpose of providing potable water supply and treating used water. Despite of all the challenges faced by PRASA in FY2018, the rapid operational response to mitigate such challenges has allowed for the recovery of the System over a relatively short amount of time; by November 2018, PRASA's service was recovered to 90%. However, the 2017 hurricanes affected the conditions of PRASA's facilities, and it becomes more imperative that projects necessary to address the damages and improve conditions are implemented to guarantee the production of safe drinking water and treatment of wastewater in compliance with applicable regulations. PRASA continues to address operational challenges resulting from intermittent power supply and budget constraints.

A summary of the O&M budgets, O&M highlights provided by PRASA's support departments and Regional personnel, and a detailed summary of PRASA's Strategic Plan, programs and Operational Initiatives are included in this section.

5.2 O&M Costs

Over the past five fiscal years, PRASA's O&M expenses have fluctuated from $695M in FY2013 to $867M (prior to expected reimbursement from the September 2017 Hurricanes and includes non-cash adjustments) in FY2018. PRASA continues its effort to become more efficient by exercising greater management controls to reduce its O&M costs and by implementing various operational programs and initiatives. However, the implementation of most of these programs/initiatives has been hindered by the ongoing fiscal crisis and by the 2017 hurricanes.

PRASA's FY2018 O&M expenses preliminary projection for the water and wastewater system (combined) prior to expected reimbursement from the 2017 hurricanes is approximately $867M, of which $779M are directly related to the O&M of the System. The other $88M are related to commercial activities and provision of customer services, including but not limited to staffing and operation of customer service offices island-wide; meter reading; connection and disconnection services; invoice preparation, printing and distribution; and customer service call centers, amongst others. PRASA estimates that during FY2018 approximately 73% of its System's O&M budget ($569M) was allocated to the water system and the remaining 27% ($210M) to the wastewater system. Estimated costs per million gallons (MG), per customer account and per 100 miles of pipe for combined utilities operations are summarized in Tables 5-1 and Table 5-2 below. A comparison to benchmark values is also provided.

Table 5-1. PRASA FY2018 O&M Water System Budget Benchmarks

Performance Indicator	FY2018 PRASA	2017 AWWA Benchmark Median[1]
Cost per Account[2]	$460.58	$461.00
Cost per MG Processed[3]	$3,073.52	$2,437.00
Cost per 100 miles of pipe[4]	$3,855,281.48	$2,791,010.00
Total O&M System FY2018 Results	$569M	-

[1]Source: 2017 AWWA Utility Benchmarking: Performance Management for Water and Wastewater.
[2]Based on number of accounts at the end of FY2018 of 1,234,895 (water accounts) and 764,165 (wastewater accounts).
[3]Based on FY2018 total production and distribution of approximately 507 million gallons per day (MGD) of potable water.
[4]Based on 14,883 miles of water pipeline.

Table 5-2. PRASA FY2018 O&M Wastewater System Budget Benchmarks

Performance Indicator	FY2018 PRASA	2017 AWWA Benchmark Median[1]
Cost per Account[2]	$275.00	$355.00
Cost per MG Treated[3]	$2,798.00	$2,298.00
Cost per 100 miles of pipe[4]	$3,509,624.00	$2,593,715.00
Total O&M System FY2018 Results	$210M	-

[1]Source: 2017 AWWA Utility Benchmarking: Performance Management for Water and Wastewater.
[2]Based on number of accounts at the end of FY2018 of 1,234,895 (water accounts) and 764,165 (wastewater accounts).
[3]Based on FY2018 total treatment of approximately 206 MGD of wastewater.
[4]Based on 5,994 miles of wastewater pipeline.

5.3 Support Departments and Regional O&M Highlights

Arcadis conducted meetings with key PRASA department directors and other personnel to obtain an update on the status of the different departments, operations, and initiatives. A summary of the information provided by PRASA is detailed in the following sub-sections below.

5.3.1 Department Updates

5.3.1.1 Human Resources

PRASA's human resources (HR) Department is currently focusing on two main tasks: 1) achieving PRASA's headcount goal of 4,900 employees by FY2019 (with no vacant positions) as presented in PRASA's Revised Fiscal Plan and 2) understanding and implementing the requirements included in the series of acts (Act 211-2015, Act 3-2017 and Act 26-2017) that have been passed in recent years.

In FY2017, PRASA completed identifying the roster of employees that classify for the Voluntary Pre-Retirement Program as defined by Act 211-2015. About 351 employees qualified for this program, as submitted by PRASA to OMB for final approval, of which 335 proceeded and resigned by June 30, 2018. In FY2018, a new retirement program (two-phased) was created by AAFAF on behalf of the Government via Administrative Orders OA-2017-5 (November 2017) and OA-2018-5 (April 2018) as a way to incentivize retirement for eligible employees under the ERS, and as is further described in Section 3.2.2 Staffing Profile of this Report.

PRASA's HR Department reports that it was active and involved before and after the 2017 hurricanes, ensuring affected employees received support. The department developed a series of employee support talk sessions to follow up with employees that were severely impacted by the hurricanes. Additional support efforts have been continued by PRASA to support its staff.

5.3.1.2 Customer Services

PRASA's Customer Service Department continues to focus on measuring and implementing metrics to further improve the following: invoicing, collections, billing adjustments, customer service complaints, service interruptions, service quality, meter actual reading, and waiting time in commercial offices as well as in the call center. Nevertheless, the aftermath of the 2017 hurricanes brought many challenges to the department due to the interruption of billings for a period of two months, full stoppage of service suspensions during and right after the emergency, and the deficient service credit that PRASA had to grant customers for a deficient service right after the emergency. Billings restarted four months after Hurricane María and customers were given 45 days to pay their bill before service suspensions were enforced.

Moreover, after the 2017 hurricanes over 100 staff in the department resigned. Statistics show that 22 regular employees voluntarily left and 87 employees qualified under the pre-retirement program. This situation has forced the department to hire 50 new employees.

PRASA operates 12 commercial offices with an average rate of 1,200 people per day visiting the offices for invoice payments and service requests. As of June 30, 2018, the Bayamon Commercial Office remained closed (expected to open in FY2019). Its rehabilitation was delayed due to the difference between the estimated project budget approved by the Governing Board and the Contractor's bid, which exceeds $1M. As a result of the Bayamon office being out of operation, the overall waiting time in the San Juan and Carolina commercial offices has increased.

Actual meter readings versus estimation was included as new KPI on August 2017 to drive a reduction in meter reads estimation, increase invoice accuracy, and reduce adjustments. Meter replacements have

been significantly reduced compared to previous years. Current inventory of 5/8" meters typically used for residential and commercial customers is estimated at about 1,700 and is being used strictly for new service connections or critical replacements. Inventory will be replenished as necessary until the P3 Project Agreement is executed and the Contractor, who will assume all responsibilities for meter replacements, is fully transitioned.

The department's ongoing and future initiatives are summarized below:

- Revision of Customer Service Protocols for alignment with the most recent version of Regulation 8901 and it is expected to end by December 2018 or January 2019.
- Upgrade of cashiers and other equipment at the commercial offices (subject to schedule of implementation of the P3 Project).
- Upgrade of portable terminals (TPL, for its Spanish acronym) to improve the investigation of service claims (subject to schedule of implementation of the P3 Project).
- Update of SAP system by adding further security firewalls to the Customer Service Database.
- Development and implementation of a service requests monitoring tool for call centers IVRs to facilitate classification and accountability of calls.
- Expansion of breadth of services provided by the call centers' private contractors. To achieve this, PRASA is revising the automatic operator format to be able to program investigation appointments by phone. There are currently two private companies managing the call centers and these private contracts are renewed every three years; the next renewal is during FY2019 and may be transitioned to the P3 Project Contractor.
- In response to request to a number of Mayors, rehabilitation and implementation of Customer Service Mobile Units to provide mobile customer services in specific communities across the island. There are currently two units which are on standby due to budget cuts; however, PRASA expects to bring them back into service during FY2019 and eventually transition the initiative to the P3 Project Contractor.

PRASA's fiscal situation has caused a slow down on the implementation of the above-listed initiatives. With respect to other government initiatives, such as the Central Government's Integrated Services Offices, PRASA has not provided staff for such offices and the decision to participate is currently on hold.

5.3.1.3 Purchasing and Logistics

PRASA's Purchasing and Logistics Department continues to operate mainly from the central administration building, although certain purchasing and logistics personnel are permanently assigned to the regions. Regarding purchasing practices, the SAP Portal program has been updated to better integrate the release process of purchase orders (POs) and provide improvements in the visualization of the POs status. As of March 2018, orders below $3,000 do not have to be approved by the director of the department, but rather by the different regional managers. Prior to that date, 100% of those POs had to be approved by the department director or appointed delegate which resulted in a slower approval workflow process. In an effort to decrease delays, during FY2018 the "liberador sustituto" initiative, as called in Spanish, was developed and implemented. This new initiative consists in assigning two substitute employees to each key person within the PO process algorithm. Both the substitutes and key

persons can have visibility and power of approval at the same time. Furthermore, through emergency procedures, the department subcontracted the services of an external firm to audit and certify POs before they reach the department director, in this way improving the transparency and effectiveness of the emergency purchase process.

Recently, the Government of Puerto Rico approved a waiver to exempt PRASA from the Central Government Purchase approval process, which required final approval by OMB and/or the Governor's office for purchases over $50,000, thereby reducing a potential delay in approvals of up to 60 days and need to execute emergency POs. Instead, starting in FY2019 PRASA is only required to notify OMB and/or the Governor's office (depending on purchase amount). This waiver also applies to PRASA's Request for Proposals (RFP) and bid approval processes.

Regarding logistics practices, on October 2017 PRASA closed the distribution center at Toa Baja and started using two new distribution centers:

- Trujillo Alto – This location started as a warehouse center for the Metro Region and it has been transformed into a distribution center that serves the Metro, East and part of the South Regions. PRASA has already completed the relocation of inventory from Toa Baja warehouse to this new location.
- Aguadilla – This location is currently being upgraded to a distribution center that will provide services to the North, West and part of the South Regions.

The new distribution centers and PRASA's warehouses island-wide are interconnected and communicate with each other mostly via SAP Portal. PRASA reports that these changes have led to greater inventory controls. Moreover, as part of their effort of maintaining control of PRASA's purchased materials, staff performs daily counts using SAP Portal at all their facilities. After the 2017 hurricanes, PRASA revised inventory minimum and maximum amounts for materials to guarantee that critical and necessary O&M items are available during an emergency.

The storage yard located at the Puerto Nuevo WWTP, which houses the large diameter material and equipment is still being utilized by PRASA. However, it is currently undergoing rehabilitation and improvement works. The same applies to the transshipment area at the same location, which is utilized to store decommissioned materials and equipment.

The department's ongoing and future initiatives are summarized below:

- Bar Code implementation is currently in process at the Aguadilla storage warehouse. The contract with the service provider was signed on February 2018. Completion of this initiative has been delayed to FY2019.
- Logistics algorithm optimization for storage warehouses and distribution centers is being implemented. Staff at warehouses and distribution centers are required to check the availability of an item at other PRASA locations island-wide before a purchasing request is started.
- The inventory labeling for better categorization of equipment undergoing repair is being implemented. For example, a letter "R" is added to the pump identification number once it returns from the repair shop.

Some of the most relevant impacts of the 2017 hurricanes to the Purchasing and Logistics Department are summarized below.

- Aguadilla and Trujillo Alto storage warehouses suffered great damage in their infrastructure and were not operational right after the hurricane. Therefore, an emergency provisional storage had to be opened and established in Hormigueros. Rehabilitation works were performed in both warehouses. As of the date of this report, the Aguadilla warehouse is fully operational, and Trujillo Alto is almost fully operational.
- Interconnection and communication between distribution centers and storage facilities were damaged but recently recovered and operating in parallel since last July 2018. The communications collapse caused that POs had to be processed manually and runners in motorcycles were sent to the different locations to receive/send purchase requisitions. This caused a significant orders backlog already completed and approved that have to be uploaded into the system for record. The department is still addressing this backlog.
- The Materials Requirement Planning (MRP) system, which controls and monitors the inventory balances started working again by mid-July 2018. This system automatically sends POs once the item has reached certain amount of inventory.
- There are currently about 200 EGUs being operated island wide. The overall purchase process for EGUs has been challenging for all PRASA departments involved.
- After the 2017 hurricanes, there was no staff available in the Bids Department, which greatly impacted the issuance and execution of bids.
- FY2018 initiatives were suspended after September 2017 to address the recovery efforts. They are expected to be reactivated on FY2019.

5.3.1.4 Systems and Information Technology

PRASA Systems and Information Technology (IT) Department continues developing the information technology management areas and the implementation of the Global Technological Innovation for PRASA's Renovation Program (INTEGRA, by its Spanish acronym). The INTEGRA program was re-planned during FY2018 to re-start implementation in FY2019. It consists on the replacement of the MDTs, which were used for location monitoring and service orders management. The new system is designed to operate on an android device. A firm has already been contracted for the implementation of this initiative.

During FY2018 the following initiatives and programs were implemented:

- The SAP SRM Portal project was completed.
- Upgrades to the storage capacity and speed were performed during FY2018. These include the replacement of the OBM IXV (180 TB – 4 TB Flash) for three systems which are: A9,000 / V9,000 / V7,000 and amount to a total of 300 TB (all Flash).
- *Fiori* application was implemented for the approval of POs and Contracts, which can be used instead of SAP R3 when preferred.

- The *Arin* application was supposed to be completed during FY2018, however due to cyber-attacks, this initiative was put on hold until firewalls are upgraded for the operation of Intercept X, necessary for *Arin*. New Firewalls were acquired during FY2018. *Arin* is expected to be implemented during FY2019 and is already being implemented for telemetry purposes.
- Banking Transactions Security – An upgraded encryption application, TLS 1.1, was implemented for such purposes. The implementation of TLS 1.2 is programmed for FY 2019.
- The SAIA app implementation was completed during FY 2018; however, the Contract is awaiting sign off by the PR Fire Department and PRASA. This app enhances the hydrants inspection process.

The IT Department is still providing support to the SAP Portal application for PRASA. As previously mentioned, PRASA plans on eliminating the use of Lotus Notes and utilize SAP Portal going forward. Various benefits for implementing this change include: 1) no license fees since the free SAP applications like *Fiori* will be used; 2) better storage capabilities provided by Office 365; 3) more user-friendly applications.

PRASA's IT future initiatives include the following:

- Firewalls upgrade programmed for FY2019; firewalls were already acquired in FY2018.
- Replacement of Lotus by FY2019.
- Payment Gateways – During FY2018 this initiative was in the planning phase. It consists in the consolidation of all payment methods under one (Pay Admin App), which will facilitate the system updating process. It is expected to be implemented by October 2018.
- Portal Life Ray – This will segregate applets within the website which will ease the safe addition of content to the website. It is expected to be implemented by October 2018.
- Acquisition of off-grid communication systems – VHF Radios for the Operations Department and P-25 Radios for Carraízo, La Plata, Toa Vaca Dams and PRASA Headquarters.
- Implementation of a microwave communication system (off-grid) at Carraízo and La Plata Dams as an off-grid alternative to optic fiber. As of June 30, 2018, optic fiber has not yet been reestablished in those areas.
- Update of PRASA Website Portal.
- Barcoding in Storage Warehouses (a Purchase and Logistics project).
- EGUs Redundancy – Installation of a second EGU for the department to promote power continuity of all IT systems during emergency events.

One of the initiatives mentioned in the previous CER, which was the interface between SAP and Department of Transportation and Public Works (DTOP, by its Spanish acronym) could not be implemented due to the incompatibilities between systems. DTOP systems are federal and manual, which does not permit its integration with PRASA's SAP.

During and right after the 2017 hurricanes, the IT Department was the only department in operation at PRASA Headquarters. Staffing levels in the department were also affected by the employee migration and the Pre-Retirement Program of April 2017. Notwithstanding that the IT Department was in operation;

Hurricane María directly impacted remote monitoring capabilities. A lot of the hardware (antennas, etc.) that enabled remote monitoring was lost and are gradually being replaced by PRASA. As of the date of this Report, only about 70% of the WAN up and running.

PRASA's fiscal situation has brought delays of projects execution due to budget cuts. The lack of capital improvements negatively impacts hardware upgrades. The department has managed to use operating budget savings to implement hardware upgrades, which are necessary for the proper operation of the IT systems.

5.3.1.5 Compliance

PRASA's Compliance Department continues to monitor regulatory compliance in PRASA facilities and continues to maintain open channels of communication with Regulatory Agencies. As a result of the 2017 hurricanes, PRASA Compliance Department had one of the worst impacts to PRASA – the total loss of the Caguas Central Laboratory, PRASA's main analytical testing laboratory. Damages due to flooding and from wind impacts to the building's roof were estimated over $20M, including laboratory equipment and material losses. PRASA is currently contracting private laboratories to perform most of the analytical tests required at facilities and the water distribution system. PRASA's smaller laboratory located in the west of the island was operating and receiving the West Region facilities samplings. Currently, PRASA is working on installing a temporary laboratory complex composed of portable office trailers at the Caguas Central Laboratory premises. PRASA is undergoing permitting processes to certify the temporary lab and expects to have it certified and operational by November 2018. A new lab will likely be constructed, subject to availability of funds.

Up until September 2017, PRASA had been in significant compliance with the 2015 USEPA Consent Decree and 2006 PRDOH Settlement Agreement. However, following the 2017 hurricanes and given the prolonged time without electric power and deficient communication systems, PRASA was unable to meet all requirements. As such, PRASA requested Force Majeure protection and a hold for a period of time for ongoing and upcoming work and deadlines and stipulated penalties with both Regulatory Agencies. Ongoing negotiations with USEPA and PRDOH are being conducted on a case by case basis. Further detail is included in Section 6.

PRASA is currently in the process of implementing several operational strategies and initiatives in the system to reduce DBPs, which PRASA acknowledges to be the biggest compliance challenge at the time after the implementation of the Stage 2 Disinfectant By-Products Rule (D/DBPR). Complying with Stage 2 D/DBPR is more challenging since averaging results across monitoring locations within a system is no longer applicable. Hence, reporting for the DBPs running annual average (RAA) per location has resulted in more violation instances. PRASA has continued to implement several operational strategies in the System to reduce these incidences. In FY2016 and FY2017, PRASA performed water quality modeling to identify the root cause of these non-compliance events to establish corrective actions and implement control measures. Since FY2017, PRASA has developed an action plan to address exceedances to DBPs and continued to implement in FY2018, which consists of, but is not limited to a combination of the following corrective measures:

- Elimination/reduction of pre-chlorination
- Increasing frequency of process tanks/systems wash

- More frequent drainage of systems
- Change in coagulants
- Hydraulic modeling to reduce retention time in tanks
- Lowering pH
- Training

PRASA recognizes that no single corrective action will solve the DBP issues; but rather, corrective measures will need to be combined and the different departments involved must collaborate to achieve compliance.

As part of their efforts to comply with the requirements stipulated by the Regulatory Agencies regarding the optimization of preventive maintenance protocols and corrosion prevention, new opportunities to improve the preventive and corrective maintenance program are required to ensure the proper O&M of all critical facilities. The draft Corrosion Prevention Program was submitted to the USEPA for review on June 1st, 2017. PRASA expects to commence the implementation of the Corrosion Control Program at PRASA facilities by December 2019. As indicated by the Compliance Department, the implementation of the Sewer System Operation and Maintenance Plan (SSOMP) program for Puerto Nuevo WWTP, which includes mapping pipelines, cleaning and flushing program, assessment of System's condition, among others, was also impacted by the 2017 hurricanes. The Compliance Department also reported that they continued with its FOG Program.

Also, in compliance with the consent decree requirements, PRASA continues the implementation of the Process Control System (PCS) at treatment facilities in accordance with potable water and wastewater industry standards. The PCS aims to keep current and revised to address, as appropriate, new regulations, treatment process changes, new equipment and/or treatment units installed/eliminated, and addition/elimination of chemicals. The PCS plans were completed for all WTPs STSs and WWTPs prior to their expected due date (December 2017); however, revisions and additional actions will have to be taken considering the lesson learned and impact of the 2017 hurricanes. Notwithstanding, PRASA shall periodically revise the PCS plans and update as needed. Also, the department continues focusing on the implementation of remedial measures and commitments to improve the separate and combined sanitary sewer system operating efficiency to minimize sewer overflow impacts.

Furthermore, the department continues as the responsible party for PRASA's Health and Safety Program, which includes talks, meetings, and task risk assessments to improve O&M practices and employee safety. Over the last few years, an external consultant has been working on the development of the Health and Safety Program, which was completed in June 2017. The implementation of the program is delayed until July 2019.

Lastly, the Compliance Department is working on the logistics to submit a revised schedule for expected compliance with the 2015 USEPA Consent Decree and 2006 PRDOH Settlement Agreement. Additional details on Consent Decree programs are provided in Section 6.

5.3.1.6 Legal

The Legal Department deals with 1) claims, which include courts and extra-judicial; and 2) litigations, which include damages, contract non-compliance (class action lawsuits, service & contractors Contracts), bid injunctions, bankruptcy and administrative (bills, water theft, injunctions). The department consists of the director, three auxiliary directors (Litigation, Opinions/Counsel, Contracts) and a pool of 11 lawyers. Also, for damages and pre-judgements litigation related to insurance claims they use contracted external counsel. However, the fiscal situation has forced the legal department to use in-house lawyers to minimize the contracting costs. Invoice objection and water theft litigations are managed through administrative proceedings, with an average rate of about 10 administrative hearings per day. PRASA's current backlog of pending administrative cases dates back to 2016. As for PRASA's financial debt negotiations, these are managed exclusively by external law firms.

The department reports that there has been a decrease in litigation cases, mainly due to the CIP continuing to be suspended. During FY2018, the legal department concentrated its efforts on existing litigation, mainly related to contractors claims, in which the principal subject was PRASA's non-payment of already performed work. Also, during FY2018 the department provided guidance and legal advice to the Compliance Department regarding the 2015 USEPA Consent Decree. The Legal Department expects by FY2019 to finalize agreements with the regulatory agencies regarding the 2015 USEPA Consent Decree and the 2006 PRDOH Drinking Water Settlement Agreement.

After the 2017 hurricanes, most of the department's employees were temporarily assigned to emergency recovery efforts including 1) providing legal advice for contract related matters, 2) optimizing contractual and emergency purchases/contracting procedures, 3) streamlining internal legal procedures, and 4) coordinating with different federal agencies, such as U.S. Army Corps of Engineers (USACE) and FEMA. In turn, this caused delays in the ongoing legal matters, although much of the procedures in many governmental dependencies remained on hold for a period after September 2017.The legal department is still providing support to PRASA's acquisition of services and goods process which has still not been reestablished to normal operating conditions.

The Puerto Rico Legislative House of Representatives passed a series of bills and amendments as a result of the recent emergency and the slow recovery of the island in terms of essential services, particularly the power utility. These laws have an impact on operational aspects such as: billing and collections, service procurement and infrastructure rehabilitation after emergency events. Such laws are included below:

- Act 143 of July 11, 2018, known in Spanish as: *"Ley de Facturación Justa, Razonable y Transparente de los Servicios Públicos Esenciales en Situaciones de Emergencia*" (Act 143-2018) – This law prohibits utilities from billing during natural disasters.
- Act 107 of May 30, 2018, known in Spanish as: *"Ley para enmendar el Artículo 3.009 de la Ley Núm. 81 de 1991, Ley de Municipios Autónomos de 1991"; enmendar la Ley Núm. 83 de 1941, Ley de la Autoridad de Energía Eléctrica; y enmendar la Ley Núm. 40 de 1945, Ley de Acueductos y Alcantarillados"* (Act 107-2018) – This law grants the Municipalities or other government agency, the ability to repair in a timely manner the damage caused by natural events, including infrastructure that belongs to PRASA or PREPA. The purpose of this measure is to grant the municipalities intervention in the repair of electric and water utilities, without prior authorization by PREPA or PRASA. However,

a notification of five days in advanced is necessary. PRASA's legal department feels the notification is too short and may compromise PRASA's infrastructure downstream or upstream of the repair point due to the municipalities' or any other agency's lack of knowledge regarding PRASA's system.

- Act 182 of August 5, 2018, *"Ley para enmendar el Artículo 7 de la Ley Núm. 33 de 1985, Ley para Establecer Requisitos Procesales Mínimos para la Suspensión de Servicios Públicos Esenciales"* (Act 182-2018) – This law amends Act 33 of 1985 and establishes a minimum time of notice to the customer prior to the service suspension.

As for new initiatives, the legal department is actively working closely with other PRASA's departments to provide guidance regarding the contracting of services related to the emergency and reconstruction efforts.

5.3.1.7 Infrastructure

PRASA's Infrastructure Department continues to oversee and manage PRASA's CIP. However, as previously mentioned, PRASA's CIP continues to be suspended until funding is identified. The Infrastructure Department is also responsible for the management of the Comprehensive Energy Management Program, the Plant Automation Program and Planning Department.

The Infrastructure Department has managed the initial asset damage assessments and estimates for claims negotiations with PRASA's insurance company and FEMA. The department has continued its support during the ongoing claim negotiations and is working closely with FEMA. Currently, the Interim Executive Director for Infrastructure, in coordination with PRASA's Executive Management Team and FEMA, has undertaken the process to reactive the CIP. Additional details on the CIP are provided in Section 6 of this Report.

5.3.2 Regional Updates: Challenges and Initiatives

Meetings with all five regional directors were conducted during the months of July and August 2018. The purpose of these meetings was to assess the progress of the region based on the established KPIs, the impact of Puerto Rico's fiscal situation, the issues and challenges being faced before and after the 2017 hurricanes, the programs and initiatives developed in each operational region during FY2018, future initiatives and overall operational activities.

The Regions presented issues and challenges as a result of limited operational budgets, damages caused by the 2017 hurricanes, and slow recovery efforts. Some of the most common issues and/or challenges among all regions are listed below:

- Lack of personnel for O&M functions, mainly due to hiring freezes and low workforce supply caused, in part, by the population emigration to the U.S., and the Pre-Retirement Program. One important aspect that was not considered during the Pre-Retirement is the fact that a number of the eligible employees occupied positions that needed immediate replacement to meet daily obligations (e.g. plant operators) thereby creating a greater need for recruitment and hiring.
- Continuing issues to fill open positions and long recruitment process, as it can take up to a year to obtain OMB approvals required per Act 211-2015.

- Service interruptions, mainly due to PREPA's unreliable electric power system after September 2017, damaged or missing EGUs, underground water and wastewater pipe collapses, and ruptures of deteriorated infrastructure or defective equipment.
- Limited visualization and weak communication between facilities due to the severe hurricane damages to optic fiber and telemetry systems.
- No availability of fleet vehicles, mainly due to deterioration of vehicles, long repair times and limited to no budget for purchasing new vehicles.
- Delay in obtaining approvals of POs.
- Aging infrastructure.
- Length of time to address and close out work service orders.
- Sanitary Sewer Overflows (SSO) caused by lack of power or EGUs to operate WWPSs.
- Compliance challenges in meeting regulatory parameters with equipment out of service.
- Limited availability of diesel to operate EGUs.
- Limited availability of security services to protect PRASA installations in the aftermath of the hurricanes.

The power blackout and lack of communications experienced on the island after the September 2017 hurricanes halted PRASA's routine operational activities. Most of PRASA's efforts were directed to emergency and recovery efforts. In this matter, the main challenge faced by the regions was the lack of EGUs in many facilities, especially in pumping stations as well as the lack of diesel supply across the island. This situation brought with it a great deal of service interruptions for weeks and even months after the event on both the water and wastewater systems. PRASA expects to replace or install new EGUs to most of its facilities. This action will be managed in two phases: first, replacing the damage EGUs and second, providing EGUs to facilities, mostly in the water distribution system, that do not have one installed.

In terms of communications, it is important to note that most of the optic fiber was damaged, especially the PREPA Net[13]. At an operational level this issue caused great difficulty for regions to visualize and remotely operate many of their facilities. As of the date of this Report, visualization capabilities have not been fully restored.

During FY2018 most of the regions reported a shortfall in employees. Immediate replacement of personnel has not been achieved. All Regions have reported a limited amount of human resources to fulfill field operations, which has adversely impacted PRASA's response to service interruptions and System repairs. In an effort to deal with this challenge, most Regions have redistributed essential personnel to be able to meet the necessities of the emergency recovery, which is still ongoing.

Late reimbursements from FEMA, have delayed recovery works. Currently, the rehabilitation of systems is being affected by the lack of sufficient funds to perform such activity, this delay in funding only

[13] PREPA owned networks infrastructure.

exacerbates the physical deterioration of the facilities and may ultimately impact their operation. Also, the vehicles fleet availability has been severely impacted in all regions due to deterioration, age and lack of funds to replace such fleet, thus putting at risk PRASA Operations Department performance. However, PRASA has assigned a $20M budget to all the regions to reactivate fleet renewal. Unfortunately, the PO process, and in particular the approval phase, is very slow, further delaying the improvement of the fleet capacity.

However, the 2017 hurricanes also created opportunities for PRASA's Regions, such as: 1) the identification of areas of opportunities for redundancy, 2) identification of already existing redundancy within the distribution system, 3) and facilitation of improvements and rehabilitation projects (access to federal funds), among others. Redundancy is critical and has been set as a goal for upcoming projects. Rehabilitation projects are being performed under the emergency order approach. Currently, the Special Fee funds are being used for some of these repairs. The regions have developed contingency plans for emergency power backup throughout the facilities island-wide which prioritize essential services facilities (hospitals, shelters, etc.) and identifies relays to service areas, among other considerations.

There are other issues specific to each Region, which are important to highlight. For example, in the West Region repairs are taking too long to be resolved, partly because of purchasing, logistics and payment challenges. Also, service interruptions are worse in FY2018 compared to FY2017 results, due to limited system visualization, weak communications and an unreliable electrical system. Service interruptions are lasting approximately three days. In the North Region, there are problems with pipes bursting because of high pressures in the water system. The region is working to reduce water system pressures by switching several wells to standby mode, specifically in the Manatí Operational Area. The North Region is also dealing with the saline intrusion in the Islote trunk sewer and the rehabilitation of the Manatí trunk sewer which collapsed in several segments. Meanwhile, the Metro Region is working with the new alignment of the 40-inch diameter transmission pipeline at Puerto Nuevo, as the current alignment limits operational flexibility between the Sergio Cuevas WTP and Superaqueduct WTP service areas. Normal repairs are taking more than 96 hours which is negatively impacting water services.

Additionally, the Regions are also continuing their efforts to control costs and improve compliance records. Some of the most common ongoing regional programs across the regions are energy consumption reduction and control of DBPs. However, other programs that were implemented during previous fiscal years are currently on hold or proceeding at a slow pace due to the current lack of personnel and funding. These programs are: reduction of SSOs and combined sewer overflows (CSWOs), NRW reduction, among others. Table 5-3 summarizes some of the initiatives and projects being implemented or planned during FY2018 and initiatives to be implemented during FY2019, subject to funding availability.

Table 5-3. New and Future Initiatives and Projects by Operational Region

Region	Initiatives/Projects	Description
West	Pilot Program Joint Venture with Mech Tech	This program will enhance fleet maintenance and reduce O&M cost related to fleet maintenance. After discontinuing efforts to contract with a national fleet management company, PRASA is now pursuing this initiative which consists in the recruitment of two experts in fleets from Mech Tech to help PRASA in the assurance of the quality of both

Region	Initiatives/Projects	Description
		corrective and preventive maintenance of the fleet. O&M cost is expected to be reduced by challenging quotes/ invoices from private auto mechanics shops and verifying quality of works. These experts will provide their opinion when buying vehicles for PRASA. This initiative will be implemented on FY2019.
	Heavy Equipment Leasing for O&M Cost Reduction	This initiative consists in the reduction of O&M cost related to backhoe loaders ownership. The leasing of backhoe loaders comes with a complete maintenance program, thus creating a substantial reduction in heavy equipment operating costs over time. This initiative will be implemented during FY2019.
	Asphalt Cost Reduction	Coordination with Municipalities to establish Memorandums of Agreement (MOAs) or Contracts so that Municipalities address asphalting needs after a repair. Municipalities already included in this program are: San Sebastián (obtained during FY2017), Hormigueros, Aguada and Añasco (obtained during FY2018).
	Projects	• Mayaguez Submarine Outfall- repair of pipeline rupture, to address violations to the discharge permit. • Installation of fixed EGUs in pump stations related to Guajataca. • Asphalt contracts with the municipalities of Hormigueros, Aguada and Añasco.
Metro	Water Compliance Actions to meet DBPs	This initiative consists in the reduction of chlorine application (1.8-2 mg/l) at discharge, elimination/reduction of pre-Cl, System's drain program, tank clean-up program (yearly), use divers for tanks that cannot be taken out of service and WSTs oscillation in term of water level with the goal of reducing retention time, in order to avoid water aging. To achieve this, in Barrazas System several pumps have been activated at different times to vary the distribution flow throughout the day. An added benefit of this measure is that it has reduced energy consumption. Also, as part of this measure the System's drain Program was established as well as sampling points (100% accomplished).
	FOG Program	A preventive maintenance has been included as a mitigation initiative under this program. Also, as a preventive measure, a seminar was conducted at Torres de Andalucía at San Juan since, they were experiencing several problems with their FOG system and it was affecting that area's collection system.
	SOMP – Sewer Operation Maintenance Program	The implementation of the program has assisted in limiting overflows. PRASA indicates that Metro Region has approximately 3,260 km of sanitary pipping.
	Energy Consumption Reduction Program	This initiative includes performing pumps adjustments, reducing time in operation, using smart system in several systems, which reduces consumption. Another initiative regarding reduction in energy consumption is the elimination of the Pumps Stations in the systems of Caimito and Quebrada Arenas, due to pressure problems at the Hollywood Hills PS and WST and PS Holy Hills.

Region	Initiatives/Projects	Description
	Projects	• Transition from chlorine gas to liquid chlorine in Guaynabo-Los Filtros and Canóvanas Nueva WTPs • Puerto Nuevo's 48-inch potable water transmission pipeline- new alignment needed, as current alignment hinders flexibility between Sergio Cuevas and Superaqueduct WTPs Service areas. This project is on the list of Resiliency Projects for FEMA funds ($13 - $14 M) • Elimination of Hollywood Hills and Holy Hills pump stations. • Puerto Nuevo Incinerator emission testing to comply with regulations.
East	Restructuring of Fleet Department and Acquisition of New Vehicle Fleet	As part of the restructuring initiative of the Fleet Department, a new fleet coordinator was assigned to each operational area within the region. A new on-site and off-site repair and maintenance contract was granted to the company Mayaguez Fleet for the Humacao operational area. Also, the region will be acquiring a new vehicle fleet to improve the operations department performance during FY 2019.
North	Water Compliance Actions to meet DBPs	This initiative includes the following measures: WSTs level oscillation, frequent WST wash program, increase in the drainage frequency at Jayuya and Manatí distribution tanks, level control at WSTs, water quality testing, elimination of several WSTs, reduction of service areas, and elimination/reduction of pre-chlorine injection.
	Pipe Rupture and Water Loss Mitigation	Aggressive plan to replace pipelines. There are several measures to reduce pressure in the system. One is to reduce the use of wells by switching several wells to standby mode, especially in the Manatí Operational Area. This is an ongoing plan and has decreased potable water loss, but it's limited to the available budget.
	Sanitary Overflow Prevention Initiative	Identification of illegal interconnections in the Arecibo Operational Area, infiltration of saline water into Islote Trunk Sewer, CSWOs, and collapsed pipe segments in Manatí Trunk Sewer, piping replacement plan, sectorization, and detailed investigation for the occurrence of overflows.
	Energy Consumption Reduction Initiative	Same concept as other regions. Key initiatives include: installation of telemetry in the Toa Alta system will help control pumping of the Winche and Winche Contorno Pump Station to reduce pump operating hours and thus energy consumption; elimination of Vega Baja (La Trocha) WTP, transfer of potable water from Superaqueduct WTP to North Region System distribution tanks in the grid and the Río Arriba WTP bypass at the raw water well pump station Ojo de Agua 5.
	Projects	• Rehabilitation of the Quebrada weir • Relocation of the Dorado WWTP • Elimination of La Trocha WTP • Elimination of the Río Arriba WTP • Elimination of Matadero and Ojo de Agua Wells • Electrical infrastructure rehabilitation of the Negros Corozal Dam • Electric Infrastructure rehabilitation of the Morovis Sur WTP

Region	Initiatives/Projects	Description
South	Water Compliance Actions to meet DBPs	This initiative includes the elimination of the pre-chlorine injection; enhanced coagulation with the implementation of Gulbrandsen GPAC 200, GC850, MAC 4000, MAC 2000; cleaning of sedimentation tanks from a semi-annual basis to three times per year, measuring at WTP exit; quality vs draining time analysis of draining activities (some Systems need an increase of draining time from 20 minutes to one hour); the increase in polymer dosing for removal; and automatic modulation of the Coto Laurel System, Tank 4th Extension, and Coamo-Toa Vaca.
	Acquisition of Vehicle Fleet	New vehicles are in process to be acquired for the region's fleet. However, budget is limited, and it only represents approximately 20% of the fleet.
	Pipeline Ruptures and SSOs Control	This initiative includes the validation of leak/overflow claims; relocation of the Guayama WTP raw water pipeline and raw water transfer of 600 gpm to Carite, which will decrease the water pressure in the raw water pipeline and at the same time decreases energy consumption due to raw water pumping, since the Carite system is a gravity system.
	Energy Consumption Reduction Initiatives	Same concept as other regions. This initiative includes: • Auditing of PREPA bills • Facilities lighting replacement to LED
	Optimization of Operations	Optimizing use of operators by reorganization of personnel to be able to reduce vacancies from six operators that were missing to three operators. However, there are still vacancies.
	Non-Revenue Water Recovery	Measurement of System's drain flow and installation of water meters inside PRASA's facilities. Drainage flow metering has been implemented in Yauco only for fire hydrants. Increased visualization of PRASA's South Region System will be achieve with the installation of three systems at Guayama Operational Area Tanks and a total of 20 systems were acquired for such purpose.
	Projects	Rehabilitation of the sanitary trunk sewer from Salinas to Guayama, which collapsed after the September 2017 hurricanes.

5.4 Strategic Plan

PRASA's Executive Management Team continues to work on its Strategic Plan update which will be aligned with the objectives included in PRASA's Revised Fiscal Plan and in the Government of Puerto Rico's "Plan para Puerto Rico". PRASA has reported that the new Strategic Plan, once completed, will maintain the basics elements of the previous plan. Operational and performance KPIs and metrics are also being revised.

5.4.1 Key Performance Indicators

Tables 5-4 and 5-5 present a summary of PRASA's KPI goals and results. The results are stated for FY2017 as of June 2017 (Table 5-4), and for FY2018 as of June 2018 (Table 5-5). In FY2017, PRASA achieved a compliance score of 48% on its KPIs on an island-wide basis, mostly because of PRASA's

fiscal situation hindering the implementation of certain initiatives. In FY2018, however, PRASA's KPI results reduced substantially more due to the impacts of Hurricanes Irma and María. A KPI compliance score of 29% was attained.

As previously mentioned, PRASA had a challenging FY2018. Considering that most of PRASA facilities are PREPA dependent for electrical power, the crippled power and communication systems posed a major challenge for PRASA to restore and sustain operations, let alone maintain or improve KPIs. This effect is reflected on the results for almost all Fiscal Health, Operational Efficiency and Organizational Transformation KPIs.

Table 5-4. FY2017 PRASA Operations Key Performance Indicators

Strategic Plan Initiative	Key Performance Indicators	FY2017 Goals	Results as of June 2017
Fiscal Health	Employees per Connection	3.34 or less Employees per 1,000 connections	3.25
	Overtime	Reduce to 7% or Below	9%
	Budget Compliance[14] (excludes electricity costs)	Below 100%	86%
	Collections vs. Billings	Increase to 94% or Above	94.8%
Operational Excellence	Compliance - Water System	Increase to 99% or Above	99.5%
	Compliance - Wastewater System	Increase to 97% or Above	97.9%
	Billing Adjustments	Reduce to 2% or Below	3.0%
	Complaints in Customer Service (per 1000 active accounts)	Reduce to 16.7 or Below	17.5
	Monthly Average of Customers with Service Interruptions (as a Percentage of Total Customers)	Reduce to 5% or Below	6.8%
	Customer Attention Time (Commercial Office)	Maintain below 30 min.	33.13 min
	Vehicle Availability	Increase to 92% or Above	80%
	Average Processing Time of Purchase Orders[1]	Less than 40 days	42.58 days

[14] Measures ratio of actual expenses/anticipated (budgeted) expenses excluding energy costs.

Strategic Plan Initiative	Key Performance Indicators	FY2017 Goals	Results as of June 2017
	Preventive vs. Corrective Maintenance Ratio	Increase to 80%	79%
	Average Time for Equipment Repairs	Less than 25 days	24.13 days
	Reported Leaks	Reduce to 4,598 monthly	3,935
	Reported Overflows	Reduce to 2,298 monthly	2,383
	Repair time for leaks	Reduce to 53.0 hrs.	51.7 hrs.
	Repair time for overflows	Reduce to 32.0 hrs.	31.6 hrs.
	Average Water Production (MGD)	Reduce to 505 MGD	509 MGD
	Percent of NRW[2]	Reduce to 53.2%	-
Infrastructure and Sustainability	Energy Consumption (Annual)	Reduce to 660.34 MkWh	630.91 MkWh
	Project Progress (CIP)[3]	Greater or equal to 0.9	-
	Cost Performance (CIP)[3]	Greater or equal to 0.9	-
Organizational Transformation	Training (cumulative hours per employee)	More than 26 hrs. per year	23 hrs.
	Unplanned Work Effectiveness (Absenteeism)	Reduce to 2 days	2.5 days
	Planned Work Effectiveness	Reduce to 10%	5%

[1] The Average Processing Time of Purchase Orders goal was modified for FY2017 to include the process time needed for the Lotus Notes process that was recently incorporated. Also, now calendar days are considered instead of business days. The new KPI goal considers 15 days required for the Lotus process and 25 days for the SAP process.
[2] The Percent of NRW KPI is only measured annually and island wide.
[3] Due to the suspension of the CIP, the Project and Cost Performance KPIs for FY2017 are not being measured.

Table 5-5. FY2018 PRASA Operations Key Performance Indicators

Strategic Plan Initiative	Key Performance Indicator	FY2018 Goals	Results as of June 2018
Fiscal Health	Employees per Connection	3.34 or less Employees per 1,000 connections	2.21
	Overtime	Reduce to 7% or Below	11.1%[6]
	Budget Compliance (Excludes Electricity Costs)	Below 100%	101.5%[6]

Strategic Plan Initiative	Key Performance Indicator	FY2018 Goals	Results as of June 2018
	Collection vs. Billings	Increase to 96% or Above	81.2%[6]
Operational Efficiency	Compliance - Water System	Increase to 99% or Above	98.4%[6]
	Compliance - Wastewater System	Increase to 97% or Above	95.0%[6]
	Billing Adjustments	Reduce to 2% or Below	6.0%[6]
	Complaints in Customer Service (per 1000 Actives Accounts)	Reduce to 16.7 or Below	14.0
	Monthly Average of Customers with Service Interruptions (as a Percentage of Total Customers)[1]	Reduce to 5% or Below	35%[6]
	Customer Service Attention Time (Commercial Office)	Maintain below 30 min.	27:06 min
	Vehicle Availability	Increase to 92% or Above	62.0%[6]
	Average Processing Time of Purchase Orders[2]	Less than 40 days	-
	Preventive vs. Corrective Maintenance Ratio	Increase to 80%	75.5%[6]
	Average Time for Equipment Repairs	Less than 25 days	39.54 days[6]
	Reported Leaks	Reduce to 4,598 monthly	3,769
	Reported Overflows	Reduce to 2,298 monthly	1,948
	Repair Time for Leaks	Reduce to 53.0 hrs.	108.2 hrs.[6]
	Repair Time for Overflows	Reduce to 32.0 hrs.	60.4 hrs.[6]
	Average Water Production (MGD)[3]	Reduce to 505 MGD	507 MGD
	Percent of NRW[3]	Reduce to 53.2%	-
Infrastructure and Sustainability	Energy Consumption (Annual)[2]	Reduce to 660.34 MkWh	-
	Project Progress (CIP)[4]	Greater or equal to 0.9	-
	Cost Performance (CIP)[4]	Greater or equal to 0.9	-

Strategic Plan Initiative	Key Performance Indicator	FY2018 Goals	Results as of June 2018
Organizational Transformation	Training (Cumulative Hours per Employee)[5]	More than 25 hrs. per year	9.2 hrs.[6]
	Unplanned Work Effectiveness (Absenteeism)	Reduce to 2 days	2.57 days[6]
	Planned Work Effectiveness	Reduce to 10%	2.2%

[1] The Monthly Average of Customers with Service Interruptions (as a Percentage of Total Customers) does not include the first two quarters of FY2018 to exclude the service interruptions due to Hurricanes Irma and María. Also, this indicator was not evaluated for the first three months of FY2016 due to the rationing plan in effect during these months.
[2] This KPI was not measured or available due to the impact of Hurricane María.
[3] The Percent of NRW KPI is only measured annually and island wide. However, since FY2017 PRASA has not been reporting this KPI and is in the process of redefining a new KPI to assess NRW.
[4] Due to the suspension of the CIP, the Project and Cost Performance KPIs for FY2018 are not being measured.
[5] This KPI does not include the first two quarters of FY2018 to exclude impacts due to Hurricanes Irma and María.
[6] These KPIs results were all adversely impacted by the September 2017 Hurricanes.

5.5 On-Going Programs and Initiatives

The following are programs and initiatives, some of which began development and implementation prior to FY2015, being pursued by PRASA. A brief description and status of each of these initiatives is provided below.

5.5.1 Integrated Maintenance Program (IMP)

The previous 2006 and 2010 Consent Decrees with USEPA and the 2006 PRDOH Agreement required that PRASA implement and continue to develop a comprehensive Integrated Preventive Maintenance Program, which evolved to the IMP during FY2013 to include both corrective and planned (i.e. preventive, predictive and proactive) maintenance activities, to ensure the proper O&M of its treatment plants and other critical facilities, including WWPSs. Through this program, PRASA established a plan to enable programmed and continuous maintenance to treatment plants, pump stations, vehicles, and equipment to provide for more reliable service, improve client satisfaction, and achieve long-term operational cost savings through preservation of assets. PRASA continues to finance part of the program through its CIP (costs associated with the necessary R&R prior to the integration of the facilities into the preventive maintenance program) and the rest (the actual maintenance costs) through its O&M budget.

The 2015 USEPA Consent Decree included the requirement for PRASA to continue with the approved IMP, which includes the following key components:

- Recordkeeping
- Maintenance planning and scheduling
- Storeroom and inventory system
- Maintenance personnel training and organization
- Cost and budget for maintenance operations

In addition to the minimum requirements established in previous Consent Decrees, the 2015 Consent Decree required PRASA to develop and submit to USEPA no later than March 1, 2017 a Corrosion Control Program to add to the implementation of the IMP. An extension to this deadline was agreed upon between PRASA and USEPA, hence, PRASA submitted the draft Corrosion Control Program for review on June 1, 2017. Nevertheless, the emergency caused by the passage of Hurricanes Irma and María over the island compelled PRASA to put the program temporarily on hold. As reported by IMP, another serious problem they are currently facing is the difficulty to enforce the program due to the lack of technical staff. In order to continue with the program implementation, PRASA needs to recruit additional staff to support the program. The recruitment process is expected to be completed no later than January 2019. It is important to note that although the Corrosion Control Program remains on hold, minimum requirements are still followed as established in the 2015 Consent Decree.

During FY2017, another relevant change for the IMP Department was the appointment of a new Executive Director and the redistribution of leadership within the management; as the IMP's Assistant Manager was appointed lead of the Fleet Department. Also, since FY2018 the Fleet Department is reporting directly to the Operations Vice President.

PRASA's vehicles are currently equipped with a GIS-enable tracking system known in Spanish as "Sistema Integrado de Transporte" (SIT). The SIT will also assist with the future implementation of the fleet maintenance tracking system using the SAP Portal as platform to: 1) receive automatic notifications when a vehicle is due for maintenance and 2) keep a maintenance history log for each vehicle. The fleet maintenance tracking system was completed on September 2017.

PRASA continues to evaluate the need for new metrics and setting more aggressive goals to continue to improve its operations. Nevertheless, the IMP Department was unable to track metrics from September 2017 to December 2017. One of the main concerns of IMP is related to the weak state of PRASA's communication infrastructure and the negative effect on their System visualization capabilities. There are currently 1,000 EGUs operating island-wide, which are 300 less than the available generators prior to the September 2017 hurricanes. In an effort to address this situation, during FY2019 PRASA conducted a bid process for the purchase of 143 prime-type units and 25 portable emergency generators to replace the non-working existing permanent generators.

Another critical factor during FY2018 was the fiscal situation's impact to IMP's ability to hire new staff. Additionally, the lack of technical personnel has adversely affected the KPI's follow up, preventive maintenance and the Corrosion Control Program.

On-going IMP initiatives executed during FY2018 include the following:

- Predictive Maintenance is currently being implemented through private contracts. Some of the predictive maintenance techniques include ultrasound technology, vibration, among others, to make sure that the preventive maintenance is working properly and to be able to predict future failures. Internal personnel were trained but have not yet executed predictive maintenance, since there is still a lack of equipment, and additional training is needed.
- Live tracking IMP metrics was reestablished in January 2018 and is on-going.
- The installation of new telemetry systems for selected water infrastructure to view the system in SCADA was conducted in 100 automation and visualization devices in potable water facilities

distributed throughout the island. This effort will continue through FY2019. IMP is actively working on improving their visualization and automation capabilities and target connecting 600 facilities in one year (FY2019).

- The IMP department completed the standardization of the automation and visualization through *4DOC*, which is an ultra-low power data acquisition system to monitor off-grid or hard to reach locations, on all PRASA regions.

PRASA's IMP Department future initiatives include the following:

- During FY2019, the department is considering the installation of electronic pressure switches in pump stations. Electronic pressure switches offer multiple advantages over the mechanical switches, currently in use for most PRASA pumps stations. This technology offers better accuracy, long term stability, simpler operation and avoids the alteration of the pressure switch settings. As mentioned by the Department Manager, the latter one being the most common factor involving sanitary sewer overflows. PRASA has already installed electronic pressure switches in San Germán and had proven to be an effective way to control sanitary sewer overflows.
- PRASA is undergoing negotiations with USEPA to develop an interim Corrosion Control Plan (FY2019) until they can submit a permanent program that fully address USEPA's remarks on the previous submitted plan.
- As part of the efforts to guarantee the corrective and preventive maintenance of PRASA's assets, IMP is working on the optimization of PRASA's Lubrication Program. The optimization is mainly focused on storage, standard compliance and staff training in better lubrication practices. During FY2018, great part of the equipment specifications where revised to ensure the adequate lubrication. For FY2019 the specification revisions will continue, and it is expected to be fully enforced by FY2020.
- Digitalization of form AAA-500 C[15] and corresponding SOP revision. There is currently a pilot test in the Metro Region regarding this project. This project it is intended to eliminate the human error in the operating hours and maintenance recordkeeping.
- Development of Project Workorders (PWs) under FEMA to obtain new generators for facilities that did not have a generator before the September 2017.

5.5.2 Non-Revenue Water Reduction Program

In May of 2008, PRASA began to implement its comprehensive NRW Reduction Program to reduce water losses (apparent and real), increase revenue, reduce operational costs, and minimize water infrastructure capital investments.

Reducing NRW is a high priority goal for PRASA, as it will have both a revenue enhancing and an expense reduction impact to PRASA's finances. In late 2011, PRASA retained the services of Miya, an NRW consultant, who completed a Report (May 2012) that identifies a series of short, mid, and long-term activities. Furthermore, as part of the NRW management and reduction plan, PRASA established the

[15]PRASA form for monitoring EGUs, usage log, maintenance and testing.

Water Recovery Office and is now conducting periodic water audits (refer to Section 4), which are used to implement controls and develop action items to address NRW and meet the established goals.

As challenging as it has been, reducing NRW continues to be a top priority objective for PRASA. Hence, in pursuing PRASA's vision to achieve long-term sustainability, PRASA has included the reduction of NRW as one of the three key focus areas of PRASA's Revised Fiscal Plan. To do so, PRASA has established three main initiatives, which are described in detail in Section 2.5 and listed below:

- Reducing the system water production to 450 MGD by FY2020
- Privatizing PRASA's customer services via a P3 to reduce commercial losses
- Reducing physical losses through a series of initiatives

The Water Recovery Office further established a NRW team to include not only the Water Recovery Office staff, but also integrate operations personnel to address PRASA's Revised Fiscal Plan NRW initiatives efficiently and effectively per Region. PRASA's Water Recovery Office also oversees the GIS Office.

5.5.2.1 Revenue Optimization Program

As part of the NRW Reduction Program, PRASA's strategy has focused mostly on revenue optimization (enhancing) initiatives, which target apparent losses related to its commercial operation. Since 2009, PRASA has implemented a public-private effort that is charged with identifying new opportunities for revenue sources and optimizing collections. These activities, which include small and large meter changes, identifying theft and inactive accounts, disconnections and collections efforts, among others, have resulted in significant additional revenue for PRASA over the past fiscal years. Approximately $100M per year of PRASA's revenues (or about 10% of total Operating Revenues) are generated from these initiatives. In the future, most of these initiatives will be transferred to and address by the P3 Project Contractor.

5.5.2.2 Accounts and Structures Validation Initiative

PRASA's Water Recovery Office established the Accounts and Structures Validation Initiative (INVEC, by its Spanish acronym) in FY2015. This initiative has identified connections that are not already identified in PRASA's SAP customer database or georeferenced in PRASA's Geodatabase, thereby helping to identify and address illegal connections. Through INVEC, PRASA identified what is internally known as "red structures". Red structures are occupied housings located at a distance of 100 meters or less from PRASA infrastructure, as reported by GIS, that are not connected to PRASA system. Hence, these structures may be either non-PRASA communities (communities that have their own private water source) or illegal connections (theft, derivations).

An initial number of 300,000 accounts were identified. In its Geodatabase efforts in previous fiscal years, PRASA was able to narrow down this number to 265,505 by eliminating structures that are 600 square-feet or more and at a distance of 6 meters from a water meter to reduce the potential of keeping gazebos. Then, PRASA searched for structures such as hotels and industries to also disregard those and were able to further narrow the number down to 205,000 accounts. Thirteen percent (13%) of these accounts (26,000 accounts) were identified as communities with low economic resources that are illegally

connected to PRASA (with service but without meters), known as the “yellow structures”. These yellow structures are to be georeferenced in PRASA’s Geodatabase. PRASA intends to continue the search for schools and hospitals to keep reducing this number prior to going to the field for verification. However, this initiative was impacted by the effects of the September 2017 Hurricanes and was put on hold during FY2018. The initiative is expected to be transferred to the P3 Project Contractor.

5.5.2.3 Water Leak Detection

To better understand the magnitude of hidden water leaks (physical losses) in PRASA’s water system, in FY2013 PRASA carried out a project to detect leaks in the Arecibo and Caguas water distribution systems. In total, between the two systems a total of 600 miles of pipeline was surveyed. About 288 leaks were detected with an estimated flow of about 4.7 MGD. Through this project, PRASA confirmed that there are a significant number of undetected water leaks in PRASA’s water system. Based on these results, PRASA projects that there could be as much as 100 MGD being lost through undetected water leaks throughout the island. Hence, PRASA’s Executive Management Team believes that detection and repair of these leaks could significantly reduce the volume of PRASA’s NRW.

In January 2014, PRASA expanded the leak detection project throughout the island. PRASA established a goal of surveying about 7,000 miles of water pipelines, island-wide, over an 18-month period as part of the project. The water pipeline inspections goal was completed by June 2015 and a total of 3,800 leaks were detected.

As of December 2015, PRASA established a new goal of surveying about 3,500 miles of small meter water pipelines throughout the island and a total of about 25.5 miles of large meter water pipelines in selected areas. The bid process for this project was performed and a contractor was selected. However, due to the September 2017 Hurricanes impact this initiative was placed on hold. As of the date of this Report, PRASA’s new management is evaluating the next steps and goals for the Water Leak Detection Program which is to be performed in parallel with the Pressure Management Program. As previously mentioned, this initiative is included in PRASA’s Fiscal Plan.

PRASA’s Regions prioritize leak repairs in accordance to their severity, giving a higher priority of repair to major leaks which represent a higher reduction in NRW.

5.5.3 Comprehensive Energy Management Program

PRASA’s energy cost is the second largest cost behind Payroll and Benefits. PRASA’s energy cost has been mostly driven by energy consumption and the electric power costs (which in turn are mostly driven by fuel oil costs). During the past five fiscal years, PRASA’s energy use has reduced from 745 million kWh during FY2013 to 644 million kWh during FY2017 (consumption data based on bills as of June 2017) and 542 million kWh during FY2018 (consumption data based on bills as of June 2018) net of the September 2017 Hurricanes impact.

PRASA continues its Comprehensive Energy Management Program to manage and reduce its energy consumption and costs. As previously reported, PRASA undertook two separate procurement processes to engage the private sector in investing in energy related projects. These are: 1) Demand Side Projects through Energy Performance Contracts (EPCs); and 2) Supply Side Projects through Power Purchase Agreements (PPAs). Additionally, PRASA continues its internal initiatives and activities being

implemented by the operational Regions and PRASA's Infrastructure Department. A description of the different initiatives is provided in the following sub-sections.

5.5.3.1 Demand Side Projects through Energy Performance Contracts

During FY2018, PRASA continued with the implementation of EPCs, although due to PRASA's fiscal situation, three EPCs were placed on hold until further notice. The objective of this initiative, which began during FY2009, is to have Energy Service Companies (also referred to as ESCOs) perform assessments and guarantee savings obtained by installing equipment and implementing activities designed to reduce energy consumption. The most important benefit for PRASA in employing this type of performance contract is the operational benefit from improvements guaranteed by the ESCOs, i.e. if the energy savings are not achieved, the ESCO will pay PRASA for the non-achieved savings. However, the ESCOs savings guarantee extends until the investment is recovered and they have earned their agreed payments.

PRASA continues with the EPCs with Honeywell International as the ESCO for water and wastewater treatment facilities. However, in response to the financial situation PRASA is facing and its effects on payments due, PRASA has decided to put on hold three of the six EPCs that have not started the construction/implementation phases. The other three EPCs under the contract have been completed (Caguas, Barceloneta and Bayamón WWTPs). PRASA expects to contract a private firm during FY2019 for the measurement and verification phase and the operation and maintenance of these three completed EPCs.

Table 5-6 provides a status summary of this initiative as of June 2018. With the completion of the implementation phase of the first three EPCs, PRASA has saved approximately $400K and 2.4 million kWh per year since FY2016.

Table 5-6. PRASA EPCs

Facilities	Status
Caguas WWTP	Construction/Implementation completed. PRASA expects to contract a private firm for a period of 1 year for the measurement and verification phase and operation and maintenance. Delayed due to the hurricanes.
Barceloneta WWTP & Bayamón WWTP	Construction/Implementation completed. PRASA expects to contract private firm for a period of 1 year for the measurement and verification phase and operation and maintenance. Delayed due to the hurricanes.
Sergio Cuevas WTP (Carraízo RWPS)	Construction/Implementation on hold.
Superaqueduct RWPS	Design completed. Construction/Implementation on hold.
Puerto Nuevo WWTP	Design on hold.

5.5.3.2 Supply Side Projects through Power Purchase Agreements

In 2009, PRASA also undertook a parallel process for procuring companies who were interested in providing independent energy supply services through PPAs. The objective is to secure one or more

PPAs for lower energy unit costs per kWh than what PRASA currently pays to PREPA. From this process, PRASA concluded successful agreements with three companies, of which one has been completed and is currently in operation. Table 5-7 below provides a status summary of the PPAs as of June 2018. In addition, during FY2017, PRASA identified 14 sites for additional solar projects with a potential capacity of approximately 16 MW. As of FY2018, PRASA projects to have saved approximately $1.4M (10 million kWh per year) from the solar PPAs currently in operation.

Table 5-7. PRASA PPAs

Proponent	Technology	Status
Windmar Renewable Energy (PV Properties)	Solar	Contract signed; 7 MW; 10 facilities (projects) have been completed and are currently in operation.
Renewable Power Development	Gasification	Contract signed; Undergoing planning and permitting process for one 10 MW facility (5 MW committed to PRASA) Contractor is facing challenges in obtaining permits, financing and waste supply contracts
Organics Management	Gasification	Contract signed; Contractor is facing challenges in obtaining permits, financing and waste supply contracts.

5.5.3.3 Regional Operational Initiatives

PRASA's Executive Management Team had set a goal to achieve additional energy consumption reductions, as per final budget, of at least five percent kWh per year island-wide, varying within regions. Since FY2014, PRASA's Operational Regions have been implementing energy conservation measures in its WTPs and WWTPs, and they are also leveraging hydraulic modeling analyses and optimization efforts to reduce energy consumption in the water distribution and wastewater collection systems (i.e., pump stations facilities). Some of the measures include, for example, simplifying and providing more flexibility to the system, reducing and optimizing the hours of operation at the facilities, elimination of WPS or WTPs, identifying energy conservation measures in the operation of the equipment, among others. Regions have identified energy conservation measures that reduce equipment operation time at the WWTPs with process control measures and at the WPSs by identifying and controlling system pressures and distribution tank overflows. However, considering the concerted effort of the Operational Regions in reduction of energy consumption for the past fiscal years, they have expressed concern on maintaining the same energy reduction target (KPI) and meeting that target without impacting customers. Also, some of the measures for energy consumption reduction to be implemented require capital investments that PRASA cannot currently fund. For FY2018, PRASA will not achieve the 5% energy consumption reduction target. Furthermore, PRASA's Executive Management Team should consider revaluating this KPI.

5.6 Treatment Plant Automation Program

In prior years, PRASA embarked on a Treatment Plant Automation Program, which consisted in the installation of the necessary equipment and the development of the system protocols to automatically

operate and remotely monitor its WTPs. However, PRDOH requested that a WTP should not be maintained without operators for more than 4 hours, implementing partially automated shifts following the 8-4-8-4 Automation plan[16]. PRDOH and PRASA agreed on an endorsement procedure prior to the implementation of 8-4-8-4 and remote operation. This meant that while plants can have Automatic Shutdown (ASD) or full automation capabilities, the WTPs must follow the endorsement procedure prior to implementation of reduced shifts or staff.

At the end of the program PRASA completed full automation for three WTPs in the North Region: Río Arriba WTP, Esperanza WTP, Sabana Grande WTP. Also, partial automation was achieved for several treatment plants, which have ASD capabilities and may be operated as 8-4-8-4. An effective automation program should be designed to be properly operated from the Remote Operating Center (ROC) at each of the five Operational Regions. Under PRASA's resiliency projects list, PRASA projects to invest at least $150M for remote operational capabilities at its facilities.

5.7 Conclusions

PRASA's main O&M efforts during FY2018 were focused on the reestablishment of the System in the aftermath of Hurricanes Irma and María. The FY2018 planned O&M investments and key PRASA initiatives have been delayed, suspended or cancelled because of the hurricanes and PRASA's ongoing challenging fiscal situation, or have been modified to meet commitments included in PRASA's Revised Fiscal Plan. Initiatives like the NRW Reduction Program will be expanded with PRASA's P3 Project and other internal programs are expected to be reactivated during FY2019 or FY2020 once funding has been identified.

[16] The term 8-4-8-4 operations refers to having an operator at the facility for a period of eight hours followed by a remote monitoring and un-manned operation for the next four-hour period. This 12-hr cycle is repeated, reducing the number of operators needed and reducing overtime.

6 CAPITAL IMPROVEMENT PROGRAM AND REGULATORY COMPLIANCE STATUS

6.1 Introduction

PRASA manages a CIP to improve and maintain its water and wastewater infrastructure. The CIP's main objectives are to maintain, modernize and simplify the Systems to achieve operational efficiency, protect public health and safeguard environmental quality, while enabling continued economic development and meeting all regulatory requirements. In addition, PRASA has included as part of the CIP objectives the restoration of damaged infrastructure to its condition prior to the September 2017 hurricanes and the implementation of sustainable measures to achieve a long-term resilient System.

The CIP is a dynamic program that evolves and undergoes revisions as needs and sources of funds are identified, and as projects transition from planning through design, construction and startup phases. The program has been funded with external financing from bond issuances and federal assistance in accordance with standard utility financing practices. Bond financing of long-term capital improvements is consistent with PRASA's mission and results in lower, more affordable water rates. Since between 2006 and 2016, PRASA invested approximately $3.7B in its CIP, with the intention of bringing the System into compliance and catch-up with capital needs that had been lacking in prior years. However, PRASA's Revised Fiscal Plan and public policies endorsed by its Governing Board include a tapered transition of financing the CIP with bonds to self-financing a significant portion with PRASA's Operating Revenues.

Given the magnitude of the CIP, it is understandable that it will continue to evolve over time and the number and budgets of projects is expected to be updated regularly. As required by PRASA's Governing Board, prior to the CIP suspension in 2016, PRASA's Infrastructure Department must annually submit for its approval an updated five-year CIP plan. However, as requested by the Oversight Board, PRASA's Revised Fiscal Plan includes a modified six-year CIP (FY2018-FY2023) which includes all adjustments resulting from negotiations with the Oversight Board as well as Regulatory Agencies and the necessary investment to reflect PRASA's infrastructure current needs to ensure adequate operation and sustainability of the System post Hurricanes Irma and María.

The CIP presented in this Report refers to the six-year CIP as included in PRASA's Revised Fiscal Plan. The approval and execution of this six-year CIP is contingent upon funding availability and allocation[17] and approval by PRASA's Governing Board.

6.1.1 PRASA's CIP Status

The Government's fiscal situation and resulting rating agency classification downgrades had a major impact on PRASA, as each downgrade also resulted in a consequential downgrade for PRASA, thereby limiting its ability to access the capital markets to obtain financing to cover its immediate CIP related expenses. Since 2014 and considering the difficulties faced in securing outside financing, PRASA began

[17] A five-year CIP was presented to and approved by PRASA's Governing Board in December 2017. The revised six-year CIP was included in PRASA's Revised Fiscal Plan as certified on August 1, 2018.

reducing CIP expenditures. As previously mentioned, PRASA used operating funds to cover expenses related to its CIP projects for some time. However, in FY2016, after expending all its surplus operating income and reserves to repay bond anticipation notes and cover a portion of its unfunded CIP, PRASA was forced to essentially postpone or terminate the execution of all CIP projects. Specifically, PRASA suspended the execution of $352M in 55 projects that were under construction, in addition to ceasing its CIP development, which was expected to start 86 projects with an investment of an additional $247M.

As of today, execution of almost all capital projects including the regulatory-driven projects is on hold indefinitely, except for some R&R projects and the initial bidding of some emergency recovery. There is a strong concern that the lack of capital investment will lead to short-term infrastructure degradation which could lead to a critical situation. Also, PRASA accumulated an outstanding debt of more than $150M owed to its CIP contractors and suppliers. As of June 30, 2018, outstanding debt with contractors had been reduced to approximately $6M and as of the date of this Report, PRASA paid off all outstanding payments due to contractors and CIP consultants.

The suspension of CIP projects may have both a short and possible long-term effect on PRASA and Puerto Rico's economy. In the short-term, PRASA is in danger of non-compliance with regulatory mandates or administrative orders and increasing construction costs. In the long-term, the cost of capital projects may also increase as vendors may price-in the risks associated with delays in payment or non-payments to contracted projects as well as degraded infrastructure which may affect the service quality, continuity and, in turn, PRASA's Operating Revenues.

6.2 CIP Development and Management

Recognizing the need to successfully implement an aggressive and robust infrastructure program, from 2005 through 2016 PRASA obtained the services of program management consultants (the PMCs) to plan, design, and manage the CIP projects in each of the five Regions. The PMCs were organized into three main teams to handle a project's lifecycle in stages: pre-construction, construction, and post-construction. As part of the pre-construction activities, the PMCs managed key tasks that drive CIP project budgets, such as defining project scopes, negotiating consultant contracts for studies and design services, reviewing project constructability, preparing project construction cost estimates, preparing bid packages, and managing bid processes (in close coordination with PRASA's Bids Board). As part of the construction management services, the PMCs served as PRASA's representative in the CIP projects, managing project schedules, negotiating project change orders and administration of construction contracts, among other activities. Finally, as part of the post-construction services, the PMCs provided support for project start-up, training, and all project close-out activities.

Because of the CIP suspension, lack of funding sources, and accrued debt, program management contracts with the PMCs were terminated in 2016. PRASA will conduct a procurement process in FY2019 to identify qualified, experienced firms to serve as PMCs as part of their CIP re-activation plan.

6.3 CIP: Project Distribution and Costs

The CIP projects are divided into categories, groups and types. Additionally, PRASA has implemented a prioritization system to better manage the CIP, given its size and complexity.

Projects included in the CIP cover major capital improvements identified throughout all five Regions, as well as island-wide initiatives such as technological advancements, telemetry implementations and R&R to the System. The CIP is developed by PRASA taking into consideration a) recovery of the system after the Hurricanes impact, focusing on improving resiliency, b) ensuring water quality, c) regulatory commitments as stipulated in consent decrees, administrative orders, and other agreements with Regulatory Agencies and d) current and future infrastructure and operational needs identified from system planning studies. Once the need for a capital improvement project is identified, a project creation form is prepared. The form summarizes the project scope, preliminary schedule, and cost estimates, amongst other information. The project is then assigned a CIP project number and added to the CIP inventory, where it is categorized according to PRASA's classification and prioritization system. Periodically (at least once a year), the changes to the CIP are presented to PRASA's Governing Board for revision and approval.

Total CIP investments per project are calculated taking into consideration the following estimated costs:

- Planning, studies, and land acquisition costs
- Design costs
- Construction costs
- Project management and inspection costs
- Contingencies
- Miscellaneous cost (includes financing costs, insurance, O&M documents and administrative costs)

Design costs typically use the College of Engineers and Land Surveyors of Puerto Rico (CIAPR, by its Spanish acronym) professional services compensation guidelines (vary by project type and complexity) and modified by the current market and availability of local designers. The construction management and inspection costs were estimated at about 5% of the net construction cost; general, administrative and insurance costs were estimated at approximately 15% of net construction cost; while contingencies were estimated to be about 10% of the net construction cost. PRASA was no longer including an annual inflation rate on construction costs over the project development period. PRASA eliminated the annual inflation rate of 3.8% previously used, considering the downturn in construction activity and lower project cost estimate results received during project bids. However, considering the construction materials cost increase after the 2017 Hurricanes and the recent boom in construction, when the CIP is activated the previously described cost percentages used to determine the various stages cost of project lifecycle will need to be reassessed.

Throughout the development of the planning and design phases of a project, the contingencies are modified as the construction cost estimates are updated. Once the project goes out to bid and the bid is awarded, the amount calculated for contingencies is no longer updated and it remains as part of the assigned funds of the project until it is completed and closed-out. During the construction phase of projects, contingencies are used to cover change order costs and other costs that may occur, such as additional land acquisition, permitting, or design activities. Before the CIP suspension, PRASA reported that existing contract change order percent in construction projects was about 3%, which is much lower than typical industry values of about 15-20%.

6.3.1 Project Classification and Prioritization

CIP projects, as recently redefined in PRASA's Fiscal Plan, are classified into the following mandatory and non-mandatory categories:

- Mandatory Compliance (2015 USEPA Consent Decree projects, 2006 PRDOH Drinking Settlement Agreement projects, Civil Actions, Administrative Orders, and other mandatory projects)
- Non-Mandatory Compliance
- Non-Mandatory Renewal and Replacement
- Non-Mandatory Quality and Growth
- Non-Mandatory Structure – Optimization and Emergencies, Fleet and IT, and Meter Replacement categories grouped together for the purposes of this FY2018 CER
- Non-Mandatory Safety and Others
- Non-Mandatory Emergency/Permanent Work

Mandatory projects are those that are required by law, as stipulated in consent decrees, administrative orders, and agreements with Regulatory Agencies including those with the USEPA and PRDOH. Non-mandatory projects are those that, although not mandated by Regulatory Agencies, are necessary to maintain, upgrade, and grow the System. These include non-mandatory compliance projects, R&R projects, quality and growth projects, structure projects, safety projects and Emergency/Permanent work projects.

R&R projects are those required to improve the system's efficiency by replacing pipelines or equipment due to emergencies or unforeseen situations, expended useful life or extreme deterioration. Quality and Growth are projects directed to expanding the service areas for water or wastewater systems and improving the operational efficiency of the Systems. The Structure category projects include technology improvements, meter replacement, fleet improvements and optimization and emergencies projects. The Safety and Others category includes projects related to the health and safety of PRASA's employees and/or protection measures to PRASA's facilities and infrastructure, such as, soil stabilization. Lastly, the Emergency/Permanent Work category was developed after the impacts of Hurricanes Irma and María. This category includes all permanent work identified by PRASA to restore the facilities to their pre-storm conditions and do not consider any resiliency or mitigation efforts, which PRASA plans to execute subject to funding availability.

Projects are further classified as either water or wastewater system projects. Water system projects include projects for improvements or construction of new facilities for water supply, water distribution, WTPs, WPSs, and tanks, amongst others. Wastewater system projects include projects for improvements or construction of new facilities for wastewater collection, WWTP, and WWPSs, amongst others.

In addition to project classification, CIP projects are ranked according to a prioritization score. This score is the result of the weighted sum of the evaluation criteria adopted in PRASA's Master Plan and negotiated with Regulatory Agencies. Four main criteria were selected to prioritize CIP projects: Regulatory Compliance (40%), Quality of Service and Reliability (30%), Operational Efficiency and Improvements (20%), and Population Impacted by Project (10%). The implementation schedule of future

long-term projects, currently not included in PRASA's CIP, will be subject to the prioritization system and PRASA's financial capacity. Additionally, at the reactivation of the new CIP, PRASA will pursue immediate restoration of all infrastructure damaged by the hurricanes and continued compliance with Regulatory Agencies. As such PRASA has identified the following priorities upon CIP reactivation:

1. Projects needed to restore the infrastructure damaged by Hurricanes Irma and María.
2. Compliance projects included in the 2015 USEPA Consent Decree and the 2006 PRDOH Settlement Agreement.
3. Construction projects that were stopped and postponed with the suspension of the CIP in 2016.

6.3.2 CIP Metrics and KPIs

As included in PRASA's Revised Fiscal Plan, PRASA intends to review and update the CIP tracking tool used prior to the suspension of the CIP to ensure compliance with the forecasted execution schedules. The tracking tool was used to perform project time management, develop a detailed project baseline and track the actual progress of all projects on a monthly basis, to keep track on projects on target and off target, and to identify gaps root causes for delayed projects.

In addition, to allow for detailed tracking of CIP compliance and success, PRASA will implement the CIP KPIs historically used: Cost Performance Index (CPI) and Schedule Performance Index (SPI). The CPI measures the cost efficiency of resources as compared to the budget and the SPI measures the relationship between the executed work versus the planned work.

6.4 Six-Year CIP (FY2018-FY2023)

PRASA's six-year CIP for FY2018 through FY2023, as included in PRASA's Revised Fiscal Plan, amounts to $1,966.5M. Annual capital expenditures by project category are presented in Figure 6-1 and Table 6-2. As shown, the six-year CIP is mainly composed of Emergency/Permanent Work projects identified after Hurricanes Irma and María, and R&R projects, both of which account for 70% of the total forecasted expenditures. The Emergency/Permanent Work projects are included in the six-year CIP and are expected to be completed by FY2022.

The six-year CIP R&R category, which accounts to about 30% of the projected CIP expenditures, almost doubled from PRASA's previous five-year CIP, with an annual average expenditure of $93M and a total of $556.3M for R&R projects. PRASA's large and complex system requires significant continuous investments to maintain and renew the condition and age of its infrastructure. The six-year CIP includes $163.7M for Mandatory Compliance projects, which represents 9% of all categories. Historically, the majority of PRASA's CIP investment (about 60%) was for mandatory and compliance driven projects. This reduction is mainly a result of the increased need for R&R and Emergency/Permanent Work projects and re-negotiation efforts with Regulator Agencies.

As reported by PRASA, although the CIP is still on hold, the total expenditure projected for FY2018, includes about 80% of the expenditures for R&R projects. The remaining amount considers the execution of emergency works performed after the hurricanes and cash flows from terminated projects such as the construction of the new Valenciano WTP.

Table 6-1. Capital Improvement Program FY2018-FY2023 by Category ($, Million)

Project Category	Fiscal Year Ending June 30,						Total FY2018-FY2023
	2018	2019	2020	2021	2022	2023	
Non-Mandatory Emergency/Permanent Works	$16.8	$138.3	$546.2	$67.6	$0.1	$0.0	$769.0
Non-Mandatory Renewal & Replacement	28.4	84.6	84.8	83.9	131.1	143.4	556.3
Non-Mandatory Structure	1.2	44.7	44.5	40.9	40.6	41.2	213.1
Mandatory Compliance (Consent Decrees, Administrative Orders, Agreements)	5.7	0.9	19.4	60.1	51.9	25.8	163.7
Non-Mandatory Compliance	1.3	2.0	6.0	13.1	39.8	53.9	116.1
Non-Mandatory Quality and Growth	0.5	5.6	7.1	10.7	22.0	35.7	81.6
Non-Mandatory Safety and Others	0.0	0.0	0.0	0.8	3.7	2.1	6.7
Sub-Total[1]	**$53.9**	**$276.1**	**$707.9**	**$277.2**	**$289.2**	**$302.1**	**$1,906.5**
Outstanding Debt Payment to Contractors	60.0	0.0	0.0	0.0	0.0	0.0	60.0
Total	**$113.9**	**$276.1**	**$707.9**	**$277.2**	**$289.2**	**$302.1**	**$1,966.5**

[1]Numbers may not add due to rounding.

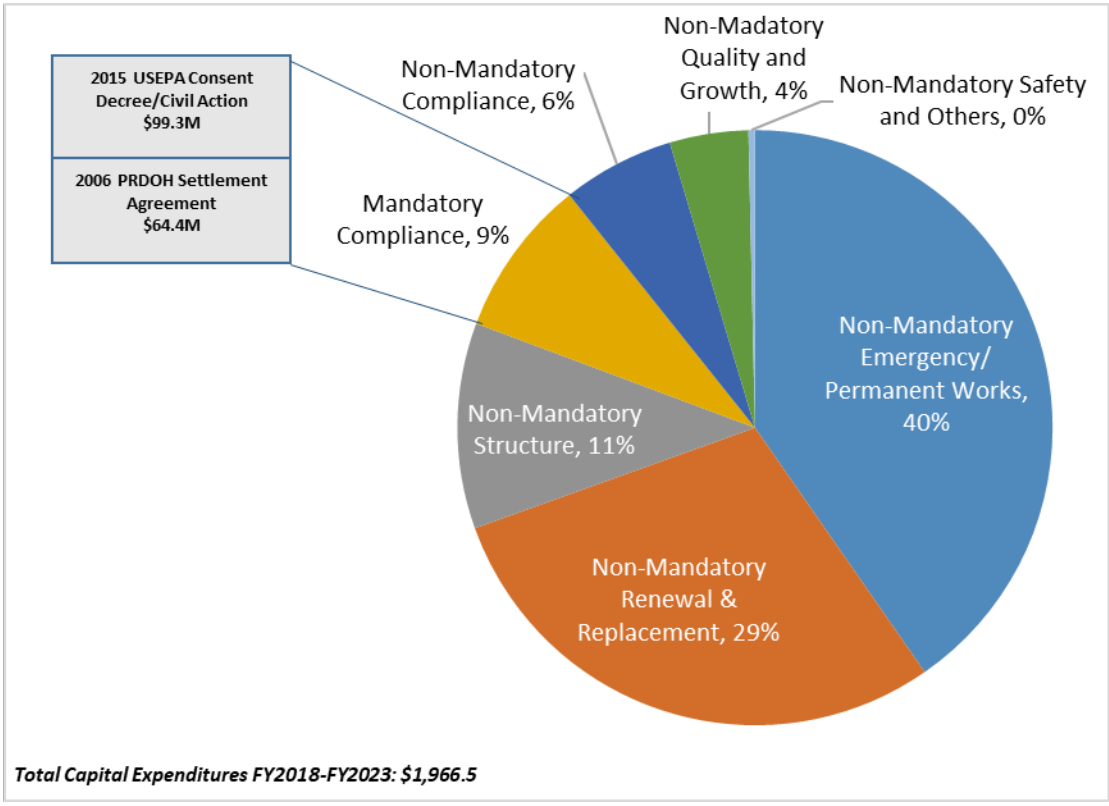

Figure 6-1. Six-Year CIP Capital Expenditures by Category

PRASA's six-year CIP consists of a total of 390 projects. As of August 1, 2018, 22% of the projects have not started, 71% are in the pre-construction stage (planning, design and bid), and 3% are in the construction and/or closeout stages but were interrupted by the suspension of the CIP. The remaining 4% are projects already in operation.

As previously mentioned, PRASA has identified a total of 157 projects under the Emergency/Permanent Work category that shall have priority once the CIP is reactivated. Out of these 157 projects, there is one island-wide project that includes budget to account for those facilities that were impacted by the 2017 hurricanes, but no assessment or cost estimate had been developed by the time of the CIP approval. This estimate was identified based on an extrapolation of the damages identified in facilities that were already visited and assessed. This project will eventually result in several projects once additional evaluations and studies are performed.

In addition, PRASA identified a total of 31 critical projects that shall also have priority once the CIP is reactivated. These include 18 terminated construction projects and 13 other critical projects that were either in the planning, design or bid phases during the suspension of the CIP.

In the preparation of the six-year CIP, PRASA assumed that the CIP would be reactivated on January 2019, which will most likely not occur considering the challenging processes with FEMA and on-going debt renegotiations with federal agencies. PRASA will need to modify its six-year CIP projections to

account for this delay. As stated by PRASA, the execution and reactivation of the full CIP will not take place until the debt renegotiation and appropriate funding is identified.

6.4.1 Water System Projects

The water system projects include projects to improve compliance (mandated and not mandated), upgrades to WTPs, STSs and water distribution systems as well as construction of new water infrastructure. Total capital expenditures in water system projects for FY2018–FY2023 are estimated at approximately $200.6M, of which approximately $69.5M is allocated for projects classified as mandatory and approximately $71.7M is allocated for projects classified as Emergency/Permanent work as a consequence of the hurricanes impact.

6.4.2 Wastewater System Projects

The wastewater system projects include projects to improve compliance, new WWTPs, and upgrades to wastewater collection systems. Total capital expenditures in wastewater system projects for FY2018–FY2023 are estimated at $276.3M, of which approximately $94.2M is allocated for projects classified as mandatory and approximately $61.4M is allocated for projects classified as Emergency/Permanent work as a consequence of the hurricanes impact.

6.4.3 Other Projects: Structure, Operational, Planning R&R and Technology

Total capital expenditures for all other capital projects are estimated at approximately $1,429.5M for FY2018–FY2023, of which approximately $5.5M is allocated for projects classified as mandatory and approximately $635.8M is allocated for projects classified as Emergency/Permanent work as a consequence of the hurricanes impact, including the $500.8M from the one island-wide project that includes budget to account for those facilities that were impacted by the 2017 Hurricanes, but no assessment or cost estimate had been developed by the time of the CIP approval. The projects in this category address R&R, preventive maintenance, meter replacements, office and building improvements, fleet upgrades, minor repairs, energy and optimization, emergency related improvements, and technology improvements.

Table 6-2 shows the project distribution and capital expenditures by group and type classification for FY2018 through FY2023.

6.4.4 Master Plan and Adaptation for Climate Change

In FY2015 the last two tasks of the Master Plan Update were completed; Task 3: CIP Reconciliation, and Task 4: Prioritization and Scheduling. However, the implementation and consolidation of the resulting projects with the CIP was not completed. PRASA’s intention is to continuously revise the Master Plan to maintain its CIP updated with the System necessities. Additional modifications to PRASA’s Master Plan may be warranted as conversations with Regulatory Agencies continue, additional regulatory requirements and needs arise, and PRASA Systems’ needs change. Key recommendations from the Master Plan are included in the six-year CIP.

As reported on previous CERs, PRASA completed a Vulnerability Study and Adaption Plan for its entire infrastructure in compliance with the February 2013 Executive Order signed by the Governor of Puerto

Rico at the time. The Climate Change Vulnerability Study findings and the strategies selected in the Adaptation Plan will be further assessed and CIP projects shall then be developed. These projects will follow the same guidelines set in the prioritization system. These based projects will serve as a roadmap for PRASA in the planning process and in its preparation towards the expected impacts of climate change. Currently, PRASA’s six-year CIP does not include projects or studies for addressing identified climate change vulnerabilities or adaptation actions.

Table 6-2. PRASA's Base CIP Projections FY2018 - FY2023 ($, in Millions)[1]

Category Type	Sub-Category	Fiscal Year Ending on June 30						Total*
		2018	2019	2020	2021	2022	2023	2018-2023
Water System	Water Supply	$0.0	$1.5	$2.8	$5.1	$7.9	$7.2	**$24.5**
	Water Pump Stations	0.0	0.4	0.0	0.0	0.0	0.0	**0.4**
	WTP Capacity Increase	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	WTP Improvements	0.4	14.2	58.8	17.2	18.6	20.6	**129.7**
	WTP New	5.4	0.0	6.0	11.0	4.8	2.6	**29.8**
	Water Distribution	0.2	1.5	2.4	2.1	2.8	5.1	**14.1**
	Other Projects (Drought)	0.0	0.2	1.1	0.7	0.0	0.0	**2.0**
	Subtotal	**$6.0**	**$17.8**	**$71.1**	**$36.1**	**$34.1**	**$35.4**	**$200.6**
Wastewater System	Wastewater Pump Stations	$0.0	$0.0	$0.0	$2.3	$7.2	$8.4	**$17.9**
	WWTP Capacity Increase	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	WWTP Improvements	0.0	12.5	52.3	17.7	29.9	27.7	**140.2**
	WWTP New	0.0	0.0	4.3	10.4	2.5	0.0	**17.16**
	Wastewater Collection	1.4	2.7	3.1	18.4	35.5	40.1	**101.1**
	Subtotal	**$1.4**	**$15.2**	**$59.7**	**$48.8**	**$75.0**	**$76.2**	**$276.3**
Meters	Water Meters	$0.1	$5.3	$4.7	$4.5	$4.5	$4.5	**$23.6**
Buildings	Buildings	0.7	25.8	43.0	2.6	0.0	1.7	**73.7**
Fleet	Fleet	0.4	9.8	11.5	9.6	8.2	8.0	**47.4**
Minor Repairs	Water & Wastewater	0.0	0.2	11.0	5.7	8.3	4.3	**29.6**
Other: (Generators, Emergencies & Contingencies, Energy & Optimization)	Water & Wastewater	16.1	39.0	41.2	19.7	15.0	14.4	**145.4**
Other: (September 2017 Hurricanes Island-wide Project)	Water & Wastewater	0.0	67.9	378.5	54.4	0.0	0.0	**500.8**
Renovation & Replacement	Water & Wastewater	28.4	84.6	84.8	83.9	131.1	143.4	**556.3**
Technology	Water & Wastewater	0.8	10.5	2.5	11.8	12.9	14.3	**52.8**
	Subtotal	**$46.5**	**$243.1**	**$577.2**	**$200.6**	**$184.7**	**$199.0**	**$1,456.2**
Total		**$53.9**	**$276.1**	**$707.9**	**$277.2**	**$289.2**	**$302.1**	**$1,906.5**

[1]Numbers may not add due to rounding.

6.5 CIP and Current Regulatory Compliance

The six-year CIP adequately addresses the requirements of existing consent decrees and agreements and considers proposed modifications to said consent decrees and agreements, as recently negotiated or in negotiations by and between PRASA and Regulatory Agencies. Nonetheless, it shall be noted that the actual cost of compliance with the consent decrees and agreements and PRASA's total capital expenditures may vary substantially depending on, among other things:

- Inflationary environment with respect to the costs of labor and supplies needed to implement the compliance program.
- Weather conditions that could adversely affect construction schedules and consumption patterns.
- Population trends and political and economic developments in Puerto Rico that could adversely impact the collection of operating revenues.
- Possibility of new environmental legislation or regulations affecting the System.
- Unanticipated costs or potential modifications to projects resulting from requirements and limitations imposed by environmental laws and regulations.
- Inherent uncertainty involved in CIP projects of the magnitude undertaken by PRASA.

Up until 2015, PRASA was subject to three consent decrees with USEPA and one settlement agreement with PRDOH to eliminate treatment plant non-compliance and unpermitted discharges of untreated sewage, and to improve the quality of potable water and STSs. These agreements included the following:

- 2003 Consent Decree (PRASA IV), U.S. v. PRASA, Commonwealth of Puerto Rico, and "Compañía de Aguas de Puerto Rico", Inc., Civil Action No. 01-1709 (JAF) – Addresses violations to the Section 301 and 402 of the Clean Water Act (CWA) and regulations and PRASA's NPDES permits with regards to certain PRASA's WWPSs.
- 2006 Wastewater Consent Decree, U.S. v. PRASA and Commonwealth of Puerto Rico, Civil Action No. 06-1624 (SEC) – Addresses violations to the Section 301 and 402 of the CWA and regulations promulgated there under, and PRASA's NPDES permits with regards to PRASA's WWTPs.
- 2006 PRDOH Drinking Water Settlement Agreement, Civil Action KPE 2006-0858[18] as amended – Addresses non-compliance and alleged violations with the Puerto Rico Potable Water Purity Protection Law, as amended ("Ley para Proteger la Pureza de las Aguas Potables de Puerto Rico, Ley Núm. 5 de 21 de Julio de 1977, según enmendada"), the Safe Drinking Water Act (SDWA) and applicable regulations, and the General Environmental Health Regulation ("Reglamento General de Salud Ambiental, Reglamento Núm. 6090 de 4 de febrero de 2000").
- 2010 USEPA STS Consent Decree, U.S. v. PRASA and Commonwealth of Puerto Rico – Addresses alleged violations to the SDWA and the CWA specifically to the National Primary Drinking Water Regulations.

[18] The Settlement Agreement was signed: March 15, 2007 and subsequently amended on June 16, 2008.

In light of the challenges faced by PRASA, resulting from the continued uncertainty and strain on the Government's economy and despite PRASA being in material compliance with the requirements of the consent decrees and agreements, PRASA requested and negotiated amendments. In 2012, PRASA and the Regulatory Agencies began discussions to modify certain requirements of the consent decrees and agreements to re-align compliance priorities and, in turn, help alleviate PRASA's financial burden. After an extensive negotiation process and under the terms agreed upon by PRASA and USEPA, on September 15, 2015, the U.S. Department of Justice (USDOJ) filed the 2015 USEPA Consent Decree executed among USEPA, PRASA and the Commonwealth of Puerto Rico in settlement of the matters addressed in a complaint brought against PRASA by USDOJ on behalf of USEPA also filed on such date. On May 23, 2016, the 2015 Consent Decree between USEPA and PRASA was officially logged and accepted by the Court, placing an end to the extensive renegotiation process. The 2015 USEPA Consent Decree consolidates and supersedes the three previous USEPA's Consent Decrees with PRASA (i.e. PRASA IV: 2003 Consent Decree, 2006 Wastewater Consent Decree and 2010 USEPA STS Consent Decree).

As for the 2006 PRDOH Settlement Agreement, as amended, PRASA restarted negotiation talks with PRDOH in January 2017. To date, PRASA and PRDOH have agreed to present joint motions to renegotiate certain terms and conditions on the Term 2 and Term 3 mandatory projects.

The consent decree and settlement agreement currently in effect with the Regulatory Agencies are:

- 2015 USEPA Consent Decree: U.S. v. PRASA and Commonwealth of Puerto Rico, Civil Action No. 15-2283 (JAG) – Addresses violations to the Section 301 and 402 of the CWA and regulations promulgated there under, and PRASA's NPDES permits with regards to PRASA's WWTPs, WWPSs and WTP's STSs.
- 2006 PRDOH Drinking Water Settlement Agreement, Civil Action KPE 2006-0858, as amended – Addresses non-compliance and alleged violations with the Puerto Rico Potable Water Purity Protection Law, as amended, the SDWA and applicable regulations, and the General Environmental Health Regulation. Amendments to this Settlement Agreement are being addressed by the PRDOH and PRASA through independent motions.

On September 2017, upon declarations of "States of Emergency" for Hurricanes Irma and María, PRASA submitted a notification to both USEPA and PRDOH invoking Force Majeure and indicating the possibility of some delays in projects and programs due dates. In June 2018, another letter was sent to the Regulatory Agencies requesting time extensions with their corresponding justifications due to the lack of funding to reactivate the CIP, the ongoing debt renegotiation process, and the impact of the hurricanes. At this time, no assurances can be given that the USEPA or the PRDOH will grant such project deadline extensions, although PRASA remains positive and maintains open communication channels with the Regulatory Agencies. Some of the programs identified by PRASA and notified the Regulatory Agencies to be in potential noncompliance include, but are not limited to the following:

- Remedial measures
- Flow meter devices and high-level indicators
- Puerto Nuevo CSS and Regional WWTP

- Puerto Nuevo WWTP Sewer System Operation and Maintenance Program and Condition Assessment Program
- Specific requirements for areas of concern in the Puerto Nuevo WWTP Sewer System
- Interim effluent limits for WTPs and WWTPs
- Integrated Maintenance Program
- Training Program
- Implementation of Process Control System

6.5.1 2015 USEPA Consent Decree Modifications

The 2015 USEPA Consent Decree includes the following modifications:

- Postponement or advancement in deadlines and completion dates of certain projects currently included in the CIP. Compliance deadlines were extended through approximately 2034.
- Scope of work revisions negotiated for certain projects to better address certain facilities' current needs.
- Elimination of certain projects from the consent decrees and agreements given that the facility is: 1) in compliance, 2) due to the declining population trends the project no longer needs to be performed, or 3) because the project has already been completed and certified.
- Addition of new compliance projects (categorized as Other Regulatory Projects and New Mandatory Projects). Several projects that were not originally included in the consent decrees were negotiated to be included. Additional projects added include: capacity evaluation projects for compliance of STSs, I/I studies for the seven sanitary sewer systems covered by the first Sanitary Sewer System Evaluation Plan (SSSEP), and Caño Martin Peña/ENLACE projects. Also, PRASA shall develop and implement a second SSSEP for all other sanitary sewer systems by December 2016 (completed).
- Inclusion of the operation, maintenance and capital improvement program requirements related to the Puerto Nuevo wastewater collection system, including alleged CSWOs. PRASA shall comply with all the requirements of its NPDES Permit and with the Permit concerning CSWOs. The most recent NPDES permit for the Puerto Nuevo WWTP requires that PRASA implement the Nine Minimum Control (NMC) measures, to be revised annually, and a Long-Term Control Plan (LTCP) for the Puerto Nuevo WWTP service area to address wastewater collection system and CSWOs occurrences. As such, PRASA is currently undertaking the development and design of a Sewer SSOMP or S2OMP for the Puerto Nuevo WWTP service area. The SSOMP will manage both the combined sewer systems and the sanitary sewer system requirements as stipulated in the NPDES permit (NMC and LTCP) in addition to a comprehensive capacity, management, operations, and maintenance (CMOM) program for all the Puerto Nuevo sanitary sewer system. As required by the 2015 Consent Decree, PRASA submitted the SSOMP for USEPA's review and approval on June 30, 2016. By January 2017 USEPA commented PRASA's SSOMP and approved it. In addition, PRASA was required to submit annual reports on the status of the implementation of the SSOMP. The first annual report was submitted to USEPA in May 2017.

The following tasks, at a minimum, shall be performed by either PRASA personnel or a private contractor as part of the SSOMP: sewer system reconnaissance to enable complete inspections, observation and cleaning of the sewers; fats, oil and grease control; sewer cleaning; sanitary sewer overflows, dry-weather overflows and unauthorized release prevention and control; and mapping. Through these efforts, PRASA expects to identify System needs related to overflows (including CSWOs) and to be able to better estimate the effort and expected costs of a future repair plan. After the inspections are completed, if deemed necessary, within 60 days of completing the sewer system reconnaissance of the Puerto Nuevo WWTP service area, PRASA shall submit to USEPA for review and approval its proposed plan to undertake the Condition Assessment of the Puerto Nuevo WWTP sewer system, which shall include a series of remedial measures.

- Amendments to the interim limits. PRASA requested interim limits for its WTPs and WWTPs to comply with NPDES compliance parameters and newly implemented regulations regarding numeric nutrient criteria for nitrogen and phosphorus. It is anticipated that to comply with the lower discharge limits imposed and/or to be imposed by USEPA for these parameters and others, operational modifications and even additional capital improvements to treatment facilities may be required, which would be subject to the CIP Prioritization System.
- Development of a Prioritization System. The Prioritization System is a project scheduling methodology developed to provide an objective and systematic guideline to prioritize the implementation of infrastructure projects and required regulatory projects. Specific criteria were defined for each project category (water, wastewater or STS) and a scoring methodology was developed to objectively prioritize, as much as possible, the list of projects. The criteria consider regulatory and environmental compliance, operational requirements and needs, as well as population served, among other characteristics. The prioritization system establishes the relative priority of all planned upcoming projects with the objectives of allocating PRASA's limited financial resources according to such priority. Hence, for example, any projects to address future regulations would only be funded if they are included within PRASA's approved annual spending level and based on its priority score.
- Completion of scheduled mandatory projects under the Base List of projects, including high priority mandatory compliance projects that have already started the process of planning, design or construction and will not be subjected to the prioritization process. Specific deadlines for these high priority projects were individually discussed and negotiated between PRASA and USEPA.

6.5.2 2006 PRDOH Drinking Water Settlement Agreement Renegotiation between PRASA and PRDOH

The 2006 PRDOH Drinking Water Settlement Agreement with PRDOH renegotiation status is as follows:

- In March 2017, PRASA and PRDOH presented a joint motion to amend Appendix C-3 of the 2006 PRDOH Drinking Water Settlement Agreement to eliminate two Term 2 projects[19] no longer needed given water quality compliance records (Hatillo-Camuy WTP and Duey Rio Prieto WTP). Also,

[19] According to the 2006 Settlement Agreement, Term 2 and Term 3 projects included in the Appendix C-3 have a compliance due date of December 31, 2016 and December 31, 2021, respectively.

PRASA and PRDOH requested a deadline extension for the Term 2 Juncos Urbano System projects (which included the elimination projects in Ceiba Sur WTP and the Quebrada Grande WTP) for a Term 3 deadline. To prevent future compliance exceedances in the Juncos Urbano System, several additional measures were included in the joint motion, which included, but is not limited to the following: more stringent drainage control measures, improvements to be performed at the Ceiba Sur WTP by December 2017, and measures to reduce water production by 1 MGD at the Quebrada Grande WTP by February 2019.

- In May 4, 2018, PRASA and PRDOH had a meeting to discuss several motions to Term 3 projects. A motion was revised and agreed upon on May 11, 2018. Additional discussions regarding Term 3 projects and other Agreement requirements are expected to be discussed in the near future.
- In addition to the 2006 PRDOH Drinking Water Settlement Agreement, PRASA has agreed with the PRDOH to give priority to the compliance projects required by the Long Term 2 (LT2) Enhanced Surface Water Treatment Rule (ESWTR). This rule requires further treatment of cryptosporidium and other pathogenic microorganisms with the purpose of reducing the illness associated with them.

As previously mentioned, however, once Force Majeure notifications related to Hurricanes Irma and María were submitted to both USEPA and PRDOH, PRASA stated the possibility of some delays in projects and programs due dates. As of the date of this report, PRASA has not received response from the PRDOH; dates will be rescheduled individually on a case by case in accordance with PRDOH.

6.5.3 Consent Decrees and Agreements Progress Reports

The consent decree with USEPA and the settlement agreement with PRDOH require PRASA to implement remedial plans, develop and implement CIP projects to bring the System into compliance with regulatory requirements, and conduct evaluations concerning specific System's infrastructure and operational issues. In the preparation of this CER, Arcadis reviewed the following progress reports, submitted to Regulatory Agencies:

- 2015 USEPA Consent Decree Biannual Progress Report (BPR) No. 4 and No. 5, which were joint in a single report covering from March 1, 2017 to February 28, 2018.
- 2006 PRDOH Agreement Quarterly Progress Reports: No. 37, covering the period from April 1 to June 30, 2017; No. 38 & No. 39 (consolidated in a single report), covering the period from July 1, 2017 to December 31, 2017; and No. 40, covering the period from January 1, 2018 to March 31, 2018.

A summary of the assessed progress reports is presented in the following subsections.

6.5.3.1 2015 Consent Decree, Civil Action No. 15-2283 (JAG)

As previously mentioned, the previous three USEPA consent decrees from 2003, 2006, and 2010, respectively, were consolidated into the 2015 Consent Decree. Different from the previous agreements, the 2015 Consent Decree requires PRASA to submit biannual reports. PRASA has already submitted three biannual reports starting September 1, 2015, which were discussed in the previous 2016-2017 CER. Reports No. 4 and No. 5, evaluated in this period, are included in a joint Biannual Progress Report covering the period of March 1, 2017 to February 28, 2018.

- The cause for the joint Biannual Progress Report were the two Force Majeure events confronted on September 2017, for which in accordance with the provisions of Section XXVII (Force Majeure), Paragraph 108 of the consent decree, PRASA notified the USEPA and the USDOJ on September 5 and September 20, 2017 of impending Hurricanes Irma and María, respectively (Force Majeure Events). PRASA followed said notifications with an extension request to submit Biannual Progress Report No. 4 jointly with Report No. 5 to be submitted by May 1, 2018. The Biannual Progress Report No. 4 extension request was granted by the USEPA on November 1, 2017. The joint Biannual Progress Report was submitted by PRASA to the USEPA on May 1, 2018.
- Up to September 2017, PRASA had been in significant compliance with the consent decree. Yet pressed by the aftermath of the 2017 hurricanes, the efforts needed to restore the System and sustain operations, in most cases with auxiliary power (emergency generators), made continued work pursuant to the consent decree extremely difficult and in some cases impossible.
- To such effect, PRASA requested Force Majeure protection for ongoing and upcoming work and deadlines and stipulated penalties under the 2015 USEPA Consent Decree.
- As reported by PRASA in the Biannual Report, the reasons that impaired compliance efforts are, or a combination thereof, due to but not limited to:
    - Lack of electricity and/or water
    - Fuel shortage
    - No or poor communication
    - Providing and sustaining operation of installations and equipment with alternate power
    - Destruction or damages to PRASA installations and equipment, including Caguas Central Laboratory's total destruction
    - Lack of access to equipment within installations
    - Logistics
    - Emergency and recovery phase priorities
    - Inability of personnel to report to work
    - Deployment of personnel available to attend emergencies and alternate supply of water and sewer services
    - Reestablishment of water and sewer services
    - Reinitiating and reopening of offices and installations

The 2015 USEPA Consent Decree specifies that PRASA shall continue to implement systemwide remedial measures at all WWTPs and their corresponding Sewer Systems and at all WTPs STS owned/operated by PRASA.

- Remedial Measures: Remedial measures include the 2006 USEPA Consent Decree and 2010 USEPA STS Consent Decree renegotiated projects as previously discussed and as included in the 2015 USEPA Consent Decree Appendix H (Base List for Remedial Measures to address wash water

discharges at WTPs), Appendix I (Capital Projects subject to Prioritization) and Appendix J (Base List of Remedial Measures for WWTPs). Compliance dates were renegotiated with USEPA and vary among projects.

- All remedial measures regarding wash water discharges as included in the Base List were addressed by February 29, 2016, except for the Ceiba Sur WTP STS project. The construction contract for this project was terminated by convenience due to PRASA's fiscal situation. PRASA and PRDOH presented a joint motion to amend the 2006 PRDOH Drinking Water Settlement Agreement and request a deadline extension for the Ceiba Sur WTP project and a new compliance date was agreed upon. PRASA has also requested a time extension to USEPA in a letter dated December 15, 2016 but no written formal answer from USEPA/USDOJ has been received. The project's compliance date is December 2020. PRASA has requested an extension which is under review and discussions with USEPA.
  - The project for the decommission of the Jimenez WTP was completed in March 24, 2017 several months ahead of the estimated completion date of December 2017.
- Also, as stipulated by paragraphs 9, 10 and 11 of the 2015 Consent Decree, flow meter devices with flow totalizers and level indicators were installed at the point of discharge of most WTPs, and the remaining WTPs were scheduled to have the installation performed by June 2017. The impact of the 2017 hurricanes to treatment facilities have affected the installed flow meter equipment as well as the operating high-level indicators. WTPs not included in Appendixes 2 (99 WTPs) and 3 (97 WTPs) of the joint Biannual Report Nos. 4 and 5 meet the requirements established in paragraphs 9, 10 and 11 of the 2015 Consent Decree.
- As for the WWTPs remedial measures, in December 15, 2016, PRASA sent a letter to USEPA requesting time extensions for the remaining ten remedial measures included in the Base List as permitted by the consent decree (Paragraph 37). Despite the best efforts taken to implement an infrastructure program to fulfill the commitments with the Regulatory Agencies, the status regarding PRASA's fiscal situation remained unchanged and PRASA had to request such extension. PRASA has requested an extension which is under review and discussions with USEPA.
- As per the joint Biannual Report, PRASA completed the process of analyzing the rain and wastewater flow relationships for 45 WWTPs. The report "Remedial Measures at Wastewater Treatment Plants and Sewer System Evaluations – Puerto Rico Island-Wide Assessment of Infiltration and Inflow (I/I)" was submitted to USEPA for review and comment on December 28, 2016. Repair projects for the Sewer Systems with completed I/I studies are included in the Prioritization List.

- Modification/Prioritization of Remedial Measures:
  - In a letter dated December 15, 2016 to the USEPA and the USDOJ, PRASA requested a modification of the expected compliance dates established in the Consent Decree Appendices H and J (Base List Projects). The request is premised on the recognized fiscal crisis that the Government of Puerto Rico confronts and its cumbersome path towards to recovery that has impacted PRASA's financial conditions and continuity of its CIP. The proposed revised

compliance dates requested were based on the assumption that the CIP would be reactivated by January 2018, which has not happened to date.

- In addition, as previously stated, as a result of PRASA's Force Majeure notification the extension of the expected compliance dates of the projects established in Appendices H, I and J (Base List and Prioritization List Projects) of the 2015 USEPA Consent Decree may require changes to address the need to develop new and /or modified projects .
- PRASA is pursuing a debt restructuring to obtain new financing and reactivate the CIP. Once the debt is restructured and CIP financing sources are identified, PRASA will be in a position to establish revised projected.

The following presents a status summary of the applicable programs, standards and special conditions of probation:

- Sludge Treatment Systems at WTP: Paragraphs 13 and 14 in section VI of the 2015 USEPA Consent Decree stipulates that any new PRASA WTP that begins operation after the day of lodging shall include an alternative power unit (APU) and a STS with sufficient hydraulic capacity to manage wash water discharges. For the period covered in the joint Biannual Report Nos. 4 and 5 there were no new STS constructed.
- SSOMP Program and Condition Assessment Program with respect to the Puerto Nuevo WWTP sewer system: PRASA submitted the SSOMP on June 30, 2016 for comments and approval by USEPA. On May 1, 2017 the Puerto Nuevo 2016 SSOMP Annual Report was submitted to the USEPA.
  - As of February 28, 2018 PRASA, has recognized 1,069,000 linear feet of pipeline that are connected to the Puerto Nuevo WWTP system. In addition, PRASA completed a project to level more than 200 manholes found with buried access covers. No stormwater or illegal interconnections to the Puerto Nuevo WWTP sewer system were found during the period of March 1, 2017 to February 28, 2018.
  - By February 28, 2018 the following has been found and/or achieved regarding the Puerto Nuevo WWTP sewer system:
    - Cleaning of 445,000 linear feet of sanitary sewer pipeline.
    - PRASA completed the bid evaluation process for four sewer cleaning projects that will include 320,000 linear feet of sanitary sewer pipeline.
    - From March 1, 2017, to August 31, 2017, four PRASA sewer lines were identified with sewer defects within the Puerto Nuevo WWTP sewer system. PRASA corrected two defects during the reporting period.
    - On August 17, 2017 PRASA received a communication from the USEPA concerning a time extension request for defects reported on Biannual Reports Nos. 2 and 3. The correspondence stated that USEPA granted the time extension with date to June 30, 2018. PRASA will request USEPA further extension for said reported defects.

  - From September 1, 2017, to February 28, 2018, none of PRASA sewer lines were identified with sewer defects that hinder the operation of the Puerto Nuevo WWTP sewer system.
- As part of the USEPA/USDOJ/PRASA discussions regarding the Notifications of Force Majeure events, an extension of the Sewer System Reconnaissance High Priority Area deadline of September 15, 2018 is being sought. In addition, PRASA seeks a modification of the one-year period to correct defects identified that hinder the operation of the Puerto Nuevo WWTP sewer system. PRASA proposes the period to correct be determined based on a case -by-case evaluation.
- Related to the Puerto Nuevo WWTP sewer system initiatives and PRASA's SSOMP Program is the FOG Program and its corresponding status:
  - On May 2017, PRASA began with the orientation and public education activities on the FOG Control Program.
  - On June 2017, PRASA conducted a training program to inspectors and supervisors of the FOG Control Program.
  - At the end of June 2017, PRASA began inspections of establishments in the Metropolitan Region and progressively to the other regions to educate on the FOG Control Program. A total of 3,509 establishments were inspected island wide.
  - FOG Control Program inspections were suspended between September 2017 and February 2018 as PRASA resources were reassigned to recovery efforts.
  - Five Dry Weather Overflows were notified to USEPA for the joint Biannual Report period.
- PRASA will complete its evaluation of the Combined System Overflow outfall discharge flow-estimating alternatives by July 2019 and complete implementation by January 2020. As part of the USEPA/USDOJ/PRASA discussions regarding the Notifications of Force Majeure events, said extensions are being presented and discussed.
  - A total of six sanitary sewer overflow events have not been corrected within a six-month period of the joint BPR.

- Caño Martin Peña Projects: None of these projects were performed during the period of September 2015 to February 2018. These projects are contingent upon the completion of related prerequisite projects to be developed by parties not affiliated with PRASA.
- Puerto Nuevo WWTP Sewer System Evaluation and Repairs:
  - Paragraph 34 of the consent decree establishes that a study and mapping of the Barriada Figueroa Sanitary Sewer System shall be completed and submitted by December 1, 2016. However, the report was submitted on March 17, 2017.
  - Sewer Systems and Mapping Projects:
    - PRASA submitted to USEPA electronic maps of its Puerto Nuevo WWTP Sewer System in GIS format on December 28, 2016.

- For the year 2017, the evaluation of the sewer system was not completed due to Force Majeure events. PRASA is seeking a waiver for the submission of the electronic maps of its Puerto Nuevo WWTP Sewer System in GIS.
- By the end of the reporting period the PRASA Geographic Information System has identified approximately 58,000 linear feet of gravity mains pipeline, a 21% increase of the amount previously mapped. A final report of the findings is scheduled to be submitted to USEPA on September 2019.
- An increase of more than 32% in the number of sanitary sewer manholes identified (400 manholes) in the PRASA GIS system was reported for the reporting period.
- Linear feet of sanitary sewer system that was cleaned: During the Barriada Figueroa project, approximately 37,000 ft. of gravity main have been cleaned at least once. Additionally, a total of 8,000 ft have been cleaned up to the end of the joint BPR reporting period.

o Several areas of concern within the Puerto Nuevo WWTP system were identified on Paragraph 36 of the consent decree. Remedial measures were stipulated for each of these areas and PRASA took corresponding actions for each of the measures. As a result of the Force Majeure Events raised, certain actions for the Areas of Concern identified were not fully undertaken. The activities related to interim measures, as to inspecting and monitoring sewer systems partially resumed in October 2017. Food establishment related activities under the Areas of Concern Program halted and resumed March 18, 2018.

o On February 21, 2018, PRASA requested USEPA to remove two particular areas of concern (Highland Park Residential Development and Montecarlo Residential Development) from the listed areas on Paragraph 36 of the Consent Decree and such request was granted.

- Interim Effluent Limits for WTPs and WWTPs:

  PRASA has continued to monitor compliance with the interim limits as established in Appendices S and T (Interim Effluent Limits for WWTP's and WTPs) and final NPDES limits. Notwithstanding, the Force Majeure events impact to treatment facilities and water sampling equipment have affected PRASA's effluent monitoring data activities. Therefore, despite preparatory measures and best efforts taken, PRASA has been unable to meet the full breath of its water quality sampling and analysis, and reporting obligations under the CWA and 2015 USEPA Consent Decree for all its facilities. The reasons attributable to PRASA's inability to do so were and are:

  o Water Quality Sampling: PRASA operated with a Central Laboratory located in the Municipality of Caguas and satellite laboratories in the Municipalities of Arecibo, Mayaguez and Ponce. The Caguas Laboratory, PRASA's full scale laboratory, was severely damaged by Hurricane María. The hurricane impact rendered the Caguas Laboratory inoperable. After the 2017 hurricanes, PRASA contracted private laboratories for its water sampling and analysis.

  o NPDES Permit Compliance, Interim and Financial Limits: PRASA's compliance with NPDES permit limitations at its WWTP's and WTP's STS were too jeopardized by the passing of the hurricanes. Until facilities and sewer lines repairs are completed PRASA compliance with permit and 2015 USEPA Consent Decree limitations is compromised. The USEPA granted PRASA a

waiver from Discharges Monitoring Reports for the months of September, October, and November 2017.

- For the period covered by the joint Biannual Report there were requests and renegotiations of Interim Limits. Appendix 14 of the joint Biannual Report includes a letter of the Interim Limits Renegotiation Summary sent on August 14, 2017 to the USEPA. Parameters renegotiated include: Enterococci, Phosphorus, Total Nitrogen, Copper, Cadmium, Silver, Zinc, Lead, among others.

- Integrated Maintenance Program: FEMA and USACE are collaborating with PRASA in obtaining and providing EGUs for PRASA installations. As of November 16, 2017, approximately 400 EGUs have been installed and 600 more requested to restore and sustain operation of facilities. Preventive maintenance on other equipment resumed in December 2017.
  - Corrosion Control Program (CCP): Consent Decree's section XV, paragraph 54 states that no later than March 1, 2017 PRASA shall develop and submit to USEPA for review and approval a CCP. The CCP was submitted on June 1, 2017 per time extension granted by USEPA. Development of such program has been impaired by the 2017 hurricanes. PRASA expects to commence implementation of the CCP by December 2019.
- Operator Training Program: During the period of March 1, 2017 to February 28, 2018, PRASA hired two operators. Corresponding training was provided as per the operator training program submitted to USEPA on August 2, 2016. As a result of the 2017 hurricanes, the Puerto Rico Department of State has halted scheduling operators' exams indefinitely. Consequently, PRASA may confront a delay in complying with the operator licensing requirement within 24 months of commencing work.
- Process Control Systems (PCSs): PCSs are being implemented at PRASA's WTP STSs and WWTPs as stipulated by Paragraph 59 of the consent decree. PCSs manuals were developed and are in process of being reviewed. However, most facilities were out of operation, and others with partial treatment due to difficulties caused by the 2017 hurricanes. No new STSs or WWTPs commenced operation during the period covered by the joint BPR.
- Spill Response and Cleanup Plan (SRCP): PRASA submitted the updated version of the plan on March 25, 2016. The review process of the updated SRCP was interrupted by the 2017 hurricanes. SRCP implementation continued but the ability to respond and address SSOs was impaired.
- Monitoring, Records and Reporting requirements for Unpermitted STS: In accordance with Section XIX, Paragraph 66 of the Consent Decree the STSs identified pending NPDES Permit applications at the time of lodging of the Consent Decree are and their NPDES Permit status is:
  - As for the Almirante Sur WTP, Quebrada WTP, and Quebradillas WTP a determination has been made by the USEPA that NPDES Permit is not required. Hence for these WTPs mentioned before, PRASA requested on April 25, 2017 the withdrawal of its NPDES Permit Applications.
  - Fronton WTP permit (PR0026441) and Hogares Seguros WTP permit (PR0025810) were issued and their effective dates were July 1, 2017. As for the Las Marías WTP, a permit (PR0026930) was issued and effective February 1, 2018.

- WWTP Capacity and Flow Management: PRASA reported that Force Majeure events impact to treatment facilities have affected PRASA's flow monitoring equipment and flow monitoring activities.
- Stipulated Penalties: During the period from March 1, 2017 to August 31, 2017 (Period for the Biannual Progress Report No. 4) PRASA was subject to several penalties. Table 6-4 summarizes the penalties for such period. For the period of September 1, 2017 to February 28, 2018 (Period for the Biannual Progress Report No 5) the stipulated penalties were not assessed or adjudicated due to the Force Majeure protection invoked.

Table 6-3. Stipulated Penalties

Reporting Period	Penalty Description	Amount
March 1, 2017 to Aug. 31, 2017	Effluent Limits Exceedances	$77,700.00
	Sanitary Sewer Overflows	$6,600.00
Sept. 1, 2017 to Feb. 28, 2018	Effluent Limits Exceedances	N/A due to Force Majeure Events Waiver
	Sanitary Sewer Overflows	
Total		$84,300.00

Note that 92% of the stipulated penalties is related to effluent interim or NPDES permit limits exceedances, 8% is related to the sanitary sewer overflows.

6.5.3.2 2006 PRDOH Drinking Water Settlement Agreement

As part of the 2006 Drinking Water Settlement Agreement between PRASA and the PRDOH, PRASA submits a Quarterly Settlement Agreement Reports (QSAR). Table 6-5 shows the Quarterly Settlement Agreement Reports submitted by PRASA and the periods which each report covered.

Table 6-4. Quarterly Settlement Agreement Reports

Report Number	Reporting Period
30	July 1, 2015 to September 30, 2015
31	October 1, 2015 to December 31, 2015
32	January 1, 2016 to March 31, 2016
33	April 1, 2016 to June 30, 2016
34	July 1, 2016 to September 30, 2016
35	October 1, 2016 to December 31, 2016
36	January 1, 2017 to March 31, 2017
37	April 1, 2017 to June 30, 2017;
38	July 1, 2017 to September 30, 2017;
39	October 1, 2017 to December 31, 2017
40	January 1, 2018 to March 31, 2018
41	April 1, 2018 to June 30, 2018;

Article VII of the 2006 PRDOH Settlement Agreement states that PRASA will implement remedial actions in multiple systems or components. These remedial measures are classified as short, mid, and long-term remedial measures. A summary of the status of the remedial actions as of June 2018 is described below.

- All short-term measures, mid-term measures and long-term measures 1 and 2 projects have been completed.
- Long-term measures 3: Long-term measures 3-projects have a deadline of completion of December 2021. As of the end of the QSAR No. 41 validity period, there are a total of 8 Term 3 projects that have not been completed. The eight projects are: Monte del Estado WTP, La Pica WTP, Frontón WTP, Canalizo WTP, El Duque WTP, Culebras WTP, the elimination of Ceiba Sur WTP and Quebrada Grande WTP. As previously mentioned, the elimination of Ceiba Sur WTP and Quebrada Grande WTP were Term 2 projects renegotiated via a joint motion with PRDOH to be completed under Term 3 projects. Two of the remedial measures are going to be renegotiated with the PRDOH to be eliminated; these are El Duque WTP and Canalizo WTP projects. Also, PRASA expects to renegotiate the completion dates with PRDOH.
- Continuous Monitoring Program: Article VII of the Settlement Agreement states that PRASA shall implement a Continuous Monitoring Program in all the WTPs. Continuous monitoring is implemented at each individual filter effluent and in the combined filter effluent. Each month PRASA submits to the PRDOH a compliance certification, which are included in each of the corresponding Settlement Agreement Reports.
    - QSAR No. 37 states that PRASA submitted the required compliance certification for the period of April, May, and June of 2017 to the PRDOH as agreed in the Article VII of the Settlement Agreement.
    - QSAR No. 38 and No. 39 states that PRASA submitted the required compliance certification for the month of July of 2017 to the PRDOH as agreed in the Article VII of the Settlement Agreement. As a result of the impact caused by Hurricanes Irma and María to PRASA's facilities and normal operation the agency requested several time extensions of the due date for the submittal of the required compliance certifications.
    - QSAR No. 40 and 41 states that PRASA submitted the compliance certification for the period of January, February and March of 2018 and April, May and June 2018 to the PRDOH as agreed in the Article VII of the Settlement Agreement.
- Process Control Program: Article VII of the Settlement Agreement states that PRASA shall develop a program aimed to optimize treatment processes to be implemented in larger systems. It was decided on a meeting held on February 23, 2017, that this program will be called Process Control Program and the actions required by the program will be modified to requirements that ensure compliance with DBPs parameters' limits. Also, PRASA must implement preventive measures on those systems with frequent DBPs violations as stipulated in Article IX. PRASA will discuss with the PRDOH the amendment to the agreement.
- Training Program: As stipulated in Article XI, PRASA must train all personnel for the adequate operation and management of its facilities. PRASA developed one training which covers the seven most important topics and has a duration of two days (15 contact hours). As of June 30, 2017, 93% of the required employees completed the training. As stated in QSARs No. 38 and No. 39 as a result of the impact caused by Hurricanes Irma and María to PRASA's facilities and normal operations the Training Program schedule was also affected. PRASA stated that training for the remaining 7% will be offered and completed by March 2018. On QSAR No. 40, PRASA states that for the period of

January 1, 2018 to April 30, 2018 a total of 15 employees completed the required training. By the end of April 2018, a total of 761 employees had completed the training, accounting for 95% of the employees that are required to take the training.

- Stipulated Penalties: During the period from April 1, 2017 to March 31, 2018 PRASA had $332,450.00 in penalties related to exceedances to the primary parameters, required submittals, contact time (CT), remedial measures, and mitigation measures. It is important to note that on QSAR No. 38 and No. 39 PRASA had a single penalty of $213,800 for not complying with a required submittal which accounted for 91% of the total stipulated penalties. Primary standards stipulated penalties, represent approximately 36% of the total stipulated penalties. These primary standards are bacteriology, disinfection by-products, turbidity, and CT. PRASA has developed aggressive action plans per region per potable water system to mitigate the primary standards exceedances. Among these measures the following are being implemented: tank draining every certain amount of time, elimination of tanks, and the elimination of pre-chlorine injection at the inlet of WTPs, among other initiatives.

Table 6-5. Stipulated Penalties

Reporting Period	Penalty Amount
April 1, 2017 to June 30, 2017	$36,400.00
July 1, 2017 to September 30, 2017	$235,050.00
October 1, 2017 to December 31, 2017	$27,150.00
January 1, 2017 to March 31, 2018	$33,850.00
Total	**$332,450.00**

- Supplementary Environmental Project: The SEP project presented to PRDOH, was divided in three projects and it impacts Non-PRASA Water Systems that due to technical, administrative or financial limitations, find it difficult to operate and maintain a public water system in compliance with state and federal laws and regulations. The project is divided as follows:
  - Sampling and analysis of regulated chemical contaminants in potable water. The task was completed.
  - Installation of disinfection equipment, which was already completed as previously reported.
  - PRASA service connections to schools served by Non-PRASA systems. The task was completed.
- A second SEP project was presented to PRDOH. The project's proposed title is "Segundo Proyecto Ambiental de Salud Publica en Sistemas de Agua Públicos Comunales no servidos por la AAA, conocidos como sistemas Non PRASA, para el Muestreo de Contaminantes Químicos Regulados en Agua Potable" or *Second Environmental Public Health Project in a Community with a Public Non PRASA Potable Water System for the Sampling of Regulated Chemical Contaminants in Potable Water*, in English. An escrow account with an initial deposit of $563,700.00 was opened by PRASA on June 7, 2017 for the funding of the second SEP project.

6.6 Future Regulations and Other Regulatory Requirements

The CIP was reviewed for adequacy to comply with future regulations and other regulatory requirements that could impact compliance limits for PRASA's water and wastewater facilities. With respect to the new discharge limits for residual chlorine, nitrogen, and phosphorus, PRASA is mostly using interim limits due to their inability of meeting the new lower limits for the abovementioned parameters. This is mainly due to the fiscal situation that prevents PRASA from optimizing treatment and increasing the removal of these contaminants.

Regarding the wastewater system, PRASA has indicated that once it completes the sanitary sewer efforts in the Puerto Nuevo WWTP service area, it will expand the program to the rest of the Metro Region and, eventually, to the rest of the island (where applicable). At this time, PRASA does not have a specific time frame for when this will occur. However, it is likely that USEPA will include conditions and requirements such as those included in the Puerto Nuevo WWTP NPDES, in NPDES permits for other facilities.

Regarding the water system, anticipated future regulations for potable water systems (PWSs) at the time of this report writing include:

- Unregulated Contaminant Monitoring Program – The USEPA uses the Unregulated Contaminant Monitoring Program to collect data for contaminants suspected to be present in drinking water, but do not have health-based standards set under the SDWA. Every five years, the USEPA reviews the list of contaminants, largely based on the Contaminant Candidate List (CCL). To date, two rounds of unregulated contaminant monitoring have occurred; the results will help USEPA shape the future regulatory environment.
- Candidate Contaminant List – The CCL is a list of contaminants which are currently not subject to any proposed or promulgated national primary drinking water regulations but are known or anticipated to occur in public water systems, and that may require regulation under the SDWA. The list includes, among others, pesticides, DBPs, chemicals used in commerce, waterborne pathogens, pharmaceuticals and biological toxins.

Also, as previously noted, PRASA will be likely required to implement remediation measures in well facilities that, under the GWUDI regulation, are found to be influenced by surface water sources. Currently, the evaluation program is still underway. PRASA continues the evaluation process at these facilities to determine the improvement needs and to develop the well remediation program and action plan.

Finally, PRASA may identify additional CIP needs to bring the water system into compliance with the Stage 2 D/DBPR. PRASA is currently implementing changes in its O&M practices to bring and/or maintain the PWSs in compliance. However, any additional projects identified and included in PRASA's CIP will be subject to prioritization system.

6.7 Conclusions

PRASA's CIP generally addresses the needs of the System and complies with PRASA's existing commitments with Regulatory Agencies. The CIP includes projects that cover a broad array of current and future needs, as identified by PRASA and as required by consent decrees and agreements. The CIP also includes funding for minor repair projects and PRASA's R&R program, as well as funding for recovery

efforts as well as for resilience/strengthening. Most of the investment included for the CIP is related to Emergency/Permanent Work projects. However, as noted in previous reports, given PRASA's high rate of leaks and overflows and continuing aging infrastructure, additional funds and a reactivation and acceleration of the R&R program are required to reduce/minimize these incidences. Hence, PRASA may need to further re-prioritize its funding and capital projects to address these critical system issues. Finally, PRASA's CIP includes funding for maintenance improvements, as well as for other necessary infrastructure projects (i.e., fleet and building renovation, and technological improvements) essential to maintaining and preserving the utility assets.

PRASA will need to perform additional assessments and implement operational changes or additional capital improvements to bring non-compliant facilities into compliance. However, PRASA's most recent facility compliance results, and record under the consent decree with USEPA and the agreement with PRDOH supports PRASA's ongoing commitment to continue to maintain its System in compliance with applicable regulations and environmental matters.

The full impact of future regulations and other regulatory requirements on PRASA's System are not known at this time. As the impact of future regulations becomes more defined, CIP modifications will be required to adequately accommodate resulting needs. Additionally, further delays in addressing the damages facilities suffered during the 2017 hurricanes, could exacerbate recovery and funding needs as facilities continue to deteriorate. Additional CIP needs will need to be prioritized and implementation schedules will depend on PRASA's financial capacity. To the extent that PRASA's fiscal situation does not improve and that the identification of CIP financing continues unresolved, PRASA's CIP implementation will continue on hold. The delay in CIP reactivation and implementation could further affect the condition of the System and PRASA's ability to meet regulatory obligations, including environmental compliance regulations under the SDWA and the CWA.

7 INSURANCE PROGRAM

7.1 Introduction

Section 7.08 of the MAT establishes that "[PRASA] shall employ an Insurance Consultant to review the insurance program of the Authority from time to time (but not less frequently than biennially). If the insurance Consultant makes recommendations for the increase of any coverage PRASA shall increase or cause to be increased such coverage in accordance with such recommendations, subject to a good faith determination of PRASA that such recommendations in whole or in part are in its best interest."

Since the insurance coverage has not changed significantly in the last couple of years, Arcadis reviewed PRASA's current insurance coverage and determined its adequacy considering the type and value of PRASA's fixed assets. Also, addressed in the following sections, are some outstanding recommendations to PRASA's insurance coverage from a previous evaluation originally made by MARSH and validated or commented by AON, PRASA's Broker of Record (BOR) in FY2016. The BOR for FY2017 and FY2018, Lone Star Insurance Producers, LLC (Lone Star), was consulted to verify if the recommendations were addressed in the policy renewals or if they were not adopted. The data, opinions, and comments included in this section have been based on PRASA's copies of policies and other documents provided by PRASA for this purpose.

For the incoming fiscal year (FY2019) PRASA has decided to change its BOR from Lone Star to Goas & Associates, Inc (GOAS). Furthermore, the policies for FY2019 have suffered changes, in some cases significant changes in coverage and primarily in premiums, as an effect of the upshot of the 2017 Hurricanes Irma and María. Besides Irma and María, insurance companies may have dealt with other catastrophic events impacting the Caribbean and the United States, as last hurricane season was extremely active. The vast damages and losses suffered by the insured has, in turn, directly impacted the insurance market and resulted in increases in premiums, stricter subscription guidelines and risk assessments.

The impact of the 2017 natural disasters on the Insurance will be further discussed in the Property Insurance section.

7.2 Risk Management

Risk is exposure to loss. It is the chance of something happening that will lead to a loss or an undesirable outcome and it is measured in terms of consequences and likelihood. Risk management is an effective process that is directed towards management of risks and hazards to produce a desired set of results.

The treatment of risk takes the following forms:

- Loss Control:
    - Elimination or reduction of risk by physical, technical or mechanical means, loss prevention techniques, loss prevention engineering.
- Contractual transfer:

  - Hold harmless agreements, indemnity agreements in contracts with suppliers, contractors, service providers, customer agreements.

- Transfer of risk through insurance:
  - Self-insurance.
  - Insurance policies and coverage available from insurance companies.
- Insurance products/programs available from government's Federal Emergency Management Agency (FEMA) and state (Commonwealth of Puerto Rico) including workers' compensation, and health/medical, among others.

7.2.1 PRASA Insurance Department

The risk management function is an integral part of the management function. Within PRASA, risk identification and treatment are performed by all departments at all levels in conformity with local and federal regulations, including the Occupational Safety and Health Administration (OSHA) regulations. Risk management is applied through the employment of independent engineering and consulting firms in planning, design and construction and in the implementation of excellence in practices and processes. Furthermore, new construction is carried out in accordance with applicable building codes and regulations.

7.2.2 Identification of Risk

The risks affecting PRASA can be broadly categorized as follows:

1. Risks to property, facilities, and physical assets from natural and human causes.
2. Financial risks arising from damage to, or loss of, physical assets, such as loss of income, interruption of operations and an increase in operating expenses to continue operations.
3. Financial risks resulting in management liability related to economic downturns.
4. Regulatory issues that might result in liability or service interruption.
5. Theft of owned and non-owned property.
6. Theft of water production.
7. Liability risks, including suits from third parties for injury or loss of property, fines/penalties, injuries caused by vehicles or properties, advertising injury, products, libel, slander, false arrest/detainment and injuries occurring on or off premises.
8. Pollution liability claims and fines.
9. Public authority/errors and omissions liability, which is liability arising from financial loss incurred by other that does not result in physical injury to persons or property.
10. Reputation risk which includes incidents, events or human actions which seriously damage the image and reputation of the organization.
11. Epidemic or pandemic that causes wide-spread injury or sickness to PRASA employees.

12. Kidnap, ransom, extortion risks.
13. Privacy & Cyber Liability arising from alleged failure to adequately secure customer data.
14. Acts of Terrorism affecting PRASA's facilities or customers.
15. Strikes and Labor unrest causing loss of income, interruption of operations and an increase in operating expenses to continue operations.

7.3 Assessment of Insurance Program

This section of the report provides MARSH's outstanding recommendations and AON's responses with respect to PRASA's insurance policies currently in force. Also, included is confirmation of action by Lone Star.

7.3.1 Property Insurance

The following are the findings and recommendations under the Commercial Property Program for FY2018 placed through AIG Insurance Company (AIG).

PRASA's property is insured by a policy issued by AIG Insurance Company – Puerto Rico. Renewal of the policy occurred in April 2017 and extended until April 2018. PRASA's premium for all coverage under this policy was $5,121,336.00. Two other insurance companies are shown on the AIG policy as "subscribers." This means they have each agreed to bear a portion of each loss, as follows:

- AIG – assumed 100% of $10M primary; 45% of $140M in excess of $10M and 55% of $150M in excess of $150M. PRASA's premium share for this policy amounts to $2,925,335.
- MAPFRE PRAICO Insurance Company (MAPFRE) – assumed 55% of $140M in excess of $10M and 20% of $150M in excess of $150M. PRASA's premium share for this policy amounts to $2,017,667.
- Chubb Insurance Company (Chubb) – assumed 25% of $150M in excess of $150M. PRASA's premium share for this policy amounts to $178,334.

Coverage is written on an "all risks" basis. The policy insures real and business personal property, impounded water, dams, underground piping and covers business interruption resulting from covered physical damage/loss to property as stated in the policy.

Major policy limits and deductibles are shown in Table 7-1.

Table 7-1. FY2018 Property Coverage, Limits and Deductibles

Coverage	Limit	Deductible
Total Insurable Value	**$300 million**	As stated below
Property – All Other Perils (AOP) (including Data Processing, In Transit and equipment breakdown)	$150 million per occurrence, Combined Single Limit for Property	$25 million Combined for Property Damage and Business Interruption, except for the perils of Boiler

Coverage	Limit	Deductible
	Damage and Business Interruption, excess of applicable deductibles.	Explosion and Machinery Breakdown, where a $25,000 applies.
Windstorm	Included in $150 million property coverage.	$25 million Combined for Property Damage and Business Interruption, except for the perils of Boiler Explosion and Machinery Breakdown, where a $25,000 applies.
Earthquake (EQ)	$300 million Combined Single Limit for Property Damage and Business Interruption, excess of applicable deductibles.	$25 million Combined for Property Damage and Business Interruption, except for the perils of Boiler Explosion and Machinery Breakdown, where a $25,000 applies.
Flood	$300 million Combined Single Limit for Property Damage and Business Interruption, excess of applicable deductibles.	$25 million Combined for Property Damage and Business Interruption, except for the perils of Boiler Explosion and Machinery Breakdown, where a $25,000 applies.
Business Interruption	Included in $150 million property for AOP, including Windstorm, and $300 million EQ and Flood Coverages	$25 million Combined for Property Damage and Business Interruption, except for the perils of Boiler Explosion and Machinery Breakdown, where a $25,000 applies and 10 days Business Interruption.
Extra Expense	Included in $150 million property for AOP, including Windstorm, and $300 million EQ and Flood Coverages, subject to a $35 million Sublimit	$25 million Combined for Property Damage and Business Interruption, except for the perils of Boiler Explosion and Machinery Breakdown, where a $25,000 applies.
Contingent Business Interruption	Included in $150 million property for AOP, including Windstorm, and $300 million EQ and Flood Coverages, subject to a $35 million Sublimit	$25 million Combined for Property Damage and Business Interruption, except for the perils of Boiler Explosion and Machinery Breakdown, where a $25,000 applies.
Professional Services Fees	Included in $150 million property for AOP, including Windstorm, and $300 million EQ and Flood	$25 million Combined for Property Damage and Business Interruption, except for the perils of Boiler

Coverage	Limit	Deductible
	Coverages, subject to a $2 million Sublimit	Explosion and Machinery Breakdown, where a $25,000 applies.
Newly Acquired Locations	Included in $150 million property for AOP, including Windstorm, and $300 million EQ and Flood Coverages	$25 million Combined for Property Damage and Business Interruption, except for the perils of Boiler Explosion and Machinery Breakdown, where a $25,000 applies.
Boiler and Machinery	Included in $150 million property coverage	$25,000 each and every accident and 10 days Business Interruption.

In addition, property insurance coverage includes Addendum B, Asbestos Endorsement, included in the $150M for AOP, and $300M EQ and Flood coverages, subject to a $1M sublimit. Damages must occur during policy period and be caused by one of the following perils: fire; smoke; explosion; lighting; hail; earthquake; direct impact of vehicle, aircraft or vessel; riot or civil commotion; vandalism or malicious mischief; or leakage or accidental discharge of fire protection equipment.

As previously indicated, during the Policy coverage period, Puerto Rico was devastated by Hurricanes Irma and María, and then hit again with an extreme rain event. Consequently, PRASA was adversely impacted and implementation of the property insurance policy was warranted and put forth. After performing a preliminary assessment of damages, PRASA estimated damages in excess of $700M.This amount increases when considering the Business Interruption (Revenue Reduction) and incremental expenses components to approximately $1.4B. PRASA is in the process of finalizing the full assessments and estimates of damages for all assets in order to present the Insurance with the claims. PRASA is performing these assessments for three 2017 events, Hurricane Irma, Hurricane María and the post Hurricanes extensive Rains. PRASA can claim up to the limit of $300M for each event. The claim amounts would be verified and accepted by the Insurance company, if deemed appropriate, or negotiated. Notwithstanding, as of July 2018, PRASA has received three advances of $50M installments for a total of $150M from the Insurance to alleviate the cash flow situation created in the aftermath of the hurricanes. Furthermore, it is important to note that PRASA will claim FEMA for assistance to pay for the damages not covered by the Insurance.

Renewal of this policy for FY2019 covers from April 2018 and extends until April 2019. Triggered by the claims resulting from the damages caused by the hurricanes there are significant changes to this policy coverage and premiums. The only local insurance company to participate for this policy was MAPFRE, so as to pursue better probabilities for similar coverages the account was placed in the London markets. The result was a 42% participation by MAPFRE and 58% by London and International Markets. The premium for coverage under this policy ***tripled***, increasing to $16,112,931. The market citing the recent losses, damages, actual state of the infrastructure and the uncertainty of actual values, as well as the indeterminate value and risk exposure of underground assets as reasons for the dramatic increase.

The new Policy coverage is a follows:

- Total Insurable Limit of $300M.

- Primary of $150M with $100M SIR: MAPFRE assumes 42% of $150M ($63M); Certain Underwriters at Lloyd's assumes 48% of $150M ($72M); and IGI assumes 10% of $150M ($15M). PRASA's premium share for this policy amounts to $13,500,000. Refer to item 1 below.
- First Layer of $150M in excess of $150M, with $100M SIR: MAPFRE assumes 42% of $150M ($63M); IGI assumes 38% of $150M ($57M); HCC Tokyo Marine assumes 15% of $150M ($22.5M); and Ironshore-Bermuda assumes 5% of $150M ($7,5M). PRASA's premium share for this policy amounts to $2,612,931. Refer to item 2 below.

1. All Risks, including Windstorm, Flood, Earthquake and Boiler and Machinery: $150 million per occurrence, Combined Single Limit for Property Damage and Business Interruption, excess of applicable deductibles. Deductible of $100M Property Damage and Business Interruption combined each and every occurrence.
2. Earthquake and Flood (excluding wind driven water): $150 million per occurrence, Combined Single Limit for Property Damage and Business Interruption, excess of applicable deductibles. Deductible of $100M Property Damage and Business Interruption combined each and every occurrence.

In addition, property insurance coverage for: Asbestos with $1M Sublimit, Professional Fees with $2M Sublimit, and Contingent Business Interruption / Extra Expense with $35M Sublimit. All Sub-limits are part of and not in addition to the Loss Limits and are per occurrence.

Besides the increase in premium, another important change in the Property Policy is that the deductible also ***tripled*** to $100M, which makes the deductible 33% of the total claim that can be reimbursed by the Insurance compared to the 8% it was in the FY2018 Property Policy. In addition, the definition for Flood in the first layer changed to exclude damages by "wind driven water". Finally, the $25,000 deductible for the "Boiler and Machinery" as stated the last item of Table 7-1 is eliminated and is subject to the $100M Policy deductible.

7.3.1.1 Recommendations

1. The $25 million deductible in the FY2018 Policy applies whether the loss sustained by PRASA is due to a catastrophic peril as well as by any other insurable peril. FEMA would only reimburse PRASA if:
    a. The direct damage has been caused by a Catastrophic Peril (Windstorm, Flood or Earthquake)
    b. The affected area has been declared a Disaster Zone by the President of the United States.
    c. Subject to Availability of Funds.

After reflecting on the financial burden and stress caused by the significant damages of Hurricanes Irma and María, the bureaucracy and slow progression of reimbursements, and even with PRASA's Rainy-Day Fund of around $20 million for eventualities and the Operating Reserve Fund (which had over $40 million), PRASA should consider establishing a FUND to cover possible financial losses from any future catastrophic or any non-catastrophic, peril that might affect infrastructure and operations and, therefore, impose an unexpected financial burden. Moreover, the new deductible was increased to $100M.

7.3.1.2 Recommendations & Responses Unrelated to Policy Contract

The following outstanding recommendation was previously made by MARSH including AON comments, regarding PRASA's property insurance policy. Also, included is confirmation of action by Lone Star of said recommendations:

1. The current Property Maximum Loss (PML) Estimates for PRASA for quantifying Catastrophic Risk Exposures were performed in 2010 by MARSH Risk Consulting, through AIR Worldwide Corporation, based on a valorization study from 2006. Since then, modules, maps and projections have changed, and new modules might prove economically beneficial to PRASA; therefore, MARSH strongly recommended that PRASA undertake a new PML Study.

   AON agreed with this recommendation. Lone Star indicated that PML analysis was performed for underwriting purposes only, resulting in FY2018 policy limits being accepted by PRASA.

   Nevertheless, Arcadis still recommends that PRASA undertake a new PML study particularly after the impacts and lessons learned from the September 2017 major hurricanes.

7.3.2 Crime

PRASA maintains a crime policy issued by Chubb, providing the coverage and limits shown in Table 7-2 for loss discovered during the policy period. Renewal of policy occurred in July 2017 and extended until July 2018.

Table 7-2. FY2018 Crime Coverage, Limits and Deductibles

Coverage	Limit	Deductible
Employee Dishonesty – Insured Indemnity	$1 million	$10,000
Employee Dishonesty – Employee benefit Plan (ERISA) Indemnity	$500,000	$0
Forgery or Alteration	$1 million	$10,000
Loss Inside Premises	$1 million	$10,000
Computer Fraud and Fraudulent Transfer Instructions	$1 million	$10,000
Audit Expense	$150,000	$0
Loss Outside Premises (In Transit)	$1 million	$10,000
Securities	$1 million	$10,000
Claim Expense	$150,000	$0
Voiced Initiated Transfer	$1 million	$10,000
Extortion Threats to Persons	$100,000	$10,000
Extortion Threats to Property	$100,000	$10,000

Coverage	Limit	Deductible
Counterfeit Currency and Money Orders	$1 million	$10,000
Policy Aggregate	$1 million	Not Applicable

Renewal of this policy for FY2019 covers from July 2018 and extends until July 2019. Coverage and limits are the same as shown in Table 7-2. The premium remains the same at $28,500. However, the significant change is that the deductibles for each crime coverage increased 650% from $10,000 to $75,000. This escalation on crime coverage deductibles results from Chubb's Head Office instructions, applicable to all the accounts they manage.

7.3.2.1 Recommendations & Responses

The following pending recommendation was previously made by MARSH including AON comments regarding PRASA's Crime Policy. Also, included is confirmation of action by Lone Star of said recommendations:

1. Knowledge or Discovery of Loss clauses should be re-negotiated to specifically identify positions triggering knowledge of incidents to minimize the risk of carrier declines for late reporting.

   AON agreed with this recommendation and requested insurer for an endorsement. Lone Star confirmed that this was not included in the FY2018 policy.

   It is recommended to include in the next renewal. Arcadis requested confirmation from GOAS via PRASA. At the time of submission of this Report, no response has been provided to confirm whether the recommendation was adopted for the 2018-2019 renewal period.

7.3.3 General Liability

PRASA's FY2018 commercial general liability program is issued by MAPFRE with the limits detailed in Table 7-3, below. Renewal of policy occurred in July 2017 and extended until July 2018. Policy aggregate limit of $20 million. Also, aggregate limits apply per location and per construction project as per ISO forms CG-2504 (03-97), and CG-2503 (05-09), attached to the MAPFRE policy. A $100,000 Deductible Liability Insurance, as per ISO form CG-0300 (01-96), which contemplates both indemnity and claims adjustment expenses for bodily injury and property damage liability combined under premises/operations coverage; applies to each occurrence. This Deductible Liability Insurance has a $750,000 Aggregate or Cap as respects to claims adjustment expenses, so once this amount is paid by PRASA, the Insurance Company will pay these amounts from the first dollar and the Self-Insured Retention (SIR) would apply to indemnity payments only. Additionally, policy includes a SIR of $5,000.00 for each occurrence or offense not covered by Underlying Insurance.

Table 7-3. General Liability Coverages and Limits

Coverage	Limit
General Liability – Each Occurrence	$1,000,000

Coverage	Limit
General Liability – General Aggregate	$2,000,000
Personal and Advertising Injury	$1,000,000
Products - Completed Operations Aggregate	$2,000,000
Damage to Premises Rented	$1,000,000
Employer's Liability Stop-Gap	$1,000,000
Employee Benefits Liability	$1,000,000
Medical Expense	$10,000

Both the Stop-Gap Liability and the Employees Benefit Liability have $1M limit Aggregate. The deductible for Employees Benefits Liability is $1,000.

Renewal with MAPFRE of this policy for FY2019 covers from July 2018 and extends until July 2019. Coverage and limits remain the same, as shown in Table 7-3. The premium remains the same at $920,550.

7.3.3.1 Recommendations & Responses

The following pending recommendations were previously made by MARSH including AON comments regarding PRASA's general liability program. Also, included is confirmation of action by Lone Star of said recommendations:

1. Under the "Special Conditions" endorsement attached to the MAPFRE policy; MARSH recommended the following amendment be performed.
    a. Severity of Interest (item 8) should be revised to read Severability of Interest.

        AON agreed with this recommendation and requested insurer for correction.

        Lone Star confirmed that this was not included in the FY2018 policy. Not accepted by insurer. Arcadis requested confirmation from GOAS via PRASA. At the time of submission of this Report, no response has been provided to confirm whether the recommendation was adopted for the 2018-2019 renewal period.

2. Commercial General Liability program excludes coverage for any Terrorism event. Considering the Insured operations and act of Terrorism is an important and potentially severe exposure with considerable implications. MARSH recommended that Terrorism coverage should be considered under PRASA's Commercial General Liability program.

    AON agreed with this recommendation and has urged PRASA to include such coverage on renewals but PRASA has declined the recommendation.

    This was not included in the FY2018 policy nor the FY2019 renewal. PRASA continues to decline its inclusion, citing that it will represent an increase on premium.

    Nevertheless, Arcadis still recommends that it should be included in the policy.

7.3.4 Automobile Liability

PRASA maintains automobile liability coverage through MAPFRE. Renewal of policy occurred in July 2017 and extended until July 2018 and includes:

- Bodily Injury and /or Property Damage caused by **Any** automobile, including Hired and Non-Owned, with a $1,000,000 Combined Single Limit per accident and includes a $5,000 per person Medical Expense limit for owned autos only.
- Physical Damage to owned autos of the Insured is not included in the policy except for Specific Catastrophic events which includes Lightning, Fire, Explosion, Windstorm, Hail, Flood and Earthquake, with a limit of $2,000,000 per event and subject to a $50,000 per event deductible.
- Drive other car Coverage is included for Liability coverage on a blanket basis for up to 50 individuals.
- Policy provides automatic Physical damage coverage for Hired autos with a value up to $40,000 with a $500 Deductible. Any vehicle with a value greater than $40,000 must be submitted to the company. This coverage is subject to a deposit premium and an annual revision at a rate of 7.5%.
- Garage liability coverage is under the Compulsory Liability Insurance policy.
- Comprehensive and collision Trailer interchange coverage is provided for non-owned trailers, with a physical damage limit of $35,000 each trailer; $35,000 each tank/refrigerated unit; $20,000 each non-refrigerated or van unit; and $15,000 each flatbed, chassis and “gen set”. All subject to a $500 Comprehensive and Collision deductible. Losses to chassis will be paid under replacement cost basis.

Also, under MAPFRE the following policy was included:

- Garage Keeper coverage is included on a Direct Primary basis for Comprehensive and Collision with a limit of $1,000,000 per event for each covered location for “Autos left with you for service, repair, storage or safekeeping”. Comprehensive coverage is subject to a $250 per event deductible, subject to a maximum of $1,000 per event and collision coverage is subject to a $500 deductible. Premium for this coverage totaled $18,000.

Renewal with MAPFRE of the commercial auto policy for FY2019 covers from July 2018 and extends until July 2019. Coverage and limits remain the same as presented above. However, there are 2,782 units included, which is 124 more than the previous policy. The premium for this coverage increase 48% to $589,000.

The Garage Keeper’s coverage for FY2019 remains the same as well. No increase in premium.

7.3.4.1 Recommendations & Responses

The following pending recommendations were previously made by MARSH, including AON comments regarding PRASA’s Commercial Auto, Garage Liability and Garage Keeper’s programs. Also, included is confirmation of action by Lone Star of said recommendations:

1. MARSH recommended that form U-6 (11-93) “Liability Coverage Exclusion Endorsement” be eliminated since the language utilized is too broad and may present coverage interpretations unfavorable to PRASA.

AON agreed with this recommendation and submitted it to the insurer for review and approval.

Lone Star indicated that it submitted recommendation to insurer for the FY2018 policy, but no response was received prior to renewal. Furthermore, Lone Star said that it was included in the specifications for the FY2019 renewal. Arcadis requested confirmation from GOAS via PRASA. At the time of submission of this Report, no response has been provided to confirm whether the recommendation was adopted for the 2018-2019 renewal period.

2. Drive other Car coverage is included only for Liability. MARSH recommended that it be broadened to include both Physical Damage and Medical Payments coverage.

   AON agreed with this recommendation and submitted it to the insurer for review and approval.

   This was not included in the FY 2018 policy nor the recent FY2019 renewal. Notwithstanding, it should be considered in the next renewal.

7.3.5 Umbrella and Excess Liability

PRASA maintains a primary umbrella policy which provides a first layer of $20M limit excess of the primary general, automobile and employer's liability policies for each occurrence and aggregate. The umbrella is otherwise subject to a $5,000.00 SIR for each occurrence of bodily injury, property damage and personal and advertising injury losses not covered by the underlying insurance. Renewal of policy occurred in July 2017 and extended until July 2018. Coverage is provided through MAPFRE on a $591,550 premium.

PRASA also maintains a second layer excess liability policy providing a $40M limit in excess of the $20M umbrella limit described in the preceding paragraph for each occurrence and aggregate with a $5,000 SIR. Coverage is also provided through MAPFRE.

Renewal with MAPFRE of the umbrella and excess liability for FY2019 covers from July 2018 and extends until July 2019. Coverage and limits remain the same as presented above.

7.3.5.1 Recommendations & Responses

The following pending recommendation was previously made by MARSH including AON comments regarding PRASA's Excess Liability program. Also, included is confirmation of action by Lone Star of said recommendation:

1. Include the Garage Liability policy issued by MAPFRE under the Commercial Umbrella's "Schedule of Underlying Insurance", in order to achieve the higher limits provided by the Excess Liability program for any Garage Liability claim that could exceed policy limits or could be excluded from coverage under said program.

   AON agreed with this recommendation and submitted it to the insurer (MAPFRE) for review and approval.

   Lone Star indicates that due to changes in the ISO forms, the Garage Liability is included under the CGL Policy.

7.3.6 Directors and Officers Liability

PRASA maintains one primary and two excess layers of directors & officers (D&O) liability insurance. Coverage provided through Chubb. Renewal of policy occurred in July 2017 and extended until July 2018. Coverage is written on a claims-made basis and is subject to a prior litigation date of July 1, 2007 on the primary policy, July 1, 2010 on the first excess issued by Liberty, second excess layers by Berkley and Liberty, and July 1, 2016 for the last second excess layer issued by AIG. The D&O carriers and limits are shown in Table 7-4.

Table 7-4. FY2018 Directors and Officers Liability

Insurer	Limit	Premium
Chubb Insurance Company (Primary)	$15 million	$125,000
Liberty International Underwriters (First Excess Layer)	$10 million excess of $15 million	$35,000
Berkley Insurance Company (Second Excess Layer)	$10 million excess of $25 million	$30,000
Liberty International Underwriters (Second Excess Layer)	$10 million excess of $35 million	$25,000
AIG Insurance Company (Second Excess Layer)	$5 million excess of $45 million	$20,000
Total D&O Limit	$50 million	$235,000

The primary layer of D&O insurance is subject to a $500,000 SIR for claims against indemnified persons or a claim against PRASA alleging a breach of duties.

Renewal of this policy for FY2019 covers from July 2018 and extends until July 2019. The policy coverages for the primary and each excess layer remains the same as presented in Table 7-4. However, there was a significant increase on the premiums of each coverage, as follows:

- Primary policy increased $25,000 (20%) to $150,000. Coverage provided by Chubb;
- First Excess Layer by Liberty increased $15,000 (43%) to $50,000;
- Second Excess Layer by Berkley increased $10,000 (33%) to $40,000;
- Second Excess Layer by Liberty increased $10,000 (29%) to $35,000; and
- Second Excess Layer by AIG increased $5,000 (25%) to $25,000.

Overall, the total premium increased 28% to $300,000, mostly due to the current critical fiscal situation and the Oversight Board influence trigging changes on policy premiums of financial lines coverages.

The following pending recommendations were previously made by MARSH, including AON comments regarding PRASA's Directors and Officers insurance. Also, included is confirmation of action by Lone Star of said recommendations:

1. **Consider Re-negotiating Definition of Application Endorsement so that it is pertinent**. The Amend Definition of Application Endorsement makes reference to documents filed with the Securities

& Exchange Commission. The intent of this endorsement should be to limit information used in underwriting to information received within the last year. This clarification is important because when faced with large claims insurance carriers frequently evaluate the opportunity to rescind the policy. When documentation is limited to that submitted within the past year, it is more difficult for them to rescind the policy.

AON agreed with this recommendation and requested insurer for the correct endorsement.

Lone Star indicated that insurer said that endorsement could be renegotiated upon renewal as it was not included in FY2018 policy. Lone Star said that recommendation was included in specifications for FY2019 renewal. Arcadis requested confirmation from GOAS via PRASA. At the time of submission of this Report, no response has been provided to confirm whether the recommendation was adopted for the 2018-2019 renewal period.

2. **Consider Eliminating the Private Company Endorsement**. There appears to be a conflict in wording with regard to the Securities Coverage. The policy has a Private Company Endorsement that adds coverage for the corporate entity by changing Insuring Clause C from Company Securities Liability to Company Liability eliminating the securities coverage. The Private Company endorsement has a specific Public Offering of Securities exclusion. MARSH recommended eliminating the Private Company endorsement. Chubb can include the employees as Insured's by an additional endorsement.

   AON, as PRASA's BOR, will not recommend eliminating the Private Company endorsement but will instead revise its wording to harmonize the securities coverage.

   Lone Star said that upon receiving recommendation insurer indicated that endorsement could be renegotiated upon renewal, as such, it was included in specifications for FY2019 renewal. Arcadis requested confirmation from GOAS via PRASA. At the time of submission of this Report, no response has been provided to confirm whether the recommendation was adopted for the 2018-2019 renewal period.

3. **Consider Requesting Clarification to Discovery Period endorsement**. Lastly, it appears that the intent of the Discovery Period (90 Days) endorsement is to allow 90 days for PRASA to pay the premium for the extended reporting period. To achieve this, the only amendment necessary is to change the 30-day term to 90 days in Section 4, Paragraph one. The current wording references a bond policy, which is not the case and creates the impression that the premium for a 90-day extension is 75% of the annual premium when generally Chubb charges 75% for a one-year term extension.

   AON agreed with this recommendation and requested a revision of the wording to the carrier in order to clarify the intention of the endorsement.

   Lone Star indicated that insurer responded to clarification with revision on January 2018, as follows:

   "4. Discovery Period

   If the Insurer or the Insureds do not renew any Liability Coverage Part or if the Parent Company terminates any Liability Coverage Part, the Insureds shall have the right, upon payment of the additional premium described below, to an extension of the coverage granted by such Liability Coverage Part for the Discovery Period set forth in Item 5(B) of the

Declarations following the effective date of such nonrenewal or termination, but only with respect to a covered Wrongful Act taking place prior to the effective date of such nonrenewal or termination. This right of extension shall lapse unless written notice of such election, together with payment of the additional premium due, is given by the Insureds to the Insurer within thirty (30) days following the effective date of termination or nonrenewal.

The premium due for such Discovery Period with respect to any Liability Coverage Part shall equal that percent set forth in Item 5(A) of the Declarations of the Annual Premium for such Liability Coverage Part. The entire premium for such Discovery Period shall be deemed fully earned and non-refundable upon payment.

The Insureds shall not be entitled to elect the Discovery Period under this Subsection 4 with respect to any Liability Coverage Part if a Discovery Period for such Liability Coverage Part is elected pursuant to Subsection 10(b) of these General Conditions and Limitations."

4. **Consider Requesting Amendments so that the Second layer is follow form and "drops down".** The second excess layer issued by Berkley should be follow form and as such should be amended to eliminate the Bankruptcy exclusion and a drop-down exclusion allowing the underlying limit to be eroded by either payment under the policy or payment of the underlying limit by another source should be added.

   AON disagreed with this recommendation stating that a Drop-Down Endorsement had already been requested to the insurer.

   *Lone Star states that this Policy provides excess coverage over the **Underlying Insurance** during the Policy period. Coverage hereunder attaches only after the **Underlying Insurance** has been exhausted by payments for losses and shall then apply in conformance with the provisions of the followed Policy at its inception, except for premium, limit of liability and as otherwise specifically set forth in this Policy and any attached endorsements. In no event shall this Policy grant coverage other than that which is provided by the **Underlying Insurance**.*

7.3.7 Employment Practices Liability

PRASA maintains primary and excess employment practices liability (EPL) policies providing total limits of $5M in the aggregate annually for employee claims alleging wrongful termination, employment related misrepresentation, sexual harassment, retaliation or other violation of an employee's civil rights. A $100,000 SIR applies to each claim. Coverage is written on a claims-made basis and is subject to a prior litigation date of November 30, 2007 on the primary policy. Primary coverage is $5M provided through Chubb. Excess EPL coverage is through Berkley Insurance Company for $5M each claim in excess of $5M but in no event exceeding $5M in the aggregate for all claims. Also, it is subject to a prior litigation date of July 1, 2014. Renewal of this policy occurred in July 2017 and extended until July 2018. PRASA's premium for the primary policy was $135,375 and $38,000 for the excess policy.

Renewal of the EPL for FY2019 covers from July 2018 and extends until July 2019. Coverage, limits and premium remain the same as presented above.

7.3.7.1 Recommendations & Responses

A benchmarking study, shown in Figure 7-1 based on limits carried by other public corporations in the industry class with similar level of corporate and economical characteristics showed that on average, limits of $6.8M were carried. The study also shows a 75th percentile with limits of $10M and a 25th percentile with limits of $3M with a median of $5M. PRASA decided a couple of years ago to reduce the EPL limits from $10M in FY2015 to the median, based on data from previous years, and has maintain those limits.

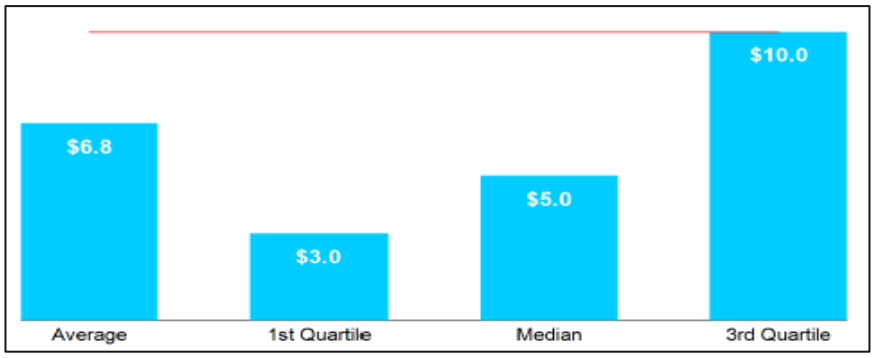

Figure 7-1. Employment Practices Liability Benchmarking Analysis

The following pending recommendation was previously made by MARSH, including AON comment regarding PRASA's Employment Practices policies. Also, included is confirmation of action by Lone Star of said recommendation:

1. The EPL Excess does not include a Drop-Down Endorsement to govern when and how such excess policy will respond on behalf of the Insured in the event of the primary policy's exhaustion.

   AON states that a Drop-Down Endorsement has already been requested to the insurer.

   Lone Star states that this Policy provides excess coverage over the Underlying Insurance during the Policy Period. Coverage hereunder attaches only after the Underlying Insurance has been exhausted by payments for losses and shall then apply in conformance with the provisions of the Followed Policy at its inception, except for premium, limit of liability and as otherwise specifically set forth in this Policy and any attached endorsements. In no event shall this Policy grant coverage other than that which is provided by the Underlying Insurance. ***Followed Policy means the policy (ies) listed in Item 7.A. of the Declarations.***

7.3.8 Premises Pollution Liability

Chubb provides pollution liability coverage on a claims-made basis at $10M per pollution condition, $10M annual aggregate limits. Coverage is subject to a $250,000 per accident SIR. Policy was renewed on July 1, 2017 and extended until July 2018. A retroactive date of July 1, 2002 applies. PRASA's premium for this policy was $253,740. An added coverage for "Terrorism Risk Insurance Act" was offered but not accepted by PRASA due to higher premiums.

Renewal of this policy for FY2019 covers from July 2018 and extends until July 2019. Coverage, limits and premium remain the same as presented above.

7.3.8.1 Recommendations

PRASA should consider adding the “Terrorism Risk Insurance Act” policy.

7.3.9 Accident Liabilities for Travel and Divers

PRASA’s FY2018 accident coverage program for travel is issued by Chubb with the limits detailed in Table 7-5, below. Renewal occurred on July 1, 2017 and extended until July 2018. Policy has a $2.5M annual aggregate limits. Coverage is available for six (6) participants as determined by PRASA. PRASA’s premium for this policy was $1,000.

Table 7-5. FY2018 Accident (Travel) Liabilities

Coverage	Limit
Accidental Death and Dismemberment	$500,000
Accidental Medical Expenses Reimbursement	$7,000
Medical Sickness Reimbursement	$3,500
Emergency Medical Transfer	$50,000
Repatriation of Remains	$5,000
Cancellation and Interruption of Travel	$500
Loss of Personal Belonging	$1,000
Assistance Service Included	-

Renewal of this policy for FY2019 covers from July 2018 and extends until July 2019. Coverage, limits and premium remain the same as presented above.

In addition, PRASA maintains an accident coverage program for divers, as issued by Chubb. Renewal occurred on July 1, 2017 and extended until July 2018. Policy has a $750,000 annual aggregate limits. Coverage is available for three (3) participants as determined by PRASA. Coverage includes $250,000 limit for Accidental Death as well as for Accidental Dismemberment. PRASA’s premium for this policy was $19,900.

Renewal of this policy for FY2019 covers from July 2018 and extends until July 2019. Coverage, limits and premium remain the same as the previous fiscal year.

7.3.10 Cyber Liability

PRASA does not currently purchase cyber liability insurance. PRASA retains client information as part of the operations that might include data that is considered Personal Identification Information (PII) in Puerto Rico. This information includes social security numbers, driver’s license numbers, bank account numbers (with or without access codes), among other things. There have been many well publicized breaches and cybersecurity awareness continues to grow. This new cyber consciousness has had an impact on

litigation, cyber claims, and how companies respond to data breach attacks. A privacy breach or cyber-attack can affect any company.

7.3.10.1 Recommendations & Responses

The following outstanding recommendation was previously made by MARSH including AON comment regarding PRASA's cyber liability policy:

1. **Consider cyber liability coverage.** MARSH recommended that PRASA complete a self-assessment to determine potential areas of weakness as compared to international standards and also to determine the potential frequency and severity of a breach. These two studies will help to gauge limits. With this information in hand, MARSH recommended that PRASA purchase a Privacy & Cyber Liability policy to insure against liability arising from potential allegations such as PRASA failed to adequately secure customer data and the associated identification theft costs needed to repair customer credit.

   AON agreed with this recommendation to purchase a Privacy & Cyber Liability Policy and has advocated so at the last two renewals but has not been approved by PRASA.

   PRASA requests such professional policy from subconsultants (IBM, Accenture, etc.), however are still exposed to liability for all work not performed by subconsultants. Arcadis agrees with previous recommendations that PRASA should purchase a Privacy & Cyber Liability Policy.

7.3.11 Professional Liability

PRASA maintains a miscellaneous errors and omissions liability policy through Chubb, providing a $25M per claim limit and a $50M annual aggregate limit, subject to a $100,000 per claim deductible. Renewal of policy occurred in June 30, 2017 and extended until June 30, 2018. The policy is written on a claims-made basis and claims and defense costs are included within the limit. The policy has a September 21, 2004 retroactive date. Coverage applies to contract administration, design, engineering, consulting, inspection, and construction management, including planning, permitting, regulatory compliance services, land acquisition, assisting in construction, procurement assistance, start-up services, testing and extended commissioning under the PRASA multi-year CIP as modified by the PRASA Board of Directors from time to time. PRASA's premium for this policy was $689,989.

Renewal of this policy for FY2019 covers from July 2018 and extends until July 2019. Coverage, limits and premium remain the same as presented above.

7.3.11.1 Recommendations & Responses

The following pending recommendations were previously made by MARSH, including AON comments regarding PRASA's Errors & Omissions policy. Also, included is confirmation of action by Lone Star of said recommendations:

1. **Consider amending Section III. Definition, Item G. Client**, to mean any Third Party with whom the Insured has a formal written contract in place eliminating "for the supply of the Insured's Professional Services in return for a fee". Most claims under this policy are centered around contract disputes with

contractors. The current policy definition does not accurately reflect the intent of an Owner Controlled Insurance Program of this type.

AON agreed with this recommendation and requested an amendment.

Lone Star stated that definition is clear and does not require to be amended.

2. **Consider amending Section V., Item M.,** Contractual Liability exclusion to add a clarification at the end of the exclusion as follows: "however, this exclusion will not apply to Professional Services as defined in Item 5." Many of the claims filed under the policy have to do with contract administration. This exclusion might preclude coverage for these claims.

   AON agreed with this recommendation and requested an amendment.

   Lone Star stated that item 5 is clear and does not require to be amended.

7.4 Owner Controlled Insurance Program

PRASA maintains an OCIP for its multi-year Capital Improvements Program - CIP. In addition to covering PRASA, the OCIP is designed to insure enrolled contractors, subcontractors (and design professionals for General Liability only) of all tiers working on the CIP. The OCIP does not cover vendors, installers, truckers, delivery persons, concrete/asphalt haulers, and/or contractors who do not have on-site dedicated payroll, except as otherwise endorsed into the policy. The OCIP program provides builder's risk, general liability, umbrella, pollution liability insurance and miscellaneous errors & omissions professional liability insurance. Each of these coverages is discussed below.

7.4.1 Contractors All Risk –Completed value Builder's Risk

PRASA maintains a builder's risk policy as part of its OCIP program. AIG - PR and Chubb Insurance Company (50% - 50% each) are the insurers. Coverage applies to all risks of direct physical loss, except as excluded by the policy. The maximum contract value per contract is US$50,000,000.00. The Limit of Liability in any one occurrence and in the annual aggregate for the policy term is US$100,000,000.00. Certain sub limits apply to additional exposures, such as off-site storage, inland transit and debris removal, but these sub limits are part of and not in addition to the Limit of Liability and are subject to the per project reported value as maximum limit of liability.

The AOP deductible is US$20,000.00 for any one occurrence. Other deductibles are 2% for flood and 2% named windstorm, and 5% for earthquake of the total insured values at risk at the time and place of loss any one occurrence, with a minimum of US$100,000.00 any one occurrence for projects with a contract value of more than US$10,000,000.00. In addition, a US$100,000.00 deductible in any one occurrence applies for damage to Principal's existing property, property insured while undergoing testing and commissioning; and in respect to damage to existing property.

7.4.1.1 Recommendations & Responses

The following outstanding recommendations were previously made by MARSH, including AON comments regarding PRASA's OCIP builder's risk policy. Also, included is confirmation of action by Lone Star of said recommendations:

1. Request an endorsement to include a “Partial Occupancy Provision” to grant permission for partial occupancy of project areas. Therefore, coverage will not cease or expire due to the partial occupation of any project area or due to the project’s substantial completion.

   AON agreed with this recommendation and submitted it to the insurer for review and approval.

   Lone Star confirms that this was not included in the FY2018 policy renewal. Arcadis requested confirmation from GOAS via PRASA. No response has been provided to confirm whether the recommendation was adopted for the 2018-2019 renewal period.

2. MARSH recommended negotiating coverage for: Wet Works and any type of roads, ways, expressway works, overpasses and bridges, viaducts and tunneling works. These are usually impacted during water mains and sewer pipes construction and should be covered with at least a reasonable sub limit.

   AON stated that this kind of sub limit would require additional premium. To be discussed with PRASA for the next renewal presentation.

   Lone Star confirms that this was not included on the FY2018 policy renewal. Due to the ongoing fiscal situation PRASA is hesitant to add additional costs. Arcadis requested confirmation from GOAS via PRASA. No response has been provided to confirm whether the recommendation was adopted for the 2018-2019 renewal period.

3. Requested deleting endorsement MR106- Warranty concerning sections limiting the length of certain ground works, to a maximum length of section of 1,000 feet.

   Lone Star agreed with this recommendation and submitted it to the insurer for review and approval for FY2019 renewal. Insurer indicated that endorsement could be negotiated, however, it was not considered in the recent renewal.

   PRASA and BOR should follow up with insurer prior to the next renewal.

4. Consider including a “Claims Preparation Expense” additional coverage sublimit to provide for the necessary and reasonable fees or expenses incurred by the insured’s customary auditors, accountants, architects or engineers that may assist the insured proving a claim.

   AON states that this kind of sub limit will require additional premium. To be discussed with PRASA for the next renewal presentation.

   PRASA declined to include in FY2018 policy renewal, as it is cautious to increase premium costs due to its unfavorable fiscal situation. It was also declined by PRASA for the FY2019 policy renewal.

7.4.2 Commercial General Liability

The OCIP general liability policy is as “per occurrence” policy provided by Chubb and includes the limits shown in Table 7-6.

Table 7-6. FY2018 OCIP General Liability Coverages and Limits

Coverage	Limit
Each Occurrence	$2 million
General liability – General Aggregate	$4 million
Personal and Advertising Injury	$2 million
Products/ Completed Operations - Aggregate	$4 million
Employer's Liability Stop Gap	$2 million
Fire Damage (Any One Fire)	$250,000
Medical Expense (Any One Person)	$5,000

A US$5,000 per claim deductible applies for bodily injury and a US$5,000 per claim deductible applies to property damage for each loss. Policy is silent as to who is responsible for deductibles. The OCIP Manual states the Contractor should assume this deductible.

This policy covers PRASA/AAA and contractors and all tiers of subcontractors and consultants performing operations at or from the project site in connection with the work for PRASA under the contract documents.

The Completed Operations coverage extension is for five (5) years from the termination date of the policy or its renewal(s). MARSH recommended changing it to ten (10) years to cover the full statutory limit (Statute of Limitations Law).

AON states that this kind of amendment will require additional premium. AON submitted this recommendation to the carrier to discuss it with PRASA for the next renewal presentation.

PRASA maintained the 5 years in the February 2017 policy renewal, as it is cautious to increase premium costs due to the dire fiscal situation.

7.4.3 Commercial Umbrella Liability

The OCIP commercial umbrella liability policy is provided by Chubb. The limits of insurance are US$50,000,000.00 Each Incident and US$100,000,000.00 Policy aggregate, in excess of the primary OCIP commercial general liability limits of insurance. Each incident retained limit is the underlying insurance or US$10,000.00 Self Insured Retention (SIR).

The Completed Operations coverage extension is for five years from the termination date of the policy or its renewal(s).

7.4.4 Contractor's Pollution Liability

The OCIP contractor's pollution liability insurance is provided by Chubb. Coverage applies on an occurrence basis and covers pollution arising from construction activities involving PRASA's wrap-up

program. The policy provides a $25M limit each loss and annual aggregate subject to a $25,000 SIR and covers PRASA and OCIP contractor participants.

7.5 Conclusions

In the opinion of Arcadis, the insurance program covering PRASA's exposures to risks of accidental property and liability losses arising from on-going operations provides reasonable coverage. However, several recommendations to PRASA's insurance program are provided.

Particularly, PRASA should address the following key recommendations:

1. Conduct a PML Study considering new CAT Modellings and parameters. Specially after the lessons learned in the aftermath of the September 2017 Hurricanes.
2. PRASA should consider establishing a fund to cover possible financial losses from any future catastrophic or any non-catastrophic, peril that might affect infrastructure and operations and, therefore, impose an unexpected financial burden.
3. Consideration to Cyber Security Coverage, which is excluded under all current PRASA's Insurance Programs. Also, complete a self-assessment to determine potential areas of weakness as compared to international standards and to determine the potential frequency and severity of a breach.
4. Consideration to Terrorism Coverage, which is excluded under all current PRASA's Insurance Programs.
5. Consideration for the next Crime Policy renewal - the Knowledge or Discovery of Loss clauses should be renegotiated to specifically identify positions triggering knowledge of incidents, in order to minimize the risk of claim declines by the carrier for late reporting.
6. Consideration to broaden Drive Other Car coverage to include both Physical Damage and Medical Payments coverage.

8 SYSTEM ASSETS AND FINANCIAL ANALYSIS

8.1 Introduction

In accordance with the MAT (as amended), Arcadis hereby provides a statement of the estimated cost of all additions made to the System and of all the retirements of property made in FY2018. The statement relies on most recent preliminary data available from and provided by PRASA. Also, Arcadis evaluated PRASA's financial forecast as included in PRASA's Revised Fiscal Plan as certified by the Oversight Board on August 1, 2018 and assessed the appropriateness of rates and charges. A summary of the findings is provided in this section.

8.2 System Assets

8.2.1 Fixed Assets Changes

Table 8-1 shows that, as of June 30, 2018, PRASA had an estimated preliminary total book value of fixed (capital) assets of approximately $6,766M. Additionally, PRASA has approximately $321M of assets that are currently under construction or as "Work in Progress". Including land and other non-depreciable assets, as of June 30, 2018, the book value of PRASA's total fixed assets amounts to $6,370M (net of accumulated depreciation).

Table 8-2 provides a summary of the fixed assets changes from FY2016 to FY2017 and from FY2017 to FY2018.

Table 8-1. Estimated Fixed Assets Summary through June 30, 2018 ($, Millions)

	Original Cost	Accumulated Depreciation	Book Value
Fixed Assets	$10,993	($4,623)	$6,370
Work in Process	321	-	321
Land and other Non-Depreciable Assets	75	-	75
Total Fixed (Capital) Assets	$11,389	($4,623)	$6,766

Table 8-2. Fixed Assets Changes ($, Thousands)

	FY2016 to FY2017	FY2017 to FY2018
Fixed Assets (Net of Accumulated Depreciation)	($186,353)	($220,285)
Work in Process	(73,243)	(12,701)
Land and other Non-Depreciable Assets	82	44
Total Fixed Asset Changes	($259,514)	($232,942)

PRASA's preliminary, not audited, Total Assets were estimated at $8,016M as of June 30, 2018. Total Assets include current assets (approximately $516M), restricted assets (approximately $366M in restricted cash and cash equivalents), total capital assets ($6,766M as previously mentioned), and other assets ($19M in deferred loss resulting from debt refunding).

8.3 PRASA's Rate Structure

PRASA's base and volumetric rate structures for residential customers and non-residential customers (commercial, industrial and certain government customer classes) were approved on July 15, 2013. On December 18, 2013, PRASA further amended the rate structure for non-residential accounts. These are summarized in Tables 8-3 through 8-9. Furthermore, to cover all projected operating expenses, CIP needs and debt service obligations (assuming debt restructuring, or new external financing is attained), Included in PRASA's Revised Fiscal Plan are a series of moderate rate adjustments as required by the Oversight Board the first of which was implemented on January 1, 2018 followed by another on July 1, 2018. PRASA's Revised Fiscal Plan adjustments are calculated separate from the base and volumetric amounts, as compounded percentages of the total customer invoice amount. Additional adjustments are projected to be implemented annually on July 1st of each year through FY2023. Table 8-10 summarizes the proposed annual adjustment amounts by customer type.

Table 8-3. 2013 Residential Monthly Base Charge per Account (includes first 10 cubic meters of monthly consumption)

Water Service Line	Water	Wastewater	Water & Wastewater
1/2" & 5/8"	$10.60	$9.11	$19.71
3/4"	18.40	15.86	34.26
1"	30.23	20.36	50.59
1-1/2"	57.12	31.32	88.44
2"	97.24	53.56	150.80
3"	149.15	89.23	238.38
4"	335.50	156.69	492.19
6"	894.72	731.19	1,625.91
8"	1,431.55	835.64	2,267.19
10"	2,290.50	1,337.02	3,627.52
12"	3,664.80	2,139.25	5,804.05

Table 8-4. Residential Volumetric Rate per Cubic Meter

Use Block (m^3)	Water	Wastewater	Water & Wastewater
>10 – 15	$1.25	$1.02	$2.27

Use Block (m^3)	Water	Wastewater	Water & Wastewater
>15 – 25	1.99	1.59	3.58
> 25-35	2.69	2.14	4.83
>35	2.84	2.27	5.11

Table 8-5. Residential Environmental Compliance and Regulatory Charge (ECRC)

Use Block (m^3)	Water	Wastewater	Water & Wastewater
Base Charge (0 – 10)	$1.00	$1.00	$2.00
>10 - 15	6.50	6.50	13.00
>15 - 25	10.50	10.50	21.00
>25 - 35	17.50	17.50	35.00
> 35	31.50	31.50	63.00

Tables 8-6 through 8-9 summarize the existing rates for non-residential customers (includes commercial, industrial and certain government customer classes) as implemented on July 15, 2013 and amended on December 18, 2013.

Table 8-6. Non-Residential Monthly Base Charge per Account

Water Service Line	Water	Wastewater	Water & Wastewater
1/2" & 5/8"	$24.37	$20.10	$44.47
3/4"	36.09	31.85	67.94
1"	61.10	44.85	105.95
1-1/2"	122.43	75.23	197.66
2"	194.62	117.32	311.94
3"	436.87	243.86	680.73
4"	725.75	459.81	1,185.56
6"	1,858.58	1,474.93	3,303.51
8"	2,939.80	2,288.04	5,227.84
10"	4,703.70	3,660.87	8,364.57
12"	7,525.91	5,857.39	13,383.30

Table 8-7. Commercial and Government Volumetric Rate per Cubic Meter

Use Block (m^3)	Water	Wastewater	Water & Wastewater
>0 – 100	$1.74	$1.44	$3.18
>100 – 200	2.16	1.73	3.89
> 200	2.84	2.27	5.11

Table 8-8. Industrial Volumetric Rate per Cubic Meter

Use Block (m^3)	Water	Wastewater	Water & Wastewater
>0	$2.27	$1.82	$4.09

Table 8-9. ECRC for Non-Residential Customers

Commercial and Government ECRC Meter Size Equal to or Less than 2-inches[1]			
Use Block (m^3)	**Water**	**Wastewater**	**Water & Wastewater**
>0-100	$1.18	$0.98	$2.16
>100-200	1.22	1.01	2.23
>200	1.26	1.04	2.30
Industrial ECRC Meter Size Equal to or Less than 2-inches			
>0	$1.54	$1.22	$2.76
Non-Residential ECRC Meter Size Greater than 2-inches			
Meter Size	**Water**	**Wastewater**	**Water & Wastewater**
3"	$482.00	$482.00	$964.00
4"	839.50	839.50	1,679.00
6"	2,340.00	2,340.00	4,680.00
8"	3,703.00	3,703.00	7,406.00
10"	5,924.50	5,924.50	11,849.00
12"	9,479.50	9,479.50	18,959.00

Additionally, to cover all projected operating expenses, CIP needs and debt service obligations (assuming debt restructuring, or new external financing is attained), PRASA's Revised Fiscal Plan included a series of consistent, but moderate rate increases as required by the Oversight Board. Therefore, assuming that

all initiatives will be implemented, and that debt relief will be achieved through the current negotiations, the following annual rate increase per customer type shall be applied effective January 1st, 2018 and every July 1st of each year thereafter through FY2022:

Table 8-10. PRASA's Proposed Fiscal Plan Annual Rate Adjustments by Customer Type

Customer Type	Annual Rate Increase
Residential	2.5%
Commercial	2.8%
Industrial	3.5%
Government	4.5%

Rate increases due on January 1st and July 1st of 2018 have already been implemented in compliance to PRASA's Revised Fiscal Plan. As the proposed rate increase is less than 4.5% per year PRASA is expecting to implement the change through the automatic increase allowed by the existing Rate Resolution. The impact of these rate increases is further discussed in the next section.

Lastly, PRASA charges customers for other services summarized in Table 8-11. These rates became effective as of July 1, 2016.

Table 8-11. PRASA's Other Customer Service Charges

Activity	Charges
Service Reconnection – Residential	$40.00
Service Reconnection – Commercial	$75.00
Service Reconnection – Industrial	$75.00
Sprinkler System 1"	$38.17
Sprinkler System 2"	$57.26
Sprinkler System 3"	$85.90
Sprinkler System 4"	$128.86
Sprinkler System 6"	$193.29
Sprinkler System 8"	$289.94
Sprinkler System 10"	$434.91
Sprinkler System 12"	$652.37
New Service Connection ⅝"	$800.00
Meter Testing In-Situ ½" a 1½"	$30.00
Meter Testing In-Situ >= 2"	$80.00

8.3.1 Additional Provisions for Rate Increases

As approved by PRASA's Governing Board, future rate increases, which shall not be implemented before FY2018, shall follow the provisions, as amended, that had been previously approved under Resolution No. 2167 (dated October 6, 2005) as follows:

a. Adjustments and increases after July 1, 2017 will be calculated according to a specified formula (Coefficient of Annual Adjustment [CAA] described below);

b. Beginning July 1, 2017, there is a cap or limit on future annual increases of 4.5% and a limit on the cumulative increases of 25% (as approved by PRASA's Governing Board);

c. If PRASA requires an increase in excess of 4.5% in any single year, or once the 25% cumulative limit is reached, PRASA must follow the formal approval process required under Act 21 of 1985 (Act 21-1985) requesting a rate increase.

Adjustments and increases implemented after July 1, 2017 are limited by the calculation of the CAA described in the Resolution and as presented herein. There are three steps to determining the CAA as follows:

- STEP 1 – Calculate the Coefficient of Deficiency (CD) for the applicable year:

  CD = Operating Expenses and Debt Service / Operating Revenues

- STEP 2 – Calculate the Coefficient of Annual Base (CAB) for the Base Year:

  CAB = Operating Expenses and Debt Service (FY2007) / Operating Revenues (FY2007)

- STEP 3 – Calculate the CAA:

  CAA = CD/CAB

If the CD for any year is greater than the CAB from FY2007, i.e., CD for FY2017 greater than CAB, then the rates can be increased by the lesser of the CAA minus one (CAA-1) or 4.5% until the 25% cumulative maximum is reached. If the cumulative maximum is reached or should PRASA in any given year require a higher rate increase than maximum annual adjustment amount of 4.5%, PRASA shall then follow the rate increase process required by Act 21-1985, as amended. The first step under Act 21-1985 requires review and ratification by PRASA's Governing Board of the proposed rate structure and approval to initiate the rate modification/increase process. The second step is the appointment of an independent Official Examiner that will conduct an independent review of the proposed changes and increases and will lead public hearings. The third step is the development of a report by the Official Examiner that includes his findings and recommendations, to be considered by PRASA's management and Governing Board prior to final approval of the rate structure modifications and increases to be implemented. This report is published for public commentary. The fourth and final step is the review and final approval by PRASA's Governing Board, considering the Official Examiner's recommendations.

8.4 FY2018 Preliminary Results and FY2019-FY2023 Forecast

Arcadis reviewed the financial information provided by PRASA and included in PRASA's Revised Fiscal Plan, which is summarized in Exhibit 1. This section summarizes Arcadis's review and provides an assessment of PRASA's financial condition, particularly as it relates to assessing PRASA's financial

preliminary results for FY2018 and the reasonableness of PRASA's assumptions in the preparation of the six-year financial projections (the forecast period or the Forecast) from FY2019-FY2023, to assess the sufficiency of the revenues necessary to support the projected operations and capital costs as shown in Exhibit 1; including O&M expenses, debt service payments, and required deposits in compliance with the MAT (as amended). Additionally, the Forecast illustrates the anticipated DSC, for the forecast period.

The following information, provided by PRASA, was reviewed:

- MAT, as amended and restated
- Sixth Supplemental Agreement of Trust
- Preliminary revenue and expense projections for FY2018
- PRASA's FY2019 Annual Budget approved by PRASA's Governing Board on June 21, 2018 under Resolution No. 3082 as amended on January 22, 2019 by Resolution No. 3105
- PRASA's Revised Fiscal Plan, including revenue and expense projections
- Debt service schedules for all currently outstanding debt service and preliminary projected debt obligations, and DSCs
- The amount received and expected to be received from PRASA's insurance company and FEMA as a result of the impacts from Hurricanes Irma and María on September 2017

8.4.1 Operating Revenues

As defined in the MAT, **Operating Revenues** *"shall mean all moneys received by or on behalf of the Authority, including (i) the moneys derived by or on behalf of the Authority from the sale of water produced, treated or distributed by, or the collection, transmission, treatment or disposal of sewage by the Systems, (ii) any proceeds of use and occupancy insurance on the Systems or any part thereof, (iii) except as provided in the following sentence, any income from the investments made under this Agreement, (iv) any special assessments, including assessments in the nature of impact fees, (v) amounts, if any, paid from the Rate Stabilization Account into the Operating Revenue Fund in any Fiscal Year minus the amounts, if any, paid from the Operating Revenue Fund into the Rate Stabilization Account during the same Fiscal Year; and (vi) regularly scheduled payments received under any Qualified Swap or Hedge Agreement during such period. In no event shall Operating Revenues include (i) income from the investment of moneys on deposit to the credit of the Construction Fund, proceeds of insurance (except use and occupancy insurance) or condemnation awards (which are required to be deposited directly to the credit of the Capital Improvement Fund), (ii) proceeds of sales of property constituting a part of the Systems (which are required to be deposited directly to the credit of the Capital Improvement Fund), (iii) the proceeds of Bonds or other Indebtedness, (iv) any governmental grants or appropriations available to pay Current Expenses of the Authority, including grants or appropriations received by the Authority and specifically made for the payments of principal of and interest on obligations of the Authority or for reimbursing the Authority for such payments, (v) any amounts received from the Commonwealth of Puerto Rico on account of Commonwealth Guaranteed Indebtedness (which is required to be deposited directly in the Commonwealth Payments Fund) or Commonwealth Supported Obligations (which is required to be deposited in the Commonwealth Payments Fund), (vi) any amounts transferred from the Budgetary Reserve Fund to the Trustee and (vii) any termination or similar payment*

under any interest rate swap or similar hedge agreement received by the Authority (which are required to be deposited directly to the credit of the Capital Improvement Fund)."

PRASA's projections for FY2018 to FY2023 net of PRASA's Revised Fiscal Plan's revenue enhancing initiatives and net of the expected insurance reimbursement from revenue loss from the September 2017 Hurricanes impact, on an accrual basis, are presented in Table 8-12.

Table 8-12. PRASA Operating Revenues ($, Millions)

Fiscal Year	Operating Revenues
FY2018 Projection based on Preliminary Results	$952.7
FY2019 Annual Budget[1]	$1,016.7
FY2020 Projected	$994.0
FY2021 Projected	$1,063.0
FY2022 Projected	$1,133.5
FY2023 Projected	$1,192.1

[1] As approved by the Oversight Board on September 21, 2018.

A discussion on PRASA's Operating Revenue assumptions is presented below.

1. Base Fee and Service Charges, Net of Subsidies (Exhibit 1, line 1) – PRASA's single largest source of revenue is from the monthly base charge and volume rate for services, the ECRC, and the Special Charge of $2.00. PRASA's Base Fee and Service Charges for FY2018, net of subsidies (Service Revenues) are preliminarily about $929.5M, which is approximately $186.2M less than what was budgeted for FY2018. This change between the preliminary results and what was budgeted for FY2018 reflects the impacts of Hurricanes Irma and María on PRASA's revenues.

   PRASA's approved Annual Budget for FY2019 includes Service Revenues, also net of subsidies, in the amount of $1,033M, which represents a net increase of $103.3M over FY2018 preliminary projections. Table 8-13 provides a breakdown of PRASA's Service Revenues for FY2018 through FY2023, including rate increases that were implemented in FY2018 in compliance with PRASA's Revised Fiscal Plan. As shown, Service Revenues are expected to increase from the FY2020 projection of $1,092M to $1,170M by FY2023.

   PRASA's Service Revenues are presented net of subsidies. While all customers pay for service, PRASA provides a 35% subsidy to the base charge for residents over the age of 65 who are eligible under the PAN (Programa de Asistencia Nutricional by its Spanish acronym) Program or residents under the TANF (Programa de Asistencia Temporal para Familias Necesitadas by its Spanish acronym) Program; both government assistance programs. Also, since FY2010, and in compliance with Act 69 of August 2009, now Law 22-2016, PRASA provides a subsidy to all public housing residential customers limiting the monthly payments of these customers to only the water and wastewater base fee charge. Tables 8-14 summarizes the number of residential customers that are provided a subsidy for water and wastewater bills as of June 30, 2018. The number of customers benefiting from the PAN subsidy has varied from 58,234 reported by PRASA for FY2017 to 58,711 in FY2018. The number of customers benefiting from the TANF subsidy decreased from 15,312 in

FY2017 to 10,654 in FY2018. The number of public housing customers under a fixed tariff increased from 52,165 in FY2017 to 54,521 in FY2018.

Table 8-13. PRASA Service Revenues - Excluding Operational Initiatives ($, Thousands)

Service Revenue Category	FY2018 Preliminary	FY2019 Annual Budget	FY2020 Projected	FY2021 Projected	FY2022 Projected	FY2023 Projected
Base Fee, Volume Charges, and ECRC and Special Charges[1]	$920.8	$990.4	$1,023.5	$1,020.1	$1,017.2	$1,014.0
Rate Increases[2]	8.7	42.4	68.2	95.6	124.8	155.7
Total (Net of Subsidies)	**$929.5**	**$1,032.9**	**$1,091.7**	**$1,115.7**	**$1,142.0**	**$1,169.7**

[1] Based on existing rates, includes rate adjustments, and projected reductions due to consumption reduction.
[2] Revenues generated from rate adjustments implemented in each year, in accordance with PRASA's Revised Fiscal Plan; net of new electronic bill discount.

Table 8-14. Water and Wastewater Subsidized Customer Accounts FY2018

Subsidy	Number of Customers	Percent of Total Residential Customers[1]
PAN Subsidy	58,711	5.0%
TANF Subsidy	10,654	0.9%
Fixed Tariff (Public Housing)	54,521	4.6%
Total	**123,886**	**10.5%**

[1]Based on a total number of residential customers of 1,175,315 provided by PRASA as of June 30, 2018.

PRASA's Service Revenue projections are based on certain assumptions, including growth and consumption assumptions that could be affected by numerous factors. For example, the continued strain on the economy as well as the continued population outmigration could cause a further decline in the consumption patterns of PRASA customers. Also, the timeliness or results of the revenue initiatives included in PRASA's Revised Fiscal Plan may differ from projections. Additional discussion on PRASA's Service Revenue assumptions is provided below.

Growth and Consumption Assumptions

PRASA has experienced a compound annual reduction in number of accounts of about 0.1% per year in the last five fiscal years. Furthermore, as shown in Table 8-15, from FY2017 to FY2018 the number of customer accounts decreased slightly. Compared to FY2017, there was a minimal decrease in the residential accounts. The number of accounts of all other customer classes reduced with the higher percentage observed in the number of government accounts which reduced by about 3.6% from FY2017 to FY2018; while commercial and industrial accounts reduced by approximately 1.5%.

Table 8-15. PRASA Customer Accounts

Fiscal Year	Customer Class				Total
	Residential	Commercial	Industrial	Government	
FY 2017[1]	1,175,615	50,247	806	10,060	1,236,728
FY 2018[2]	1,175,315	49,487	792	9,697	1,235,291
% Difference	**0.0%**	**-1.5%**	**-1.7%**	**-3.6%**	**-0.12%**

[1] Number of accounts by customer class through June 30, 2017.
[2] Number of accounts by customer class through June 30, 2018.

In FY2017, PRASA's average monthly billed consumption per account increased by approximately 4.1% compared to FY2016. This increase, however, was expected as customer consumption stabilized after the 2015 drought ended. That said, FY2017 consumption results were lower than those registered prior to the drought period: in FY2014, PRASA's average monthly consumption per account was 20.6 m^3 whereas in FY2017 it was 18.5 m^3, suggesting customer consumption has not reached pre-drought conditions.

In FY2018, PRASA's total average monthly billed consumption decreased by approximately 13.4% compared to FY2017 or 9.9% compared to FY2016 (which is the fiscal year with the lowest recorded average monthly billed consumption for the past five fiscal years). This 13.4% decrease in turn resulted in a decrease in the average billed consumption per account of approximately 13.3%, as shown in Tables 8-16 and 8-17. This decrease, however, was expected as a result of the interrupted water service caused by the September 2017 Hurricanes. As previously mentioned, a month after the impact of Hurricane María approximately 30% of the clients remained without water service. Almost two months after the event, 90% of the accounts were back in service. Factoring out the months of September through March to analyze the average billed consumption per account without the effect of the hurricanes, results in a 5-7.0% decrease as compared to FY2017 results, equivalent to an average monthly consumption per account of 17.6 m^3. Overall, since FY2012 PRASA has experienced a compound annual reduction in average monthly billed consumption per account of about 4.4% per year.

Table 8-16. Average Monthly Billed Consumption by Class (1,000 Cubic Meters)

Fiscal Year	Customer Class				Total
	Residential	Commercial	Industrial	Government	
FY 2017[1]	16,354	2,644	1,194	2,674	22,867
FY 2018[2]	13,739	2,460	1,171	2,424	19,795
% Difference	**-16.0%**	**-7.0%**	**-1.9%**	**-9.4%**	**-13.4%**

[1] Based on billed consumption through June 30, 2017.
[2] Based on billed consumption through June 30, 2018.

Table 8-17. Average Monthly Consumption per Account (Cubic Meters)

Fiscal Year	Customer Class				Equivalent Average
	Residential	Commercial	Industrial	Government	
FY 2017[1]	13.9	52.6	1,481.4	265.8	18.5
FY 2018[2]	11.7	49.7	1,479.1	250.0	16.0
% Difference	**-16.0%**	**-5.6%**	**-0.2%**	**-6.0%**	**-13.3%**

1 Based on information through June 30, 2017.
2 Based on information through June 30, 2018.

According to the U.S. Census Bureau, there was a 1.7% annual decline in Puerto Rico's population between 2012 and 2017.[20] The Oversight Board projects Puerto Rico population dropped by 5.8% since FY2017 as a result of the September 2017 Hurricanes[21]. Prior to the hurricanes impact, Puerto Rico's population reduction was projected at an estimated annual rate of 0.25%. Post Hurricanes Irma and María the Oversight Board developed updated, more aggressive population projections to account for the population outmigration experienced and to be experienced as a result of the Hurricanes. The updated estimates project an average 2% annual population decline through FY2023, that is a 11.2% decline over the six-year period (FY2018 to FY2023)[2]. This trend in population decline is one of the reasons for the water consumption reduction pattern experienced in recent years, which worsened in 2016 due to the drought that affected a large portion of the Island towards the end of FY2015 and the first half of FY2016; and declined even further as a result of the hurricanes impact. However, this significant population decline was not reflected in PRASA's numbers of active accounts. This may be due to 1) customers not requesting PRASA for a disconnection order, 2) backlog in disconnections, or 3) migration of part of family components, maintaining an active water account for the remainder of the family. As of October 2018, PRASA had a total backlog for disconnection orders of 86,414 accounts, from which 73,604 were generated from 2017 and 2018.

To account for the possibility of further reductions in customer accounts and consumption during FY2019, PRASA's FY2019 Annual Budget assumes the projected macroeconomics indicators provided by the Central Government: 1.2% population decline compared to FY2018 for residential accounts and 6.13% GNP increase when compared to FY2018 for nonresidential accounts. As of the Forecast period, PRASA included a reduction in Base Fee and Services Charges (net of subsidies) of 3.4% for FY2020 (considering the effects of the hurricanes) and an average reduction of 6% for FY2021 thereafter. This includes the following projected macroeconomics indicators provided by the Central Government:

[21] The Central Government's revised new Fiscal Plan for Puerto Rico (August 20, 2018) estimates the population for FY2018 to be at 3,143,000.

Table 8-18: Macroeconomic Indicators Assumption for Service Revenue Projection

FY	Population Change (compared to prior year)	GNP Change (compared to prior year)
2019	-1.20%	6.13%
2020	-0.65%	1.05%
2021	-1.45%	1.33%
2022	-1.45%	1.50%
2023	-1.41%	1.40%

Considering the projected reduction in population and the average monthly billed consumption per account of the past five fiscal years, Arcadis finds the Forecast amount for Service Revenues reasonable.

Rate Increases Assumptions

As proposed in PRASA's Revised Fiscal Plan, annual rate adjustments shall be applied each July 1st of the Forecast, starting on FY2018, as follows:

- Residential: 2.5%
- Commercial: 2.8%
- Industrial: 3.5%
- Government: 4.5%

PRASA expects to obtain a total of approximately $495.4M additional revenues by FY2023 from the annual rate increases, from which $42.4M additional revenues are projected and included in the FY2019 Annual Budget, as presented in Table 8-13. This amount is net of the electronic bill discount initiative which would give a monthly $1.00 credit to those customers who subscribe to electronic billing and forego paper billing.

Arcadis believes that PRASA's assumptions for Service Revenues are reasonable based on historical results and the assumptions listed above. Nevertheless, the following should be noted:

- Despite the consumption adjustment from FY2016 to FY2017 after the drought, historical results show that average consumption per account has continued a downward trend in recent years.
- Continued strain on the economy, the high unemployment rate in Puerto Rico[22], and the reduction in new construction permits and economic activity index[23], among other economic

[22] Based on the U.S. Bureau of Labor Statistics, as of June of 2016 the unemployment rate in Puerto Rico was 11.2%; Source: www.bls.gov/lau/
[23] Source: Puerto Rico Economic Indicators; Puerto Rico Planning Board

factors, could continue to materially affect consumption profiles, resulting in further declines in the consumption patterns and/or number of PRASA customers.

- Proposed rate increases could vary depending on PRASA's revenue and expense results, and ability to achieve the expected results from the initiatives included in PRASA's Revised Fiscal Plan.

2. Ongoing Initiatives (Exhibit 1, lines 3) – In past years, PRASA has included a separate line item to include additional billings from on-going initiatives aiming to increase revenues and collections. However, the additional billings from said initiatives are currently netted from PRASA's FY2018 preliminary results and Forecast Service Revenues as presented in line 1.

   PRASA maintains several initiatives to improve its overall efficiency, increase revenues and collections and reduce expenses. PRASA's major on-going revenue enhancing initiatives include: NRW Reduction Program, Revenue Optimization Program, and measuring and reporting KPIs. As part of the NRW Reduction Program, PRASA's strategy has focused mostly on revenue optimization (enhancing) activities under the Revenue Optimization Program, which target apparent losses related to its commercial operation. Since 2009, PRASA has implemented a public-private effort that is charged with identifying new opportunity for revenue sources and optimizing collections. These activities, which include small and large meter changes, identifying theft and inactive accounts, disconnections and collections efforts, among others, have resulted in significant additional revenue for PRASA over the past fiscal years. Approximately $100M per year of PRASA's revenues (or about 10% of total Operating Revenues) are generated from these initiatives.

   In addition to these on-going initiatives, PRASA has identified new revenue enhancing initiatives as included in PRASA's Revised Fiscal Plan. These initiatives are included as a separate category (line) and are described in detail below (Exhibit 1, line 6).

3. Adjustment for Billings Not Collected (Exhibit 1, line 4) – Prior to the rate increases implemented in 2005 and 2006, PRASA's historical percentage of Adjustment for billings not collected (Adjustment for uncollectibles) was approximately 4% of its Service Revenues. Although PRASA's rate of uncollectibles increased significantly in the years following the 2005/2006 rate increases, in FY2012 and FY2013, PRASA's rate of accounts with billings not collected (including collections from prior years) stabilized below 6%.

   In FY2018, the percentage of billings not collected increased to almost 9% because of PRASA's invoicing and collection challenges after the September 2017 Hurricanes. This percentage considers $56M from due balances of Government Accounts collected by PRASA on June 2018 (PRASA's Revised Fiscal Plan initiative further discussed in Exhibit 1, line 6). Excluding such amount, the collections would have been 15%.

   For its FY2019 Annual Budget, PRASA has assumed an Adjustment of billings not collected of Service Revenues of 8%, to account for the possibility of a reduction in collections given the on-going fiscal crisis affecting Puerto Rico and exacerbated by the September 2017 Hurricanes, and to consider the current liquidity crisis for most government accounts (now required to pay rate increases with the expiration of Act 66-2014). This assumes billings not collected as follows: residential, commercial and industrial account collections of 92%, and government account collections of 75%

(prior to the impact of PRASA's Revised Fiscal Plan initiatives; refer to line 6 of Exhibit 1, which increased the rate to 80%).

For FY2020 through FY2023, PRASA has assumed an Adjustment of billings not collected of Service Revenues prior to PRASA's Revised Fiscal Plan initiatives from 9% in FY2020 to 4% in FY2023. This assumes an Adjustment of billings not collected applied to the resulting billings as follows: residential, commercial and industrial account collections increase of 1% as compared to FY2019 Annual Budget, and government account collections increase of 5% as compared to FY2019 Annual Budget.

To further decrease its rate of billings not collected below this assumed level, 1) PRASA expects that the execution of the P3 Project will be effective in promptly addressing customer complaints and service disconnections expecting a further improvement in the collections rate by 2% for non-government accounts, and 2) PRASA will continue to proactively pursue government account payments under the government collections improvement initiative expecting a further improvement in the collections rate by 5% annually for government accounts.

Arcadis finds this amount reasonable; however, PRASA should closely monitor changes in economic indices for the island and continuously monitor collection results given the uncertain economic and fiscal situation for Puerto Rico as a whole. Also, the assumed rate of uncollectibles could be materially affected: 1) if the proposed rate increases cause customer consumption adjustments or further reductions in number of accounts, 2) if collections from Government accounts do not improve as a result of cost controls or budgetary restraints, or 3) worsening conditions or further delays in economic recovery in Puerto Rico.

4. Other Income (Exhibit 1, line 5) – PRASA's Other Income includes: Miscellaneous Income, Special Assessments (fees paid by developers), and income from other sources. Miscellaneous Income mainly includes interest income and other miscellaneous revenues. Special Assessments are fees paid by developers for construction projects or new development connections. These fees apply to new water and sewer connections to the System. The FY2018 fees were about $500 each for water and sewer connections ($1,000 total per unit for both). Special Assessments depend on the fees paid by developers of new projects and it is expected that the current economic situation will continue to impact the local new housing market during the foreseeable future.

   PRASA's Other Income revenues for FY2018 preliminary projections totaled $1.7M, of which approximately $0.1M are from Miscellaneous Income and $1.6M from Special Assessments. PRASA is projecting $2M ($0.5M from Miscellaneous Income and $1.5M from Special Assessments) in additional revenues from Other during the forecast period.

   Arcadis believes that PRASA's assumptions for Service Revenues are reasonable based on historical results and the assumptions listed above.

5. PRASA's Revised Fiscal Plan Revenue Enhancing Initiatives (Exhibit 1, line 6) – In addition to the annual rate increases and electronic bill discount previously discussed, which totaled $8.7M in FY2018 and is estimated at about $42.4M in FY2019, PRASA has also included the benefits of the following revenue enhancing initiatives as presented in PRASA's Revised Fiscal Plan: P3 Project, adjustment policy revision, new disconnection fee, and government accounts collections. Additional revenues from these initiatives are expected to be obtained every year of the Forecast thereafter as summarized in Table 8-19.

Table 8-19. PRASA's Revised Fiscal Plan Revenue Enhancing Initiatives ($, Millions)

PRASA's Revised Fiscal Plan	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023
Initiatives	Preliminary Projections	Annual Budget	Projected	Projected	Projected	Projected
P3 Project	$0.0	$0.0	($15.9)	$11.4	$36.2	$61.1
Adjustment Policy Revision	2.0	2.0	2.0	2.0	2.0	2.0
Disconnection Fee	0.0	2.3	1.5	1.2	1.2	0.9
Government Accounts Collections	56.0	10.5	10.9	11.3	11.7	-
Total Additional Revenues[2]	**$58.0**	**$14.8**	**($1.5)**	**$25.9**	**$51.1**	**$64.0**

[1] PRASA'S Revised Fiscal Plan Revenue Enhancing Initiatives also include: Annual Rate Increase and Electronic Bill Discount (See Table 8-13), included under Base Fee and Service Charges for effect of this report.
[2] Numbers may not add up due to rounding.

Private-Public Partnership (P3) Project

PRASA is in the process of developing and entering into a public-private partnership (P3) agreement with one or more firms for the design, build, finance, maintenance and operation of a series of improvements and technologies to enhance PRASA's customer service activities and to reduce the current high volume of NRW. The P3 Project originates from PRASA's need and goals to change the way it currently operates its customer services and metering and billing practices, to address its NRW issue, and to increase operational efficiency and operating revenues through the incorporation of advanced technologies and processes. Because of PRASA's current financial situation, its executive management team has determined that it requires private enterprise expertise and capital funds to cover the estimated technological investments.

The Puerto Rico Public-Private Partnerships Authority (P3 Authority), together with PRASA commenced the procurement process for the P3 Project in FY2018. A Desirability and Convenience (D&C) Study was published on March 27, 2018, which concluded that a P3 procurement method was desirable for the project. The issuance of the request for qualifications (RFQ) was completed on June 18, 2018. Four proponents were qualified and on September 26, 2018 the request for proposals (RFP) was issued. PRASA is expecting to have the execution of the P3 agreement completed by the first half of FY2020. The net estimated cash flow benefit to PRASA for FY2020 through FY2023 is $93M.

A significant component of the P3 Project net benefits for PRASA is conditioned on PRASA's ability to reduce its customer service headcount. While it is expected that a number of current PRASA employees will be hired by the private partner, to the extent that PRASA is not able to make the necessary staff adjustments, the expected P3 Project benefits could be materially affected.

Adjustment Policy Revision and Disconnection Fee

In February 2017, PRASA's Governing Board Approved Regulation 8901, which among other customer service updated requirements and measures, states that adjustments made for bills where a hidden leak is detected will only apply to the sewer bill portion (not both water and sewer) as the water has already been consumed or lost in the system and PRASA has already incurred in its production cost. Starting in FY2018, PRASA projected to reduce current adjustments by 60% or $2M per year. In FY2018 PRASA met this projection and has included it as part of the Forecast.

Also, Regulation 8901, creates a new $15 charge for the cost of disconnecting service (in addition to the reconnection fee already in place). Based on the annual number of disconnections performed (approximately 200,000 per year), PRASA estimates that the maximum revenue amount to be achieved from this initiative would be about $3M per year. However, once implemented, PRASA expects that the new disconnection fee will deter clients from having their services suspended, thereby reducing the projected amount of annual disconnections performed. Therefore, over the forecast period, PRASA is assuming that the additional revenues from this initiative will decrease from $2.3M in FY2019 to $0.9M in FY2023.

Both initiatives were implemented on January 1, 2018, nevertheless PRASA expects imposing the disconnection fee in the second half of FY2019.

Government Accounts Collections

Historically, collections of government accounts have been a challenging process. Included in PRASA's Revised Fiscal Plan is the implementation of an aggressive program to enforce collections from government accounts, which consists of reaching a 95% government accounts collection rate by FY2023. A delinquent notification and warning of service disconnection will be sent in two phases and if no payment is received, the account will be disconnected. If no payment is received after the service disconnection has been executed, PRASA will proceed to inactivate the account.

Following the Oversight Board recommendations, the level of collections for government accounts was increased from the assumed 75% post-hurricanes collection rate by: 1) $56M during FY2018, which represents a 93% collection rate in government accounts due to the agreement made between PRASA and the Central Government for the collection of outstanding delinquencies government accounts; and 2) 5% collections rate improvement (from 75% to 80% collection rate) equivalent to approximately $10M increase per year from FY2019 trough FY2022 when a maximum assumed collection level of 95% is reached.

Support from the Central Government and AAFAF is crucial for the successful implementation of this initiative.

6. Insurance Reimbursement from Revenue Loss (Exhibit 1, line 7) – PRASA has made claims under its insurance policies for business interruption and property damage and has requested FEMA disaster grants for property repair, replacement and restoration in excess of insurance proceeds and for certain emergency expenses. Arcadis reviewed the MAT, as amended, to determine the adequacy of the allocation of both insurance proceeds and FEMA reimbursements/grants to be obtained as a result of the impact of the September 2017 Hurricanes; whether these proceeds can be applied as Operating Revenues or Authority Revenues. Arcadis requested PRASA to obtain legal opinion on the appropriateness of these assumptions.

As per the definition established in the MAT for Operating Revenues (as defined in Section 8.4.1 of this report), "*insurance proceeds (except use and occupancy insurance) or condemnation awards, are in no event to be included as Operating Revenues…*". Additionally, the MAT includes the following in the definition of Operating Revenues; "*Operating Revenues shall mean all moneys received by or on behalf of the Authority, including…(ii) any proceeds of use and occupancy insurance on the Systems or any part thereof…*". Use and occupancy insurance refers to business interruption insurance coverage. Hence, proceeds for business interruption insurance have been included as part of the Operating Revenues for the FY2019 Annual Budget.

FEMA grants, on the other hand, do not cover loss of income. FEMA grants and insurance proceeds to the extent that they are to reimburse PRASA for Current Expenses have been treated as a deposit to the Current Expense Fund as discussed in more detail in Section 8.1.6. Insurance proceeds and FEMA grants received for the repair, replacement or reconstruction of the damaged or destroyed property have been applied to the CIP as discussed in more detail in Section 8.1.6.

PRASA has received funding from both its insurance carriers and FEMA in order to recover from damages sustained from Hurricanes Irma and María. These amounts have been included in PRASA's FY2018 preliminary projections and FY2019 Annual Budget. PRASA's insurance policy provides for $300M in coverage per event for property damages and business interruption losses.

8.4.2 Authority Revenues (Other Sources of Revenues)

Based on the MAT, **Authority Revenues** *"shall mean Operating Revenues plus (i) any governmental grants or appropriations available to pay Current Expenses of the Authority, including grants or appropriations received by the Authority and specifically made for the payments of principal of and interest on obligations of the Authority or for reimbursing the Authority for such payments, (ii) any amounts received from the Commonwealth of Puerto Rico on account of Commonwealth Guaranteed Indebtedness (which is required to be deposited directly in the Commonwealth Payments Fund) or Commonwealth Supported Obligations (which is required to be deposited in the Commonwealth Payments Fund), (iii) any amounts transferred from the Budgetary Reserve Fund to the Trustee and (iv) any amounts received by the Authority from any source of funding that does not otherwise constitute Authority Revenues as reimbursement for Costs of Improvements paid by the Authority in the current or the immediately preceding three fiscal years from Operating Revenues.*

8.4.3 Operational (Current) Expenses

As defined in the MAT:

"**Current Expenses** *"shall mean the reasonable and necessary current expenses, incurred by the Authority in the ordinary course of business, calculated on an accrual basis, of maintaining, repairing and operating the properties constituting the Systems or causing said maintenance, repair and operation, which expenses shall exclude depreciation, reserves for allowances for doubtful accounts and other non-cash reserves or expenses. For purposes of the Rate Covenant and the Annual Budget required by Section 7.02 of the MAT, Current Expenses will be calculated on an accrual basis. For all other purposes of the MAT, Current Expenses will be calculated on a cash basis. Notwithstanding any accounting treatment to the contrary, the amount of any termination or similar*

payment under any interest rate swap or similar hedge agreement shall, if payable by the Authority, not be taken into account in computing Current Expenses to the extent the same is paid by or on behalf of the Authority from the proceeds of any Indebtedness."

PRASA's preliminary Operational Expenses for FY2018, projected Annual Budget for FY2019, and projections for FY2020 to FY2023, on an accrual basis and net of (i) capitalized expenses, (ii) PRASA's Revised Fiscal Plan expenses reduction initiatives, and (iii) the September 2017 Hurricanes impact, are presented in Table 8-20.

Table 8-20. PRASA Operating Expenses ($, Millions)

Fiscal Year	Operating Expenses w/o FEMA Reimbursements	Operating Expenses net of FEMA Reimbursements
FY2018 Preliminary	$867.4	$656.0
FY2019 Annual Budget[1]	$718.4	$691.6
FY2020 Projected	$665.3	$665.3
FY2021 Projected	$665.1	$665.1
FY2022 Projected	$670.3	$670.3
FY2023 Projected	$675.0	$675.0

[1] As approved by the Oversight Board on September 21, 2018.

PRASA's projections for Operating (Current) Expenses, on an accrual basis, and associated assumptions are discussed below. Note that for certain expense categories, PRASA has assumed that expenses will increase year-over-year at an assumed rate of inflation. Following AAFAF's and the Oversight Board guidelines, PRASA has assumed that the inflation rate will be on average about 1.45% for the Forecast period (FY2019 through FY2023), that is from 1.5% in FY2019 to 1.4% in FY2023, as applied for the Government's Fiscal Plan and adopted by other agencies and public corporations. However, Puerto Rico's inflation rate during the last quarter of FY2018 remained above the FY2019 projected rate[24].

1. Payroll and Benefits (Exhibit 1, line 14) – Payroll and Benefits continues to be PRASA's largest expense category. Since FY2009, PRASA has implemented cost control methods to reduce its staff levels and, in turn, Payroll and Benefits costs. PRASA's FY2018 Payroll and Benefits preliminary results, prior to expense reduction due to PRASA's Revised Fiscal Plan expense savings initiatives, prior to the September 2017 Hurricanes impact and prior to capitalization, amounts to $315.6M, or about $38.1M less than the FY2018 budget. For FY2019, PRASA is projecting Payroll and Benefits in the amount of $335.2M, prior to expense reduction due to PRASA's Revised Fiscal Plan expense savings initiatives, prior to the September 2017 Hurricanes impact and prior to capitalization.

   Up until FY2017, assumptions regarding Payroll and Benefits costs per employee and overtime costs (as a percentage of total payroll and benefits costs) were increased mainly to cover the required contribution increases to the Employees Retirement System (ERS). However, starting on FY2018, the Payroll and Benefits costs assumptions have been increased primarily to cover for the self-funding of

[24] Source: Trading Economics (https://tradingeconomics.com/puerto-rico/inflation-cpi/forecast)

PRASA's pension costs in lieu of the contributions to the ERS, net of expected savings with the implementation of Act 26-2017. Also, PRASA is projecting to decrease its headcount to 4,900 employees by the end of FY2019 and maintaining it throughout the Forecast period.

Based on the historical results and the assumptions made by PRASA in its projections (discussed below), and assuming that PRASA's plan to self-fund its pensions costs will be implemented, Arcadis believes that the Payroll and Benefits projections are reasonable. However, as further discussed below, if PRASA is required to continue the ERS contributions, in addition to self-funding its pension costs, the forecasted Payroll and Benefits costs will not be achieved, and costs would materially increase affecting PRASA's Forecast.

Headcount and Overtime Assumptions

Over the past six fiscal years PRASA has reduced its staff levels by about 2.6% each year, remaining at an average of approximately 4,785 employees since FY2013.

As of June 30, 2016, and June 30, 2017, PRASA had a total headcount amount of 4,798 and 4,654 employees, respectively. As of June 30, 2018, PRASA had a total headcount of 4,625 employees (including 335 employees qualified under the Voluntary Pre-Retirement Program to be discussed in more detail below). As a consequence of Hurricanes Irma and María, PRASA received many resignations and leave from employees that were, at the most part, either emigrating from Puerto Rico or hired in new jobs. Approximately 164 employees resigned during the months of September 2017 through June 2018. In addition to the amount of resignations received during FY2018, another 393 employees resigned as a result of two government-related programs: 1) Voluntary Pre-Retirement Program as stipulated under Act 211-2015 and 2) ERS Voluntary Transition Program as stipulated under the Administrative Orders OA-2017-5 and OA-2018-5. Both programs are further discussed in more detail.

As of June 30, 2018, PRASA had over 1,783 vacant positions and was looking to supplement certain key areas. As of August 31, 2018, PRASA's hiring plan focused mainly in employing personnel for the Customer Service, Maintenance and Operations Departments. Staffing needs identified involves electromechanics, plant operators, and supervising and managerial positions in all three aforementioned departments. The FY2019 Annual Budget assumes a total of 4,900 employees, or a net increase of 275 employees from FY2018 headcount. The Forecast period also assumes a total of 4,900 employees.

Based on FY2018 preliminary results through June 30, 2018, the current overtime level is at approximately 11% of total payroll costs, which already incorporates the overtime factor reduction as required by Act 26-2017 (described below). PRASA has assumed a rate of overtime of 8% (as percentage of payroll) along with other adjustments that result in an increase of the average annual cost per employee for the FY2019 Annual Budget and in every year thereafter of the forecast period.

Legislated Acts Assumptions

Act 26-2017 – Act No. 26 was enacted on April 29, 2017 (Act 26-2017) to ensure compliance with the Government's Fiscal Plan approved and certified by the PROMESA Oversight Board on May 13, 2017 and re-certified post Hurricanes Irma and María on June 29, 2018. Act 26-2017 supersedes any previous act. Among other measures, Act 26-2017 requires all marginal benefits to be the same for all employees of the Government of Puerto Rico including all public agencies, instrumentalities and

corporations, such as PRASA. The act freezes and reduces some payroll benefits or compensation such as:

- Vacation licenses are reduced from 30 days to 15 days (at an accumulation rate of 1.25 per month of service and may be accumulated to up to a maximum of 60 days by the end of each natural year)
- Sickness licenses are reduced from 18 days to 12 days (at an accumulation rate of 1 per month of service and may be accumulated to up to a maximum of 90 days by the end of each natural year) for employees recruited after February 4, 2017
- Licenses in excess will not be paid out, except for vacation days accrued up to 60 days
- Elimination of all bonuses, except for Christmas bonuses, which shall have a maximum of $600
- Extra hours will be compensated at a maximum rate of 1.5x regular hourly rate

Act 26-2017 impact, as presented above was incorporated in PRASA's Payroll and Benefits costs for the Forecast, except for the elimination of the Christmas Bonus required by the Oversight Board. However, following the Central Government's public policy, PRASA and PRFAFAA consider local laws, such as Act 26-2017, to have supremacy over any other stipulation. As such, PRASA will pay the Christmas bonus to its qualifying employees up to $600 per year. Nonetheless, PRASA has indicated that efforts will be made to identify savings from other Operating Expense categories to achieve the bottom line total Operating Expenses as budgeted and required by the Oversight Board for the Forecast period.

Voluntary Pre-Retirement Program (Act 211-2015) – As a result of the fiscal crisis, the Puerto Rico Government enacted Act No. 211 on December 8, 2015 (Act 211-2015), which created a "Voluntary Pre-Retirement Program". Act 211-2015 intends to create a program, "whereby eligible employees of the Government of the Commonwealth of Puerto Rico may voluntarily separate from service by receiving incentives until they meet the requirements for retirement; provide for the requirement of credited years of service needed to qualify for this Program; establish the timeframe for employees to exercise their option to avail themselves of the Voluntary Pre-Retirement Program; provide the special incentives that shall be granted to employees who avail themselves of the Program; provide the requirements needed to implement the Program; and for other related purposes".

The program seeks to offer incentives to certain eligible employees to voluntarily retire early and still receive compensation equal to 60% of their average salary, payout of unused vacation and sick leaves (as per Act 66-2014) and keep their health insurance coverage for a term of two years. These incentives are applicable until they meet the requirements for full retirement. Consequently, the program attempts to reduce the workforce progressively and voluntarily, thus allowing for the economy to undergo a transition process. This may reduce expenses such as payroll and "fringe benefits" costs on PRASA but requires that OMB evaluate and certify that employees eligible for the program and under consideration represent savings for PRASA. Besides the reduction of expenses, Act 211-2015 stipulates that the resulting vacant positions from the retirement program be eliminated, and that agencies take administrative or operational measures to restructure in the absence of these positions. However, OMB might authorize to maintain positions, if certified to be essential, and in accordance with the plan submitted by PRASA. PRASA has included the projected benefits from this

program as part of PRASA's Revised Fiscal Plan's cost savings initiatives discussed in line 21 of Exhibit 1.

As stated, this pre-retirement program will impact headcount and consequently overtime. As of June 30, 2018, PRASA submitted to OMB approval of a total of 351 employees eligible for the pre-retirement program, of which 335 were approved to proceed.

ERS Voluntary Transition Program Assumptions

As a result of the fiscal crisis and the hurricanes impact which exacerbated such crisis, AAFAF on behalf of the Puerto Rico Government circulated an Administrative Order (OA-2017-5) on November 7, 2017, which created an "ERS Voluntary Transition Program" intended to create an alternate program for eligible employees under the ERS. On April 18, 2018 a second Administrative Order (OA-2018-5; amended on June 29, 2018 as OA-2018-9) was circulated extending the program to a second phase, and on October 23, 2018, a new Administrative Order (OA-2018-13; amended on November 15, 2018 as OA-2018-14) further extended the program to a third phase. Employees will have until November 30 and December 15, respectively to enroll the programs.

Eligible employees who avail from the program and voluntarily resign to their position shall receive economic incentives consisting of 6-month salary as well as a medical plan incentive and payout of unused vacation leaves up to 60 days, according to Act 26-2017.

As previously mentioned in Section 3, during the first phase of the program, a total of approximately 107 employees applied of which 58 were approved and voluntarily resigned by June 30, 2018. No employees retired on the second phase. For the third phase of the ERS Voluntary Transition Program, 92 employees were eligible and approved of which 41 employees resigned effectively by November 30, 2018 and 51 resigned effectively by December 31, 2018.

Collective Bargaining Agreements Assumptions

In FY2012, PRASA and its larger employee union, the UIA-AAA by its Spanish acronym, signed a new Collective Bargaining Agreement (CBA), effective from January 2012 through December 2015. It included certain retroactive and future economic agreements that have an impact on PRASA's payroll and benefits expense projections, which started in FY2013. Also, PRASA and its second employee union, the HIEPAAA by its Spanish acronym, signed a new CBA effective from May 2012 through June 2016. It also contains certain economic agreements (i.e., salary increases) that also have an impact on PRASA's Payroll and Benefits expenses. Under Act 66-2014, PRASA was able to negotiate some terms included under the CBAs with both UIA-AAA and HIEPAAA. Both UIA-AAA and HIEPAAA unionized personnel agreed with PRASA that the CBAs will continue as stipulated except for certain terms which include: the saving plans, salary increases, holiday and sick day benefits, among others. Act 3-2017 extends the negotiation term until June 30, 2021 for the non-economic clauses included in the CBAs. However, Act 26-2017 supersedes all previous agreements or laws and requires that the new stipulated measures regarding human resources, payroll, benefits and compensation to be implemented even for union employees. PRASA has included in its Payroll and Benefits Forecast period the costs and savings associated with Act 26-2017 implementation.

Pension Costs Assumptions

The Central Government's ERS has been facing a significant number of financial difficulties, as reflected in its net pension liability and historical funding shortfalls which are expected to continue. Because PRASA's employees and retired employees participate in the ERS, PRASA is responsible for the portion of the net pension liability attributable to its employees.

As provided in a circular letter from the Department of Treasury on June 27, 2017 (Number 1300-46-17), beginning in FY2018, employers that participate in the ERS will have to pay the pension benefit of its retired employees on a Pay-Go basis due to the lack of sufficient liquid assets in the ERS. Therefore, PRASA's FY2018 preliminary projections and FY2019 Annual Budget consider the impact of fully funding the retirement (pension) benefit payments for PRASA's retired employees on a Pay-Go basis, based on actuarial reports provided by the ERS. Also, PRASA eliminated from its projections all the employer contributions to the retirement system including the Cost of Living Allowance (COLA) contribution and the Annual Additional Contribution to the ERS. The amount projected does not include any additional future contributions to the ERS, which PRASA is not expected to comply with.

The Oversight Board, however, has requested PRASA to include in its Forecast period a reduction in the pension payments made on a Pay-Go basis as is presented in Table 8-21. Nonetheless, PRASA has indicated that in line with the Central Government's public policy, pension costs will not be reduced to the extent it is possible.

2. Electric Power (Exhibit 1, line 15) – PRASA's FY2018 preliminary projections for Electric Power, prior to reductions due to PRASA's Revised Fiscal Plan expense savings initiatives, and excluding the impact of the 2017 Hurricanes, and prior to capitalization, total $101.9M. This amount is approximately $51.4M less than the budgeted amount as a result of electric power service interruptions after the 2017 Hurricanes. PRASA has projected an electric power expense of $140.2M for FY2019, prior to PRASA's Revised Fiscal Plan expense savings initiatives and excluding the impact of the 2017 Hurricanes, which is $38.3M more than FY2018 projected results. PRASA's Forecast for Electric Power is based on a PREPA rate of $0.20 per kWh required by the Oversight Board. Total costs are estimated to decrease to approximately $129M by FY2023. PRASA finds this cost optimistic.

   In addition to the PREPA transformation rate, PRASA's projected cost of electric power considers the projected and expected reductions in consumption from Energy Performance Contracts (EPCs) and reductions in cost from Power Purchase Agreements (PPAs, i.e. renewable energy) that have been completed YTD as part of PRASA's Comprehensive Energy Management Program. In FY2018, the electric power purchased from PREPA decreased by 0.5% kWh as a result the reduction in electricity usage caused by electric service interruption due to the hurricanes impact, and internal energy savings initiatives through the currently on-going initiatives under the Comprehensive Energy Management Program (in addition to the reduction to be achieved by PRASA's Revised Fiscal Plan expense reduction initiatives). Refer to Exhibit 1, Line 21 for a detailed explanation on PRASA's Revised Fiscal Plan expense savings initiatives.

   Arcadis finds PRASA's forecast period projection for Electric Power optimistic. The expected savings to be achieved through the Comprehensive Energy Management Program may not be accomplished in its entirety, particularly the savings projected to be obtained from regional initiatives as they could be cancelled out by increasing energy usage of aging equipment that PRASA has had to delay

replacing because of lack of funding. Also, PREPA's transformational rate of $0.20 per kWh is low compared to PRASA's recent historical rate costs and submitted rate projections. Close monitoring of electric energy usage must continue and PRASA shall adjust as necessary. Additional discussion on PRASA's Electric Power assumptions is provided below.

Electric Energy Tariff Assumptions

On December 2015, PREPA announced that the preferential electricity all-in-rate tariff with PRASA was going to be eliminated effective in July 1, 2016. Since this date, PRASA has been paying for the energy according to the corresponding current rate based on the facilities' electric current and voltage capacity. Nonetheless, during FY2016 and FY2017, the electric power rate had been less than $0.22 per kWh given the sustained low oil barrel costs. However, as part of its financial and debt restructuring plan, PREPA has implemented a transitional charge of $0.013 per kWh. In recent months, PRASA has indicated that the average PREPA (blended) rate cost has been constantly fluctuating between $0.21-$0.22 per kWh. Thereby, the assumption used in the Forecast period of $0.20 per kWh is optimistic considering the great variability and fluctuations oil barrel costs and considering PREPA's underdevelopment restructuring plan.

Comprehensive Energy Management Program and Regional Initiatives Assumptions

PRASA has included projected savings in consumption and costs as a result of its Comprehensive Energy Management Program, which PRASA has undertaken to help manage and reduce its electricity expense. Since 2014, PRASA has implemented separate processes to engage the private sector in investing in energy related projects with Demand Side Projects through EPCs and Supply Side Projects through PPAs, and other internal measures such as Regional Initiatives. However, due to PRASA's fiscal situation, the status of such projects has been impacted since FY2016, as previously discussed in Section 5. PRASA's Revised Fiscal Plan projects that the PPA initiative (solar and gasification) will generate an average of 11.5 million kWh per year at rate of $0.15 per kWh through FY2023. Also, PRASA expects to enter into a PPA contract for solar power beginning FY2020 and estimates these will generate an average of 23.4 million kWh per year at rate of $0.13 per kWh through FY2023. PRASA projects that the third-party contract for the execution of the measurement and verification phase and the operation and maintenance of the three completed EPCs (Sergio Cuevas, Superaqueduct and Puerto Nuevo) will remain on hold during FY2019 and thus is not including any additional savings from EPCs (other than what is already being saved annually from the completed EPCs) in its forecast period. PRASA also projects to have reduced 2.4 million kWh with the EPCs initiative during FY2018. Regional Initiatives are ongoing in FY2019, although they have also been impacted by PRASA's fiscal situation. These initiatives are projected to result in an estimated total consumption reduction of 0.5% per year.

Consumption Growth Rate Assumptions

PRASA has reduced the electric power consumption from PREPA from 743 million kWh (FY2013) down to 542 million kWh in FY2018. However, the reduction in consumption experienced in FY2018 was mostly driven by the electric power service interruption due to the hurricanes. For FY2019, PRASA is projecting that its total consumption will be 630 million kWh, of which 619 million kWh will be power consumption bought from PREPA, net of the physical losses' initiative (refer to PRASA's Revised Fiscal Plan cost savings initiative in line 21 of Exhibit 1). This PREPA consumption projection

also considers the Regional Initiatives expected to be achieved in FY2019 and does not consider any additional contribution from EPCs. For the Forecast period, PRASA is projecting that its total consumption will be at an average of 609 million kWh, of which an average of 574 million kWh will be power consumption bought from PREPA, net of the physical losses' initiative (refer PRASA's Revised Fiscal Plan cost savings initiative in line 21 of Exhibit 1).

3. Maintenance and Repair (Exhibit 1, line 16) – PRASA's FY2018 preliminary projections for Maintenance and Repair prior to PRASA's Revised Fiscal Plan expense savings initiatives and prior to the September 2017 Hurricanes impact, amounts to $45.1M, which is $7.8M less than the FY2018 preliminary results as a result of the hurricanes impact. Increase in maintenance cost as a result of the hurricanes impact is presented under a separate line and discussed in Section 8.4.3.1. The FY2019 Annual Budget for Maintenance and Repair, prior to PRASA's Revised Fiscal Plan expense savings initiatives and prior to the September 2017 Hurricanes impact is $48.1M, which is about $3.0M more than the FY2018 preliminary results based on the assumption that a portion of the maintenance works will be performed as part of the emergency works post Hurricanes Irma and María. PRASA projects Maintenance and Repair expenses to increase from $48.8M in FY2020 to $50.9M in FY2023.

   Arcadis believes PRASA's Forecast period projections for Maintenance & Repair expenses is low, considering all the improvements that PRASA has deferred over the past three years, and the budget constraints that have limited infrastructure maintenance and repair.

4. Chemicals (Exhibit 1, line 17) – PRASA's FY2018 preliminary projections for Chemical costs, prior to PRASA's Revised Fiscal Plan expense savings initiatives, amount to $24.9M, $7.6M less than the budgeted amount, based on lower volume of water and wastewater treatment as a result of the hurricanes impact. Incremental chemical costs as a result of the hurricanes impact is presented under a separate line and discussed in Section 8.4.3.1. Although Chemical costs are usually affected by inflation and worldwide demand as they are mostly commodities, over the past few years PRASA has been able to control these costs with consumption optimization savings and by negotiating costs given the high volumes of chemicals purchased. The three-year average for chemical cost is approximately $29.5M. In FY2019, PRASA is projecting approximately $33.2M in Chemical costs prior to PRASA's Revised Fiscal Plan expense savings initiatives and prior to the September 2017 Hurricanes impact, which is a slight increase (to account for some inflationary additional costs) over FY2017 projected results (since FY2018 preliminary results have the hurricane impact factor). For FY2020 through FY2023, PRASA has applied an annual increase based on the assumed inflation rate (1.45% average over forecast period) on Chemical expenses, increasing from $33.6M in FY2020 to $35.1M in FY2023, prior to PRASA's Revised Fiscal Plan expense savings initiatives. Arcadis believes PRASA's Forecast period projections for Chemical expenses is reasonable, so long as inflation rates are not above those assumed by the Government and PRASA.

5. Insurance (Exhibit 1, line 18) – Preliminary projections for Insurance expenses in FY2018 total $7.5M, which is in line with the budget. PRASA has budgeted $19.2M for Insurance expenses in FY2019, which is $11.7M higher than the FY2018 preliminary projections. This amount considers negotiated adjustments to PRASA's insurance premiums for the fiscal year, which are expected to materially increase as a result of the emergency claims in FY2018 due to Hurricanes Irma and María. PRASA has applied an annual increase based on the assumed adjusted inflation rate on Insurance expenses

throughout the forecast period, increasing from $19.5M in FY2020 to $20.4M in FY2023. Arcadis believes the Forecast period projections for Insurance expenses is reasonable as coverages are adequate. However, several recommendations were made to PRASA to modify or add insurance coverages including cyber security and terrorism coverage. If PRASA adopts these recommendations, if the inflation rate is higher, and/or if insurance premiums increase, PRASA's Insurance expense could be higher than projected.

6. Other Expenses (Exhibit 1, line 19) – Other Expenses include, for example: the Superaqueduct O&M contract, professional services (i.e. the NRW recovery office and call centers), materials and supplies, security, sludge treatment and disposition, rentals, and water transport. FY2018 preliminary projections for Other Expenses total $150.3M prior to PRASA's Revised Fiscal Plan expense savings initiatives and prior to the September 2017 Hurricanes impact, $15.5M less than what was budgeted. FY2018 preliminary projections were adjusted based on year-to-date results under the current post-emergency situation. PRASA has included $153.2M for Other Expenses in its FY2019 Annual Budget prior to PRASA's Revised Fiscal Plan expense savings initiatives and prior to the September 2017 Hurricanes impact, which represents an increase of approximately 1.9% over FY2018 preliminary projections and assumes return to normal level of operations and requirements after the September 2017 Hurricanes impact. Incremental other expenses costs as a result of the hurricanes impact is presented under a separate line and discussed in Section 8.4.3.1. Other Expenses budget has been reduced by 8.1% over the past five fiscal years to account for the reduction in budget PRASA has had to pursue to control its revenues and expenses. PRASA is projecting that Other Expenses will increase year-over-year based on the adjusted assumed inflation rate, increasing from $151.5M in FY2020 up to $158M in FY2023.

   Arcadis has reviewed PRASA's projections for this expense category and finds the budget amount reasonable. However, PRASA should monitor actual costs, particularly for fuels and oils, given the projected increases that could materialize throughout the fiscal year.

7. PRASA's Revised Fiscal Plan Expense Savings Initiatives (Exhibit 1, line 20) – The Expense Savings initiatives as included in PRASA's Revised Fiscal Plan include: reduction of physical water losses, other expense reductions, elimination of the Christmas bonus and reductions in pension contributions. However, as previously discussed, the elimination of the Christmas bonus and the reduction in pension payments were included by the Oversight Board. As will be discussed further below, in lieu of carrying out these initiatives PRASA intends to identify savings from other Operating Expense categories upholding the Central Government's and PRASA's public policy. Table 8-21 presents the financial projection of these initiatives for the forecast period.

Table 8-21. PRASA's Revised Fiscal Plan Expense Savings Initiatives ($, Millions)

	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023
PRASA's Revised Fiscal Plan Initiatives	Preliminary	Annual Budget	Projected	Projected	Projected	Projected
Physical Water Losses	$2.2	$6.3	$10.0	$10.6	$10.2	$11.3

PRASA's Revised Fiscal Plan Initiatives	FY2018 Preliminary	FY2019 Annual Budget	FY2020 Projected	FY2021 Projected	FY2022 Projected	FY2023 Projected
Other Expenses Reduction	0.9	3.8	7.1	8.3	9.9	11.4
Christmas Bonus Elimination[2]	0.0	3.3	3.3	3.3	3.3	3.3
Pension Reduction[2]	0.0	0.0	9.6	9.5	9.4	9.4
Total Expense Savings[1]	**$3.1**	**$13.4**	**$30.0**	**$31.7**	**$32.8**	**$35.4**

[1] Numbers may not add up due to rounding.
[2] Following the Central Government's and PRASA's public policy, in lieu of implementing these initiatives, PRASA intends to identify savings from other Operating Expense categories.

While PRASA is committed to these initiatives (further described below), given the status of their development, and considering the coordination, planning and implementation efforts still required to be completed; it is likely that the timing for achieving the projected benefits will not be as expected by PRASA. Arcadis, therefore, finds these projections optimistic and recommends that PRASA re-evaluate the status and schedule of these initiatives. If the benefits are not realized as projected, to meet its Forecast, PRASA would likely have to reduce the amount of CIP investments planned and/or modify the projected rate increases.

Physical Losses Reduction Initiative

As previously discussed, physical losses are the largest component of NRW in PRASA's water balance. This initiative includes a series of efforts to reduce physical losses and thus NRW. PRASA expects to obtain cost savings in the amount of $50.7M from FY2018 to FY2023. PRASA expects to obtain these savings through the continuation of the water leak detection program, water pressure management and optimization, and efficiently addressing reported leaks reducing the number of days required to repair leaks. These cost savings consider that PRASA will save chemical and electricity costs from a reduction in water losses and hence, in production. To improve the system's efficiency, PRASA plans on implementing a tank telemetry and level monitoring initiative at 65% of its storage tanks, and on reducing the water production estimation by installing meters at most of its WTPs. PRASA has a goal of reducing water production in the System to 450 MGD by 2023. This initiative will require a capital investment in monitoring/communication equipment of approximately $3M during the projected period but is expected to help PRASA reduce overflows and control physical water losses.

In its FY2019 Annual Budget PRASA is expecting cost savings for these initiatives in the amount of $6.3M impacting the expense categories as follows: $7.7M cost savings in Electric Power, $2M cost savings in Chemicals costs, and $3.5M additional expenses for Maintenance and Repair due to required water pipelines maintenance and the acquisition of additional equipment. PRASA is

projecting to achieve a reduction of 35 million kWh from power consumption bought from PREPA in FY2019 from this initiative and an average reduction of million 50 kWh in FY2020 through FY2023.

Other Expenses Reduction

In its FY2018 preliminary results, PRASA included additional reductions in Other Expenses of about $0.9M and is projecting $3.8M of additional reductions in its FY2019 Annual Budget. PRASA expects to obtain cost savings in the amount of $41.4M from FY2018 to FY2023 by the implementation of the Voluntary Pre-Retirement Program, as created by Act 211-15.

Pension / Labor Reform and Christmas Bonus

The Oversight Board has included in PRASA's Revised Fiscal Plan the elimination of the Christmas bonus benefit starting on FY2019 to achieve cost savings estimated of $16.4M through FY2023 ($3.3M per year). However, following the Central Government's public policy, PRASA will consider local laws, such as Act 26-2017, to have supremacy over any other stipulation. As such, PRASA expects to pay the Christmas bonus to its employees throughout the Forecast period.

Similarly, the Oversight Board has requested to include in PRASA's Revised Fiscal Plan a reduction in the pension payments made on a Pay-Go basis. The requirement is to reduce pension contributions by 10% from FY2020 onwards in line with the Central Government's revised new Fiscal Plan for Puerto Rico to achieve a $37.9M cost savings through FY2023. However, PRASA has indicated that in line with the Central Government's and PRASA's public policy, to the extent possible pension payments will not be reduced.

8. Capitalized Expenses (Exhibit 1, line 21) – PRASA's external consultant, PJ Sun LLC, completed the most recent review of PRASA's capitalization rate on April 2017. The recommendations included in the updated report, as provided by PRASA, reduce PRASA's capitalization rate from 4.7% to 3.7%. FY2018 preliminary results for Capitalized Expenses amount to $9.7M. PRASA has included in its FY2019 Annual Budget $27.0M for Capitalized Expenses. For FY2020 to FY2023, PRASA is projecting an increase from $26.7M to $27.3M.

   Arcadis assumes that the estimation for expense capitalization used by PRASA is reasonable given that, in previous years, it has been accepted by PRASA's outside, independent auditors in the preparation of its financial statements. Arcadis has not reviewed this estimation in detail and, as such, is not providing an opinion on the reasonableness of the recommended capitalization percentage. However, it should be considered that to the extent that PRASA's financial situation places additional burden and budget constraints at the operational level, the actual amount of R&R and maintenance and repair expenditures that can be capitalized could be reduced (as in recent years), thereby reducing the amount of capitalized expenses.

9. Hurricanes' Impact on Operational Expenses (Exhibit 1, line 23) – As previously mentioned in Section 8.4.2, PRASA estimated a total hurricane impact to operational expenses in the amount of $265M. The projection of the total incremental expenses due to the hurricanes impact reflects the best estimate of PRASA based on information submitted to FEMA. The major components included as part of this immediate incremental expenses estimate include overtime payroll for employees working during the emergency; maintenance, diesel refueling and logistics for emergency power generators; the insurance deductible; investment on auxiliary backup generators (not included in CIP); water distribution services (i.e. oasis); security measures; among others. This amount is subject to the final

estimated extent of the hurricanes' damages, which PRASA is still refining. For FY2018 and FY2019, PRASA is forecasting to receive FEMA funding reimbursement at a 90% recovery rate of the total estimated incremental expenses of $265M ($238M reimbursement).

Arcadis reviewed the MAT, as amended, to determine the adequacy of the allocation of both insurance proceeds and FEMA reimbursements/grants to be obtained as a result of the impact of the September 2017 Hurricanes, and Arcadis requested PRASA legal opinion on this matter. As provided by PRASA, FEMA funds shall not be treated as Operating or Authority Revenues. FEMA does not provide grants to substitute Operating Revenues. Rather, FEMA funds are directed to disaster-related expenses to be used exclusively to cover costs of the eligible emergency and permanent work approved by FEMA. To the extent FEMA funds are received by PRASA as mentioned, such funds shall not be subject to the gross pledge set forth under the MAT as these funds cannot be used to pay bondholders. FEMA funds shall therefore be deposited to the credit of the Current Expense Fund after they are used to reimburse PRASA for Current Expenses. FEMA grants received for the repair, replacement or reconstruction of the damaged or destroyed property have been applied to the Capital Improvement Fund as discussed in more detail below.

Therefore, PRASA is projecting to deposit $211.3M and $26.9M to the credit of the Current Expense Fund during FY2018 and FY2019, respectively. However, Arcadis finds that the total $238M FEMA reimbursement budgeted to be received in FY2018 and FY2019 may be optimistic. In FY2018, PRASA only received $70.7M from FEMA for emergency related work (i.e. generator rentals and acquisition); and as of January 31, 2019, PRASA had received approximately $30M in additional funds for these types of work. FEMA has officiated to grant $14M in additional funds to cover generators and security related expenses, and additional Project Worksheets (PWs) are under FEMA evaluation or under the process of being submitted by PRASA.

8.5 Debt Service

8.5.1 Master Agreement of Trust

The MAT contains specific DSC requirements that must be met by PRASA including, but not limited to, a Rate Covenant. As stated in the Rate Covenant defined in the 2012 MAT (as amended), PRASA has covenanted to establish and collect rates, fees and charges so that it meets the following four independent requirements[25] (which will be calculated annually no later than six months after the end of each fiscal year based on Operating Revenues and Authority Revenues set forth in PRASA's most recent audited financial statements):

- Operating Revenues shall be sufficient to be at least equal to 250% of annual debt service with respect to Senior Indebtedness for the current fiscal year;
- Operating Revenues shall be sufficient to be at least equal to 200% of annual debt service with respect to Senior Indebtedness and Senior Subordinate Indebtedness for the current fiscal year;

[25] Capitalized terms as defined in the MAT, as amended.

- Operating Revenues shall be sufficient to be at least equal to 150% of annual debt service with respect to all Bonds and Other System Indebtedness for the current fiscal year; and
- Authority Revenues, shall be sufficient to be at least equal to:
    - Annual debt service on Indebtedness;
    - Current expenses;
    - the amounts, if any, necessary to be deposited in any Senior Debt Service Reserve Account, Senior Subordinate Debt Service Reserve Account or Subordinate Debt Service Reserve Account to restore the amount on deposit therein to the amount of the applicable Debt Service Reserve Requirement (provided that each such Accounts will be deemed to be funded at the applicable Debt Service Reserve Requirement for so long as the deposits required by the MAT are being made);
    - the amount, if any, necessary to be deposited in the Operating Reserve Fund to maintain the balance therein at the Operating Reserve Fund Requirement; and
    - the amount, if any, necessary to be deposited in the Capital Improvement Fund and the Rate Stabilization Account of the Surplus Fund in accordance with the Annual Budget for the current fiscal year.

Should PRASA decide to issue additional debt while any of the debt issued under the MAT (as amended) is outstanding, the additional bonds test (ABT) requirements of the MAT would also have to be met. The ABT is a measure of whether DSC will still be met after the proposed, additional bonds are issued. The ABT requirements which PRASA must meet include the following:

- Senior Bonds ABT
    - Operating Revenues are at least equal to 2.5x Senior Bonds maximum annual debt service; and
    - Operating Revenues are at least equal to 1.5x maximum annual debt service on all System Indebtedness.
- Senior Subordinated Bonds ABT
    - Operating Revenues are at least equal to 2.0x combined Senior Bonds and Senior Subordinate Bonds maximum annual debt service; and
    - Operating Revenues are at least equal to 1.5x maximum annual debt service on all System Indebtedness.
- Subordinated Bonds ABT
    - Operating Revenues are at least equal to 1.5x maximum annual debt service on all System Indebtedness.

A summary of PRASA’s MAT DSC and ABT requirements is presented in Table 8-22.

Table 8-22. Summary of 2012 MAT DSC Requirements

Lien Level	Debt Secured	DSC for Additional Bonds Tests (MADS)[1]	DSC for Covenant Test	In Default if DSC not Achieved?
Senior	2008, 2012 & 2015 Senior Bonds	2.5/1.5	2.5	Yes
Senior Subordinate	Bond Anticipation Note & Senior Subordinate Bonds	2.0/1.5	2.0	Yes
Subordinate	Not currently applicable	1.5	1.5	Yes
Below Subordinate	Commonwealth Guaranteed Indebtedness	N/A	1.0	No
Below Subordinate	Commonwealth Supported Obligations	N/A	1.0	No

[1] Two tests apply to future debt. The first test is Operating Revenues divided by existing and proposed debt service (at the existing lien level); the second test is Operating Revenues divided by existing and proposed debt service (regardless of lien level) plus specified Reserve Fund deposits.

In accordance with the MAT, the flow of funds shall be as follows:

- Senior, Senior Subordinate and Subordinate debt (and any debt that is secured on a parity therewith) takes priority over current Operating Expenses.
- Commonwealth Guaranteed Indebtedness (CGI) and Commonwealth Supported Obligations (CSO) would continue to be funded/paid only after funding of current operating expenses and other funds with priority over CGI and CSO.
- All revenues shall be deposited by PRASA in the first instance to the Operating Revenue Fund to make the required deposits set forth below. The Trustee transfers the moneys on deposit in the Operating Revenue Fund to the following funds in the following order or priority:
    - Senior Bond Fund – to fund principal and interest payments on Senior Indebtedness;
    - Senior Debt Service Reserve Fund – to fund deficiencies in the reserve fund upon the issuance of additional Senior Bonds or withdrawals or valuation losses;
    - Senior Subordinate Bond Fund – to fund principal and interest payments on Senior Subordinate Indebtedness;
    - Senior Subordinate Debt Service Reserve Fund – to fund deficiencies in the reserve fund upon the issuance of additional Senior Subordinate Bonds or withdrawals or valuation losses;
    - Subordinate Bond Fund – to fund principal and interest payments on Subordinate Indebtedness;
    - Subordinate Debt Service Reserve Fund – to fund deficiencies in the reserve fund upon the issuance of additional Subordinate Bonds or withdrawals or valuation losses;

- Current Expense Fund (a new fund under the MAT) – to fund current operating expenses of PRASA;
- Operating Reserve Fund – to fund Operating Reserve Requirement and to pay reimbursement obligations on Operating Reserve Facilities;
- Capital Improvement Fund – to fund the Capital Improvement Fund Requirement;
- Commonwealth Payments Fund – to fund principal and interest payments on CGI and CSO; and
- Surplus Fund – to fund the Rate Stabilization Fund and, thereafter, for any lawful purpose.

8.5.2 Debt Service Coverage

A summary of PRASA's existing debt service obligations and coverages for FY2018 through FY2023 are presented in Exhibit 1 and summarized in Tables 8-23 through 8-25. PRASA's debt service includes: Senior and Senior Subordinate Bonds (the 2008 Series A and B Senior Lien Revenue Bonds, Revenue Refunding Bonds 2008 Series A and B, and the 2012 Series A and B Senior Lien Revenue Bonds), as well as the USDA RD bonds and USEPA SRF Loan debt, among others.

FY2018 debt service obligations totaled $232.2M, of which $230.8M were Senior lien obligations, and $1.4M were subordinated obligations. As shown, PRASA did not make payments for CSO debt. Total budgeted debt service payments as per current amortization schedules (currently under restructuring) were approximately $321.6M for FY2018.

On June 30, 2016 PRASA entered into forbearance agreements with both (i) USDA and (ii) the Puerto Rico Infrastructure Financing Agency (PRIFA), the Environmental Quality Board (EQB) and the PRDOH (all three for the SRFs), which were later extended in various occasions and now expire on May 31, 2019 for SRF and April 30, 2019 for USDA, unless further extensions to such forbearance periods are granted. The forbearance agreements grant PRASA a reduction of principal and interest on both programs of approximately $60M per year ($58.1M expected for FY2018), which was reduced from the total FY2018 CGI debt service leaving a balance to be paid in FY2018 projected at $22.3M. The payment of the balance owed since June 30, 2016 is expected to be included as part of a potential debt restructuring. Additionally, as in FY2015, FY2016 and FY2017, no funds were deposited in the CSO Account during FY2018, and accordingly, no funds were transferred by PRASA to the trustee of the PFC Bonds for the payment of debt service that was due on the PFC Bonds as this debt is payable solely from legislative appropriations.

In FY2018, PRASA did not make any payments due under the Term Loan. However, this debt is payable from any Surplus Fund under the MAT. Finally, as communicated by the Trustee via letter dated December 5, 2018, as of November 30, 2018, the Commonwealth Payments Fund deficiency is approximately $136.1M, which is covered by the Forbearance Agreements. Nevertheless, such deposit and payment shortfalls are not considered to be an Event of Default under the MAT. In FY2019, PRASA is projecting deposits to the Commonwealth Payments Fund to cover CGI debt in the amount of $81.7M, prior to the impact of the ongoing debt restructuring and the forbearance agreements. This excludes any CSO debt payments due of $9M which PRASA has assumed will not pay going forward as it is a PFC debt. In future years, PRASA is projecting deposits to the Commonwealth payments fund to cover CGI debt in the amount of $80.7M in FY2020 up to $88.0M in FY2023. PRASA has assumed that it will not

pay the CSO debt in its Forecast period totaling about $9M per year, as included in PRASA's Revised Fiscal Plan.

Table 8-23. FY2018 Debt Service Obligations and Preliminary Results ($, Thousands)

Debt Category	FY2018 Obligations without Forbearance Agreements[1]	FY2018 Preliminary Results[2]
Senior Debt	$230,788	$230,788
Senior Subordinated Debt	1,387	1,387
Subordinated Debt	-	-
Commonwealth Guaranteed Indebtedness	80,402	22,317
Commonwealth Supported Obligations	8,999	-
Total	**$321,577**	**$254,492**

[1] Considers the full debt service obligations due in FY2018 per amortization schedule; excludes forbearance agreements impact.
[2] Considers the forbearance agreements impact, no payment of the PFC bonds under the CSO nor the GDB Term Loan.

Table 8-24. FY2019-FY2023 Debt Service Obligations ($, Thousands)

Debt Category	FY2019 Projection	FY2020 Projection	FY2021 Projection	FY2022 Projection	FY2023 Projection
Senior Debt	$230,790	$230,791	$230,790	$230,789	$230,788
Senior Subordinated Debt	-	-	-	-	-
Subordinated Debt	-	-	-	-	-
Commonwealth Guaranteed Indebtedness	37,227	80,651	87,967	88,079	88,023
Commonwealth Supported Obligations	-	-	-	-	-
Total Debt	**$268,017**	**$311,441**	**$318,757**	**$318,868**	**$318,811**

[1] FY2019 considers the debt service obligations due considering forbearance agreements benefits. No payments to the CSO in FY2019 per PRASA's Revised Fiscal Plan (annual payment reduction of $9M). FY2020-FY2023 considers the full debt service obligations due per current amortization schedules prior to the impact of debt restructuring expected savings No payments to the CSO in FY2019 per PRASA's Revised Fiscal Plan (annual payment reduction of $9M).

The DSC results presented in Table 8-25 for the forecast period have been calculated using the Rate Covenant requirements per the MAT, as amended, and debt service obligations.

As shown in Table 8-25, while PRASA's Operating Revenues are projected to be sufficient to meet Senior Lien debt service payments, based on the projections included herein, PRASA's Authority Revenues will not be sufficient to meet the Rate Covenant requirements of 1.0x on All Obligations in FY2018. However, PRASA expects to reach the DSC requirement on All Obligations for FY2018 by forbearance agreements and restructuring the debt based on creditors' relief as approved by PRASA's Governing Board of $273M. For FY2019, PRASA is projecting to meet All Obligations. Note that the calculated DSC results for

FY2018 and FY2019 as presented in Table 8-25, consider both the forbearance agreements with USEPA and USDA and expected FEMA/insurance reimbursements. PRASA's forecasted Operating and Authority Revenues would not be sufficient to meet all DSC requirements through FY2023, unless PRASA restructures its debt.

Table 8-25. FY2018 - FY2023 Debt Service Coverage

Debt Service Level	DSC Requi-rement	FY2018 Preliminary DSC[4]	FY2019 DSC[5]	FY2020 DSC[6]	FY2021 DSC[6]	FY2022 DSC[6]	FY2023 DSC[6]
Senior Debt[1]	**2.50**	4.13	4.41	4.31	4.61	4.91	5.17
Senior Subordinated Debt[1]	**2.00**	4.10	4.41	4.31	4.61	4.91	5.17
Subordinated Debt [1]	**1.50**	4.10	4.41	4.31	4.61	4.91	5.17
All Obligations[2,3]	**1.00**	0.93	1.00	0.83	0.92	0.98	0.92

[1] DSC calculated with respect to Operating Revenues.
[2] DSC calculated with respect to Authority Revenues.
[3] PRASA's ability to meet All Obligations in FY2019 and Forecast period depends on its ability to complete a debt restructuring currently in negotiation.
[4] Considers the modified debt service obligations due in FY2018 in accordance with forbearance agreements benefits.
[5] Considers the modified debt service obligations due in FY2019 in accordance with forbearance agreements benefits.
[6] Considers the full debt service obligations due per amortization schedule including CGI debt; excludes CSO debt and forbearance agreements.

8.5.3 Debt Service Restructuring and Forecast Assumptions

PRASA is assuming that it will restructure part (or all) of its existing debt service to reduce obligations over the Forecast period. Because negotiations with bondholders both at the Senior lien level and with federal agencies (CGI level) are ongoing and confidential, at this time there is no additional information available to determine the reasonableness of this assumption.

PRASA has also assumed that over the forecast period, no deposits will be made into the CSO Account for payment of the PFC Bonds (a debt service reduction of $9M in each year of the Forecast) and no payments will be made for the Term Loan with the GDB. If PRASA is not able to complete its intended debt restructuring or secure the new federal funds, PRASA will be required to reduce its projected CIP expenditures and/or increase the proposed rate adjustments to successfully meet its obligations.

8.6 Reserve and Funds Deposit Requirements

8.6.1 Debt Service Reserve Funds

In accordance with the MAT as amended by the Sixth Supplemental Agreement of Trust, Reserve Funds for Senior Debt, Senior Subordinate, and Subordinate Debt must be maintained in a reserve account at least equal to:

(i) The amount set forth in the Supplemental Agreement authorizing the issuance of a particular Series of Bonds, or

(ii) If not otherwise specified in a Supplemental Agreement authorizing the issuance of a particular Series of Bonds, the lesser of:

- Maximum Annual Debt Service on the Outstanding Bonds secured by such Account, payable in any fiscal year for the related Bonds,
- Ten percent (10%) of the proceeds of the Outstanding Bonds secured by such Account calculated in accordance the Code and
- 125% of the average Annual Debt Service for the payment of the principal of and interest on the Outstanding Bonds secured by such Account.

Debt service costs include the required contributions to the debt service reserves which were originally created and funded with 2008 bond proceeds. Should future bond issuances include required reserves, PRASA plans to contribute the additional funds in each of these reserves with part of the bond issuance proceeds, as necessary.

8.6.2 Operating Reserve Fund

The Sixth Supplemental Agreement to the MAT was executed on April 19, 2016. Before the Sixth Supplemental Agreement, the MAT required that an Operating Reserve Fund be established in the amount of $150M until March 1, 2013 and thereafter:

(i) If there is a line of credit on deposit in the reserve fund, the reserve shall mean for the term of line of credit an amount equal to at least ninety (90) days of current expenses determined on the first day of the fiscal year in which such line of credit is delivered or renewed as set forth in the annual budget for such fiscal year; or

(ii) If the reserve fund is funded from revenues, the reserve shall mean an amount equal to not less than ninety (90) days of current expenses determined annually based on the current expenses relating to the fiscal year of such calculation as set forth in the annual budget for such fiscal year.

The Sixth Supplemental Agreement to the MAT, amended Section 5.10 (a) and (c) of the Operating Reserve Fund to read as follows:

(a) In each month, the Trustee shall deposit to the Operating Reserve Fund (i) beginning on the first Business Day of the month and after making the deposits required by Section 5.02 (b) (i) through (vii), an amount of the Authority Revenues equal to 1/60 of the amount, if any, necessary to restore the amount on deposit therein to the Operating Reserve Requirement and to pay interest on any reimbursement obligations due with respect to an Operating Reserve Facility. Earnings on moneys held in the Operating Reserve Fund shall be retained therein.

(b) In lieu of or in addition to cash or investments, at any time, the Authority may cause to be deposited to the credit of the Operating Reserve Fund, an Operating Reserve Facility, in the stated amount equal to all or a portion of the application Operating Reserve Requirement. Any withdrawals from the Operating Reserve Fund made in accordance with the above paragraph (b), shall be made first from any cash or investments on deposit therein and then to the extent no such cash or investments are available, from a draw on any Operating Reserve Facility.

PRASA had a loan agreement (the GDB Loan Agreement) with the GDB under which the GDB provided a revolving line of credit to PRASA in the amount of $180M (previously $150M) that satisfied the balance that PRASA is required to maintain in the Operating Reserve Fund under the MAT. Under the GDB Loan Agreement, this line of credit is payable from moneys on deposit in the Operating Reserve Fund (after making deposits to the Current Expenses Fund) or proceeds from additional indebtedness issued under the MAT. The maturity of such line of credit was extended to June 30, 2018, contingent upon PRASA's successful completion of the 2015 Senior Bond issuance. Given that bonds were not issued on or before August 31, 2015, the facility matured on June 30, 2016. Therefore, PRASA is required to fund the Operating Reserve Fund at its requirement from Operating Revenues in accordance with the flow of funds (as defined in the MAT) or obtain a new line of credit to satisfy the Operating Reserve Fund Requirement.

Therefore, in accordance with the Sixth Supplemental Agreement to the MAT, PRASA deposited $38.4M in the Operating Reserve Fund during FY2018 (funding approximately 1/5 of the Operating Reserve Fund requirement). This deposit will continue recurrently for three additional years, until PRASA achieves the reserve fund of three months of current expenses. Deposits for the Forecast period are projected to be in accordance with the MAT, as amended. By 2021, PRASA is forecasting to have a total deposit balance in its Operating Fund of $172.2M. In future years, PRASA is projecting to make smaller deposits to align the balance with the increases in Operating Expenses, seeking to always maintain three months of current expenses in deposit.

8.6.3 Capital Improvement Fund

In accordance with the MAT, a Capital Improvement Fund must be established and funded for each fiscal year in an amount equal to the greater of:

(i) The amount set forth in the annual budget for such fiscal year, or

(ii) The amount recommended by the Consulting Engineer.

Equal monthly deposits over the fiscal year must be deposited to the Fund to make the balance of the Fund equal to the annual requirement. In addition, the following must be credited to the Fund:

(i) The proceeds of any condemnation awards,

(ii) The proceeds of insurance (other than use and occupancy insurance),

(iii) The proceeds of sales of property constituting a part of the Systems, and

(iv) The proceeds of any termination or similar payment received by PRASA under any interest rate swap or similar hedge agreement.

PRASA deposited $71.1M from Operating Revenues in the Capital Improvement Fund during FY2018 to finance a portion of its projected CIP (R&R and hurricanes-related emergency projects already being executed) as well as a projected debt repayment to its contractors. PRASA is assuming to begin all other CIP projects execution by FY2019.

In its FY2019 Annual Budget, PRASA projects to make a deposit in the Capital Improvement Fund of $26.2M from Operating Revenues, netted from FEMA/Insurance proceeds and Special Charge funds estimated at $50.0M. For FY2019, PRASA estimated capital expenditures of $76.2M. From FY2020

onwards, PRASA projects to make deposits in the Capital Improvement Fund in the average amount of $198M per year from Operating Revenues and the expected additional federal funds (FEMA, SRF and RD) of $57.5 on average per year over the Forecast period. If PRASA is not able to complete its intended debt restructuring or secure the new federal funds, PRASA will be required to reduce its projected CIP expenditures and/or increase the proposed rate adjustments to successfully meet its obligations.

Arcadis believes the assumptions taken for the Forecast period Capital Improvement Fund deposit are optimistic given the status of the CIP implementation development considering the nature and complexity of PRASA's CIP coordination, procurement and start-up process which may potentially take longer than assumed to complete the program's actual execution.

8.6.4 Construction Fund

In accordance with the MAT, a Construction Fund must be established and funded with the following deposits:

(i) the amounts required to be deposited under the resolution of the Board authorizing the issuance of particular Series of Bonds or the applicable Supplemental Agreement and,

(ii) any moneys of the Authority that may properly be deposited to the credit of said Fund, or the proceeds of any grants received from any source, to be used for the purpose of paying the Cost of Improvements.

PRASA has not included any deposits into the Construction Fund for the Forecast period.

8.6.5 Commonwealth Payments Fund

As previously mentioned, payment of debt service that was due to the USDA and USEPA on July 2016, was not able to be transferred and forbearance agreements were signed. In addition, no funds were deposited in the CSO Account during recent years, and accordingly, no funds were transferred by PRASA to the trustee of the PFC Bonds for the payment of debt service that was due on the PFC Bonds. Nevertheless, as per Section 5.02(c) of the MAT, any deficiency in the amounts required to be deposited into the Commonwealth Payments Fund to pay for the Commonwealth Guaranteed Indebtedness or the Commonwealth Supported Obligations shall not be cumulative and shall be deemed to be eliminated upon interest or principal payment date.

In its FY2019 Annual Budget, PRASA projects to make a $37.2M deposit to the Commonwealth Payment Fund, prior to the impact of the ongoing debt restructuring negotiation but considering the forbearance agreements benefit. For the rest of the forecast period, PRASA projects to make an annual average deposit of $86.2M, prior to the impact of the ongoing debt restructuring. Also, as part of PRASA's Revised Fiscal Plan debt service reduction initiatives, PRASA has eliminated the related outstanding debt service payments related to the CSO debt, which amount to $9M per year, from the projections during the forecast period.

8.6.6 Surplus Fund and Rate Stabilization Account

After all the deposits required by the MAT (as amended) have been accordingly made, any remaining moneys shall be deposited to the credit of the Surplus Fund which includes the Rate Stabilization

Account. No deposits were made in FY2017 and PRASA is not projecting to make any deposits to the Rate Stabilization Account during the projected period. As of October 31, 2018, the remaining balance in the Rate Stabilization Account totaled $3,319.

8.7 Conclusions

PRASA's Forecast (see Exhibit 1) reflects the Financial Plan certified by the Oversight Board. Despite PRASA's projected additional revenues, cost savings, new federal funds, and proposed rate increases, the Forecast reflects a total deficit of $424.4M. Annual deficits range from $28.6M in FY2022 up to $200.0M in FY2020. PRASA plans to bridge this gap with a debt restructuring and/or by identifying and securing additional revenue sources or financing.

While Operating Revenues are projected to be sufficient to meet Senior Lien debt service payments and meet Rate Covenant DSC requirements for Senior Lien Debt, Authority Revenues are not sufficient to meet All Obligations per the MAT which include the payment of the CGI and CSO debt service obligations in full. Therefore, PRASA will not meet its Rate Covenant requirement of 1.0x coverage of its current obligations throughout the Forecast. To the extent that PRASA can re-negotiate and restructure existing debt obligations, its ability to meet Rate Covenant requirements will improve. However, if this is not accomplished, PRASA will be forced to reduce its projected CIP investments or increase projected annual rate adjustments. Furthermore, PRASA must consider the overall sustainability and affordability of its rates given the overall economic situation affecting Puerto Rico and recent trends affecting customer consumption profiles.

The following events could have material negative effects on PRASA's Forecast which would further exacerbate PRASA's financial situation going forward:

- Lower revenues or savings achieved, or timeliness of PRASA's Revised Fiscal Plan initiatives.
- Higher impact from Hurricanes Irma and María on revenue, expenses or damages on PRASA infrastructure (continuing under revision and refinement by PRASA).
- Lower funding than expected from insurance or FEMA proceeds.
- Higher overtime expenses than currently planned as a result of further delays in filling vacant positions.
- Higher energy costs as a result of higher PREPA electric costs (per kWh) and/or lower savings achieved through its Comprehensive Energy Management Program.
- Higher expense costs as a result of not eliminating the Christmas bonus or reducing the pension costs.
- Higher annual inflation rates.
- Higher capital costs due to lower supply of professional and construction workforce, and higher materials and parts costs.

The probability of PRASA meeting its Forecast is conditioned on the following key assumptions:

1. **PRASA's ability to maintain its Service Revenues, billings, and collections in a continuing challenging economic environment** – Continued uncertainty and strain on the economy,

population shifts, and changing consumption patterns could continue to cause further declines in PRASA's billings (reflected in lower Service Revenues than budgeted) and collections (reflected in higher Adjustment for Uncollectibles).

2. **PRASA's ability to implement the necessary annual rate increases –** PRASA is projecting to implement annual modest rate increases that will generate about $495.4M between FY2018 and FY2023. Although now bound to PRASA's Revised Fiscal Plan, the actual amount of the rate increases will depend on PRASA's financial results, planned CIP investments, customer base and consumption trends, among others.
3. **PRASA's ability to continue to successfully implement PRASA's Revised Fiscal Plan initiatives –** PRASA's Forecast includes certain revenue enhancing and cost reduction initiatives under PRASA's Revised Fiscal Plan. Any changes to the funding, framework and execution of these initiatives would significantly alter PRASA's projected financial results. Although PRASA has made a commitment to implement the initiatives described in this Report, there is a possibility that the projected results and, more specifically, the timing of those results may not be achieved.
4. **PRASA's permanent debt restructuring –** PRASA will have to restructure its current outstanding debt to reduce its forecasted annual deficits. PRASA continues to work with federal entities to negotiate a permanent restructuring of both USDA RD debt and USEPA SRF debt and has engaged in negotiations with Senior bondholders. However, due to the confidentiality nature of this conversations, there is insufficient information available to determine if PRASA will be successful in either of these efforts.

EXHIBIT 1

	PRASA FINANCIAL FORECAST PRO FORMA[a] ($, Thousands)	FY2018 PRELIMINARY	FY2019 ANNUAL BUDGET	FY2020 PROJECTION	FY2021 PROJECTION	FY2022 PROJECTION	FY2023 PROJECTION
	OPERATING REVENUES						
1.	Service Revenues (Base Fee and Service Charges, Net of Subsidies) [b]	$929,514	$1,032,851	$1,091,660	$1,115,657	$1,141,979	$1,169,723
2.	Transfer from Rate Stabilization Account	-	-	-	-	-	-
3.	Net Additional Billings from On-Going Initiatives	-	-	-	-	-	-
4.	Adjustment for Billings Not Collected (Net of Collections from Prior Years)	(86,529)	(82,956)	(98,173)	(79,641)	(61,595)	(43,666)
5.	Other Income (Miscelaneous/Special Assessments/ZumFiber-PRASA Holdings)	1,696	2,000	2,000	2,000	2,000	2,000
6.	Revised Fiscal Plan - Revenue Enhancing Initiatives [c]	58,000	14,800	(1,500)	25,900	51,100	64,000
7.	Insurance Reimbursement from Revenue Loss	50,000	50,000	-	-	-	-
8.	**Total Operating Revenues [Sum Lines 1-7]**	**$952,681**	**$1,016,695**	**$993,987**	**$1,063,916**	**$1,133,484**	**$1,192,057**
	ADDITIONAL REVENUES						
9.	Transfer from Budgetary Reserve Fund	-	-	-	-	-	-
10.	General Fund Grants/Appropriations/Contributions	-	-	-	-	-	-
11.	Reimbursements to the Authority Revenues [e]	-	-	-	-	-	-
12.	**Total Other Sources of Revenue [Sum Lines 9-11]**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
13.	**Total Authority Revenues [Line 8 + Line 12]**	**$952,681**	**$1,016,695**	**$993,987**	**$1,063,916**	**$1,133,484**	**$1,192,057**
	OPERATING EXPENSES						
14.	Payroll and Benefits	$315,555	$335,167	$337,515	$336,893	$340,302	$344,704
15.	Electric Power	101,901	140,187	131,044	129,590	129,081	128,575
16.	Maintenance and Repair	45,086	48,108	48,822	49,518	50,232	50,935
17.	Chemicals	24,931	33,190	33,627	34,106	34,598	35,082
18.	Insurance	7,546	19,100	19,522	19,800	20,086	20,367
19.	Other Expenses	150,292	153,188	151,465	153,624	155,841	158,020
20.	Revised Fiscal Plan - Cost Saving Initiatives [d]	(3,082)	(13,400)	(30,000)	(31,700)	(32,800)	(35,400)
21.	Capitalized Operating Expenses	(9,680)	(26,970)	(26,714)	(26,771)	(27,015)	(27,294)
22.	**Total Operating Expenses [Sum Lines 14-21]**	**$632,549**	**$688,570**	**$665,280**	**$665,060**	**$670,326**	**$674,989**
	ADDITIONAL EXPENSES						
23.	Hurricane Impact on OPEX	234,800	29,858	-	-	-	-
24.	Expected FEMA Reimbursements [f]	(211,300) [f]	(26,872) [f]	-	-	-	-
25.	**Total Additional Expenses [Line 23 + Line 24]**	**$23,500**	**$2,986**	**$0**	**$0**	**$0**	**$0**
26.	**Total Operating Expenses [Line 22 + Line 25]**	**$656,049**	**$691,556**	**$665,280**	**$665,060**	**$670,326**	**$674,989**
	DEPOSITS						
27.	Deposit to the Senior Bond Fund	$230,788	$230,790	$230,791	$230,790	$230,789	$230,788
28.	Deposit to the Senior Debt Service Reserve Fund	1,387	-	-	-	-	-
29.	Deposit to the Senior Subordinate Bond Fund	-	-	-	-	-	-
30.	Deposit to the Senior Subordinate Debt Service Reserve Fund	-	-	-	-	-	-
31.	Deposit to the Subordinate Bond Fund	-	-	-	-	-	-
32.	Deposit to the Subordinate Debt Service Reserve Fund	-	-	-	-	-	-
33.	Deposit to the Current Expense Fund	-	-	-	-	-	-
34.	Deposit to the Operating Reserve Fund	38,400	30,754	33,100	35,000	1,600	1,800
35.	Deposit to the Capital Improvement Fund (Net of Projected New Federal Funds) [e]	71,100	26,230	184,200	140,700	171,300	296,700
36.	Deposit to the Construction Fund	-	-	-	-	-	-
37.	Deposit to the Commowealth Payments Fund [g]	22,317 [g]	37,227 [g]	80,651 [g]	87,967	88,079	88,023
38.	Deposit to the Surplus Fund	-	-	-			
39.	Deposit to the Rate Stabilization Account	-	-	-	-	-	-
40.	**Total Deposits [Sum Lines 27-39]**	**$363,992**	**$325,001**	**$528,741**	**$494,457**	**$491,768**	**$617,311**
41.	**Net Authority Revenues After Obligations and Deposits [Line14-Line 26-Line 40]**	**($67,360)**	**$137**	**($200,034)**	**($95,601)**	**($28,610)**	**($100,242)**
	DEBT SERVICE PAYMENTS DUE						
40.	Senior (S)	$230,788	$230,790	$230,791	$230,790	$230,789	$230,788
41.	***DS Coverage Required = 2.50***	***4.13***	***4.41***	***4.31***	***4.61***	***4.91***	***5.17***
42.	Senior Subordinated (SSUB)	1,387	-	-	-	-	-
43.	***DS Coverage Required = 2.00***	***4.10***	***4.41***	***4.31***	***4.61***	***4.91***	***5.17***
44.	Subordinated (SUB)	-	-	-	-	-	-
45.	***DS Coverage Required = 1.50***	***4.10***	***4.41***	***4.31***	***4.61***	***4.91***	***5.17***
46.	Commonwealth Guranteed Indebtedness (CGI)	22,317 [h]	37,227 [g]	80,651	87,967	88,079	88,023
47.	Commonwealth Supported Obligations (CSO)	- [h]	- [h]	- [h]	- [h]	- [h]	- [h]
48.	Debt Not Covered Under the MAT	-	-	-	-	-	-
49.	**Total Debt Service Including Debt Not Covered Under the MAT, Net of Existing Deposits**	**$254,492**	**$268,017**	**$311,441**	**$318,757**	**$318,868**	**$318,811**
	DS Coverage on All Obligations (Coverage Required = 1.00)	***0.93***	***1.00***	***0.83***	***0.92***	***0.98***	***0.92***
	RATE STABILIZATION ACCOUNT BALANCE						
50.	**Rate Stabilization Account Balance, ending balance**	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

[a] *Numbers may not add up due to rounding.*

[b] *Includes additional revenues from rate increases and elecronic bill discount intiatives of the Fiscal Plan.*

[c] *Projected additional revenues from initiatives included in Revised Fiscal Plan: P3 Project, Government Collections, New Disconnection Fee, and Adjustment Policy Revision.*

[d] *Projected expense reductions from initiatives included in Revised Fiscal Plan: Pension Reduction, Christmas Bonus Elimination, Physical Losses Reduction and Other Expense Reductions.*

[e] *Amount to be deposited from PRASA Authority Revenues.*

[f] *Amount to be deposited from FEMA funding reimbursement. FEMA funds shall be deposited to the credit of the Current Expense Fund as they are used to reimburse PRASA for Current Expenses.*

[g] *Debt service due on USDA RD bonds and USEPA SRF loans per amortization schedule. PRASA will seek to restructure and reduce its CGI obligations.*

[h] *Not all budgeted funds were deposited in the Commonwealth Guaranteed Indebtness Account during FY2018 for payment of the Commonwealth obligations of PRASA included in the CGI for the payment of debt service that was due since a forebearance period was granted by USDA and USEPA on RD and SRF loans, respectively. No funds were deposited in the Commonwealth Supported Obligations Account during FY2018 for payment of the Puerto Rico Public Finance Corporation (PFC) debt included in the CSO; and, accordingly, no funds were transferred by PRASA to the trustee of the PFC Superaqueduct Bonds for the payment of debt service that was due in FY2018. Per the MAT, this is not considered an Event of Default and as per Section 5.02(c), any deficiency in the amounts required to be deposited into the Commonwealth Payments Fund to pay for the CGI or the CSO shall not be cumulative and shall be deemed to be eliminated upon interest or principal payment date.*

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 Considerations and Assumption

In preparation of this Report and the conclusions contained herein, Arcadis has relied on certain assumptions and information provided by PRASA with respect to the conditions which may exist or events which may occur in the future. Arcadis believes the information and assumptions are reasonable but has not independently verified information provided by PRASA and others. To the extent that actual future conditions differ from those assumed herein or provided by others, the actual results will vary from those forecasts.

Arcadis has made several considerations and assumptions (as provided throughout this Report); some of the most notable are as follows:

1. Arcadis has made no determination as to the validity and enforceability of any contracts, agreements, existing laws, rules, or regulations applicable to PRASA and its operations. However, for purposes of this report, Arcadis has assumed that all such contracts, agreements, laws, rules and regulations will be fully enforceable in accordance with their terms.
2. PRASA will continue the current policies of employing qualified and competent personnel; properly operating and maintaining the System in accordance with generally accepted industry practices; and of operating the System in a prudent and sound businesslike manner.
3. The proposed CIP reflects the general needs of the System, the CIP will be largely implemented as planned and reflected in this report, and PRASA will make modifications to the CIP investment forecast if the overall System condition is negatively affected by the investment levels projected in future years.

Set forth below are the most relevant opinions which Arcadis has reached regarding the review of PRASA's System, CIP and financial projections as per PRASA's Revised Fiscal Plan.

1. PRASA has reached below the optimum staffing level stipulated by the Executive Management Team but its staffing mix is not yet optimal. For example, PRASA continues to face challenges in filling critical operational staff needs in its Operations Department(i.e., plant operators , System maintenance staff and meter readers), which results in overtime hours, delayed repairs or deficient services. PRASA shall further assess its staff mix and implement a more targeted training program to allow internal staff re-assignments thereby decreasing existing staffing needs. Furthermore, to the extent that PRASA is able to accelerate its staff management plan, additional cost efficiencies could be achieved.
2. PRASA continues to assess administrative and operational performance, and to implement organizational and policy changes, focusing on customer service, System performance, and budget controls. KPI and metrics being measured, along with stronger management oversight continue to contribute to operational and organizational improvements .
3. Arcadis visited a total of 415 facilities throughout PRASA's five Operational Regions. All WTPs and WWTPs and active RWIs were visited between October 2017 and December 2017 to assess

damages as part of the recovery efforts after the September 2017 hurricanes. Subsequently, the eight PRASA-owned regulated dams and 101 ancillary facilities were also visited and assessed between February and May of 2018.

Overall, the condition of PRASA's regulated dams is rated as adequate. The dams weathered Hurricanes Irma and María without major damage, although several experienced downstream erosions. The Cidra dam and Las Curías dam were rated as poor. Addressing the priority items indicated in PREPA's inspection reports and the additional observations made by Arcadis in the asset condition report, could give the dams a higher level of safety, and would help maintain the physical conditions of the structures so that they can continue serving the water supply system as expected. It is also recommended that PRASA perform underwater inspections at several dams, such as Loíza, La Plata, and Toa Vaca to investigate for scour at the concrete/foundation rock contact or stilling basin.

The damage assessments and cost estimates for WTPs show that facilities in the North, East and Metro Regions were the most affected by the hurricanes. Most of the facilities have been brought back to operational status and are expected to continue to serve their intended purpose of providing potable water supply in compliance with applicable regulations. However, given the suspension of the CIP, reduction in the R&R program, and ongoing fiscal challenges faced by PRASA, the condition of the WTPs has been declining over the last few years. Also, even though the WTPs are performing better with respect to compliance with limits of the Safe Drinking Water Act and effluent discharge parameters, PRASA must continue to implement corrective measures to mitigate the production of disinfection by-products. Additionally, upgrades and/or improvements to the sludge treatment systems in WTPs are necessary to meet the permanent limits established under existing permits.

The damage assessments and cost estimates for WWTPs show that facilities in the North, East, and West Regions were the most affected. PRASA should verify the flood zone levels at all WWTPs to identify vulnerabilities of assets in these facilities and determine if the potential flood risks merit a mitigation actions. Compliance with Clean Water Act and effluent discharge parameters has decreased significantly since the previous inspection. Also, it was noted that a number of facilities are still operating with interim limits or were only being monitored. Additionally, there was missing Discharge Monitoring Report (DMR) information after Hurricane María. Moreover, PRASA must plan and make the necessary improvements to meet permanent limits, or negotiate with USEPA an extension of the interim limits.

Finally, as it pertains to the ancillary assets, there was a decrease in overall score for water storage tanks, WPS and wells. Since 2015, these facilities have been showing a deterioration trend in asset condition that will continue unless CIP or R&R investments are made. In addition, future regulatory requirements may require either the implementation of significant capital improvements to include and achieve additional treatment capabilities at well facilities, or the closure of certain wells.

Although the overall rating of WWPSs remained as adequate, about 40% of the visited facilities had recorded overflows during the evaluation period. Prompt identification and actions enabled by remote monitoring will help PRASA mitigate overflows in the System, and adding pre-treatment (screens, comminutors) to facilities which receive vast amounts of solids could help lessen overflows. Most of the deficiencies noted can be addressed through PRASA's R&R program and may not require major

capital improvements. Note, however, that implementation of PRASA's R&R program also depends on PRASA's ability to identify and obtain funding sources.

4. The extent of damages to PRASA's buried infrastructure caused by the September 2017 hurricanes is uncertain. Additional evaluations and assessments will be required to identify rehabilitation and replacements needs of lateral (pipe) assets. The number of water leaks and sanitary overflows continue to be high when compared to U.S. benchmarks. However, PRASA has continued to improve its response time and attention/repair effectiveness. PRASA is implementing sanitary sewer evaluations and repair plans to reduce levels of infiltration and inflow (I/I) that must be treated in their WWTPs. However, the progress of this initiative has been affected as well by the ongoing fiscal situation.

   PRASA continues conducting periodic water audits, which are used to develop action items to address NRW. This has helped drive the reduction in the volume of water production, water losses, and in NRW reported by PRASA since 2014. However, most of PRASA's O&M efforts in FY2018 were dedicated to recovery activities. Planned O&M investments and key PRASA initiatives have been impacted (behind schedule, postponed or cancelled) by the ongoing fiscal situation and by the 2017 hurricanes.

5. PRASA is currently redefining the NRW goals and metrics to phase out calculations that still use estimation methods, moving towards use of real measurements. Furthermore, the provision of meters or other mechanisms to measure the water discarded as part of the programmed drainages will further improve accounting for the volume of NRW in the System. Additionally, the Physical Losses Reduction initiatives along with the PRASA's P3 project will further support PRASA's efforts to reduce NRW. Lastly, significant capital investments and R&R funded budgets are required to accelerate the NRW program and address leak occurrences in both a corrective and preventive manner.

6. Except for buried infrastructure improvement needs, PRASA's six-year CIP along with the O&M initiatives are in alignment with the System needs and adequately addresses all mandated requirements of existing consent decrees and agreements with Regulatory Agencies. The six-year CIP, which includes 390 projects, also includes funding for minor repair projects and PRASA's R&R program. PRASA must maintain an adequate level of R&R spend to maintain and renovate the System: U.S. industry guidelines recommend that assets, particularly buried infrastructure, be replaced at a rate of approximately 1% of total assets (within an asset class) annually. Future regulations and additional regulatory requirements are expected to require minor process changes and, in some cases major capital improvements such as construction of new treatment processes and intensive repair programs. Thus, CIP modifications will be required to adequately accommodate resulting needs; however, any additional CIP needs will be subject to PRASA's prioritization system and implementation schedules will depend on its financial capacity.

   Furthermore, PRASA six-year CIP, is mainly composed of Emergency/Permanent Works identified after the impacts of Hurricane Irma and María, and R&R projects. Together, these account for 70% of the total forecasted CIP expenditures. Although historically the majority of PRASA's CIP investment (about 60%) was allocated to mandatory and compliance driven projects, the six-year CIP includes approximately $163.7M (9% of planned investments) for Mandatory Compliance projects. This reduction is due to the extensive renegotiation process that PRASA and the Regulatory Agencies

entered to modify certain requirements of the existing consent decrees and agreements in order to re-align compliance priorities and, in turn, help alleviate PRASA's financial burden.

7. The insurance program covering PRASA's exposures to risks of accidental property and liability losses arising from on-going operations provides reasonable coverage. Also, the Owner Controlled Insurance Program (OCIP) covering PRASA's exposures to risks of accidental property and liability losses arising from construction activities provides reasonable coverage. PRASA should address the following key recommendations:

   - Conduct a PML Study considering new CAT Modellings and parameters. Specially after the lessons learned in the aftermath of the September 2017 Hurricanes.
   - PRASA should consider establishing a fund to cover possible financial losses from any future catastrophic or any non-catastrophic, peril that might affect infrastructure and operations and, therefore, impose an unexpected financial burden.
   - Consideration to Cyber Security Coverage, which is excluded under all current PRASA's Insurance Programs. Also, complete a self-assessment to determine potential areas of weakness as compared to international standards and to determine the potential frequency & severity of a breach.
   - Consideration of Terrorism Coverage, which is excluded under all current PRASA's Insurance Programs.
   - Consideration for the next Crime Policy renewal - the Knowledge or Discovery of Loss clauses should be renegotiated to specifically identify positions triggering knowledge of incidents, in order to minimize the risk of claim declines by the carrier for late reporting.
   - Consideration to broaden Drive Other Car coverage to include both Physical Damage and Medical Payments coverage.

8. PRASA's Forecast (see Exhibit 1) reflects the Financial Plan submitted to and certified by the Oversight Board. Despite PRASA's projected additional revenues, cost savings, new federal funds, and proposed rate increases, the Forecast reflects a total deficit of $424.4M (FY2019 to FY2023). Annual deficits range from $28.6M in FY2022 up to $200.0M in FY2020. PRASA plans to bridge this gap with a debt restructuring and/or by identifying and securing additional revenue sources or financing.

   While Operating Revenues are projected to be sufficient to meet Senior Lien Debt service payments and meet Rate Covenant DSC requirements for Senior Lien Debt, Authority Revenues are not sufficient to meet All Obligations per the MAT which include the payment of the CGI debt service obligations in full. Therefore, PRASA will not meet its Rate Covenant requirement of 1.0x coverage of its current obligations throughout the Forecast. To the extent that PRASA can re-negotiate and restructure existing debt obligations, its ability to meet Rate Covenant requirements will improve. However, if this is not accomplished, PRASA will be forced to reduce its projected CIP investments or increase projected annual rate adjustments. Furthermore, PRASA must consider the overall sustainability and affordability of its rates given the overall economic situation affecting Puerto Rico and recent trends affecting customer consumption profiles.

The following events could have material negative effects on PRASA's Forecast which would further exacerbate PRASA's financial situation going forward:

- Lower revenues or savings achieved, or timeliness of PRASA's Revised Fiscal Plan initiatives.
- Higher impact from Hurricanes Irma and María on revenue, expenses or damages on PRASA infrastructure (continuing under revision and refinement by PRASA).
- Lower funding than expected from insurance or FEMA proceeds.
- Higher overtime expenses than currently planned as a result of further delays in filling vacant positions.
- Higher energy costs as a result of or higher PREPA electric costs (per kWh) and/or lower savings achieved through its Comprehensive Energy Management Program.
- Higher expense costs as a result of not eliminating the Christmas bonus or reducing the pension costs.
- Higher annual inflation rates.
- Higher capital costs due to lower supply of professional and construction workforce, and higher materials and parts costs.

The probability of PRASA meeting its Forecast is conditioned on the following key assumptions:

1. **PRASA's ability to maintain its Service Revenues, billings, and collections in a continuing challenging economic environment** – Continued uncertainty and strain on the economy, population shifts, and changing consumption patterns could continue to cause further declines in PRASA's billings (reflected in lower Service Revenues than budgeted) and collections (reflected in higher Adjustment for Uncollectibles).
2. **PRASA's ability to implement the necessary annual rate increases** – PRASA is projecting to implement annual modest rate increases that will generate about $495.4M between FY2018 and FY2023. Although now bound to PRASA's Revised Fiscal Plan, the actual amount of the rate increases will depend on PRASA's financial results, planned CIP investments, customer base and consumption trends, among others.
3. **PRASA's ability to continue to successfully implement PRASA's Revised Fiscal Plan initiatives** – PRASA's Forecast includes certain revenue enhancing and cost reduction initiatives under PRASA's Revised Fiscal Plan. Any changes to the funding, framework and execution of these initiatives would significantly alter PRASA's projected financial results. Although PRASA has made a commitment to implement the initiatives described in this Report, there is a possibility that the projected results and, more specifically, the timing of those results may not be achieved.
4. **PRASA's permanent debt restructuring** – PRASA will have to restructure its current outstanding debt to reduce its forecasted annual deficits. PRASA continues to work with federal entities to negotiate a permanent restructuring of both USDA RD debt and USEPA SRF debt, and has engaged in negotiations with Senior bondholders. However, due to the confidentiality

nature of this conversations, there is insufficient information available to determine if PRASA will be successful in either of these efforts.

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