The Financial Impacts of Alternative Water Project Delivery Models:

A Closer Look at Nine Communities

The Environmental Finance Center at The University of North Carolina studied the financial structure and outcomes of alternative water service delivery models in nine communities across the country. This document summarizes the key similarities and differences of the models used by these communities.

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Acknowledgements

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About the Environmental Finance Center

The Environmental Finance Center at the University of North Carolina, Chapel Hill is part of a network of university-based centers that work on environmental issues, including water resources, solid waste management, energy, and land conservation. The EFC at UNC partners with organizations across the United States to assist communities, provide training and policy analysis services, and disseminate tools and research on a variety of environmental finance and policy topics.

The Environmental Finance Center at the University of North Carolina, Chapel Hill is dedicated to enhancing the ability of governments to provide environmental programs and services in fair, effective, and financially sustainable ways.
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About the Water Infrastructure Resiliency Finance Center

The Water Infrastructure and Resiliency Finance Center identifies financing approaches to help communities make better-informed decisions for drinking water, wastewater, and stormwater infrastructure that are consistent with local needs.
https://www.epa.gov/waterfinancecenter

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Background

One of the most challenging issues surrounding water infrastructure finance relates to the choice of what project and service delivery models are employed to build new assets, improve existing assets, and to operate, maintain and finance those assets. The most common "traditional" project delivery model used by local government utilities in the U.S. (often referred to as the "project sponsor" or "sponsor") relies heavily on phased procurement of services. In phased procurement, a project sponsor develops infrastructure assets by bidding the necessary services sequentially, starting with the procurement of a design firm to supply the infrastructure design. Under competitive bidding rules, different firms then submit bids for construction that are based on the preliminary design work. The public entity normally arranges financing for the project and retains ownership for the assets and facilities once they go into service.

State and local laws heavily influence these processes and often require (or at least orient) governmental sponsors to select qualified bidders on the basis of the lowest cost bid in response to a completed design.[1] This model is often referred to as a Design, Bid, and Build ("DBB") approach. While this approach tends to achieve lowest cost bids for project construction, it may not incentivize creativity and may include construction elements that contribute to higher future operation and maintenance costs than if construction and operation were more integrated. Further, this approach can also expose the project sponsor to a disproportionate amount of risk that arises over the lifecycle of the proposed assets. This includes risks stemming from project construction change orders and operating inefficiencies that can be directly tied to the "lowest cost" procurement models used in project construction.

There are many terms and labeling conventions for alternative service delivery models. Terms such as Public Private Partnership (P3) and Performance Based Infrastructure Delivery are common, but they can carry slightly different meanings in different geographic settings (different states, different countries) and different sectors (water vs. transportation). For example, Public Private Partnership, Performance Based Infrastructure Delivery and Service Model ("P3", "PPP" or "PBI") (together, "alternative service delivery models"), are used in Europe, Canada, and Australia.

These models are touted as an approach to delivering better quality infrastructure services in a shorter build period and often at a lower cost than the more conventional U.S. infrastructure procurement models. There are multiple guides that describe the different approaches and hundreds of case studies focusing on various aspects of these models. At the same time, there is considerable debate concerning

[1] Houston, Norma. *North Carolina Local Government Contracting: Quick Reference and Related Statues.* UNC School of Government. November 18, 2014.

the effectiveness of different approaches. Many in the field are convinced that with the proper design, alternative service delivery models offer advantages over more traditional approaches and offer substantial opportunities to meet the country's sizable water infrastructure challenges.[2,3] There are also fierce critics of many of these models, particularly models that involve a higher level of participation by the private sector.[4]

Many of the publications and analyses of these models have been developed and/or published by organizations with a stated objective of either discouraging or encouraging the use of alternative models. In order to provide a different perspective on the impacts of these models, the U.S. Environmental Protection Agency (EPA) and the West Coast Infrastructure Exchange (WCX) requested that the Environmental Finance Center at The University of North Carolina Chapel Hill (UNC), a non-advocacy applied research program within the UNC School of Government, study a small sample of communities that have employed diverse models involving public-private partnerships and public-public partnerships.

Study Objective

The goal of this study was to highlight variation in approaches to alternative water project/service delivery models and the different financial impacts of these models. The study was not designed to answer the question about whether alternative service delivery models are universally beneficial or detrimental, but to show the variation in implementation and design that allows communities to customize them to fit specific needs. The study documents several components of how the models were implemented, including how the project was developed and procured and how risks were allocated. However, the primary focus of the study was on the key financial features of the models. The study examined the financial goals and features of each model as they were originally envisioned and promoted to the community leaders that approved them. In addition, to the extent possible, the study assessed whether the outcome differed from initial expectations. The study was not designed to be a detailed quantitative evaluation of each model. Rather, the study is comprised of a portfolio of "financial profiles" that provide enough detail for communities considering these models to better understand how the models can be structured and the range of financial outcomes communities can expect.

Methodology

The UNC research team worked with staff from the West Coast Infrastructure Exchange and the EPA Water and Infrastructure Resiliency Finance Center to select communities that implemented diverse service delivery models for different types of projects and services.[5] The research team investigated

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[2] Friedman, Stephen. *Successful Public/Private Partnerships: From Principles to Practices. Urban Land Institute/Private Partnership Councils*. 2016. http://uli.org/wp-content/uploads/ULI-Documents/Successful-Public-Private-Partnerships.pdf

[3] Sabol, Patrick, and Puentes, Robert. *Private Capital, Public Good. Drivers of Successful Infrastructure Public-Private Partnerships*. Brookings Institute. December 2014. https://www.brookings.edu/wp-content/uploads/2016/07/BMPP_PrivateCapitalPublicGood.pdf

[4] *Trends in Water Privatization: The Post-Recession Economy and the Fight for Public Water in the United States. Food and Water Watch*. November 2010. http://www.foodandwaterwatch.org/insight/trends-water-privatization

[5] While staff from the EPA, WCX, and representatives from many of the communities and service providers reviewed drafts of the profiles to provide comments and insights, the content presented in the study (including the description of the different models and analysis conclusions) are solely the responsibility of the authors and do not represent the official views of the EPA, WCX, or the University of North Carolina.

projects and programs in 9 communities across the country and 11 distinct examples of alternative delivery models. The communities and their partners invested in new facilities and/or capital improvements for a variety of water and wastewater services and projects. In several of these communities, the project delivery model evolved over the course of the project, resulting in the opportunity to study multiple models within a single community. In some cases, communities began their efforts with one delivery method and ultimately decided to shift to another model.

Table 1 presents a list of the communities and the different service delivery models profiled. The research team acquired and carefully reviewed contracting and other background documents for each of the project delivery methods. The team carefully reviewed technical studies, board meeting notes, and press coverage of the models to better understand how the models were presented to the public and the governing boards that ultimately approved them.

Most of the models studied involved a private sector partner or team of companies providing services to a governmental entity such as a city, county, or government utility agency; however, in one case (Allentown), the model involved a local government (Lehigh County Authority) providing services to another local government (the City of Allentown). What separated this model from a more traditional regional project was that the relationship arose from a competitive Request for Proposal process involving public and private sector bidders. The resulting public-public relationship followed a strict performance-based contractual agreement rather than a more traditional interlocal service agreement.

In some cases, partnership agreements were crafted to allow a partnering entity to manage all the components of the public entity's water and wastewater system (Bayonne, Rialto, and Allentown). In other cases, private partners were tasked with upgrading a single major existing facility (e.g. Regina Wastewater Treatment Plant). In some cases, private partners constructed completely new facilities that were to be owned by the public partner but operated by the private partner (Phoenix Water Treatment Plant and Davis Woodland Water Supply Project). Finally, in some cases private partners were tasked with constructing new facilities that were initially owned by the private sector and for the purpose of providing services under a service purchase agreement (Santa Paula Water Recycling Facility and Tampa Bay Desalination Plant).

Table 1. Communities and projects included in the study

Community/Project Sponsor	Primary Service Provider Partner (s)	Project Agreement	Model Description/ Outcomes	Facility/Facilities Served by the Model	Services Provided by Partner
City of Allentown, PA	Lehigh County Authority	Allentown Water and Sewer Utility Concession and Lease Agreement	A public-to-public partnership between the City of Allentown and the Lehigh County Authority led to a more integrated regional utility system. At the same time, the partnership generated a large initial payment that helped Allentown meet non-utility financial obligations.	Water and wastewater system	Initial capital improvements, operation and maintenance, arrangement of financing
City of Bayonne, NJ	Bayonne Water Joint Venture, LLC (Partnership between Suez/United Water and Kohlberg Kravitz & Roberts)	Bayonne Water and Wastewater Concession Agreement	After a period of underfunding and deferred maintenance, the Bayonne Water and Wastewater Concession Agreement monetized existing assets, restructured debt, and transferred asset management responsibility to the private sector. The agreement led to improved service efficiency, stronger general government financial condition and modestly higher rates.	Water, wastewater, and stormwater system	Initial capital improvements, operation and maintenance, arrangement of financing
City of Davis, City of Woodland, and University of California at Davis/Woodland Davis Clean Water Agency	CH2M Hill	Service Contract for the Design, Construction, and Operation of the Woodland-Davis Regional Water Treatment Facility	The Cities of Woodland and Davis California joined together to construct a new surface water treatment plant using a 15-year Design Build and Operate ("DBO") agreement and public financing from State Revolving Fund ("SRF") loans to reduce the lifecycle cost of the project.	River water withdrawal, transmission system and new water treatment plant	Facility permitting, project design, construction, start-up and on-going operation and maintenance

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Community/Project Sponsor	Primary Service Provider Partner (s)	Project Agreement	Model Description/ Outcomes	Facility/Facilities Served by the Model	Services Provided by Partner
City of Phoenix, AZ	American Water Services (Project Leader and Operations), Black & Veatch (Design), and McCarthy Building Companies (Construction)	Lake Pleasant Water Treatment Plant Design Build and Operate Project	The Phoenix Lake Pleasant Water Treatment Plant is one of the nation's first large-scale Design Build and Operate (DBO) water treatment plant projects. The City of Phoenix used the DBO approach to increase the speed of construction, foster technological innovation, reduce risk, and achieve lifecycle cost savings. Customer usage and operating conditions were different than originally anticipated, highlighting the potential impact of how risk associated with reductions in demand is allocated in service delivery agreements.	New Lake Pleasant Water Treatment Plant	Facility permitting, project design, construction, start-up and on-going operation and maintenance
Prince Georges County, Maryland	Corvias Prince George's County (Program Manager), CH2M Hill Constructors Inc. (General Contractor);Bowman Consulting Group, Ltd and CH2M Hill Engineers, Inc. (Design Engineers)	Prince George's County Urban Stormwater Retrofit Public Private Partnership Master Program Agreement and Master Maintenance Agreement	The Prince George's County Urban Stormwater Retrofit Public Private Partnership is a Pay for Performance service delivery model designed to improve water quality through installation of high impact stormwater control measures throughout Prince George's County. The approach delegates project selection, design, construction, operation, and maintenance responsibility to a team of private partners. The agreement also requires the development and implementation of social and economic development programs.	Urban Stormwater Retrofits	Project identification, project implementation, operation and maintenance

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Community/Project Sponsor	Primary Service Provider Partner (s)	Project Agreement	Model Description/ Outcomes	Facility/Facilities Served by the Model	Services Provided by Partner
City of Regina, Saskatchewan, Canada	EPCOR Prairies Inc.	Agreement to Design, Build, Finance, Operate and Maintain: Regina Wastewater Treatment Plant Upgrade Project	The City of Regina's detailed analysis and planning process led it to use the Design, Build, Finance, Operate, and Maintain (DBFOM) delivery mechanism to carry out necessary upgrades to their wastewater treatment plant. The City's model incorporated private sector financing, carefully allocated risks, expedited construction, and minimized facility lifecycle costs.	Upgraded Wastewater Treatment Plant	Facility permitting, project design, construction, arrangement of financing, start-up and on-going operation and maintenance
City of Rialto, California	Rialto Water Services Inc., Table Rock Capital (project lead and equity provider), Ullico Infrastructure Fund (equity provider), and Veolia Water (Operator)	Concession Agreement: Service Contract for the Design, Construction, and Financing of Upgrades and for the Operation of the Rialto Utility Authority Wastewater Facility and Water Facility	The City of Rialto, California used a 30-year concession agreement to improve operations of its water and wastewater system and to raise a significant amount of capital from private equity partners and capital finance markets. The initial funds allowed the City to accelerate capital improvements in its water and wastewater system, monetize system value by arranging to pay itself deferred utility system lease payments, and fund several strategic reserve funds.	Water and wastewater system	Initial capital improvements, operation and maintenance, arrangement of financing

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Community/Project Sponsor	Primary Service Provider Partner (s)	Project Agreement	Model Description/ Outcomes	Facility/Facilities Served by the Model	Services Provided by Partner
City of Santa Paula, CA	Santa Paula Water, LLC, a special purpose entity owned by Alinda Capital Partners (capital investor) and contracted with PERC Water Corporation (project developer and DBO firm)	Design, Build, Operate and Finance Agreement	The City of Santa Paula, California relied on an innovative project delivery model to build a new privately-owned and operated wastewater treatment facility, taking advantage of private capital as well as integrated design, construction and operations. Perceptions about the high cost of private capital led the City to issue tax-exempt debt to buy back the facility five years after its completion.	New Wastewater Treatment Plant ("Water Recycling Facility")	Facility permitting, project design, construction, arrangement of financing, start-up and on-going operation and maintenance
Tampa Bay Region, Florida	Initial: S&W Water, LLC, a partnership of Stone & Webster and Poseidon Resources Corporation	Agreement for the Construction and Operation of a Seawater Desalination Plant and Water Purchase Agreement	In Tampa Bay Region, multiple service delivery methods, each with different risk sharing approaches, contributed to the construction of one of the nation's largest seawater desalination plants.	New Seawater Desalinization Water Treatment Plant	Facility permitting, project design, construction, arrangement of financing, start-up and on-going operation and maintenance

Approaches to Project Development and Procurement

In addition to variation in the type of service delivery model used in each community, there were also many different approaches to project development and procurement that occurred even before the delivery model was chosen.

Evaluating Financial Impact of Different Options

A decision to follow an alternative delivery model usually begins with some type of financial analysis of the relative value of the alternative approach versus the status quo approach (often a Design, Bid, Build Approach). While there are some practices in the area of financial analysis and evaluation that are widely used, in most cases, in this study the financial analysis approach in each community was customized to local conditions and needs. As a result, there was little standardization in the analyses used across the study population.

For example, one of the communities, Regina, followed a rigorous analytical approach called a Value for Money ("VfM") analysis which involves modeling and comparing the estimated project lifecycle cost outcomes based on conventional versus an alternative P3 procurement. Regina evaluated 12 separate delivery methods before deciding on a final approach. This type of analysis incorporates the benefit of risk elimination and transfer into the analysis. Regina's internal financial policies encouraged this type of analysis, and carrying out a VfM was a requirement of a national grant program[6] that supported the final project. The other communities studied prepared a range of different financial analyses that were presented under different titles to governing boards. In most cases, the analyses involved a calculation of net present value analysis of life cycle costs, but the methodologies varied considerably in how these analyses were formatted and presented. In some cases, the results were presented in terms of present value total "savings," and in other cases, results were presented in terms of the unit cost of production.

Procurement and Bidding

Most of the communities studied followed a two-tier winnowing approach that involved a general call for interest through a request for qualifications. Communities "qualified" a subset of firms that expressed interest who were then invited to respond to a formal request for proposals. The process of designing and implementing a robust procurement method can require significant resources. In most of the communities, an independent advisor or team of advisors assisted the public entity with procurement. Evaluating different approaches, developing procurement and contracting documents, and evaluating and interacting with bidders can cost hundreds of thousands, or even millions, of dollars depending on the scope of the project. The City of Phoenix reported spending over $600,000 in advisor fees for assistance carrying out a highly participatory evaluation of delivery options that included technical analyses, stakeholder meetings, detailed legal research, financial analysis, and preparation of reports.[7] The City of Regina estimated that its service delivery preparation and procurement process cost over $5 million dollars, taking into consideration preliminary technical design, financial analysis, and

[6] The P3 Canada Fund is a program of PPP Canada that is a merit-based program designed to incent innovation in P3s and encourage inexperienced governments to consider P3s in public infrastructure procurements. It is the first infrastructure funding program in Canada that directly targets P3 projects. Learn more at: http://www.p3canada.ca/en/apply-for-funding/the-p3-canada-fund/

[7] City of Phoenix Request for Council Action (RCA) Items. June 9, 1999.

extensive oversight during the active phases of the procurement.[8] The City of Regina's efforts included establishing and maintaining a standalone procurement office, engaging the services of an independent fairness advisor, and providing $500,000 in stipends to the proposal entities. This was an amount that only covered a fraction of the private entities' proposal costs, but which demonstrated the City's commitment to the process.

Public Participation and Political Debate

How a community delivers water and wastewater services has the potential to have major environmental, public health, and economic impacts on a community. In some of the communities studied, a segment of the community was either in vocal opposition or support of a particular service delivery model. For example, in the City of Regina, a petition led to a public referendum on the use of a Design, Build, Finance and Operate model, which in turn initiated a costly educational and lobbying campaign that highlighted the benefits and potential dangers of different approaches. In the City of Rialto, a campaign initiated by a labor union resulted in a change in the operator selected to participate in the City's utility system concession. In other communities, the debate occurred primarily within the governing board chambers with a subgroup of board members adamantly opposed to a specific course of action.

Key Financial Features

While there were some similarities among the different projects, each was structured differently and had different financial features and outcomes. Some of the differences are briefly described below.

Initial Outlays

Each of the models studied included a significant initial outlay of funds over the first few years of the project. Funds were raised through a variety of approaches and used for diverse purposes. Table 2 shows a summary of the initial outlays involved in each project and how the funds were raised. In some cases, the initial outlays were used for traditional design and constructions costs. In other cases, funds were raised to make upfront concession payments that were used for both utility and non-utility purposes. In Allentown, the majority of the initial outlays went to satisfy general government pension liabilities. In both Rialto and Bayonne, the initial outlays included important system improvements spread out over the first few years; however, these outlays were small compared to the overall funds initially raised ($41 of $177 million in Rialto and $6.5 of $174 million in Bayonne). In Santa Paula, Tampa Bay, and Phoenix, almost all of the initial outlays went towards costs associated with the development, design and construction of a new facility. In Regina, the funds went towards the expansion of an existing facility. In Prince Georges County, the funds were used for the implementation of new stormwater control measures.

[8] Rob Court (Manager, Environmental Engineering Branch), email correspondence with author, July 29, 2016.

Table 2. Summary of initial outlays

Community/Project Sponsor	Title of Agreement	Estimated Initial Major Outlays	Primary Methods Used to Raise Initial Outlay Funds	Major Uses of Initial Outlays
City of Allentown, PA	Allentown Water and Sewer Utility Concession and Lease Agreement	$307 Million	Tax exempt and taxable revenue bonds issued by service provider	Upfront concession payment used to meet pension liability; Retirement of existing utility debt; and funding reserves
City of Bayonne, NJ	Bayonne Water and Wastewater Concession Agreement	$174 Million	Private equity and taxable bonds issued by service provider	Upfront concession payment used to retire debt and to support general government services/projects; initial capital investments
City of Davis, City of Woodland, and University of California at Davis/Woodland Davis Clean Water Agency	Service Contract for the Design, Construction, and Operation of the Woodland-Davis Regional Water Treatment Facility	$141 Million	California Clean Water and Drinking Water State Revolving Fund loans issued by project sponsor	DBO design and construction fees for new water supply project
City of Phoenix, AZ	Lake Pleasant Water Treatment Plant Design Build and Operate Project	$237 Million	Tax exempt revenue bonds issued by project sponsor	DBO design and construction fees for new water treatment plant and other project development costs (legal, consulting etc.)
Prince Georges County, Maryland	Prince George's County Urban Stormwater Retrofit Public Private Partnership Master Program Agreement and Master Maintenance Agreement	$100 Million	Tax exempt revenue bonds issued by project sponsor and Maryland Clean Water State Revolving Fund loans issued by project sponsor	New stormwater project implementation fees covering design, construction, and oversight

Community/Project Sponsor	Title of Agreement	Estimated Initial Major Outlays	Primary Methods Used to Raise Initial Outlay Funds	Major Uses of Initial Outlays
City of Regina, Saskatchewan, Canada	Agreement to Design, Build, Finance, Operate and Maintain: Regina Wastewater Treatment Plant Upgrade Project	$180 Million	Private equity structured as loan to project sponsor, national government grant, and project sponsor reserves	Costs of design and construction for upgraded and expanded wastewater treatment plant
City of Rialto, California	Concession Agreement: Service Contract for the Design, Construction, and Financing of Upgrades and for the Operation of the Rialto Utility Authority Wastewater Facility and Water Facility	$177 million	Private equity and privately placed loans issued by service provider	Upfront concession payment used for economic development projects; retirement of existing debt; system capital improvements; project development costs; and funding reserves.
City of Santa Paula, CA	Design, Build, Operate and Finance Agreement	$62 Million	Private equity and privately placed loans issued by service provider	Design and construction costs for a new wastewater treatment plant

Community/Project Sponsor	Title of Agreement	Estimated Initial Major Outlays	Primary Methods Used to Raise Initial Outlay Funds	Major Uses of Initial Outlays
Tampa Bay Region, Florida	Agreement for the Construction and Operation of a Seawater Desalination Plant and Water Purchase Agreement (Initial Agreement)	$158 Million	Regional grant and tax exempt bonds issued by project sponsor (prior to unexpected early transfer to project sponsor, tax exempt private activity bonds were planned but not utilized)	Design and construction of new seawater desalination plant

Revenue Models

The revenue models deployed throughout the communities rely on different financial flows; however, in every case the public entity retained ultimate responsibility for setting rates. The Bayonne, Rialto, and Allentown projects depended on a contracted partner collecting bills directly from customers. In the remainder of the communities, the public project sponsor collected rates from customers and used the revenue to make contractual payments to private entities. The terms of payment depended on how the contract was designed and whether the private entity had been responsible for arranging and retiring financing.

In situations where the private partner maintained debt or return on equity requirements, the public entity was required to make fixed capital payments that were independent of the quantity/volume of services provided. Private entities were reimbursed for the operating services they provided through a range of methods, but generally these included a fixed and variable component. In most cases, the fixed component of the operating fee was so significant that the private entity was guaranteed a stable source of revenue even if the demands were much lower than projected. Electricity costs and chemical costs were often treated as direct pass-throughs; however, most contracts contained clauses that set maximum electricity usage caps to provide public entities with protection against excessive energy expenditures due to operator error or inefficiency. Alternatively, some of the contracts, such as Santa Paula's, contained clauses that allowed private entities to retain a portion of electricity savings if the savings were due to an intentional measurable efficiency gain attributable to the actions of the private operator.

Cost of Capital

The cost of capital associated with the different approaches to raising the initial funds varied among communities. These ranged from "free" in the case of the sizable grants used in Regina and Tampa Bay, to as high as 20% for some of the private equity used in Rialto. All of the projects involved some form of debt for at least a portion of the initial outlay; however, the type and structure of the debt varied considerably between projects. Woodland and Davis tapped into the state revolving loan funds for very low interest long-term debt for all of their initial outlay requirements. Phoenix and Tampa Bay each issued tax-exempt revenue bonds. Bayonne, Rialto, and Santa Paula included debt issued by the private partner. In the case of Regina, private financing was structured as a loan between the private partner and the project sponsor, yet payment was integrated into the performance requirements of the contract. In other words, unlike a traditional loan, if the private partner did not perform, their payments were at risk.

This concept of integrating risk into financing makes comparing the cost of capital across different approaches complicated. Prior to Tampa Bay Water's purchase of the partially completed desalination plant, the private partners had been responsible for financing construction. At the time of the purchase, the private partners reported that unexpected technology, business, and operational challenges had far exceeded what had been projected (and thus exceeded the negotiated settlement price from Tampa Bay Water). Once Tampa Bay Water took over full ownership and financing responsibility, it was able to use its strong credit rating to access tax-exempt "low cost capital". However, Tampa Bay Water also assumed full responsibility for subsequent construction risks.

Debates over the cost of capital of different partnership models are often intense and can influence how projects are structured and perceived. In the case of Santa Paula, vocal concern over the cost of capital incurred by the private partner contributed to the City's decision to buy back the facility and put it under public ownership. While the cost of capital for initial outlays is important, focusing only on the cost of capital as a metric for financial efficiency can be misleading, since it may not take into account other financial advantages

associated with the capital structure. Financing provided by the private sector can incorporate ancillary costs that contribute capital costs that are higher than a simple public sector debt issuance. For example, the Santa Paula private capital arrangement absorbed millions of dollars in interest during construction. In Tampa Bay and Regina, private financing took significant permitting, construction, performance and operating risk. Santa Paula, Rialto, and Bayonne incorporated private equity into their capital structures in a way that resulted in the transfer of some level of risk to their private partners. In each case, the equity was blended with lower cost debt to reduce the overall cost of capital associated with the initial outlay. The reported return requirements for this equity were in line (10 to 20%) with other types of private investment, but were much higher than tax-exempt bond financing or publically subsidized programs such as a state revolving fund.

Table 3. Diverse Examples of Capital Financing Involved in Projects

Project	Description of Capital Sources	Terms/ investment tax status	Notes
Regina	$78.7 Million in Private Sector (EPCOR) financing structured as loan to public sponsor	27 ½ years, 6.46%[9] (Taxable)	Payment of return to private sector is contingent on performance
Davis Woodland Water Supply	$95.5 Clean Water State Revolving Fund Loan issued by public sponsor	30 years, 1.7%[10]	California state law changed to allow project to access state revolving funds
Rialto	$25 million in private equity (Table Rock Capital and Ullico Infrastructure Fund) integrated into overall project financing	30 years, 19.6%[11] (Taxable)	Equity was blended with privately placed debt projected to result in a blended rate of 8.6% for entire deal
Allentown	$308 million in bonds issued by service provider (Lehigh County Authority)	29 years, 5.45% (Tax-exempt)	Bonds sold at discount resulting in $297 million of proceeds
Bayonne	$110 million in privately placed taxable bonds issued by private service provider	18 years, 5.07%[12] (Taxable)	

[9] *Agreement to Design, Build, Finance, Operate and Maintain: Regina Wastewater Treatment Plant Upgrade Project.* The City of Regina and EPCOR Water Prairies, Inc. July 3, 2014.

[10] *Woodland and Davis Receive Initial Installments of State Funding for Water Supply Project.* Woodland-Davis Clean Water Agency. February 16, 2015. http://www.wdcwa.com/images/uploadsdoc/WDCWA_MediaRelease_SRF__FundsReceived_21615.pdf

[11] *Proposed financing included in Agenda Report for the City Council/RUA Meeting of March 27, 2012.* City of Rialto. March 22, 2012.

[12] *Bayonne Water & Wastewater Concession | InfraDeals "Funding Details".* Infra-deals. September 15, 2015. http://www.infra-deals.com/deals/950558/bayonne-water-and-wastewater-concession.html

Financial Impacts of Alternative Service Delivery Models

Evaluating the financial impact of an alternative service delivery project in a robust, quantitative fashion is difficult for several reasons. First, the analysis would involve comparing a path or approach that was chosen with a path that was not chosen. In other words, it is impossible to know exactly what would have happened if a community had chosen another alternative. Nevertheless, the experiences in the communities studied provided many opportunities to assess different financial impacts based on how projects were implemented, particularly comparing and contrasting promised results with actual outcomes.

The anticipated positive financial impact of a particular project varied based on each community's objective at the outset and the type of service delivery model chosen. None of the service delivery models were implemented solely based on the anticipated savings; however, for many of the projects, the anticipated positive financial impact was an essential part of how the project was presented.

Reduced Design and Construction Costs

Santa Paula, Regina, and Davis and Woodland faced urgent regulatory deadlines that they believed could not be achieved through traditional procurement. However, in each case, the projects were presented to highlight the potential savings. In the case of Regina and Santa Paula, integrating the design, construction and financing was seen as a way of accelerating construction and reducing construction and permitting risks that could have led to change orders. Regina estimated that its delivery approach (excluding the grant it received), cost approximately 20% less than what it would have cost with a traditional design build and bid approach; however, this figure compares an assumed cost (DBB) with an actual expenditure. The cost of Santa Paula's new wastewater treatment plant ($62 million) was substantially lower than the $80-$95 million estimated cost if the project had relied on DBB. Regina and Santa Paula incorporated private financing in their models to further incentivize their private partners to perform and assume construction risk.

Davis Woodland and Phoenix relied on integrated DBO models, but retained responsibility for financing their facilities. In both cases, the communities had access to such low cost capital that they believed retaining financing responsibly and foregoing the added performance incentive that private financing can add was prudent for their communities.

The projects in Phoenix, Regina, Santa Paula and Davis and Woodland all proceeded relatively smoothly during construction and projects were completed well within their deadlines.

Operating Efficiencies

All of the communities studied used their chosen alternative delivery model to assign operating responsibility to their partners. In some cases, such as in Tampa Bay, Santa Paula, and Rialto, the communities had historically relied on private sector operators. In Regina and Phoenix, where the public sector had operated most of the system assets prior to the projects, the transition to private management was more significant. For Regina, the cost savings associated with private sector operations had much more to do with integrating the operation of the facility with the design and construction of the facility under a single contract rather than an assumption that the private sector was innately able to operate a facility more cost effectively than the public sector. The opportunity to consider operating costs from a lifecycle approach (when both operating and construction costs are linked in a contract) influenced the design of many of the facilities. The contracts are structured to take advantage of financial incentives that may at times motivate the private sector more than the public sector. Specifically, the private sector may be more willing to take risks and invest in creative solutions in order to gain

financially. For example, the contract in Santa Paula provided direct financial benefits to the operator to reduce energy usage during the operation phase. As a result, the operator modified the design and implemented operational changes that reduced the energy use of the facility resulting in added profit for the operator and savings in terms of costs sharing for the public entity. Additionally, Santa Paula and Phoenix's facilities both required less staffing than similar facilities in their respective regions. While operational efficiencies were mentioned in many of the projects studied, there were few quantified projections. In areas such as Bayonne and Regina, the projects were structured to provide workforce transition measures such as employment and benefit protection that reduced opportunities for measures that drastically reduce labor costs.

The partnership in Allentown was unique for many reasons, including the fact that the service delivery partner was a public entity rather than a private entity. From an operational efficiency standpoint, the partnership generated efficiencies that were linked to the ability to consolidate two nearby interconnected systems. It is worth noting that the consolidation could have occurred in other ways, such as through the creation of a new authority, but that may not have led to the monetization of the equity that Allentown sought. In summary, the Allentown model included a consolidation that generated cost savings, which were then used to monetize system equity and generate funds for non-utility purposes in a way that had a reduced impact on City taxpayers.

Models that included the operation of energy and/or chemical intensive facilities dealt with those costs in several different ways. In general, agreements specified that these costs were essentially pass-through costs that the public sponsor had to pay with possible maximum usage (but not expenditure) caps to guard against inefficiency. Several agreements such as Santa Paula included clauses that allowed the private sector to tap into energy savings that they were able to create through innovation or operational changes thereby incentivizing efficiency. If the goal is operational efficiency and cost savings, these clauses clearly provide more efficiency drivers than a simple pass-through agreement.

Impact Outside Water Services

In several of the communities, the most pronounced financial impact involved aspects other than pure cost savings or project economies. While Allentown, Bayonne, and Rialto chose alternative delivery models that were designed to improve service, in each case monetization of the equity in their systems was an equal or primary driver for the model. In the case of Allentown and Bayonne, the concessions were designed to generate significant upfront payments that the communities used for essential general government services outside of the water system. Allentown's arrangement generated a cash influx to plug a pension liability that was adversely affecting the City's financial health and future. Bayonne tapped into its concession payment to slow the rise of property taxes and to carry out economic development projects. In the case of Prince George's County, the County used the private sector to help catalyze economic and community development initiatives while meeting environmental objectives. In some situations, the positive financial impacts had tradeoffs in terms of customer bills. In the case of Allentown, Bayonne, Rialto, and Prince George's County, the private sector partnerships provided community economic benefit, but the underlying cost of the benefits shifted onto the water service customer.

Reduced Demands and Retained Revenue Risk

Many of the projects studied for this report were designed and constructed during a period of unforeseen declines and variability in water demand.[13] Water demands and water service sales in many parts of the country

[13] Hughes, Jeff, et. al. *Defining a Resilient Business Model for Water Utilities.* Water Research Foundation. 2014. http://www.waterrf.org/Pages/Projects.aspx?PID=4366

began to flatten or decline in ways that historic demand models failed to predict. A portion of the drop in demand was attributed to historic economic downturns. Other reasons for demand drops include rapid uptake of water efficient appliances and fixtures and increased service prices.

Untangling the impact of the demand drop from the positive impact of the delivery models during this time requires understanding how demand risk was allocated. The majority of the projects studied and the majority of alternative service delivery models are designed to shift many financial risks (such as construction risk and permitting risk) to private partners. However, very few models shifted the financial risk of demand drops. In fact, some of the models were designed to protect private partners from demand risk that may have amplified the negative financial impact of reduced demands on the public partner. For example, the operating contract associated with Phoenix's DBOM facility was structured with large fixed payments. When demand dropped in Phoenix, the cost of running the contracted facility was higher than other operating cost scenarios that would have involved significant curtailments at the facility. In the end, the City of Phoenix was able to renegotiate its agreement, but the lack of operational flexibility left Phoenix wary of a similar agreement in the future. Bayonne's payment structure was designed to guarantee the private partner a set revenue amount. The rate adjustments needed to produce those revenues assumed sales that did not materialize, leading to higher than anticipated rate adjustments. These adjustments cast a negative light on the service delivery model, even though the root cause of the higher rates was linked to faulty demand projections by the City, not an inherent operational problem.

When Things Do Not Go as Planned

The alternative delivery experience in Tampa Bay Water was arguably one of the most complex service delivery experiences in the water sector. The service delivery model evolved over time for reasons linked to the project itself (new technology design challenges) as well as factors well outside the project, such as the bankruptcy of the international firm originally tasked with construction. Unraveling the financial impacts associated with the different service delivery models was particularly challenging. The project is often cited as an example of a case of problematic project implementation, given the well-documented construction delays and cost overruns. However, in many ways the experience also demonstrated some of the financial benefits of alternative service delivery models. At the time of construction, desalination technology was still in early stages of development. The Tampa Bay model succeeded in that the early costs associated with construction problems remained with the private operator up until the point that problems with their parent company led to bankruptcy and exit from the project. While Tampa Bay had to pay more for an unfinished plant, it is impossible to know if Tampa Bay could have done it any cheaper under a different model. It is possible that the public utility would have encountered many of the same challenges as the private sector, but under a different contracting mechanism would have incurred the expensive change orders and construction delays that are typical for many complicated construction projects.

The project was also built in the midst of the same declining demand trends mentioned above. The project was originally framed as providing water at a rate of under $2.00 per thousand gallons, an extremely competitive rate for desalination water. However, this estimate was based on what now proves to be unrealistic construction costs and higher sales. Tampa Bay now estimates that water from the plant costs over $4.00 per gallon based on the production needed and final costs. Yet the project is still seen as a success by the utility given the essential role it plays in providing an alternative water source to an area that has been plagued by over-pumping of its ground water source. Tampa Bay is also a cautionary tale for communities that believe they can use an alternative service delivery model to protect the public entity from all risks.

The Danger of Focusing on Financial Impacts Alone: Risk and Service Quality Matter

The research team focused primarily on identifying the financial impacts of alternative delivery models because the issue of financial impact typically dominates public debate and governing board discourse and is often presented and analyzed in overly simplistic terms. In almost every community, "cost savings" were highlighted at some time during the project development process as an essential component of the project. Often cost saving promises depended on favorable assumptions or framing. In some cases, projects were sold primarily on a basic presentation of financial benefits even though the underlying objective of using an alternative service delivery model may have had more to do with project and service quality than cost savings. For example, in Regina the key public message supporting the project was that the alternative service delivery model allowed the City to tap into grants to which it otherwise would not have had access, even though the detailed assessment used to justify the project focused much more on risk reduction than access to grant funds. There was clear evidence that in some communities, the use of alternative service delivery models provided direct financial benefits to the ratepayers. However, there were other examples where the models deployed led to ratepayers clearly paying more for services than they would have under other models, but in which the alternative model nerveless provided significant benefits (e.g. Allentown's use of the upfront payment to pay down public pension liabilities).

The models that involved extensive service provider arranged financing tended to rely on multiple assumptions to show significant cost savings. In the communities chosen, there was not clear evidence that the use of service provider financing directly resulted in significant ratepayer savings, but there was evidence that the use of service provider arranged financing provided incentives that contributed to project quality. In cases such as Allentown, Rialto and Bayonne, service provider arranged financing facilitated the monetization of existing utility equity to be used for general community goals in a way that may have been more challenging if the project sponsor's capital had been used.

General Observations and Trends Among the Communities Profiled

In addition to the general financial impacts described above, the research team noted a number of commonalities among many of the communities studied that are worth noting by public officials considering alternative delivery models.

Service Delivery Model Advocates

Most of the communities had an individual or small group of individuals that strongly believed in the service delivery model that was ultimately implemented in their communities. These advocates ("champions") included elected officials, staff, and advisors. In some cases their advocacy and support helped overcome the basic inertia linked to long-practiced approaches. In other cases their support was essential to overcoming more vocal opposition such the public campaigns waged in Regina or the internal leadership disagreements in Santa Paula.

Commitment to Oversight

All of the communities studied employed agreements and resulting models that were quite complex. Most of the communities studied devoted significant resources to analyzing service delivery options and to designing conditions, documents, and processes that supported a chosen model. In some cases, larger communities were

able to devote skilled staff to this oversight function while in other cases the community relied primarily on hired advisors. This attention to oversight (both at the outset of projects and in some cases on a recurring basis) required a significant time and resource commitment. It seems difficult to imagine these projects advancing without continued public oversight, so the cost of this oversight should taken into account when considering and evaluating costs.

Understanding the Benefits of Private Sector Financing

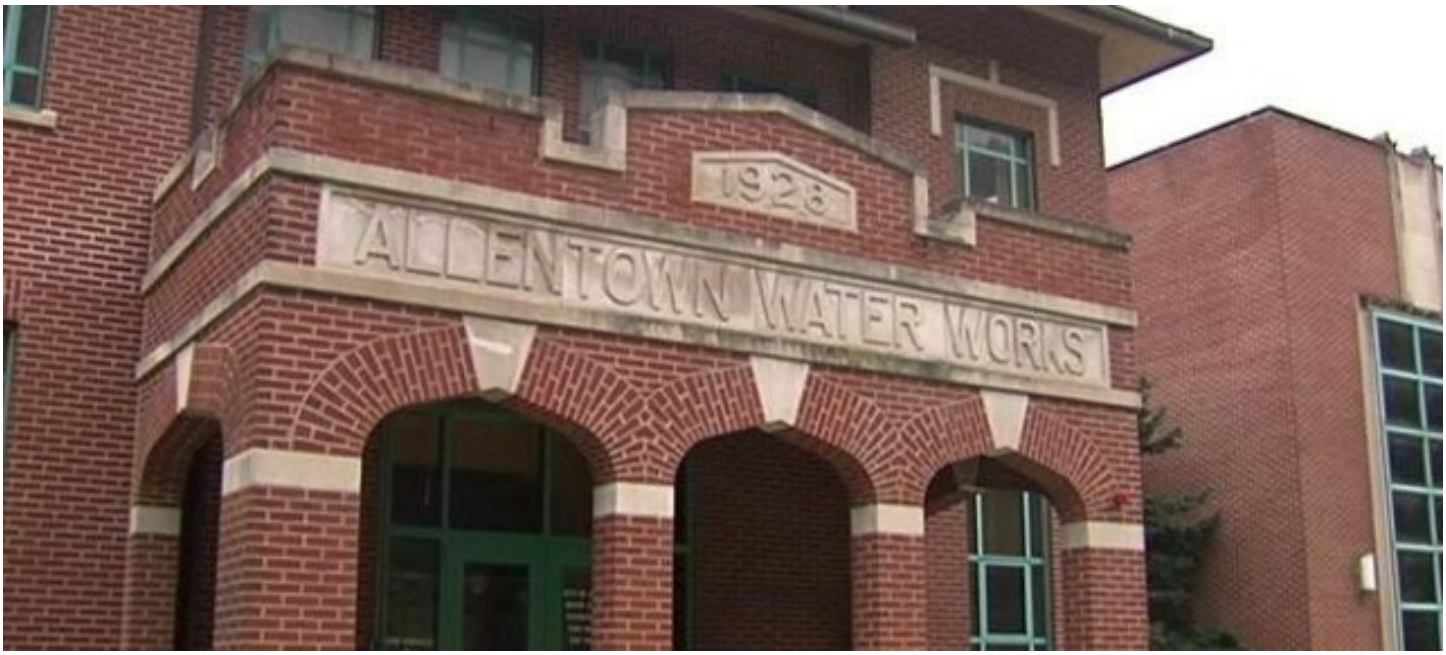
The use of private sector capital or private sector issued debt is often touted as a means to fill a need for additional capital. However, there is little evidence to suggest that the communities studied would not have been able to find other sources of capital for their project needs, and in many cases, capital could have been obtained at a lower cost. Private sector arranged capital in non-risk corrected terms costs more (sometimes significantly more) than publically arranged capital. The benefits of the privately provided capital in the communities studied had much more to do with other goals. In these cases, obtaining private capital was a strategy to monetize existing equity for use in non-utility purposes, to incentivize performance, and potentially to reduce costs by promoting innovation or reducing cost overruns or delayed implementation.

Contractualized Service Performance

One of the universal results of all the service delivery models studied is that the models "contractualized" specific performance outcomes that prior to the contract were considered more discretionary on the part of the public body. The contracts studied included a range of mandatory initiatives such as specific asset investments, replacement reserve funding contributions, and asset management practices that without the contract, the public entity may have been able to ignore or postpone in order to realize short term savings. To paraphrase one of the public officials interviewed, the contract protected the public entity against themselves by taking away the temptation to reduce key services or investments. Of course, the other side is that contractualizing a service level does lock a community into a set service level and the potential higher costs associated with that service level. Communities that have a tradition of artificially maintaining low rates by delaying investment and cutting corners will have to be prepared to defend the value and resulting higher rates linked to service improvement. There is no evidence among the communities studied that it is possible to enter into alternative service delivery models that result in significantly improved services and increased investments while also reducing what customers pay compared to what they paid in the past for "unimproved services." All of the communities studied involved contracts that improved services, added new infrastructure, and required rate increases which in some cases were very significant.

Overall, this study of alternative service delivery models suggests that alternative delivery models will not solve all the challenges facing the water sector, but for some communities, a carefully implemented model may be an option to help reach some of their goals.

Allentown Water and Wastewater Utility Concession



A public to public partnership between the City of Allentown and the Lehigh County Authority led to a more integrated regional utility system. At the same time, the partnership generated a large initial payment that helped Allentown meet non-utility financial obligations.

The City of Allentown entered into a concession with the Lehigh County Authority (LCA) to operate Allentown's water and wastewater system. This allowed Allentown to tap into water system equity and future customer revenues in order to cover other essential, non-utility costs, such as pension liabilities. At the same time, the deal created a larger consolidated utility system that was able to achieve operating savings through increased efficiency and economies of scale. LCA relied on the tax-exempt bond market to raise the funds it needed to make the initial concession payment and seed several reserve funds. For the citizens of Allentown, this arrangement resulted in converting a very sizable general government pension liability to long-term LCA debt that will be repaid by water revenue collected in the future from utility customers. For LCA, a desirable, highly predictable future revenue stream provided the ability to pay the initial upfront concession payment, assure high quality service, and make planned capital investments. However, by early 2016, LCA had found project cash flows less predictable than expected and it called into question the accuracy of some of the cost information provided by Allentown that LCA used to develop its financial projections. Allentown has refuted LCA's claim.[1]

[1] Opilo, Emily. *Lehigh County Authority Feeling Strain of Water-Sewer Deal; Blames Allentown Numbers.* The Morning Call. March 14, 2016. http://www.mcall.com/news/local/allentown/mc-lehigh-county-authority-allentown-legal-dispute-lease-20160314-story.html

Table 1. Key Project Details

Project Title:	Allentown Water and Wastewater Concession and Lease[2]
Primary Facility:	Entire water and wastewater system including distribution, collection, and treatment facilities
Local Government Entity:	City of Allentown
Primary Partner(s):	Lehigh County Authority
Delivery Model:	Concession
Contract Period:	50 years
Population Served:	34,000 water connections (180,000 individuals including residents of Allentown and neighboring communities) and 190,000 wastewater customers
Major Initial Outlays:	LCA issued $307 million in bonds to cover the upfront concession payment to Allentown ($211 million), fund deposits to key operating and reserve funds, and fund transaction costs
Flow of Revenues:	LCA collects revenue directly from customers based on rates that are determined by a schedule set out in the contract

Background

The City of Allentown, Pennsylvania owns (and, until recently, operated) a large water and wastewater utility that provides retail service to Allentown residents and wholesales treated water and wastewater services to neighboring communities. The system includes treatment facilities with 30 MGD of water capacity and 40 MGD of wastewater capacity in addition to an expansive regional water distribution and wastewater collection network. The utility is under an USEPA Administrative Order to eliminate sanitary sewer overflows. The system has some deferred maintenance, but is reported to be technically sound and financially secure.

Allentown decided to enter into a concession for the operation of the City's water and wastewater system because of financial needs that were unrelated to the system. In 2012, Allentown had been facing pension funding shortfalls for many years. Even after reducing staff and cutting costs, the City forecast that required annual contributions to its pension plan would take 30 percent of general fund revenues by 2015. The City's political leaders decided to enter into a concession for Allentown's financially sound water and wastewater system to pay down pension obligations.

> **"We can monetize the system, which we are doing through the lease, to use that revenue to pay for this unfunded pension liability, which if we don't do it will crush us financially."**
>
> - *Ed Pawlowski, Mayor of Allentown*

[2] The contract between LCA and the City of Allentown refers to the agreement as a concession and lease; however, for clarity the word "concession" is used throughout the rest of this profile.

Project Development and Procurement

Over the course of eight months, Allentown staff worked extensively with a group of advisors to carefully construct a concession model that would generate a large upfront payment while assuring high quality service. This large upfront payment would be used immediately to pay down the City's pension obligations. The resulting concession terms, which were included as bidding documents, covered a variety of key issues such as stipulations for hiring current workers, operating criteria, and rate schedules.[3] Nine entities responded to the Request for Qualifications (RFQ), and of these, Allentown qualified seven. Qualified entities were eligible to submit bids once Allentown issued a formal Request for Bids (RFB). After the bidders were qualified, Allentown conducted a series of reviews and discussions with prospective bidders to identify problematic terms and refine the concession documents to enhance the workability of the concession.

Four of the seven qualified entities submitted six separate bids on the project (two entities submitted two bids each – one bid conforming exactly to the RFB terms and one non-conforming bid). The terms of the concession were clearly spelled out in a draft agreement that was part of the RFB. The key terms to be submitted by the bidders were the magnitude of the upfront concession fee, with a floor of $150 million, and the size of the annual concession fee. Since two of the bidders upfront payments were within 10 percent of one another, under the terms of the RFB the City requested a best and final offer (BAFO) to allow bidders to increase their bids if desired.

LCA, a publicly owned water and wastewater utility in close proximity to Allentown, was one of the entities qualified to submit a bid and ultimately was selected as the lessee. During the bidding and negotiation process, LCA advocated for Allentown to do a full sale of the system instead of a concession, which would have allowed LCA to pay a higher upfront payment.[4] Allentown preferred to maintain ownership, and in the end the arrangement went forward as a 50-year concession, not a sale. While this was the first venture of this magnitude for LCA, it had completed 30 smaller acquisitions during its 50-year history. Allentown chose LCA as the concessionaire because LCA offered the highest upfront bid[5] and because LCA successfully highlighted its knowledge of the area and proximity to the City of Allentown. LCA had been Allentown's largest water and wastewater customer for over 40 years, and it bid on the concession partly to protect its own interests.[6] The process took a year and one month from the release of the RFQ to the awarding of the concession.

As part of the procurement process, Allentown prepared and shared with bidders detailed estimates of existing costs and revenue flows from both retail customers and wholesale customers. At the time of the concession, Allentown had a number of water and wastewater sales agreements with neighboring communities. These wholesale relationships were transferred to LCA under the concession agreement. LCA used the information provided by Allentown to construct and run financial models of the financial impact of the concession agreement. One of the key requirements established by the LCA governing board for moving forward with the deal was that the transaction would not place any additional financial burden on LCA's current customers.

While the Allentown City Council was very supportive of the agreement, it was a contentious decision. Allentown residents and members of LCA's own Board of Directors voiced numerous concerns. Allentown residents showed the greatest concern over potential rate increases, lack of local control, and whether the decision was fiscally sound.[7]

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[3] *How Allentown Leased Its Utilities to Fund Pensions.* Governing: The States and Localities. September 9, 2013. http://www.governing.com/blogs/view/gov-how-allentown-sold-its-utilities-to-fund-its-pensions.html
[4] Aurel Arndt (Former Chief Executive, Lehigh County Authority), phone correspondence with author. March 09, 2016.
[5] *City of Allentown Water and Sewer Utility System Request for Bids.* Lehigh County Authority to City of Allentown. March 27, 2013.
[6] Aurel Arndt (Former Chief Executive, Lehigh County Authority), phone correspondence with author. March 09, 2016.
[7] *Council Meeting Minutes.* Allentown City Council. Allentown, PA. April 17, 2013.

Table 2. Select Project Milestones[8]

Date	Milestone
July 2012	The Mayor and City Council of the City of Allentown release a RFQ for a long-term concession of the City's water and sewer system
August 2012	Nine companies respond to the RFQ. Allentown qualifies seven respondents
November 1, 2012	Detailed draft agreement is structured as a RFB is issued
March 2013	Four of the seven qualified entities submit six bids
April 2, 2013	LCA is awarded the water and wastewater concession
July 2013	LCA issues tax-exempt and taxable revenue bonds to raise funds to enter into the agreement
August 7, 2013	Concession and related Financing Settlement; all contracts are signed and required documents are provided by Lease parties; Lease commences at midnight
March 2016	LCA claims Allentown provided inaccurate cost and revenue information during the process

Key Financial Features and Outcomes

While the contractual details of the arrangement are complicated, the conceptual framework is fairly simple. The City of Allentown granted LCA the right to operate the water and wastewater system for 50 years in exchange for an upfront payment of $211.3 million and an annual concession fee of $500,000. LCA is responsible for managing all aspects of the system, including customer service and billing. Both parties agreed to a long-term schedule of steady rate/revenue adjustments that were designed to recover the cost of the initial upfront payment, retirement of outstanding Allentown utility debt, and a series of initial capital investments. The concession documents also state the terms for additional rate adjustments that may be required to cover additional capital investments or unexpected events such as a sudden loss of a wholesale customer.[9] See Appendix A for schematics that describe the initial outlays and recurring expenditures associated with the agreement.

Allentown used the proceeds of the transaction to contribute $158 million to fund pension obligations[10] and to pay down $30 million in debt on the water and wastewater system so that the title was clear.[11] The remaining $23 million was used to cover the cost of the transaction, staff and equipment for a new stormwater department (since stormwater services had previously been provided by staff who moved over to LCA), and to fill other City staffing vacancies.[12]

LCA issued a series of bonds to meet its obligations to the City under the terms of the agreement. According to former LCA CEO Aurel Arndt,[13] the use of capital appreciation bonds ($44 million of the priced issue) was important because it allowed LCA to get the overall funding it needed while minimizing bond interest payments during the early years of the transaction. Use of capital appreciation bonds allowed scheduled rate increases to be lower in these early years than would otherwise have been possible. The bond offering included three series of bonds with a stated par of $307,684,000.

[8] Lehigh County Authority Water and Sewer Sale| InfraDeals "Project History". Infra-Deals.com.
[9] Allentown Water and Sewer Utility System Concession and Lease Agreement. 2013. http://www.allentownpa.gov/Portals/0/files/PublicWorks/Compliance/LCAConcessionLeaseAgrmt.pdf
[10] Burton, Paul. As Pension Woes Hover, Allentown Oks Water Deal. The Bond Buyer. April 26, 2013. http://www.bondbuyer.com/issues/122_81/allentown-pennsylvania-city-council-approves-220-million-water-sewer-deal-1051084-1.html
[11] LCA's Water Lease Agreement Explained. Lehigh County Authority. http://www.allentownpa.gov/Portals/0/files/PublicWorks/Compliance/LCAs%20Water%20lease%20agreement%20explained.pdf
[12] Aurel Arndt (Former Chief Executive, Lehigh County Authority), phone correspondence with author. March 09, 2016.
[13] Ibid.

Most of the bonds issued were tax-exempt with an effective interest rate of 5.4486 percent and an average life of 28.7 years. Approximately $18 million of the bonds were slated to seed operation and maintenance reserves and were issued as taxable securities. The taxable debt is retired first, which has the effect of minimizing the impact the taxable rate can have on the annual debt service requirement. In aggregate, the bonds were sold at a discount and resulted in $296,760,141 in proceeds. The table below shows the sources and uses of funds.

Table 3. Detailed sources and uses of LCA funds[14]

Sources:	
2013 Bond Proceeds (net of original issue discount[15])	$296,760,141
Uses:	
Upfront concession payment	$211,332,217
Capital improvement fund	$31,850,565
Debt service reserve fund	$28,090,273
Capitalization interest account	$3,450,000
Operations and maintenance reserve fund	$9,199,515
Major maintenance reserve fund	$7,500,000
Cost of issuance	$5,337,569
Total:	$296,760,141

The core cost recovery mechanism of the agreement rests on a long-term schedule of rate adjustments beginning in 2016 that includes a 2.5% adjustment ("margin change") plus the annual change in the consumer price index for urban customers (CPI-U) for the first 20 years of the contract. Thereafter rates change based on a two percent margin change plus the CPI-U for the following 10 years.

The revenue from existing Allentown water and wastewater customers goes to LCA during the concession period (50 years) and is used to cover contractually-required future capital expenditures, operation and maintenance costs, an annual payment to the City and LCA's debt service for the bonds it issued at the outset of the concession agreement. In the latter years of the concession, LCA is also required to begin depositing revenues into various funds to be used for future capital investments and other purposes.

A number of events could trigger additional rate increases beyond the indexed schedule. These include loss of a major wholesale customer, regulatory changes and "major capital expenditures" above preset limits and schedules. The agreement sets out a schedule for required capital investments. These costs are to be covered through the scheduled rate adjustments. For example, the agreement requires that LCA replace four miles of water lines each year. The agreement also specifies the cost recovery terms for additional "major capital improvements (MCI)." These improvements include adding capacity to the wastewater plant or new investments that exceed $1 million, adjusted for inflation. Under the agreement, LCA may pass these costs on to customers using the interest rate on LCA's financing when MCI is financed from LCA debt, or LCA may use the same rate of return on equity allowed to investor-owned

[14] Arndt, Aurel. *Case Study - WIFIA Financing of a P3 Like Infrastructure Project.* Lecture, P-3 Connect: Defining the Future of P3 in the US. Denver, Colorado. July 29, 2014.

[15] While LCA's total bond issuance was nearly $308 million, the proceeds were only $297 million because the bonds were sold at a discount, less than face value. The price for a bond sale will be less than the stated par amount when the bond issues' weighted average coupon is less than the weighted average market yield.

utilities in Pennsylvania when MCI is financed from LCA revenues, which generally fluctuates between 7 and 11 percent over time depending on economic conditions.[16]

LCA also agreed to concession conditions that offered equivalent employment to every union employee of the system in good standing, approved a collective bargaining agreement for those employees, and accepted the union as the sole bargaining representative for union employees. Allentown was also able to select some employees as "key employees," and LCA was required to offer these employees, as well as any non-union operations employees, equivalent positions.[17] There were 10 to 15 employees not covered by either of these stipulations that LCA was obligated to interview but not hire (although LCA did end up hiring the majority of these workers).[18] Out of 100 existing Allentown workers, 84 chose to work for LCA. In addition, Allentown created a new compliance department that includes dedicated staff charged with managing and monitoring the concession contract. The department is funded through the payment of the annual concession fee so that it does not become a hidden, undocumented financial cost of the arrangement.[19]

Table 4. Project Risks for LCA, City of Allentown, and Ratepayers

Risk Category	Responsible Parties	Description
Operations and maintenance including costs associated with regulatory changes	LCA	LCA must follow a very detailed operations performance plan that encompasses wide variety of potential operating issues
	City of Allentown	Responsible for overseeing contract but otherwise has limited responsibility
	Ratepayers	Preapproved indexed retail rates and rate adjustments are designed to cover all operating costs. Other municipal customer rates are governed by separate municipal service agreements that generally provide LCA to pass on actual costs to wholesale customers.
Capital Needs	LCA	Responsibility for all capital improvements, including a set list of projects. Able to pass on costs related to Major Capital Improvements (>$1million, indexed) directly to ratepayers
	Ratepayers	Initial indexed retail rates and rate adjustments are designed to cover a relatively modest list of capital improvements. Future major capital improvements can be directly passed on to ratepayers
Revenue/Demand	LCA	LCA bears demand risk for any drop in retail sales since agreement is based on indexed rate increases, not revenue increases. LCA must absorb a portion of revenue loss linked to loss of municipal wholesale customers (up to 7 percent), after which ratepayers make up any drop in revenues over a three-year period.
	Ratepayers	Retail ratepayers are largely protected from having to meet revenue shortfalls due to retail demand drops but could absorb some risk if demand drops causing revenue loss to exceed 7%.
Financial/Debt	LCA	All debt for the system now rests with LCA. Under the agreement, LCA is allowed to recover a rate of return on any future capital investments but must decide how to finance those investments
	Ratepayers	Ratepayers carry responsibility for generating revenue to support existing LCA debt, but their contribution is limited to pre-set rate adjustment formulas
Catastrophic	LCA	Responsible for incurring costs related to catastrophic events but has authority to pass those on to customers
	Ratepayers	Ultimately the risk of carrying unforeseen catastrophic costs rests with ratepayers

[16] *Allentown Water and Sewer Utility System Concession and Lease Agreement.* City of Allentown and Lehigh County Authority. 2013. http://www.allentownpa.gov/Portals/0/files/PublicWorks/Compliance/LCAConcessionLeaseAgrmt.pdf
[17] Ibid.
[18] Arndt, Aurel. *Case Study - WIFIA Financing of a P3 Like Infrastructure Project.* Lecture, P-3 Connect: Defining the Future of P3 in the US. Denver, Colorado. July 29, 2014.
[19] McGimpsey, David. *How Allentown's Water Utility Saved the City with Mayor Ed Pawlowski.* The Water Values Podcast. http://www.thewatervalues.com/pod44

The arrangement had significant positive financial impacts for the City of Allentown. The City received a very large upfront payment that was used to pay off existing general government liabilities. The City also receives an annual payment commencing in 2016 (and indexed thereafter) that covers the management of the contract. Partially due to these benefits, the City's credit rating has improved since the transaction. Prior to the agreement, Standard & Poor's (S&P) assigned Allentown a BBB+ rating and stable outlook. As of February 19, 2015 (post-transaction), the City's S&P rating was upgraded from BBB+ to A+.[20] However, the new arrangement has put some financial restrictions on the City. Like many cities, prior to entering into the concession, the City of Allentown could use revenue collected by the utility to offset general city costs. For example, the utility was able to use water and wastewater revenues to cover stormwater services and to pay a portion of costs incurred in other City departments that may have indirectly supported utility services. Subsequent to entering into the agreement, the ability to make any annual direct or indirect transfers was lost beyond the $500,000 annual concession payment.

The impact on the system's water and wastewater customers is much more complex. Future rates are clearly laid out in the agreement, but it is impossible to accurately compare this outcome with what rates would have been if Allentown had not entered into the agreement. The agreement establishes a schedule of rate increases for retail customers according to the formula mentioned above. The Mayor of Allentown has repeatedly stated that he believes the rate increases under the concession agreement are reasonable and potentially lower than increases the City would have made. He cites recent increases over the previous 5 to 10 years that were actually higher than the indexed increases as evidence of the positive outcome.[21] The Mayor has also mentioned rate stability as a key benefit. However, future rate adjustments beyond the indexed increases are a risk given the terms of the contract, which state that future "major capital improvements" beyond a relatively short list can trigger cost recovery adjustments. One factor that has seemingly had a positive impact on the utility's customers (and an adverse impact on LCA) is continued low inflation rates, which have, to date, resulted in only small rate increases because the rate schedule is based on the CPI-U. According to Aurel Arndt, LCA modeled a variety of inflation scenarios in their projections, but did not expect that the CPI-U rate would be as low as it has been at the outset of the contract period.[22]

LCA was particularly willing to bid on the Allentown concession because Allentown's rates were relatively low compared to other rates in the area. LCA believed these original rates were not pushing the limits of affordability, and so the Allentown system represented an opportunity to generate future revenues in a way that may not be an option in many other systems.[23] LCA was clear that it was passing all the costs of the transaction on to customers, including the financing costs associated with raising the funds that went to non-utility purposes (i.e., pension funds). This, in effect, passes along the City's future pension liabilities as additional costs to system customers. At the same time, LCA believed that it could produce significant operational cost savings by running Allentown's system more efficiently.[24] The impact on taxpayers vs. ratepayers is complicated because many, but not all, of Allentown's water system ratepayers are also taxpayers. Conceptually, the impact of this arrangement appears as a net positive for the average family in Allentown, as most families saw extra costs on their utility bill, but a potentially larger general government financial burden was removed from their future tax bill. In addition, the project contributed to Allentown's stronger credit rating, which lowers current borrowing costs. The ultimate cost benefit ratio will depend on the combined tax and rate impact. It is clear that ratepayers who are not also taxpayers have less of a direct benefit from this arrangement. However, the impact to these ratepayers is tempered by the fact that none of this analysis takes into account the avoided potential consequences to the entire region if the City of Allentown had suffered catastrophic financial problems.

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[20] Kraft, Randy. *Standard and Poor's gives Allentown an upgraded A+ rating.* Lehigh Valley News. February 19, 2015. http://www.wfmz.com/news/news-regional-lehighvalley/Local/standard-and-poors-gives-allentown-an-upgraded-a-rating/31354928

[21] McGimpsey, David. *How Allentown's Water Utility Saved the City with Mayor Ed Pawlowski.* The Water Values Podcast. http://www.thewatervalues.com/pod44

[22] Aurel Arndt (Former Chief Executive, Lehigh County Authority), phone correspondence with author. March 09, 2016.

[23] Ibid.

[24] Ibid.

> **"For us it also was a stabilizing effect. It took that aspect out of politics, put it into the realm of contractual agreement, which I think is beneficial for our ratepayers … and gives them more stability in predicting rates for year-to-year-to-year to come in the future."**
>
> *- Ed Pawlowski, Mayor of Allentown*[25]

The impact on LCA and their customers is also complicated. LCA now benefits from a larger, more diverse customer base. And as a previous customer of the Allentown system, LCA has more control over the water and wastewater treatment plants that serve them because of the agreement. Allentown also provided water and wastewater service to other communities through service agreements, which with their pricing terms effectively transferred to LCA at the time the concession was signed. Most of these agreements allow LCA to recover documented operational costs and a cost-driven supplemental revenue.

In early 2016, LCA claimed that the documentation that the City prepared outlining the costs and revenues associated with serving the system's suburban customers were inaccurate. The claim indicates this arrangement has a potentially negative financial impact for LCA when compared to prior expectations. At the time this document was written, it remains to be seen how the disagreement will be resolved.

From a strict water and wastewater delivery perspective, this arrangement has resulted in a more integrated utility, effectively consolidating (at least for the next 50 years) the operations of two utilities into one system. Initial progress in identifying economies of scale has been positive.[26] In addition, this arrangement allowed a local government in financially difficult circumstances to leverage the equity it had in its water and wastewater assets to address financial challenges.

[25] McGimpsey, David. *How Allentown's Water Utility Saved the City with Mayor Ed Pawlowski.* The Water Values Podcast. http://www.thewatervalues.com/pod44

[26] Aurel Arndt (Former Chief Executive, Lehigh County Authority), phone correspondence with author. March 09, 2016.

Appendix A. Simplified Project Financial Flows

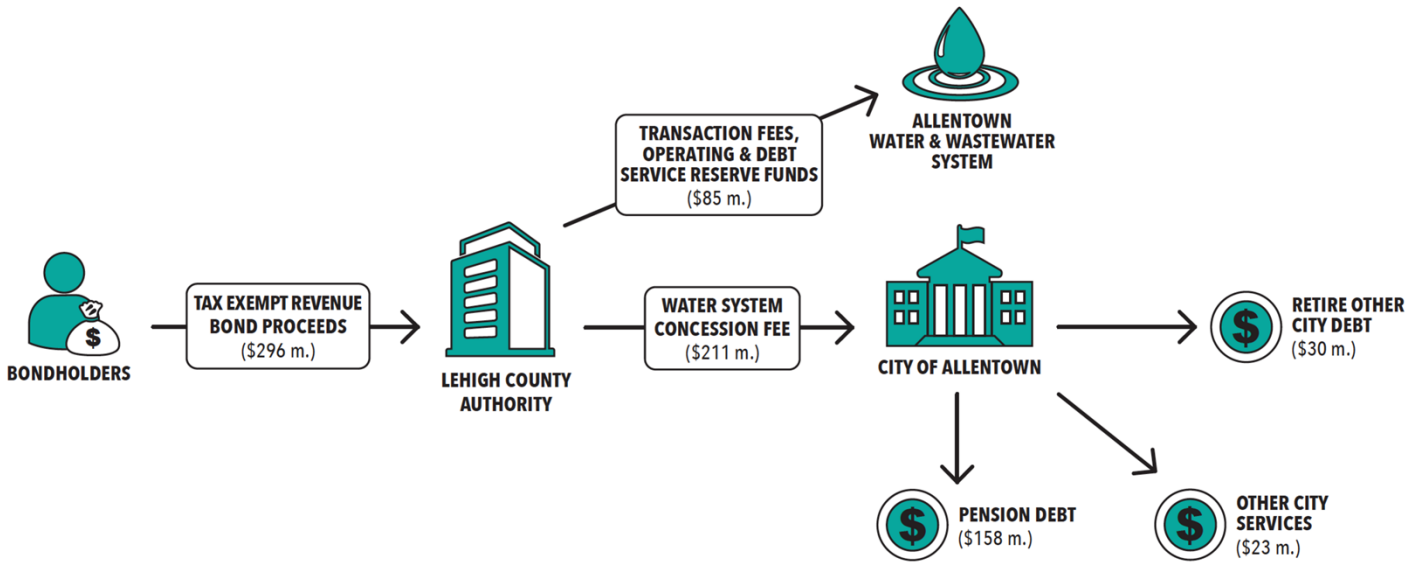

Figure 1. Flow of Initial Project Outlays

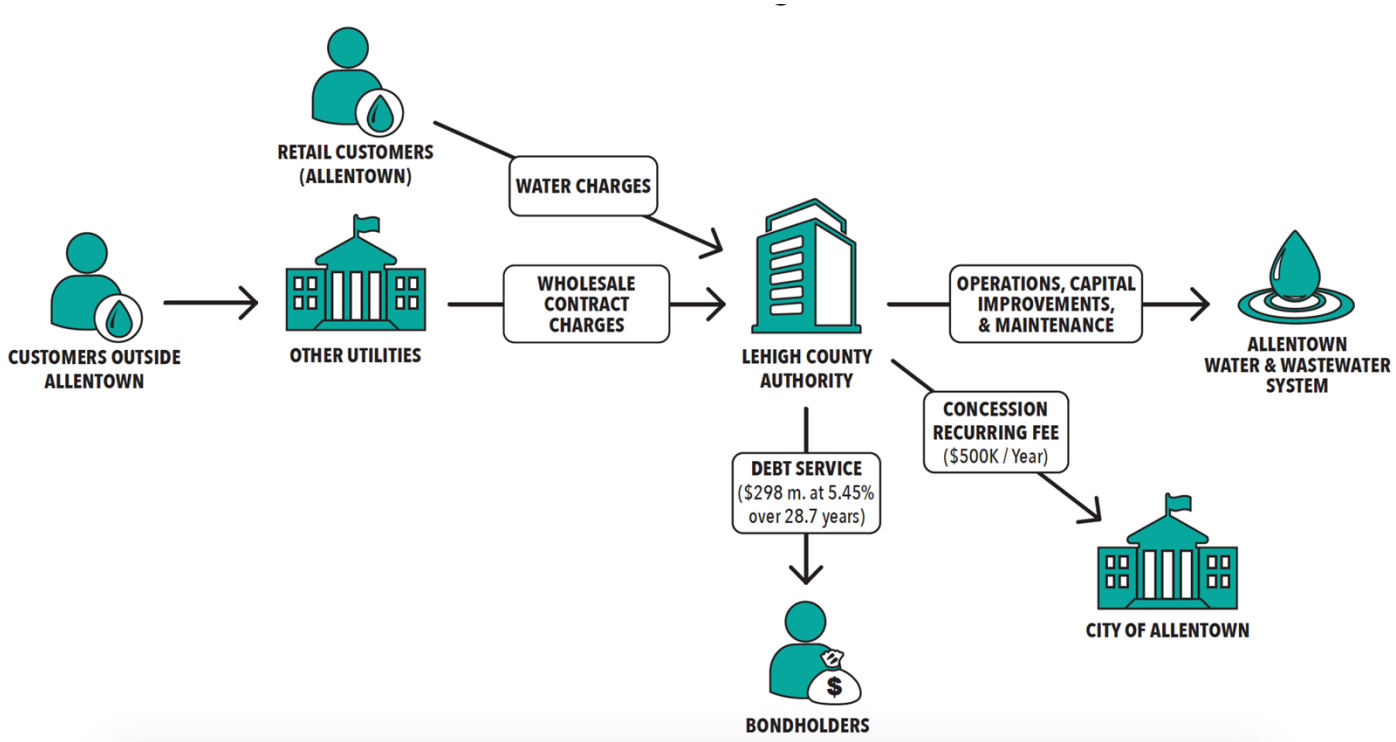

Figure 2. Recurring Financial Flows

Acknowledgements

Written by Jeff Hughes† and Carol Rosenfeld. October 2016.

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Cover photo from WFMZ: http://www.wfmz.com/news/news-regional-lehighvalley/Local/lca-officially-assumes-control-of-allentowns-water-sewer-systems/21391660

† Jeff Hughes is a member of the United States Environmental Protection Agency's Environmental Finance Advisory Board.

About the Environmental Finance Center

The Environmental Finance Center at the University of North Carolina, Chapel Hill is part of a network of university-based centers that work on environmental issues, including water resources, solid waste management, energy, and land conservation. The EFC at UNC partners with organizations across the United States to assist communities, provide training and policy analysis services, and disseminate tools and research on a variety of environmental finance and policy topics.

The Environmental Finance Center at the University of North Carolina, Chapel Hill is dedicated to enhancing the ability of governments to provide environmental programs and services in fair, effective, and financially sustainable ways.
www.efc.sog.unc.edu

About the Water Infrastructure Resiliency Finance Center

The Water Infrastructure and Resiliency Finance Center identifies financing approaches to help communities make better informed decisions for drinking water, wastewater, and stormwater infrastructure that are consistent with local needs.
https://www.epa.gov/waterfinancecenter

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Bayonne Water and Wastewater Concession Agreement

After a period of underfunding and deferred maintenance, the Bayonne Water and Wastewater Concession Agreement monetized existing assets, restructured debt, and transferred asset management responsibility to the private sector. The agreement led to improved service efficiency, stronger general government financial condition and modestly higher rates.

The Bayonne Water and Wastewater Concession transformed the Bayonne water and wastewater utility from a utility struggling with a backlog of capital needs, high debt, and a history of deferred maintenance to a utility where annual maintenance and capital investment is contractually specified. This agreement was structured to improve the overall financial condition of Bayonne as well as improving water and wastewater services. In this concession, the cost of capital contributed by Bayonne Water Joint Venture is based on a combination of interest on taxable debt and private equity rate of return requirements. The capital investment is contractually regulated, regularly monitored, and offers comparable rates of return to the regulated utility sector. The resulting contract created a schedule of revenue needs, or "revenue path", and requires recurring rate increases to meet those revenue needs. However, rate increases have been higher than initially predicted due to lower than projected water sales and the reallocation of some of the initial concession fee funds from rate stabilization purposes to general governmental purposes.

Table 1. Key Project Details

Project Title:	Bayonne Water and Wastewater Concession Agreement
Primary Facility/Service:	Water, wastewater, and stormwater distribution and collection network
Local Government Entity:	City of Bayonne operating through Bayonne Municipal Utilities Authority
Primary Partner(s):	Bayonne Water Joint Venture (Partnership between Suez/United Water and Kohlberg Kravitz & Roberts)
Delivery Model:	Concession
Contract Period:	40 years
Population Served:	12,000+ meter accounts[1]
Major Initial Outlays	Upfront concession fee ($150 million),[2] project development and misc. reserves ($16.3 million) plus contractually required capital investments over the first 3 years including $7.5 million in meter and billing upgrades
Flow of Revenues:	Concessionaire collects revenues (bills) directly from users; rates are set by public entity to meet contractual annual revenue requirements

Background

The Bayonne Municipal Utilities Authority (the Authority) is the water and sewer utility created and managed by the City of Bayonne, New Jersey to provide its residents with water, wastewater, and stormwater collection/transmission services. The City of Bayonne currently has a population of approximately 66,000 people. The population has remained relatively steady since 2000, but had been experiencing a slow decline since 1950 when the population was 77,203.[3]

The Authority does not operate its own treatment plants. Instead, it purchases treated water through a contract with the North Jersey District Water Supply Commission and receives wholesale wastewater treatment through the Passaic Valley Sewerage Commission. As the New Jersey Board of Public Utilities has noted, historically the Authority did not always increase water and wastewater rates in proportion to the increased costs of running the system, thus incurring unsustainable debt and significant backlogs for necessary capital improvements.

Prior to the concession agreement being signed in 2012, the Authority had not raised rates since October 2006, when it passed a 27 percent increase.[4] Since then, the Authority experienced financial stress from decreased revenue resulting from water conservation, loss of a major industrial customer, an aging system with increased capital and maintenance costs, loss of key staff members the Authority could not afford to replace, and deferred debt obligations which came due at the same time revenue decreased.[5] The Authority was also troubled by a number of operational challenges, including a very high level of non-revenue water that is typically attributed to leaks and poor metering processes.[6]

The City of Bayonne was also experiencing significant financial pressure outside of its water and wastewater services. Between 2008 and 2010, the city relied on borrowing to meet as much as 40% of its basic annual revenue needs and

[1] Patrick Cairo (Senior Vice President, Corporate Development, Suez), email correspondence with author. August 31, 2016
[2] *Bayonne Water & Wastewater Concession Project Overview.* KKR. Presentation to New Jersey Board of Public Utilities. August 7, 2012.
[3] US Census 2014. http://www.census.gov/
[4] *State of New Jersey Board of Public Utilities Agenda*. Agenda Item 5B. October 23, 2012.
[5] *Why the Bayonne Water/Wastewater Public-Private Partnership Succeeded*. NW Financial Group LLC. April 1, 2013. http://www.nwfinancial.com/pdf/NW-BMUA-Report.pdf.
[6] *A Tale of Two Public-private Partnership Cities.* Knowledge@Wharton. June 10, 2015. http://knowledge.wharton.upenn.edu/article/a-tale-of-two-public-private-partnership-cities/.

received a low General Obligation credit rating (Baa1) with a "Negative Outlook" from Moody's.[7] This operational and financial stress led the City of Bayonne to pursue a public private partnership.

Project Development and Procurement

The Authority issued a draft Request for Qualifications and Proposals in March of 2011 seeking comments from potential operators. The Authority considered comments and issued a final Request for Qualifications and Proposals. The Request called for two service options: the first, a 20 year contract that was to include at least a $10 million dollar concession fee; the second, a 40 year contract that would allow the operator to retain all water and wastewater fees while paying concession fees at least large enough to pay off the Authority's outstanding debt.[8] Prior to the final solicitation due date, eight companies expressed interest, but for unclear reasons, only one group proceeded with a formal response. Under the 40 year proposal, United (now doing business as Suez) proposed a joint venture between United Water and Kohlberg Kravitz & Roberts (KKR), named the Bayonne Water Joint Venture (Bayonne Water). The Authority considered and analyzed Bayonne Water's proposal against the option to continue to operate the system internally.

The procurement process was dominated by extended negotiations between the Bayonne Water and public representatives throughout 2011 and most of 2012. The negotiations were underpinned by analyses designed to assure that both parties were able to meet their objectives. The City's main priorities were to keep rate increases to the minimum that would allow the project to be self-sufficient and to transfer responsibility (through debt retirement and refinancing) for $125 million in city-backed debt to the private sector. The Bayonne Water team developed the Revenue Path Model (see details below), which was the option that the Authority ultimately chose to achieve these objectives.[9]

The procurement process and negotiations involved individuals and organizations representing both public sector and private sector interests. Both the public and private sector engaged outside financial advisors, legal counsel, and engineering/technical advisors. The mayor in office during the development and initiation of the agreement lost a close election in 2014, resulting in a new mayor and administration taking over several years into the agreement.

Table 2. Select Project Milestones[10]

Date	Milestone
March 2011	The Authority issues Draft Request for Qualifications and Proposals seeking comments
June 2, 2011	The Authority releases Final Request for Qualifications and Proposals
August 19, 2011	Responses due for Request for Qualifications and Proposals
September 11, 2011	The Authority qualified United Water as selected respondent and began negotiations
March 20, 2012	Memorandum of Understanding reached
August 8, 2012	KKR and United Water acting as Bayonne Water Joint Venture signed 40-year concession with the Authority to operate the city's water and sewerage systems
December 2015	Revenue shortfall from existing rates requires a higher than expected rate increase (13.25% instead of 3.5-4%)

[7] *Ratings Update: Moody's Affirms the City of Bayonne's Baa1 Rating and Negative Outlook. Moody's Investor Service. November 5, 2010. https://www.moodys.com/research/MOODYS-AFFIRMS-THE-CITY-OF-BAYONNES-NJ-Baa1-GO-RATING-Rating-Update--RU_16711782.*
[8] *State of New Jersey Board of Public Utilities Agenda*. Agenda Item 5B. October 23, 2012.
[9] *Why the Bayonne Water/Wastewater Public-Private Partnership Succeeded*. NW Financial Group LLC. April 1, 2013. http://www.nwfinancial.com/pdf/NW-BMUA-Report.pdf.
[10] Bayonne Water & Wastewater Concession | InfraDeals "Project History". Infra-deals. September 15, 2015. http://www.infra-deals.com/deals/950558/bayonne-water-and-wastewater-concession.html

Key Financial Features and Outcomes

One of the defining characteristics of the model in Bayonne is the structure of concession payments, which include a large upfront concession payment ($150 million) and annual concession fees ($500,000 each year).[11] The upfront outlay was effectively a method of restructuring much of the city's existing utility and general government debt while at the same time generating a modest cash influx for the city. Approximately $125 million of the initial concession fee went towards refunding existing debt, $6.5 million was returned to the concessionaire to cover transaction costs, and the remaining $18.5 was used to support general governmental needs and tax stabilization.[12] Several reports on the project (including a report by one of the Authority's financial advisors) mention the possible creation of a rate stabilization fund using part of the concession fee proceeds; however, according to the City[13], the funds that were available after paying off the outstanding debt were eventually used entirely to meet general fund needs.

Under the terms of the deal, Bayonne Water is responsible for operations, meeting specific operating standards, maintenance up to $500,000 per year, and $2.5 million per year (adjusted by inflation) of capital improvements over the term of the contract. These contractually specified capital investment requirements were one of the key service improvement benefits of this model. Bayonne Water was also required to install approximately $7.5 million in new meter equipment in the first two years to improve billing services and increase revenue capture.[14]

> **"What the partnership does is remove the need for political will for the maintenance of the system. It's hard to imagine politicians committing an equal amount of money to maintaining our water supply."**
>
> *- Tim Boyle, Executive Director, Bayonne Municipal Utilities Authority*[15]

Bayonne Water committed to continuing employment for the Authority's 30 employees for a year after the agreement and to retain 19 employees thereafter. The employees also had the opportunity to take other positions within United Water.[16] Bayonne Water was also required to cover any employee termination costs for up to 12 months. The Authority maintains oversight and monitoring for the system with its remaining staff. The annual concession fee of $500,000 covers this work, along with other costs such as insurance and pension contributions for remaining staff.[17]

To pay for the deal, Bayonne Water issued approximately $110 million in privately placed taxable bonds with a final maturity date of November 2037 and an average life of 18 years. The bonds were priced at par with a fixed 5.07% coupon. Bayonne Water covered the balance of the upfront payment and initial capital obligations with $63.8 million in equity – 90 percent from KKR, and 10 percent from United Water.[18] The cost of capital that will eventually be incurred by ratepayers for the initial outlay under this model includes the debt costs associated with the taxable bonds and the

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[11] Bowen, Mick. *KKR, United Water Price Private Placement Bonds for Bayonne Water Concession*. InfraAmericas. November 21, 2012. Accessed April 18, 2016. http://www.infra-americas.com/registration/login.php?lastUri=/news/usa/1137378/kkr-united-water-price-private-placement-bonds-for-bayonne-water-concession.thtml.

[12] *Order Approving an Agreement to Establish a Public-Private Contract Between the Bayonne Municipal Utilities Authority and United Water Joint Venture, LLC.* New Jersey Board of Public Utilities. Agenda Item 5B. October 23, 2012.

[13] Tim Boyle (Executive Director, Executive Director of the Bayonne Municipal Utilities Authority), phone correspondence with author. April 19, 2016.

[14] *Why the Bayonne Water/Wastewater Public-Private Partnership Succeeded*. NW Financial Group LLC. April 1, 2013. http://www.nwfinancial.com/pdf/NW-BMUA-Report.pdf.

[15] *A Tale of Two Public-private Partnership Cities.* Knowledge@Wharton. June 10, 2015. http://knowledge.wharton.upenn.edu/article/a-tale-of-two-public-private-partnership-cities/.

[16] Baumann, Joseph. *Public Private Partnerships Case Study: Bayonne Municipal Utilities Authority*. American Water Intelligence Summit Infrastructure Finance Panel. November 14, 2012.

[17] *Why the Bayonne Water/Wastewater Public-Private Partnership Succeeded*. NW Financial Group LLC. April 1, 2013. http://www.nwfinancial.com/pdf/NW-BMUA-Report.pdf.

[18] Bayonne Water & Wastewater Concession | InfraDeals "Funding Details". Infra-deals. September 15, 2015. http://www.infra-deals.com/deals/950558/bayonne-water-and-wastewater-concession.html

scheduled return on equity to the private partners (reported as being in the "low" double digits).[19] Appendix A shows the key relationships between the public and private partners and the financial flows between the different groups that support the provided services.

The agreement's structure is founded on a revenue model referred to as the "Revenue Path" model, which is guided by a schedule of revenue requirements to be generated through water and sewer rates. Under the agreement, the concessionaire (Bayonne Water) collects and retains the user fees; however, the Authority is responsible for adjusting rates to generate the required revenues. Under the terms of the initial agreement, the Authority was required to raise rates by 8.5% the first year and then freeze rates for two years.

It was widely reported and presented that beginning in 2015, annual rate increases in the range of 3.5% would be required for the City to meet its contractual revenue requirements. However, after raising rates approximately 4% in 2015, the City was obligated to raise rates 13.25% in 2016 to meet their contractual revenue requirements. This rate increase triggered considerable political debate and media coverage.

Several confounding factors led to the discrepancy between the original projected rate increase and the actual rate increase. First, the agreement is based on required revenues, so if water sales are lower than projected, rates must increase faster and higher than predicted to generate the same amount of revenue. In addition, Bayonne Water's modeling may have also overestimated the revenue gains that the contractually required meter improvement initiative would generate. According to a representative from the concessionaire, the investments in new meter technology, while reducing water loss, improving meter reading accuracy and customer service, may have actually led to a short term reduction in revenue because of the technology enabled customers to identify and repair leaks and therefore reduce their water purchases.[20] Finally, it appears that the Authority had less access to rate stabilization funds than originally anticipated because the City used the balance of the concession fee for general-purpose uses rather than for rate stabilization purposes. Presentations and articles about the agreement consistently mentioned that $6.5 million of the original concession fee was supposed to be deposited in a rate stabilization fund and that $18.5 million was to be provided to the City of Bayonne for general purposes. According to the Authority's executive director, Tim Boyle, who began working several years into the agreement, the City ended up not being able to use any of the concession fees to offset rate increases; instead the City used concession fees to meet general fund shortfalls.[21] The Authority's service area is concurrent with the city taxpayer boundaries such that there is considerable overlap between taxpayers and water and wastewater customers.

The discrepancy in promised (or at least perceived to be promised) rate adjustments and actual rate adjustments highlights the difference between revenue risk and rate setting/demand risk. The agreement did not change the Authority's exposure to revenue risk. Prior to the agreement, if demand fell the Authority would have had to increase rates to maintain stable revenues. Under the agreement, the Authority is obligated to generate specific revenue levels, and if current customer demand falls or if the Authority loses customers, the Authority is still responsible for adjusting the rates to generate contractually set revenue limits.[22] Risk transfer by definition leads to the potential that one party can incur significant costs if certain outcomes occur. In the case of Bayonne, it was never envisioned that demand risk was transferred to the private party since the City maintained ownership, yet high profile promises of "rate" stability as an outcome of the agreement may have masked the fact that demand risk was not transferred. Strong disagreements remain over why the projected revenues were so much lower than expected.

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[19] *Why the Bayonne Water/Wastewater Public-Private Partnership Succeeded*. NW Financial Group LLC. April 1, 2013. http://www.nwfinancial.com/pdf/NW-BMUA-Report.pdf.

[20] Patrick Cairo (Senior Vice President, Corporate Development, Suez), email correspondence with author. August 31, 2016.

[21] Tim Boyle (Executive Director, Executive Director of the Bayonne Municipal Utilities Authority), phone correspondence with author. April 19, 2016.

[22] *Why the Bayonne Water/Wastewater Public-Private Partnership Succeeded*. NW Financial Group LLC. April 1, 2013. http://www.nwfinancial.com/pdf/NW-BMUA-Report.pdf.

It is important to note that the public sector also retains the upside of demand variation if it occurs – if demands increase and lead to rate revenues that are greater than the required amount, a portion of the surplus returns to the Authority. In many respects, the Revenue Path Model is conceptually closer to a regulated Rate of Return Model than a comprehensive concession agreement in capital investments. Investor return (profit) on the part of the private entity is very closely monitored and bounded. The "sharing model" approach used in Bayonne takes advantage of some of the incentives described in a recent paper prepared by the US Treasury Department that specifically examined new hybrid models for crafting partnerships.[23] The Executive Director of the Authority stressed that the Bayonne model, while similar to a private regulated model, has a significant differences in that the City of Bayonne will benefit from years of required capital investment during the contract, but at the end of the contract will have full ownership of the assets, which would not be the case with full privatization.[24]

The agreement does shift some risks to the private entity (see Table 3). Some of the risks shifted to Bayonne Water include: cost overruns for meter replacement, cost of service and other costs related to the system (including repayment of any debt relating to the agreement), and increases in operating costs.[25] Other risks that remain with the Authority (and ratepayers) include capital expenses greater than $2.5 million per year, pass through third party water and wastewater treatment cost increases above 2% per year, and force majeure events (new regulations, etc.) causing costs to increase more than $3 million in one year. These shared risks also make the Revenue Path Model similar to a Utility Commission regulated water utility model, with the ability to pass some costs on to ratepayers and an embedded target rate of return within the contract calculations. Bayonne Water has relatively little risk that its return will fall dramatically; however, it also has limited ability to generate any type of windfall profits. It can only increase its profits by decreasing operational or debt service costs.[26]

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[23] *Expanding the Market for Infrastructure Public-Private Partnerships: Alternative Risk and Profit Sharing Approaches to Align Sponsor and Investor Interests.* Report. April 2015. https://www.treasury.gov/connect/blog/Documents/Treasury%20Infrastructure%20White%20Paper%20042215.pdf.

[24] Tim Boyle (Executive Director, Executive Director of the Bayonne Municipal Utilities Authority), phone correspondence with author. April 19, 2016.

[25] Rogoza, Rafal. "Bayonne Approves 40-year Deal with United Water; Water Rates to Rise 8.5%." The Jersey Journal. August 07, 2012. http://www.nj.com/jjournal-news/index.ssf/2012/08/bayonne_municipal_utilities_au.html

[26] *Why the Bayonne Water/Wastewater Public-Private Partnership Succeeded*. NW Financial Group LLC. April 1, 2013. http://www.nwfinancial.com/pdf/NW-BMUA-Report.pdf.

Table 3. Select Risk Responsibilities under the Bayonne Water and Wastewater Concession Agreement

Risk Category	Responsible Parties	Description
O&M	Bayonne Water	Responsible for most operational costs, capital expenses up to $2.5 M / year, and cost overruns for meter replacement
	Ratepayers	Responsible for increases in water and wastewater treatment costs in excess of 2% per year, capital expenses over $2.5 million per year, increases in operating costs over 2% per year, and pass through water purchase and wastewater treatment costs
Performance	Bayonne Water	Required to meet contractual performance standards
Law / Regulation changes	Bayonne Water	Responsible for changes causing cost increases up to $3 million per year
	Rate payers	Responsible for changes causing increases over $3 million per year
Demand	Rate payers	Bayonne Water is assured aggregate revenue levels; if demand is lower than projected that could lead to higher than projected rate increases
Debt/Financial	Bayonne Water	Responsible for debt related to concession fee; payment for concession fee is converted to contractually required annual revenue payments
Catastrophic	Bayonne Water	Responsible for events causing cost increases up to $3 million per year
	Rate payers	Responsible for events causing increases over $3 million per year
Oversight and monitoring	Rate payers	Responsible for a fixed fee that is incorporated into revenue requirements

One of the major selling points of this arrangement was that it would smooth out rate increases in a way that would lead to lower customer rates than if the utility provided similar services without the concession agreement (Figure 1). Based on an initial analysis carried out by the City's financial advisor, the rates under the public private partnership model were projected to eventually surpass what they may have been under public management, but this would not occur until far out into the contract (year 25).[27] While the rate increase in 2016 was higher than projected, the average rate increase over the first 5 years of the contract of just over 5% is still comparable to rate increases in many utilities across the country.

[27] *Why the Bayonne Water/Wastewater Public-Private Partnership Succeeded*. NW Financial Group LLC. April 1, 2013. http://www.nwfinancial.com/pdf/NW-BMUA-Report.pdf.

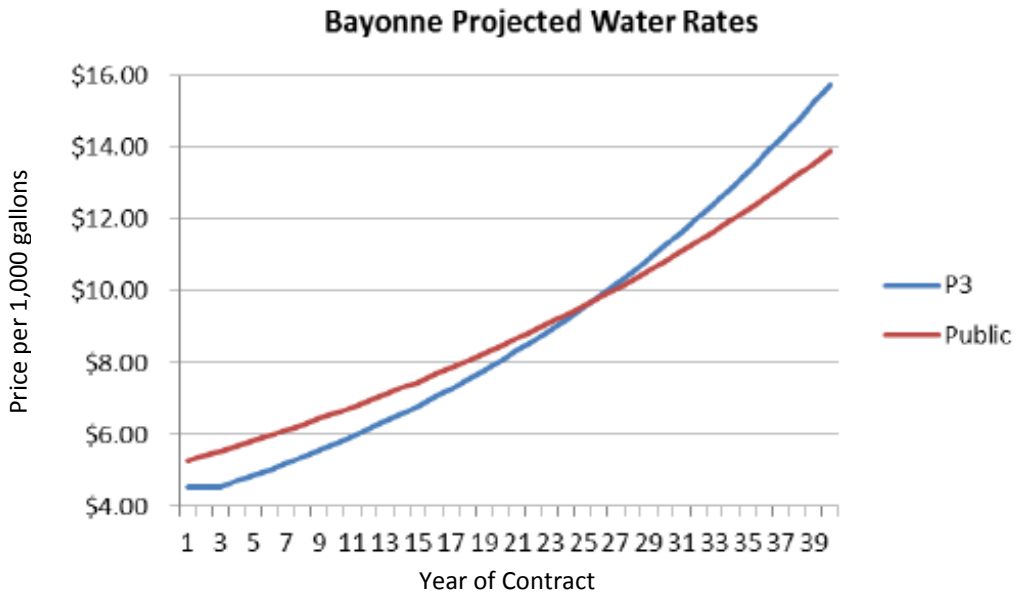

Figure 1: Bayonne Projected Water Rates[28]

What is not measurable is the increased reliability of the system, which can be attributed to the required annual investments that would not be assured if O&M responsibility remained with the Authority.

Despite controversy over resulting rate increases, the deal has led to some positive changes in the City's overall financial health. For example, the City's credit rating was shifted to stable from negative almost immediately after the deal closed and has improved since entering into the agreement (currently A3 by Moody's). According to a recent Moody's Rating, the upgrade to A3 from Baa1 reflects the elimination of the City's reliance on cash flow borrowing which was partially made possible by the concession agreement. The rating also incorporates the City's continued heavy reliance on one-time revenues to fill its structural gap.[29]

[28] *Why the Bayonne Water/Wastewater Public-Private Partnership Succeeded*. NW Financial Group LLC. April 1, 2013. http://www.nwfinancial.com/pdf/NW-BMUA-Report.pdf.
[29] "Rating Action: Moody's Upgrades Bayonne, NJ's GO to A3." Moody's Investor Service. March 07, 2016. https://www.moodys.com/research/Moodys-Upgrades-Bayonne-NJs-GO-to-A3--PR_903128471.

Appendix A. Simplified Project Financial Flows

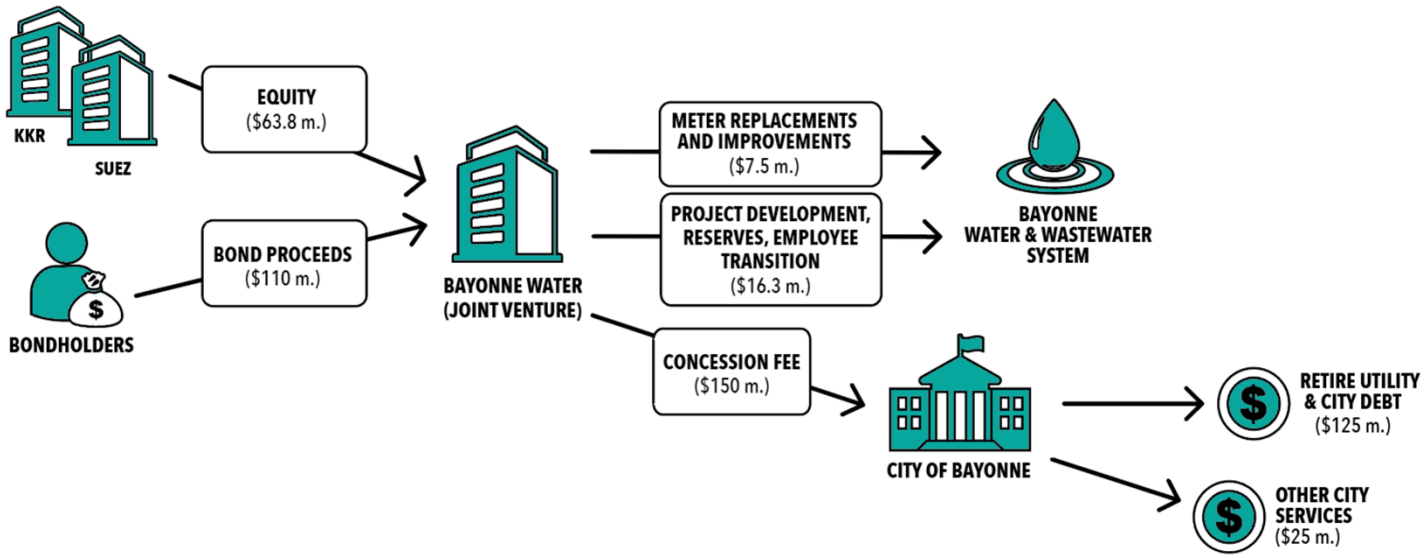

Figure 2. Flow of Initial Project Outlays

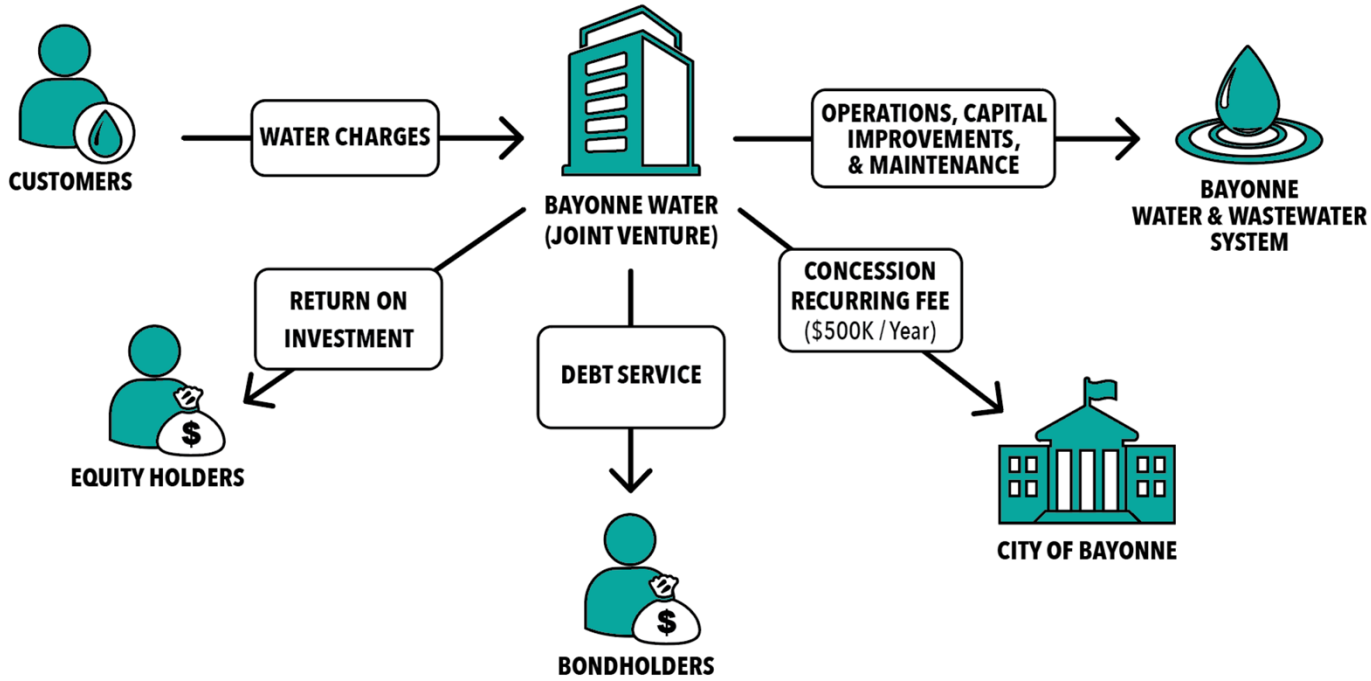

Figure 3. Recurring Financial Flows

Acknowledgements

Written by Jeff Hughes and Carol Rosenfeld. October 2016.

This research was conducted by the Environmental Finance Center at The University of North Carolina under a cooperative agreement from the EPA Water Infrastructure Resiliency and Finance Center (WIRFC). This research was a collaborative effort within the EFC, WIRFC and other key partners including the West Coast Infrastructure Exchange. Special thanks to Tim Doyle from Bayonne Municipal Water Authority and Patrick Cairo from Suez for their consultation. Thanks also to members of the USEPA's Environmental Finance Advisory Board who provided valuable insight. Lexi Kay Herndon and Allison Perch provided editorial assistance.

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The Water Infrastructure and Resiliency Finance Center identifies financing approaches to help communities make better informed decisions for drinking water, wastewater, and stormwater infrastructure that are consistent with local needs.
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City of Phoenix Lake Pleasant Water Treatment Plant Design Build and Operate Project

The Phoenix Lake Pleasant Water Treatment Plant is one of the nation's first large-scale Design Build and Operate (DBO) water treatment plant projects. The City of Phoenix used the DBO approach to increase the speed of construction, foster technological innovation, reduce risk, and achieve lifecycle cost savings. Customer usage and operating conditions were different than originally anticipated, highlighting the potential impact of how risk associated with reductions in demand is allocated in service delivery agreements.

Now ten years after the execution the original Design, Build, Operate (DBO) Agreement, the Lake Pleasant Water Treatment Plant, one of the largest, highest profile DBO water treatment plants in the country, continues to serve as an important water supply option for the City of Phoenix. The City's choice to use DBO as the project delivery mechanism had little to do with access to capital, since Phoenix is a financially healthy city with excellent access to credit. Instead, Phoenix sought to reduce risk, improve project quality, increase operational efficiency, and achieve lifecycle cost savings over a traditional Design Bid Build (DBB) project. However, due to lower than anticipated water demand growth, the plant is currently operating at production levels significantly

below what was forecast when the City signed the original DBO agreement. The City was able to renegotiate the terms of the agreement in 2014 leading to a significant reduction in annual expenditures.

Key Project Details

Table 1. Key Project Details

Project Title:	Lake Pleasant Water Treatment Plant Design Build and Opearate (DBO) Project
Primary Facility:	Drinking water treatment plant (80 mgd)
Local Government Entity:	City of Phoenix
Primary Partner(s):	American Water Services (Project Leader and Operations), Black & Veatch (Design), and McCarthy Building Companies (Construction)
Delivery Model:	Design Build and Operate (DBO)
Contract Period:	15 years
Population Served:	Approximately 1.535 million people served by entire Phoenix Water System (2016)[1]
Major Initial Outlays:	$605,000 for project delivery model analysis and evaluation[2] $6.8 Million (estimated) for professional services during procurement[3] $228,846,090 for DBO design/build fee including permitting, design, construction, and start up[4]
Flow of Revenues:	City of Phoenix sets rates, collects fees, and uses revenues to pay debt service on City issued bonds for DBO design/build fee and to pay contractually required annual DBO operating fees

Background

The City of Phoenix water system serves approximately 23% of the population of Arizona (1.535 Million).[5] The City relies primarily on surface water directly withdrawn from area watersheds, water supplied through large federal and state water supply projects such as the Salt River Project (water from Salt and Verde Rivers), and water from the Central Arizona Project (water from the Colorado River).[6] Historically, the cost of water to customers in Phoenix has been low compared to many other utilities across the country. A survey of large water utilities in 2016 found Phoenix had the lowest rates of any major water utility in the country, with an annual cost of slightly more than $80 for 60,000 gallons.[7]

The genesis for the Lake Pleasant Water Treatment Plant can be traced to the 1992 City of Phoenix Water Master Plan, which recommended constructing a drinking water treatment plant that was capable of using water from the Central Arizona Project.[8] In the late 1990s, the City of Phoenix realized that it would need to

[1] Kathryn Sorensen (Director of Phoenix Water Services), email message to author, July 13, 2016.
[2] City of Phoenix Request for Council Action (RCA) Items. June 9, 1999.
[3] Gritzuk, Michael. *Recommendation for Project Delivery Methods for the Future Lake Pleasant Water Treatment Plant Project*. City Council Report. City of Phoenix. January 11, 2000.
[4] Gritzuk, Michael. *Lake Pleasant Water Treatment Plant Project Update.* City Council Report. City of Phoenix. January 13, 2005.
[5] *2011 Phoenix Water Resource Plan.* City of Phoenix Water Services Department.
[6] *ibid*
[7] *The State of Public Water in the United States*. Food and Water Watch. February 2015.
[8] *City of Phoenix Civic Improvement Corporation Junior Lien Water System Revenue Bonds Series 2005. Appendix C: Engineering Review of the Water System*. June 2, 2005.

build a new drinking water treatment plant to supply households in the growing northern part of the city.[9] The City included this expansion in its five-year Capital Improvement Program (CIP).[10] The City considered a variety of delivery models and eventually chose the Design Build, Operate (DBO) model. At the time, City staff recommended proceeding with the project, as they believed that the City would be unable to serve the northern part of the City's service area if the plant was not operational by 2007.[11]

In 2003, the City awarded the DBO agreement to a consortium comprised of American Water Services, Black & Veatch, and McCarthy Building Companies. Through this agreement, the City retained ownership of the plant and rate-setting responsibility. McCarthy Building Companies managed plant construction, Black & Veatch managed design, equipment procurement, and start-up, while American Water Services, Inc. (American Water) managed the overall project and continues to manage operations post-construction. At the time it opened, the plant was the largest drinking water DBO project in North America. The plant's current capacity is 80 million gallons per day (mgd), and it could be expanded to provide 320 mgd. The plant has received several awards for its use of new technology, including a ballasted flocculation process for high-rate sedimentation, automation, and design that uses local materials.[12] The project also included a new raw water intake on Waddell Canal,[13] a pump station, two miles of raw water pipeline, two finished water storage reservoirs with 40 million gallon capacity, and carbon regeneration equipment.[14]

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[9] *Lake Pleasant Water Treatment Plant.* American Water. June 9, 2009. http://www.amwater.com/files/LakePleasantCaseStudy06.16.09.pdf
[10] *City of Phoenix Civic Improvement Corporation Junior Lien Water System Revenue Bonds Series 2005*. June 2, 2005.
[11] Fairbanks, Frank. *Lake Pleasant Water Treatment Plant Project.* City Council Report. City of Phoenix. July 2, 2003.
[12] *Lake Pleasant Water Treatment Plant.* Water Design-Build Council. 2015. http://waterdesignbuild.com/water-design-build-projects/lake-pleasant-water-treatment-plant-az/
[13] *Lake Pleasant Water Treatment Plant.* American Water. June 9, 2009. http://www.amwater.com/files/LakePleasantCaseStudy06.16.09.pdf
[14] Gritzuk, Michael. *Lake Pleasant Water Treatment Plant Project Update.* City Council Report. City of Phoenix. January 13, 2005.

Project Development and Procurement

The City engaged several advisors during the project development phase to evaluate potential project delivery models and to help with early phase implementation activities such as planning meetings with key stakeholders (see Table 2). The advisors joined City staff to create a "study team" that was responsible for carefully evaluating various project delivery models and making a final recommendation to City Council.[15]

Table 2. Primary Advisors to City of Phoenix for Evaluating Service Delivery Mechanisms (1999)[16]

Company	General Responsibility	Approximate Cost
Greely and Hansen	Coordinated team of engineering, legal, and financial advisors	Not to exceed $250,000
Hawkins, Delafield & Wood	Researched procurement law, provided legal feedback on options, and prepared legal summary documents	$63,750
Malcolm Pirnie	Participated in interviews and jointly prepared technical memorandums	$201,801
Raftelis Financial	Evaluated financial and economic impacts of alternative project delivery methods	$89,380
		Total $604,931

The project delivery evaluation process occurred throughout 1999; during this period the City of Phoenix considered 11 different delivery models for the project. The study team evaluated the potential models against a set of 24 core values (e.g. compliance with regulations, minimized costs, viability in market place, etc.). The study team selected these core values based on consultation with stakeholders and legal/financial advisors. The evaluation of core values narrowed the list of delivery methods to three: Design-Bid-Build in consultation with the City Water Services Department, Design-Build with City Operations, and DBO with a private partner. The study team evaluated these three options based on estimated net present value lifecycle costs, time to completion, risk, and track record of success.[17]

City staff presented the results of the evaluation to the City Council Environment and Natural Resources Subcommittee on December 15, 1999 and to the full City Council in January of 2000. The evaluation team and City Council Environment and Natural Resources Subcommittee recommended proceeding with the DBO model, and City Council adopted the recommendation in January 2000.[18] Later that year, the State of Arizona amended state law to authorize the use of new project delivery methods including DBO.[19]

As part of the project development process, the City calculated a "benchmark" cost target that reflected what the City believed the project would cost to construct and operate using more traditional service models (such as a Design, Bid, and Build and public operation). The City established a savings goal of 8% to 16% that it hoped to realize by using alternative delivery mechanisms. Members of both the Environment and Natural Resource Sub

[15] Gritzuk, Michael. *Recommendation for Project Delivery Methods for the Future Lake Pleasant Water Treatment Plant Project*. City Council Report. City of Phoenix. January 11, 2000.
[16] City of Phoenix Request for Council Action (RCA) Items. June 9, 1999.
[17] *Environmental and Natural Resources Subcommittee Meeting Minutes.* City of Phoenix City Council. December 15, 1999.
[18] Gritzuk, Michael. *Recommendation for Project Delivery Methods for the Future Lake Pleasant Water Treatment Plant Project*. City Council Report. City of Phoenix. January 11, 2000.
[19] Fairbanks, Frank. *Lake Pleasant Water Treatment Plant Project.* City Council Report. City of Phoenix. July 2, 2003.

Committee and full City Council cited the anticipated maximum estimated net present value lifecycle cost savings ($32 Million) as a critical reason for selecting the DBO model.[20,21]

The City issued a Request for Qualifications (RFQ) in November of 2000.[22] In July of 2001, the City invited three firms to begin the proposal process, which consisted of submitting preliminary technical proposals, revised preliminary technical proposals, financial technical proposals, and price proposals. On September 5, 2001, the City issued the formal Request for Proposals (RFP) outlining the project requirements for the three pre-qualified firms and issued subsequent addenda until November 8, 2002. During this time, the City provided the firms with "reasonable" access to the plant site and key utility assets that would be needed for the project. The City provided each team with a stipend of $100,000 to offset some of the costs of participating in the proposal process.[23] The firms submitted preliminary technical proposals on December 5, 2001, and the City held individual meetings with the proposers to clarify aspects of their preliminary proposals in January 2002. The City worked with the proposers from March 2002 to May 2002 to clarify and revise the proposed service agreement that would govern the project terms. The firms submitted their final technical proposals and price proposals on November 22, 2002.[24]

After evaluating and scoring the three proposals, the selection team recommended that the City award the DBO agreement to Earth Tech Consortium, as it's proposal was the highest rated and presented the lowest lifecycle cost. City Council awarded the agreement to Earth Tech Consortium on April 30, 2003. However, in June of 2003, the City rescinded the contract after Earth Tech Consortium was unable to post the required performance bond; Earth Tech Consortium subsequently withdrew its proposal.[25]

After Earth Tech Consortium withdrew, the City evaluated other options that included switching from a DBO approach to other procurement models. The City Water Services Department recommended selecting the second rated proposal submitted by the All American Water Team, which was comprised of American Water Services Inc., Black and Veatch, and McCarthy Building Companies. The City Manager's Office, on the other hand, recommended returning to the Construction Manager at Risk (CMAR) model used previously to build other Water Services Department facilities, stating concerns "that so far the DBO process has had many uncertainties and difficulties and that this first-time process will continue to be problematic."[26] Despite these concerns, on July 3, 2003, the City Council approved the recommendations of the City Water Services Department and awarded the DBO contract to American Water Services Inc. on behalf of the entire All American Water Team.[27]

In August 2003, the City Water Services Department issued a notice to begin the permitting and design work under the agreement. The project required the City to obtain 48 separate permits from a variety of state and federal agencies. Construction of the plant began on June 1, 2004.[28] In February 2007, the City declared that the

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[20] *Environmental and Natural Resources Subcommittee Meeting Minutes.* City of Phoenix City Council. December 15, 1999.
[21] Gritzuk, Michael. *Recommendation for Project Delivery Methods for the Future Lake Pleasant Water Treatment Plant Project*. City Council Report. City of Phoenix. January 11, 2000.
[22] *Lake Pleasant Water Treatment Plant Design-Build-Operate Project Service Agreement.* City of Phoenix, Arizona, Water Services Department. August 2003.
[23] Nathan Wright (Management Assistant, Phoenix Water Services), email message to author, April 8, 2016.
[24] *Lake Pleasant Water Treatment Plant Design-Build-Operate Project Service Agreement.* City of Phoenix, Arizona, Water Services Department. August 2003.
[25] Fairbanks, Frank. *Lake Pleasant Water Treatment Plant Project.* City Council Report. City of Phoenix. July 2, 2003.
[26] Fairbanks, Frank. *Lake Pleasant Water Treatment Plant Project.* City Council Report. City of Phoenix. July 2, 2003.
[27] *ibid*
[28] Gritzuk, Michael. *Lake Pleasant Water Treatment Plant Project Update.* City Council Report. City of Phoenix. January 13, 2005.

plant was substantially completed. The operation phase of the plant under the DBO agreement officially began in June 2007.[29]

Timeline

Table 3. Select project milestones

Date	Milestone
1992	City of Phoenix Water Master Plan recommends constructing a water treatment plant that is capable of using water from the Central Arizona Project. This is the genesis for the Lake Pleasant Water Treatment Plant.[30]
June 1999	City Council approves professional services agreements to evaluate alternative delivery mechanisms.
January 2000	City Council approves moving forward with the DBO model to construct water treatment plant.
April 2003	City Council awards DBO contract to Earth Tech Consortium.
June 2003	Earth Tech Consortium does not post the payment and performance bonds stipulated in contract; City Council rescinds contract award to Earth Tech Consortium.[31]
July 2003	City Council awards DBO contract to American Water Services, Inc. on behalf of the All American Water Team.[32]
August 2003	City of Phoenix executes a DBO agreement with American Water Services, Inc.[33]
June 2004	Construction of the plant begins.
June 2005	The City issues revenue bonds for long-term financing of project.[34]
February 2007	Plant is substantially complete; plant performance testing is complete.
June 2007	Operation terms of DBO agreement officially begin.[35]
January 2014	The City modifies terms of DBO agreement to reduce the amount of water it receives from the plant.

Key Financial Features and Outcomes

The City of Phoenix structured the Lake Pleasant Water Treatment Plant DBO agreement to include a "design/build" payment of $228,846,090 to cover the permitting, design, construction, and start-up of the facility, as well as a separate series of operation service fees during the life of the agreement.[36]

The DBO design/build fee did not include any of the project development costs incurred by the City leading up to the award. A financial analysis done as part of the service delivery model presented estimates for project development costs, including "multi-disciplinary" professional services during procurement ($1.5 Million),

[29] Nathan Wright (Management Assistant, Phoenix Water Services), email message to author, April 8, 2016.
[30] *City of Phoenix Official Bond Statement Appendix C: Engineering Review of the Water System*. June 2, 2005.
[31] Fairbanks, Frank. *Lake Pleasant Water Treatment Plant Project.* City Council Report. City of Phoenix. July 2, 2003.
[32] Gritzuk, Michael. *Lake Pleasant Water Treatment Plant Project Update.* City Council Report. City of Phoenix. January 13, 2005.
[33] *Lake Pleasant Water Treatment Plant Design-Build-Operate Project Service Agreement.* City of Phoenix, Arizona, Water Services Department. August 2003.
[34] *City of Phoenix Civic Improvement Corporation Junior Lien Water System Revenue Bonds Series 2005*. June 2, 2005.
[35] Nathan Wright (Management Assistant, Phoenix Water Services), email message to author, April 8, 2016.
[36] Gritzuk, Michael. *Lake Pleasant Water Treatment Plant Project Update.* City Council Report. City of Phoenix. January 13, 2005.

preparation of preliminary design used for the request for proposals ($3.5 Million), and legal costs for preparation of all contract documents ($1.8 Million). The City used an appropriation from its Capital Improvement Program (provided from tax-exempt bonds issued in 1996) to cover these costs as well as the costs associated with the initial service delivery model evaluation work.[37]

The City eventually financed the design/build portion of the DBO agreement with tax-exempt bonds that were issued in 2005 by the City of Phoenix Civic Improvement Corporation. The project was included in $600 million in junior lien (subordinated) revenue bonds collateralized by the entire water system. The bond issue was structured with serial bonds maturing in years 2010 – 2027 and a term bond maturing in 2029. Yields to investors ranged from 3.07% to 4.11%. The principal repayment schedule was structured to provide level debt service payments over the 20-year repayment period.[38] The City relies on water utility user fees and charges to make debt service payments.

The operations and maintenance component of the agreement specifies the payment of an Annual Service Fee (ASF) that is comprised of a fixed component, a variable component, and pass through charges. The original agreement provided the City with the opportunity to select one of three potential desired average day delivery volumes every year of the agreement, each with a different fixed fee that the City would have to pay for that year. At the time the agreement was executed, the three production levels were 40 mgd, 55 mgd, and 70 mgd, and the fixed charge portion of the service fee was $5,154,605, $5,777,763, and $6,413,473 respectively. Under the agreement, the City pays directly for electricity.[39]

At the time the agreement was executed, the net present value of the estimated fixed portion of the service fees was $115.5 million for the 15 years term of the agreement.[40] The fixed fee portion of the agreement covers labor and materials costs of operating the facility, including major maintenance, repair, and replacement costs.[41] Major capital repairs and replacements are included in a maintenance plan. Under the agreement, the City can request and pay for additional capital modifications.

According to City reports, the inclusiveness of the DBO agreement in terms of covering the costs and risks of building and operating the plant was one of the primary drivers for choosing the DBO model.[42] Table 4 shows the allocation of risk responsibility for select areas. Under the agreement, American Water absorbed the majority of operational risks and had to assure the City that the plant produced specific volumes of water at very high quality levels. The agreement did allocate some operational risk to the City, including electricity price increases; however, it protected the City from jumps in energy use through payment clauses that incorporated maximum allowable energy usage.[43]

Table 4. Allocation of Select Risk Responsibilities under the Original Phoenix Design Build and Operate (DBO) Agreement [44]

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[37] Fairbanks, Frank. *Lake Pleasant Water Treatment Plant Project.* City Council Report. City of Phoenix. July 2, 2003.
[38] *City of Phoenix Civic Improvement Corporation Junior Lien Water System Revenue Bonds Series 2005*. June 2, 2005.
[39] *Lake Pleasant Water Treatment Plant Design-Build-Operate Project Service Agreement.* City of Phoenix, Arizona, Water Services Department. August 2003.
[40] Fairbanks, Frank. *Lake Pleasant Water Treatment Plant Project.* City Council Report. City of Phoenix. July 2, 2003.
[41] *ibid*
[42] Gritzuk, Michael. *Lake Pleasant Water Treatment Plant Project Update.* City Council Report. City of Phoenix. January 13, 2005.
[43] *Lake Pleasant Water Treatment Plant Design-Build-Operate Project Service Agreement.* City of Phoenix, Arizona, Water Services Department. August 2003.
[44] Fairbanks, Frank. *Lake Pleasant Water Treatment Plant Project.* City Council Report. July 2, 2003.

Risk Category	Responsible Parties	Description
Construction and Permitting	American Water Services	Responsible for all issues related to integration of design and construction. Fixed design/build price includes initial construction and delivery of completed project by February 2007.
	City of Phoenix	Responsible for assisting with permitting.
Financing	American Water Services	Responsible for financing during construction, but retains no equity in facility after construction is completed.
	City of Phoenix	Responsible for obtaining and retiring debt used for facility.
Operations and Maintenance	American Water Services	Responsible for assuring proper functioning of plant for life of agreement.
	City of Phoenix	Responsible for any operation and maintenance charges beyond what is specified in agreement; responsible for increases in electricity prices.
Capital Modification	American Water Services	Responsible for repairs and replacements as specified by agreement.
	City of Phoenix	Responsible for major modifications beyond what is specified in agreement.
Finished Water Quality	American Water Services	Responsible for meeting water quality standards above requirements of other City of Phoenix facilities and US EPA Standards.
	City of Phoenix	Agreement accommodates anticipated future water quality needs. The City is responsible for added cost of chlorine if it requests chlorine residuals higher than 1.3 mg/L.
Demand	American Water Services	Agreement includes a minimum production amount (mgd) that the City is required to purchase regardless of whether it is needed.
	City of Phoenix	Agreement includes a minimum production amount (40 mgd) and associated fee that the City must pay even if actual demands fall below that level.

At the time of the execution of the agreement, the City estimated that the net present value of design/build and operating costs under the DBO agreement would be 7% lower than if they had used a traditional Design Bid Build and public operation approach. These estimated savings were slightly less than the original estimated savings target (8% to 16%) cited at City Council meetings when the DBO approach was approved in 1999 and 2000. During the early evaluation of service delivery models, the anticipated design and construction cost savings were highlighted more than any additional anticipated operation and labor cost savings. However, the study team envisioned that the approach would incentivize technological innovation to decrease operation costs. Leadership from several of the City's labor unions voiced their opposition to the DBO approach when it was presented to City Council.[45] The City operated several water treatment facilities, and as such, was experienced with staffing and operating facilities.

In the end, the financial impact of choosing a DBO model over other models can never be calculated exactly because it requires comparing an option that was actually implemented with an option that was only modeled using the best available assumptions at the time. Water Department leaders reported being pleased with the design and build aspects of the project and believed the project delivery methodology resulted in a well built, functioning facility at a reasonable cost.[46]

The ultimate financial impact on customers on the operations cost side is more complicated. Department staff believed that the original structure of the DBO operations agreement was based on water demand assumptions that never fully materialized, which led the City to pay more for operation than it would have if it had run the plant by itself. For this reason, the City considered exercising the buyout clause to terminate the agreement in 2012.[47] Water supply demands and growth patterns in the City changed substantially since the plant was planned and constructed, and population growth in Phoenix has been slower than originally anticipated. In addition, the City of Phoenix, like many urban water systems across the country, has experienced unprecedented drops in water demand over the last 10 years. The 2000 Water Resources Plan Update projected that the average day demand in 2010 would be 363 mgd.[48] However, the 2011 Water Resources Plan reported that actual average day demand in 2010 was approximately 300 mgd, a 16% decline since peak demand year of 2002, even while population increased by almost 8%[49] (see Figures 1). As a result, the City did not need the water volume that it had originally forecast.

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[45] *City Council Policy Session.* City of Phoenix City Council. January 11, 2000.
[46] Nathan Wright (Management Assistant, Phoenix Water Services), email message to author, April 8, 2016.
[47] Kathryn Sorensen (Director, Phoenix Water Services), telephone interview with author, October 9, 2015.
[48] *City of Phoenix Civic Improvement Corporation Junior Lien Water System Revenue Bonds Series 2005*. *Appendix C: Engineering Review of the Water System*. June 2, 2005.
[49] *2011 Phoenix Water Resource Plan.* City of Phoenix Water Services Department.

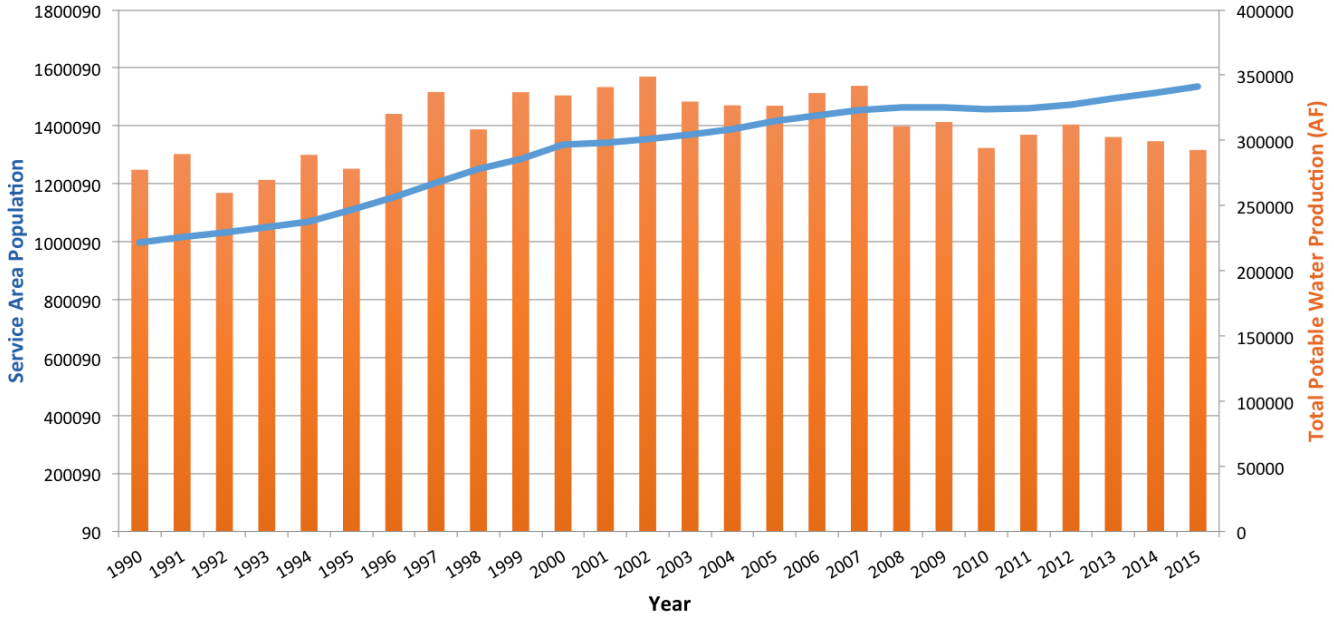

Figure 1. Water Demand and Population Growth.[50]

Since going into operation, the City had selected and paid for the minimum level of production from the plant (40 mgd). By 2011, the City determined that the plant was producing more water than needed and at an elevated per unit cost due to the high water quality standards that had originally been specified in the agreement. The City had required that the plant be designed to provide water with very low levels of disinfection by-products such as Triahalomethane (THM) under the assumption that water from the treatment plant would be needed to serve areas far away from the plant. Very low levels of THM in water from the plant would allow for THM increases that would be expected during transmission. The plant was designed to produce water at 40 parts per billion (ppb) THM, well below the US EPA Safe Drinking Water Standard of 80 ppb.[51] Treating water to 40 ppb THM requires additional chemical and operating procedures beyond what would be required to meet the current federal requirements, resulting in increased costs. However, the plant's water has not been needed in those distant service areas, and water quality models show that the water would meet all regulatory requirements if the THM levels were adjusted.

The City estimated that renegotiating the agreement to purchase 25 mgd instead of the 40 mgd minimum in the original agreement would save $1.1 Million a year.[52] Furthermore, the City estimated that setting the THM "not to exceed" level at 60 ppb rather than 40 ppb would save an addition $200,000 per year. In the end, Phoenix was able to successfully renegotiate the agreement to allow for lower volumes and less strict THM standards. The revised agreement terms became effective January 1, 2014.[53] This reduction required the installation of variable frequency drives (VFDs) in the Lake Pleasant Pump Station. By the terms of the agreement, the City was responsible for the costs of this modification for a total cost of approximately $2 Million.[54]

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[50] Kathryn Sorensen (Director, Phoenix Water Services), email message to author, April 8, 2016.
[51] Table of Regulated Drinking Water Contaminants. US Environmental Protection Agency. July 15, 2016. https://www.epa.gov/ground-water-and-drinking-water/table-regulated-drinking-water-contaminants
[52] Sorensen, Kathryn. Proposed Opportunities for Operational Savings at the Lake Pleasant Water Treatment Plant. City Council Report. City of Phoenix. November 19, 2013
[53] *First Amendment to the Service Agreement for the Design, Construction and Operation of the Lake Pleasant Water Treatment Plant Project.* Contract No. 107745-01. City of Phoenix. January 1, 2014.
[54] City of Phoenix Ordinance S-41768, May 27, 2015

The DBO experience in Phoenix highlights the potential for risk allocation to result in financial implications at the construction and operation phases of the agreement. Risks are often presented and discussed at the outset of a project in hypothetical terms, but the financial impact of a risk allocation decision is never fully experienced until after a project is implemented. From the City's perspective, the transfer of construction, permitting, and design risk at the project outset contributed towards the on-time and on-budget delivery of a complex multifaceted project. On the other hand, the City's retention of demand risk eventually did carry significant financial implications in the form of operation costs that were higher than if the City had not entered into the agreement. While the City was able to re-negotiate the agreement and minimize this impact, water department staff believed the structure of the original agreement limited their operational flexibility so much that the staff seriously questioned the use of similar long-term operation agreements in the future.[55]

[55] Kathryn Sorensen (Director of Phoenix Water Services), telephone interview with author, October 9, 2015.

Appendix A. Simplified Project Financial Flows

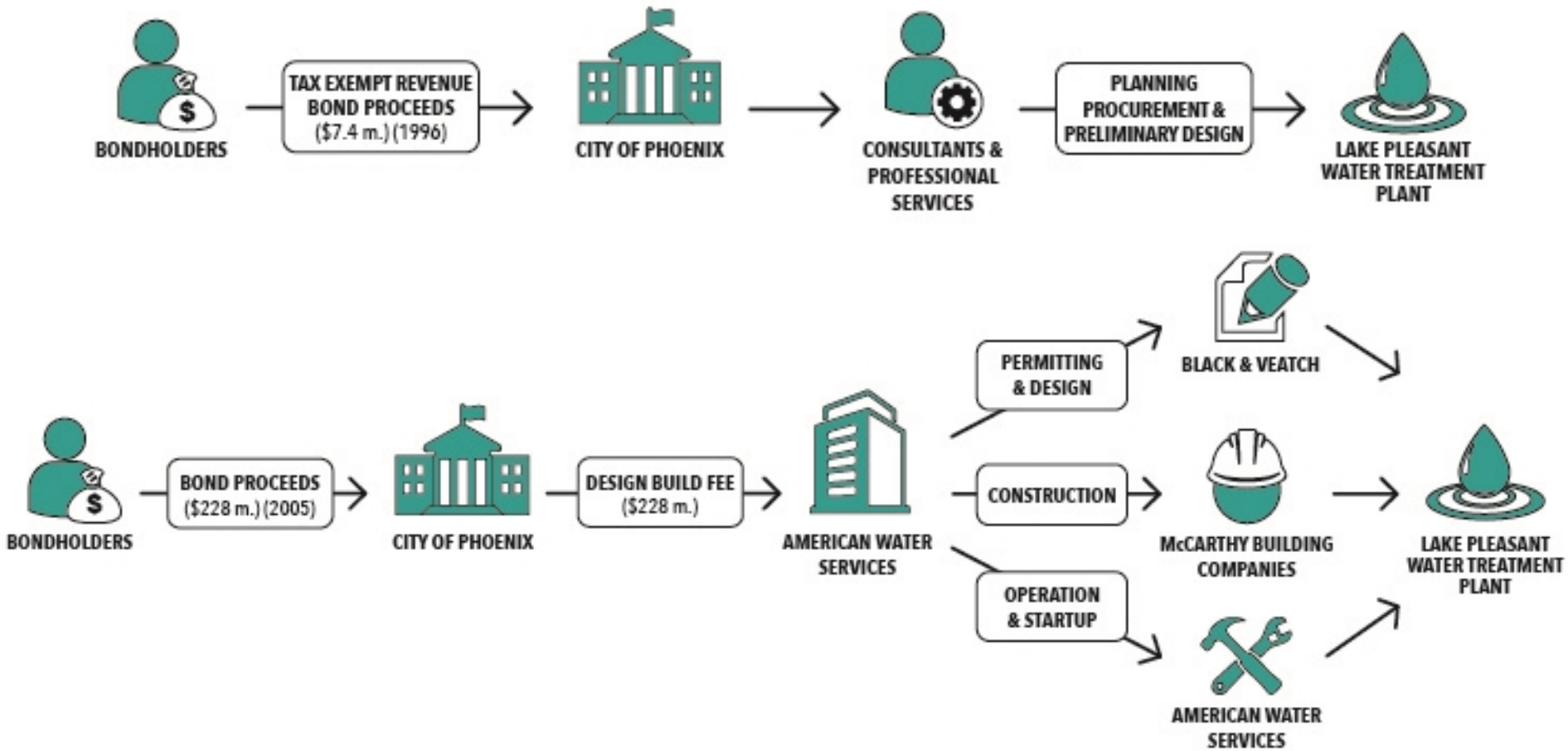

Figure 1. Flow of Initial Project Outlays

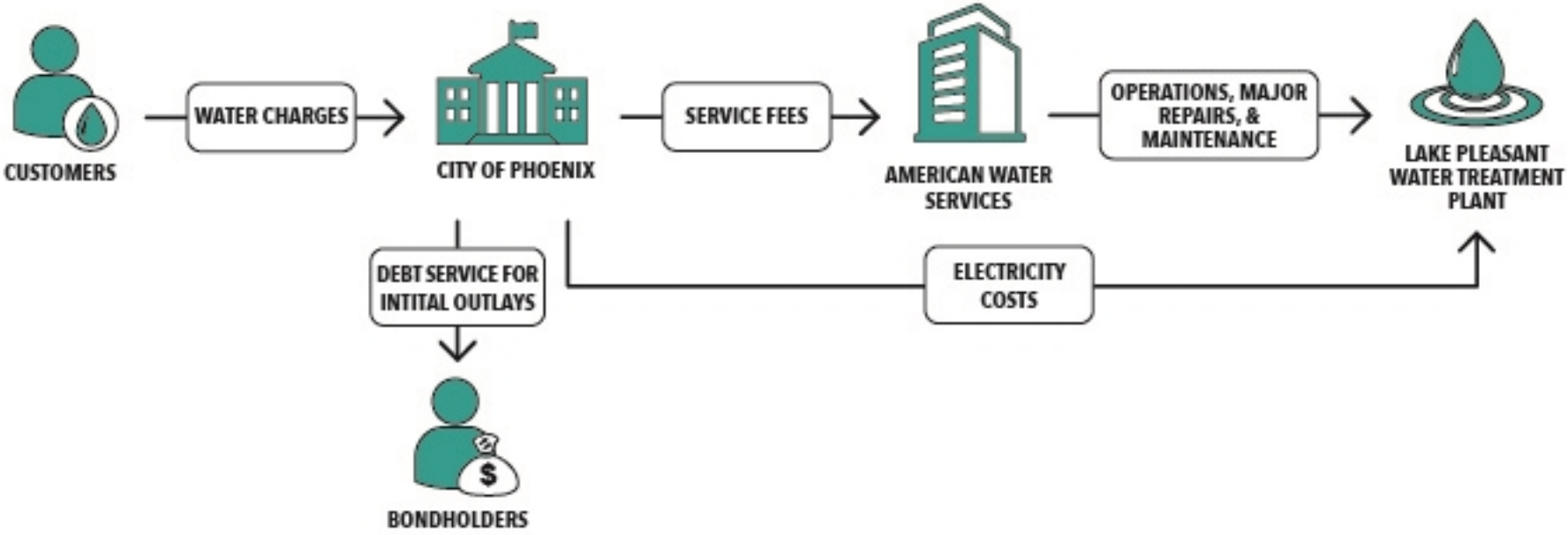

Figure 2. Recurring financial flow

Acknowledgements

Written by Jeff Hughes[†]

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[†]*Jeff Hughes is a member of the United States Environmental Protection Agency's Environmental Finance Advisory Board*.

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About the Water Infrastructure Resiliency Finance Center

The Water Infrastructure and Resiliency Finance Center identifies financing approaches to help communities make better informed decisions for drinking water, wastewater, and stormwater infrastructure that are consistent with local needs.
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City of Regina Wastewater Treatment Plant Upgrade Design, Build, Finance, Operate, & Maintain Project

The City of Regina's detailed analysis and planning process led it to use the Design, Build, Finance, Operate, and Maintain (DBFOM) delivery mechanism to carry out necessary upgrades to it's wastewater treatment plant. The City's model incorporated private sector financing, carefully allocated risks, expedited construction, and minimized facility lifecycle costs.

The City of Regina, Saskatchewan needed to quickly upgrade and expand an outdated wastewater treatment facility. After extensive analysis, the City embarked on an alternative service delivery method. The project has received significant attention due to the extensive preparation and planning that went into the procurement process. The City also intentionally incorporated an innovative private sector financing model that linked capital payments to performance. While heralded by professional organizations and the provincial government as pioneering, the project also stirred resentment among some groups, including the public employees union.

Key Project Details

Table 1. Key Project Details

Project Title:	**Regina wastewater treatment plant upgrade**
Primary Facility:	Upgraded wastewater treatment plant (24.3 mgd average demand and 118.9 mgd wet weather flow)
Local Government Entity:	City of Regina, Saskatchewan, Canada
Primary Partner(s):	EPCOR Prairies Inc.
Delivery Model:	Design, Build, Finance, Operate, and Maintain (DBFOM)
Contract Period:	30 years
Population Served:	200,000 people in 2013, growing to an estimated 258,000 people in 2035[1]
Major Initial Outlays:	$180.8 million over a five year period
Flow of Revenues:	City of Regina collects user fees and uses a portion of them to make its contractual payments, which include both operating and capital components

Background

The City of Regina is the capital of Canada's province of Saskatchewan. It is a vibrant, fast-growing region, with a population of approximately 200,000 people projected to grow to 258,000 by 2035.[2] Regina's wastewater treatment plant, originally constructed in the 1950s and upgraded in 1980, relied on outdated treatment technology and equipment that was near the end of its useful life. The facility also had reached its capacity and needed to be expanded. The new wastewater treatment permit issued to the City in 2014 required updated treatment processes in order to meet much more stringent effluent requirements.[3] This new permit took effect at the end of 2016, leaving the City relatively little time to design and construct an upgraded plant.[4]

Project Development and Procurement

The City devoted a substantial amount of time and resources to thoughtfully planning and preparing for this project. According to the project manager, as many as five full-time Regina staff members were devoted to the project during procurement.[5]

Prior to proceeding with the DBFOM model, the City considered and analyzed 12 alternative options, each of which involved different models and financing scenarios. The City undertook a rigorous Value for Money (VfM) analysis, which identified and compared lifecycle capital, operation, and risk costs for each potential model. The City was required to carry out a VfM analysis in order to qualify for a Public Private Partnership (P3) grant from the Canadian government. The City's policy also strongly encouraged the completion of a VfM analysis.[6]

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[1] *Regina Wastewater Treatment Plant Upgrade Project, Saskatchewan: Delivering Clean and Safe Wastewater for a Growing City.* The Canadian Council for Public Private Partnerships. 2014.
[2] Wastewater Treatment Plant: Regina Wastewater Treatment Plant Construction 90% Complete. City of Regina. June 14, 2016. http://www.regina.ca/residents/water-sewer/wastewater--treatment--plant/
[3] *Alteration and Division of Permit to Operate a Sewage Works in the City of Regina.* Saskatchewan Water Security Agency. May 10, 2014.
[4] *Regina Wastewater Treatment Plant Upgrade Project, Saskatchewan: Delivering Clean and Safe Wastewater for a Growing City.* The Canadian Council for Public Private Partnerships. 2014.
[5] Rob Court (Manager, Environmental Engineering Branch), email correspondence with author, July 29, 2016.
[6] *The Regina Administration Bylaw (Bylaw No. 2003-69).* City of Regina, Saskatchewan. September 22, 2014.

The City issued a Request for Qualifications (RFQ) in May of 2013 (see timeline in Table 2) and received responses from ten teams.[7] During this time, Regina Water Watch, an organization that favored a traditional procurement method and public management of the facility, launched a petition drive to demand the City hold a referendum to move forward with the DBFOM approach. The petition fell short of the number of authenticated signatures needed (10 percent of the population), but the City decided to hold a referendum anyway to allow for public involvement in the final procurement decision. An intense campaign ensued with the City and the Chamber of Commerce on one side and Regina Water Watch and its backers, including the primary public sector union, Canadian Union of Public Employees (CUPE), on the other. According to published reports, proponents and opponents of the measure spent well over $500,000 to develop communication materials (videos, billboards, yard signs, etc.) for and against the proposal. In the end, 57 percent of approximately 49,000 voters voted against public management, thereby allowing the DBFOM model to proceed.[8]

The City invited three teams to participate in the Request for Proposals (RFP) phase beginning in October 2013. Information sharing was an essential component of this project. Regina established a special data site to share detailed technical documents and partial design information with proposers. The City also awarded a total of $500,000 in stipends to the teams. According to the City Project Manager, the stipend likely only covered a small portion of the proposal cost, but it was an important sign of the City's dedication to the DBFOM approach.[9] Proposing teams and the City followed an extremely detailed proposal preparation structure. Throughout the entire process, the City adhered to extremely strict confidentiality and procurement procedural requirements. For example, during the proposal-drafting period, the City engaged a fairness adviser who was present throughout the many site visits and meetings to ensure a level playing field and that the City acted as a good public partner.

The final proposals included both detailed design and construction plans as well as detailed operations and maintenance plans. In May 2014, the City awarded the project to EPCOR Prairies Inc. (EPCOR), whose proposal came in at the lowest net present value (NPV). Prior to the final announcement and the signing of the project agreement in July 2014, the City Council entrusted the authority to award the contract and enter into the agreement to the Deputy City Manager and Chief Operating Officer. City Council required these delegates to follow a specified methodology, but sought to avoid the additional time and potential political pressure involved in sending the final decision back to the Council for approval. The City and EPCOR signed the contract in July 2014, and within a month EPCOR took over responsibility for operating the existing plant.

The City estimated that procurement of the project cost $5 million dollars of staff time and external expenses. Major costs included the preliminary engineering work ($1.599 million in 2014), financial and fairness consultants (approximately $1 million), legal services ($1.1 million), and honorariums provided to shortlisted bidders ($500,000).[10] At the same time, the City estimated that the ten teams that participated in the RFQ phase may have each spent as much as $500,000 in preparation costs, and the three finalists spent as much as $2.5 million each.[11]

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[7] Court, Rob. *Successful Transfers of Responsibilities from the Owner to the DBFOM Partner, Regina WWTP*. Presentation to Design-Build for Water/Wastewater Conference in Charlotte, NC. April 20, 2016.
[8] *Regina Wastewater Treatment Plant Upgrade Project, Saskatchewan: Delivering Clean and Safe Wastewater for a Growing City.* The Canadian Council for Public Private Partnerships. 2014.
[9] Rob Court (Manager, Environmental Engineering Branch), interview with author, August 3, 2015.
[10] Rob Court (Manager, Environmental Engineering Branch), email correspondence with author, July 29, 2016.
[11] Court, Rob. *Regina's Wastewater Treatment Plant Upgrade Project: Procurement Process.* Presentation given October 29, 2015.

According to the City Project Manager, the project is "one of the most complex capital" projects the City has initiated to date. The upgraded plant includes three new bioreactors, which reduce ammonia and phosphorous in wastewater, the refurbishment of the primary sedimentation tanks, and three new secondary clarifiers.[12]

Table 2. Select project milestones

Date	Milestone
June 2011	Conceptual design of a new treatment plant begins and becomes the basis for delivery model evaluations.[13]
June 2012	With the authorization of the City Council, investigation of alternative delivery options begins.[14]
February 25, 2013	City Council approves the DBFOM delivery model.[15]
May 14, 2013	City issues RFQ, ten teams respond.[16]
June 21, 2013	P3 Canada Fund approves funding for the project.[17]
July 24, 2013	Regina City Council unanimously votes to hold a referendum on the project's service delivery model.[18]
September 25, 2013	Referendum held, voters support DBFOM procurement model.
October 2013	City invites three teams to respond to the RFP.
May 29, 2014	City selects EPCOR to proceed with the project.[19]
July 3, 2014	City's delegate representatives enter into agreement with EPCOR (financial close).[20]
August 1, 2014	EPCOR takes over managing Regina's wastewater treatment plant.[21]
June 2016	Plant is 90% complete.
December 31, 2016	Scheduled construction plant completion date.

Key Financial Features and Outcomes

The reported capital cost for the project was $180.8 million.[22] EPCOR primarily financed this cost during construction; however, the agreement requires the City to reimburse EPCOR for some capital costs by paying an early milestone payment of $30 million and $49.7 million at substantial completion of requirements. The City funded part of the Substantial Completion payments from a P3 Canada grant ($48.2 million) along with utility reserves generated from impact fees. The P3 Canada grant program is specifically designed to provide up to 25

[12] *Regina Wastewater Treatment Plant Upgrade Project, Saskatchewan: Delivering Clean and Safe Wastewater for a Growing City.* The Canadian Council for Public Private Partnerships. 2014.
[13] Rob Court (Manager, Environmental Engineering Branch), interview with author, August 3, 2015.
[14] *ibid.*
[15] Court, Rob. *Regina's Wastewater Treatment Plant Upgrade Project: Project Background.* Presentation given at Stanford University's P3 for Water Course. October 28, 2015.
[16] *ibid.*
[17] Rob Court (Manager, Environmental Engineering Branch), interview with author, August 3, 2015.
[18] Gilligan, Eugene. Regina voters approve P3 for wastewater plant. InfraAmericas. http://www.infra-americas.com/registration/login.php?lastUri=/news/canada/1280377/regina-voters-approve-p3-for-wastewater-plant.thtml
[19] *Wastewater Treatment Plant: Regina Wastewater Treatment Plant Construction 90% Complete.* City of Regina. June 14, 2016. http://www.regina.ca/residents/water-sewer/wastewater--treatment--plant/
[20] Court, Rob. *Regina's Wastewater Treatment Plant Upgrade Project: Project Background.* Presentation given at Stanford University's P3 for Water Course. October 28, 2015.
[21] *Wastewater Treatment Plant: Regina Wastewater Treatment Plant Construction 90% Complete*. City of Regina. June 14, 2016. http://www.regina.ca/residents/water-sewer/wastewater--treatment--plant/
[22] All dollar denominations refer to Canadian Dollars

percent of the project development and construction capital costs for public private partnership projects. The grant to Regina was an integral financial component of this project and contributed to gaining public support for using a P3 delivery model.

After completion of construction in 2017, the remaining $78.7 million in construction costs will be considered a long-term loan from EPCOR to the City for the remaining term of the project agreement. This debt will be retired through a series of monthly contractually specified "capital payments." The debt is considered to include risk costs absorbed by EPCOR and it carries an interest rate equivalent to 6.462 percent for a period of 27 ½ years. The City maintains the authority to withhold payments due to non-performance. The structure of this financing and payment arrangement was an integral component of the City's strategy to allocate risk to EPCOR to incentivize performance. The risk table below shows a summary of select risk allocations.

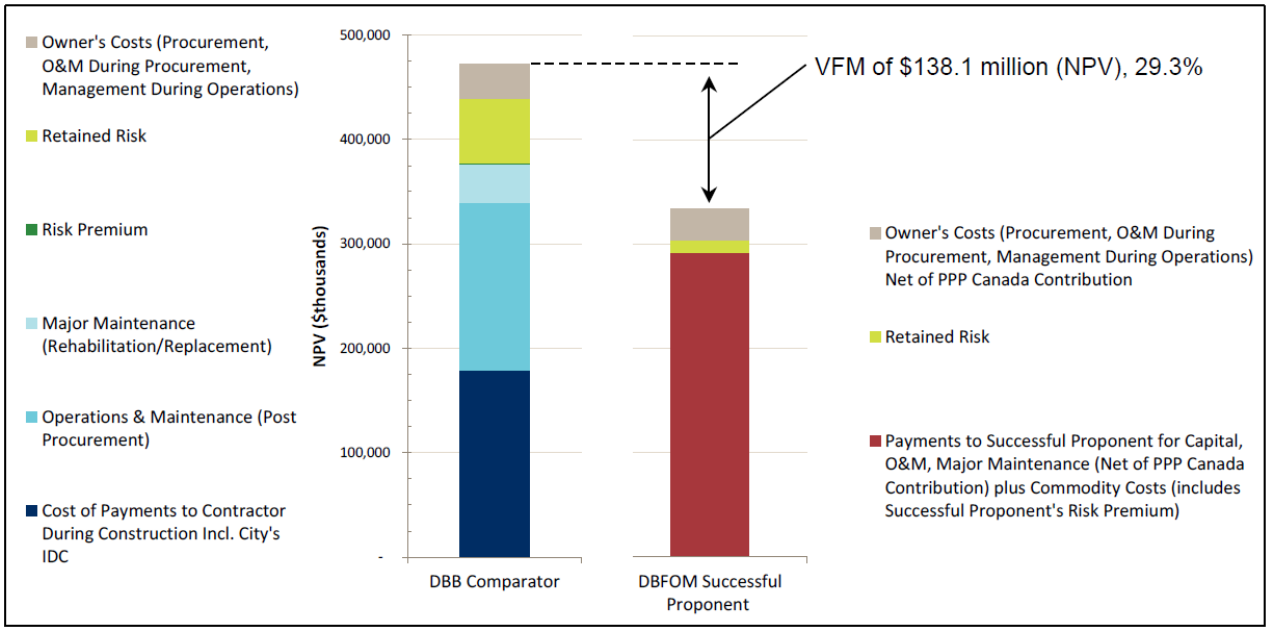
Table 3: Allocation of Select Risk Responsibilities

Risk Category	Responsible Parties	Description
Permitting	EPCOR	Responsible for obtaining permits. While permits remain in City's name, EPCOR is liable for any fines or costs to address violations.
	City of Regina	Responsible for facilitating initial interaction between Province and EPCOR; holds permits.
Design and Construction	EPCOR	Responsible for integrated design and construction services to meet certain volumetric and treatment quality performance specifications. Agreement includes substantial holdback and penalty clauses for construction delays.
	City of Regina	Maintains very minimal responsibility during construction of select legacy equipment.
Operations and Maintenance	EPCOR	Responsible for most aspects of operation of plant subject to detailed operation and management plans.
	City of Regina	Fiscally responsible for certain energy and chemical costs. EPCOR is responsible for costs if power and natural gas do not meet proposal performance specifications.
Recurring Capital Needs	EPCOR	Responsible for capital costs related to most aspects of the wastewater treatment plant for the life of the contract.
	City of Regina	Responsible for select "latent defects" in legacy equipment in early phase of agreement.
Risk Category	**Responsible Parties**	**Description**
Revenue/Demand	EPCOR	EPCOR's revenue stream is not impacted by fluctuation in demand
	City of Regina	Responsible for full operation payment (other than a decrease in some pass through charges), even if demand falls drastically.
Financial/Debt	EPCOR	Responsible for approximately half of initial project construction capital cost structured as debt agreement with City.
	City of Regina	Responsible for approximately half of initial capital cost. Also responsible for monthly capital payments (debt service) to EPCOR that can be withheld due to lack of performance.
Catastrophic	EPCOR	Responsible for carrying certain types of insurance that cover some unexpected costs.

	City of Regina	City retains cost responsibility for *Force Majeure* events

The City will make separate monthly payments to EPCOR that include a "capital payment", an "infrastructure operation and maintenance payment," and a "renewal payment."[23] The exact nature and breakdown of these payments is confidential, but they do include funds to support all aspects of operation, minus some pass through commodity charges and capital costs associated with renewal and capital improvements. There will also be a separate commodity charge to cover commodities such as gas and electricity. Should EPCOR achieve higher efficiency in its use of natural gas and electricity than estimated in its financial offer, the costs savings will be shared fifty-fifty with the City. Regina maintains control of rate setting and their calculation of revenue requirements and customer rates will take into consideration costs paid to EPCOR. As part of its referendum communication plan, the City calculated and disseminated the annual savings per account ($276) resulting from the award of the national P3 grant (assuming the impact of the entire amount was spread evenly over the first four years of the agreement).[24]

In interviews with project staff and in public presentations, the City has stated that it believes the DBFOM approach had a positive impact on the utility and ratepayers. The City carried out a detailed assessment of the DBFOM and other procurement options prior to moving forward. As mentioned above, the City used a rigorous VfM methodology, which included financial costs as well as estimated risk costs. By necessity, most VfM assessments depend on assumptions about different scenarios, and these assumptions ultimately impact the results. Regina conducted a revised VfM calculation based on the details of EPCOR's specific proposal. The analysis showed a NPV savings of 20.1% for the chosen DBFOM over a traditional Design Bid Build (DBB) approach, excluding the P3 grant funds. Figure 2 below shows the NPV savings increases to 29.3% when including the $48.2 million P3 grant.[25]



[23] *Agreement to Design, Build, Finance, Operate and Maintain: Regina Wastewater Treatment Plant Upgrade Project.* The City of Regina and EPCOR Water Prairies, Inc. July 3, 2014.
[24] Rob Court (Manager, Environmental Engineering Branch), email correspondence with author, July 29, 2016.
[25] *City of Regina Wastewater Treatment Plant Expansion & Upgrade Project: Value for Money Report.* Deloitte. July 24, 2014.

Figure 2: Final Value for Money analysis from the City's perspective[26]

The savings of the DBFOM model over other options are due largely to assumptions related to the construction costs of the project and the reduction in retained risk for the City in the DBFOM approach. The ultimate cost for the project came in significantly lower than the original engineering estimate for a DBB project. It is impossible to know what the exact cost would have been under a DBB model, but the City and its contractor took great steps to minimize factors that typically lead to cost overruns and change orders. Likewise, it is impossible to confirm that the higher risk costs associated with the DBB model would actually have materialized in reality, but they were based on extensive discussions and analysis of a series of potential outcomes and the financial repercussions of those outcomes. The analysis included Monte Carlo simulations to develop risk profiles for each procurement process.

The City did not expect the arrangement to lead to significant operations and maintenance savings, with the exception of some modest energy and chemical savings.[27] One of the reasons the City predicted the operation costs would be fairly similar is that they structured the project agreement to facilitate transfer of labor. All labor agreements were subject to collective agreement and permitted employees to move to positions within the City.[28] In the end, 13 of the 24 staff positions transferred over to EPCOR, while other employees left or chose to stay with the City.[29] Employees who transferred to EPCOR worked for the City for the first five months of the contract and then made the transfer. All employees also received equal or better benefits through EPCOR's benefits package while remaining members of CUPE Local 21 as a separate bargaining unit.[30,31]
Regina's choice of a DBFOM procurement model resulted in cost savings in some areas and increased costs in others. Increased costs came from extended project preparation, planning, and preliminary design costs that exceeded what would traditionally occur with a DBB approach. Yet these expenditures reduced uncertainty and risk later in the project. The most obvious impact of choosing a P3 approach was Regina's eligibility for and eventual award of a very sizeable grant. From the perspective of the City, this is a significant, quantifiable benefit of their choice and was an essential component of their communications strategy to promote this approach. Conversely, the decision to require private sector financing resulted in a non-risk adjusted cost of capital that was higher than the rate the City likely could have accessed. The City recently completed another major capital project that incorporated $100 million of 30-year debt from the provincial government that carried a rate of 4.1 percent – a rate the Project Manager thought likely if the City had sought similar debt rather than turning to EPCOR. However, the project was specifically designed to incorporate private financing as a strategy to reduce capital and operational risk costs that the City felt would ultimately provide financial benefits and outweighed the increased capital cost. In the end, EPCOR used balance sheet financing and included a guarantee from their parent company (EPCOR Utilities Inc.), leading to a competitive capital rate for Regina as well as EPCOR having a significant stake in assuring the project's success.

At the time of publication, the project was scheduled to be completed on time without any major costly change orders.

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[26] Court, Rob. *Regina's Wastewater Treatment Plant Upgrade Project*. Presentation at the New Cities Foundation Workshop. May 9, 2016.
[27] *City of Regina Wastewater Treatment Plant Upgrade: Business Case Submission to PPP Canada.* Deloitte. March 4, 2013.
[28] *Regina Wastewater Treatment Plant Upgrade Project, Saskatchewan: Delivering Clean and Safe Wastewater for a Growing City.* The Canadian Council for Public Private Partnerships. 2014.
[29] Rob Court (Manager, Environmental Engineering Branch), interview with author, August 3, 2015.
[30] *ibid*
[31] *Regina Wastewater Treatment Plant Upgrade Project, Saskatchewan: Delivering Clean and Safe Wastewater for a Growing City.* The Canadian Council for Public Private Partnerships. 2014.

Appendix A. Simplified Project Financial Flows

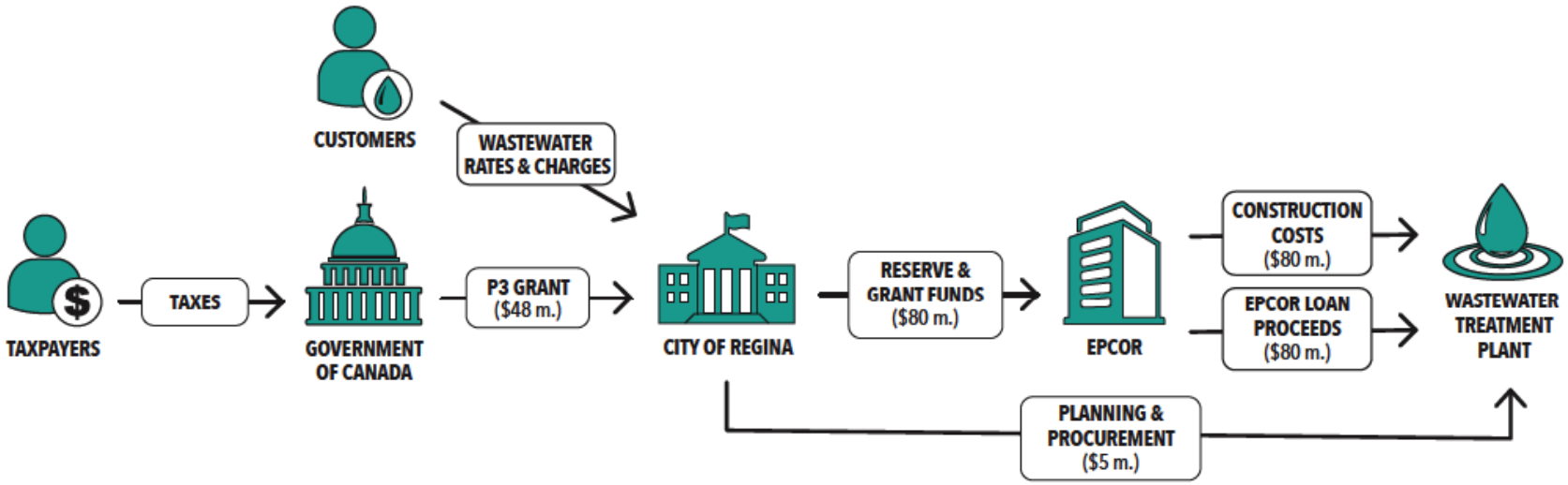

Figure 3. Flow of Initial Project Outlays

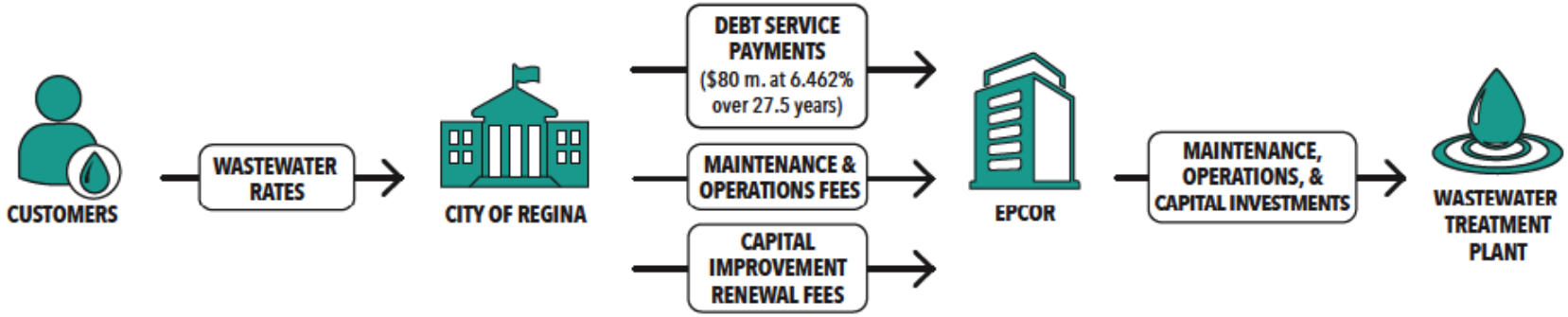

Figure 4. Recurring Financial Flows

Acknowledgements

Written by Jeff Hughes[†] and Carol Rosenfeld

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Cover photo: Construction to upgrade Regina Wastewater Treatment Plant. Used with permission from Rob Court, City of Regina.

[†]*Jeff Hughes is a member of the United States Environmental Protection Agency's Environmental Finance Advisory Board*.

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Davis Woodland Water Supply
Design Build and Operate (DBO) Project

The Cities of Woodland and Davis California joined together to construct a new surface water treatment plant using a 15 year Design Build and Operate (DBO) agreement and public financing from State Revolving Fund (SRF) loans to reduce the lifecycle cost of the project.

Woodland and Davis, two neighboring California cities, have historically relied on groundwater as their primary drinking water source. Problems with the quality and the long-term quantity of regional groundwater sources required the cities to build a new surface water treatment facility. Faced with an ambitious regulatory deadline and a complicated multicomponent project design, the communities chose to join together to form a new regional utility, the Woodland-Davis Clean Water Agency (the Agency). The Agency's charge was to construct new raw water intake facilities, a large surface water treatment facility, and transmission lines connecting the facility to existing utility networks in the Cities of Woodland and Davis. After careful evaluation of different procurement options, the Agency entered into a Design Build Operate (DBO) agreement with CH2M HILL Companies, Ltd. (CH2M). One of the unique aspects of this DBO project was that state law allowed it to take advantage of low cost public financing in the form of State Revolving Fund (SRF) loans.

Table 1. Key Project Details

Project Title:	Davis Woodland Water Supply Project
Primary Facility/Service:	Surface water treatment plant (30 million gallons per day), raw water pipeline, treated water transmission lines to City of Woodland and City of Davis distribution systems
Local Government Entity:	Woodland-Davis Clean Water Agency (A Joint Powers Authority created by Cities of Davis and Woodland, University of California Davis, and Yolo County)
Primary Partner:	CH2M Hill
Primary Advisor:	West Yost Associates
Delivery Model:	Design Build and Operate agreement (DBO)
Contract Period:	15 years with 5 year renewal option
Population Served:	Approximately 2/3rds of Yolo County, CA (roughly 140,000 people)
Major Initial Outlays:	$141,152,772 for Design Build portion of the DBO agreement
Flow of Revenues:	Davis and Woodland remain the primary retail water service providers and control rate setting for their respective communities. The cities use revenue from water sales to make payments to the Agency, which in turn is responsible for paying facility debt service and DBO agreement fees.

Background

In the past, the Cities of Woodland and Davis have relied completely on groundwater for drinking water; however, over time, groundwater quality has declined. For 40 years, from the 1950s through the 1980s, the region tapped into the intermediate portion of the groundwater basin to meet water needs. Since then, new water quality requirements at both the state and federal level, as well as the deterioration of existing wells, made it necessary for Davis and the University of California – Davis to construct deeper wells, some up to 2,000 feet below ground.[1]

By tapping into the surface waters of the Sacramento River, the Cities of Woodland and Davis hoped to replace depleted groundwater resources with a safer and more reliable water supply.[2] In addition, the cities faced regulatory pressure to improve the quality of their wastewater discharges. In March of 2010, under the cities' National Pollutant Discharge Elimination System (NPDES) permits, the Central Valley Regional Water Quality Control Board issued a ruling requiring the cities to improve their wastewater discharge and gain compliance by late 2015 (Davis) and 2016 (Woodland).[3] The source water switch avoided trace contaminants (Selenium) and high levels of salinity found in their groundwater source, thus resulting in improved wastewater discharge.

In order to access Sacramento River surface waters, the Agency had to acquire water rights, engage partners in planning (including a reclamation district interested in improving fish habitat), finance a shared raw water intake, and install raw water transmission lines and treated water lines. Ultimately, providing water customers in the region with access to treated surface water required a number of integrated projects. This project profile focuses on the part of the overall water supply development that was delivered through a Design Build and Operate agreement.

Project Development and Procurement

[1] *Davis-Woodland Water Supply Project Community Profile: Sustainable Economical Drinking Water Solutions*. Woodland-Davis Clean Water Agency. December 2007. http://www.wdcwa.com/images/uploadsdoc/Atch5DWWSPCommunityReportDec07.pdf

[2] *Woodland-Davis Clean Water Agency Website*. http://www.wdcwa.com/

[3] *Briefing Notes CWSRF Financing for the Davis-Woodland Water Supply/Water Quality Improvement Project.* California State Water Resources Control Board. March 18, 2014.

Due to its complexity and scope, the project required significant staff support, as well as outside legal and engineering consultant services. The Agency engaged West Yost Associates, an engineering firm that had worked extensively with Woodland and Davis in the past, to lead project management and procurement oversight efforts. The firm analyzed potential project delivery mechanisms, carried out preliminary design activities, and prepared a project financial analysis. The Agency also engaged Municipal Finance Services, Inc. to analyze financing options for the project. The consultants worked closely through all phases of procurement with a specially created advisory team (the "Facilities Procurement Committee") that included staff from the cities and several representatives of the Agency's consultants.[4] A technical memo sent to the Agency in October of 2010 summarized the results of a detailed analysis of procurement options, including looking at traditional methods (Design Bid Build) and using a Design Build (DB) contract and separate operations contract. The memo concluded by recommending that the Agency proceed with an integrated Design Build and Operate (DBO) procurement model.[5]

The process to select a private partner took approximately 3 years. The Facilities Procurement Committee oversaw every step of the process; the committee was responsible for making recommendations to the Agency General Manager, who would in turn make recommendations to the Agency Board.

The Agency issued a Request for Qualifications in January of 2011 and eventually invited three firms to submit proposals. The Agency then issued a draft Request for Proposals (RFP) for comment to potential bidders in October of 2011. After receiving comments, the Agency issued a revised RFP in December of 2012 that laid out the technical requirements as well as the financial structure of the envisioned DBO agreement. The final procurement involved two steps: initial submissions were due in February of 2013 and final detailed proposals were due in June of 2013.[6]

Two of the three invited firms submitted proposals (the third firm cited timing and workload issues as its reason for not participating). One of the two submitting teams withdrew after being notified that its Initial Concept Submittal (ICS) was not in compliance with the RFP.[7] Late in the procurement process (during the pricing phase), the Agency became concerned that the lack of multiple proposals might reduce competitive pricing pressure. To address this concern, the Agency lowered their not-to-exceed contract price cap an additional 10% from a cap that had already been set 10% lower than West Yost's project estimate under a traditional procurement model. According to the Agency's General Manager, this, along with the Agency's requirement that bidders maintain "open books" that included the entire bid pricing details which could be reviewed during the negotiation process, led to a very cost effective final price.[8]

Since the Agency was a new entity with few existing staff, the RFP did not include staff retention requirements that are common for projects involving expansion or upgrades. In the RFP, the Agency established requirements that respondents solicit local contractor interest in addition to submitting a local procurement and employment plan. The Agency also required that respondents provide these elements while still adhering to competitive pricing for the design, construction, and operation of the project.[9]

The choice of DBO as the project delivery method was not the focus of public concerns. However, there was significant public debate (particularly in Davis) over the more fundamental decision to proceed with the new water supply project and how to set user rates to pay for the project. In fact, Davis was required to hold a referendum on the project before it could officially proceed; in March of 2013, voters approved the project 54% to 46%.[10]

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[4] Dennis Diemer (General Manager, Woodland-Davis Clean Water Agency), phone correspondence with author. September 8, 2016.
[5] Yost, James and Gilbert, Jerry. *Technical Memorandum: Davis-Woodland Water Supply Project – Project Delivery Analysis and Recommendation*. West Yost Associates. October 19, 2010.
[6] *Request for Proposals for Davis Woodland Water Supply Project Design-Build-Operate.* Woodland-Davis Clean Water Agency. December 20, 2012.
[7] *Update on the Woodland-Davis Water Supply Project*. Woodland-Davis Clean Water Agency Presentation. June 20, 2013.
[8] Dennis Diemer (General Manager, Woodland-Davis Clean Water Agency), phone correspondence with author. June 16, 2016.
[9] *Davis Woodland Water Supply Project Procurement Documents – Addendum No.1*. Woodland-Davis Clean Water Agency. April 15, 2013. http://www.wdcwa.com/images/uploadsdoc/Addendum_No_1.pdf
[10] *Briefing Notes CWSRF Financing for the Davis-Woodland Water Supply/Water Quality Improvement Project.* California State Water Resources Control Board. March 18, 2014.

Even after the referendum passed, the City of Davis faced additional public challenges. In anticipation of the project cost, the City of Davis proposed a sizable rate increase (ultimately the project was predicted to triple the average household bill over a number of years) along with an innovative new rate structure that shifted how costs were apportioned among customers. California law provides voters with opportunities to challenge and ultimately reject rate increases. The combination of a new rate structure, magnified by the increased revenue needs, led a group of Davis citizens to form an organization that filed suit challenging the adopted rate structure. In June 2014, the citizen organization successfully led a referendum petition that overturned the new rates.[11] By August 2014, the City and those opposed to the new rate structure eventually came to an agreement over a simpler rate structure that would provide sufficient revenue for the project.

Timeline

Table 2. Project milestones

Date	Milestone
September 2009	The Cities of Woodland and Davis establish the Woodland-Davis Clean Water Agency to oversee the regional water supply project
January 2011	The Agency issues Request for Qualifications
April 2011	The Agency receives Statements of Qualifications and develops short list of three firms eligible to propose
October 2011	The Agency sends draft Request for Proposals to selected firms to solicit comments
December 2012	The Agency issues final Request for Proposals for DBO contract
June 2013	Agency receives final proposals
July 2013	CH2M submits priced proposal
August/September 2013	The Agency Board is authorized to proceed with negotiations
October 2013	The Agency awards DBO contract to CH2M; project design and permitting begin
October 2014	State Water Resources Control Board approves project financing agreement with the Agency
June 2016	Plant enters into service and begins to supply water to cities

[11] Ryan, Dave. *Voters say no to water rates, yes to sales tax hike.* The Davis Enterprise. June 4, 2014. http://www.davisenterprise.com/local-news/voters-say-no-to-water-rates-yes-to-sales-tax-hike/

Key Financial Features and Outcomes

DBO Initial Capital Payment

The agreement between the Agency and CH2M provides for separate payments for the design build portion of the contract and facility operation (see next section for discussion of annual service fee). The Agency agreed to pay a "Fixed Base Design Build Price" of $141,152,177 to CH2M that covers the design and building of the new treatment plant, new raw water transmission line, and new distribution lines to take water to Davis and Woodland.[12]

The agreement allocated certain construction and permitting risks to CH2M. As such, the Agency required CH2M to provide 10% of the financing for the project during construction in the form of a 10% holdback of each progress payment until construction was completed. Once completed, the Agency would pay the withheld amount to CH2M, thus satisfying CH2M's financing responsibilities under the agreement. Overall, most of the financing risk remained with the Agency as it remained responsible for 100% of the project funding requirement.[13] Table 3 below summarizes risk allocations throughout the project.

Over the course of project planning, project leaders considered several different sources of capital financing for the DBO agreement and other capital components of the overall water supply project. The initial project delivery analysis memo prepared by West Yost recommended using publically acquired financing in the form of revenue bonds and grants, if available, over the use of long-term privately acquired financing due to the anticipated higher interest rates.[14]

Ultimately, the Agency and its member cities were able to access State Revolving Fund (SRF) loans from the State Water Resources Control Board. The Water Resources Control Board authorized a $95.5 million Clean Water State Revolving Fund (CWSRF) loan for the City of Davis' shares of water project (30-year term; 1.7% interest rate). The City of Woodland was awarded a $111.4 million Safe Drinking Water State Revolving Fund loan for the regional project with an interest rate of 1.785% for a term of 20 years.[15] The loan proceeds were used for both the initial DBO payment as well as for other capital components of the overall project. Additionally both Woodland and Davis obtained separate additional SRF loans totaling $67 million to cover the costs of the local distribution system improvement projects needed by the communities to fully integrate the new surface water supply.

Incorporating SRF loans into DBO projects is uncommon, making their use one of the most unique aspects of this project. SRF managers across the country report a variety of difficulties in funding DBO projects, including capacity driven or state imposed limits on the size of individual loans they can make.[16] The Agency was able to use SRF funds only after a state law was changed to permit funding for this type of project.[17] The State was also able to issue CWSRF loans (which are reserved for wastewater facilities) for a drinking water project because the project design would reduce salt loads in wastewater discharges (in addition to lower salt levels in surface water, planners expected a reduction in customer point of use water softeners due to softer surface water).[18] The ability to access financing from the SRFs, which were not funded from bond proceeds, allowed the Cities of Woodland and Davis to secure below market rate

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[12] *Service Contract for the Design, Construction, and Operation of the Woodland-Davis Regional Water Treatment Facility and Related Facilities*. Woodland-Davis Clean Water Agency and CH2M-Hill. October 10, 2013.

[13] *Service Contract for the Design, Construction, and Operation of the Woodland-Davis Regional Water Treatment Facility and Related Facilities*. Woodland-Davis Clean Water Agency and CH2M-Hill. October 10, 2013.

[14] Yost, James and Gilbert, Jerry. *Technical Memorandum: Davis-Woodland Water Supply Project – Project Delivery Analysis and Recommendation*. West Yost Associates. October 19, 2010.

[15] *Woodland and Davis Receive Initial Installments of State Funding for Water Supply Project.* Woodland-Davis Clean Water Agency. February 16, 2015. http://www.wdcwa.com/images/uploadsdoc/WDCWA_MediaRelease_SRF__FundsReceived_21615.pdf

[16] Informal Poll of SRF Managers carried out by author. Annual State Revolving Fund Conference in Tampa, FL. November 2, 2015.

[17] Wolk, Lois. *State Water Board approves financing agreement with the Woodland-Davis Clean Water Agency.* http://sd03.senate.ca.gov/news/2014-10-21-state-water-board-approves-financing-agreement-woodland-davis-clean-water-agency

[18] *State Water Resources Control Board Resolution No. 2014-XX.* State Water Resources Control Board Resolution. March 18, 2014.

financing. They also avoided the higher financing costs associated with the public issuance of tax-exempt private activity bonds or – in the absence of a private activity bond volume cap allocation - taxable bonds.

Table 3. Project Risks for Public and Private Entities.[19]

Risk Category	Responsible Parties	Description
Permitting	Woodland-Davis Clean Water Agency	Responsible for initial environmental permits and providing "limited" permitting assistance
	CH2M	Responsible for obtaining all development and operating permits
Construction	Woodland-Davis Clean Water Agency	Responsible for significant penalties for delayed construction Responsible for any construction cost increases due to the use of SRF Responsible for sudden extreme price fluctuations in raw materials up to $500,000
	CH2M	Responsible for all aspects of integrated design and construction
Operations & Maintenance	Woodland-Davis Clean Water Agency	Major renewal and replacement (R&R) costs are paid from a ratepayer-funded repair and replacement fund. Operating costs due to changes in law may be added to agreement payments.
	CH2M	Responsible for most operational costs and capital costs under $25,000 with the exception of certain pass-through costs (e.g. chemical and electricity)
Revenue/Demand	Woodland-Davis Clean Water Agency	Responsible for paying operating fees that are largely fixed but which can be adjusted modestly on an annual basis
	CH2M	Guaranteed significant operating revenue even if demand for water from the facility is lower than anticipated
Finance/Debt	Woodland-Davis Clean Water Agency	Responsible for all long-term debt financing for the project
	CH2M	Responsible for financing of 10% of DBO price during construction period due to payment withholding requirement

DBO Operating Expenditures

[19] Yost, James and Gilbert, Jerry. *Technical Memorandum: Davis-Woodland Water Supply Project – Project Delivery Analysis and Recommendation*. West Yost Associates. October 19, 2010.

Under the agreement, operating and maintenance costs are paid through an annual service fee. The fee is comprised of a fixed base operating charge and a smaller variable component. The base operating charge depends on which of the four annual finished water demand levels the Agency elects prior to a given contract year. In other words, the Agency can forecast what its water needs will be and have some control over what it pays to CH2M. This fixed component is designed to cover most operating costs including labor, supplies, and some chemicals. The fixed component at the start of the agreement ranges from $2,850,552 for a demand level of 12 million gallons per day (MGD) to $3,626,869 for a demand level of 28.5 MGD. The relatively low variation in prices for very different demand levels shields CH2M from excessive revenue risk (see risks outlined in Table 3).

The variable component of the service fee is designed to cover the provided water in a given year that exceeds the pre-selected level. The variable component also includes several incentive payments, such as the right to a portion of electricity savings due to innovations by CH2M.[20] The Agency remains responsible for paying for electricity up to a guaranteed maximum electricity use.

Apart from the contractual service fee payment, CH2M will have access to a Repair and Replacement (R&R) account to cover major capital repairs and replacements which exceed $25,000 and which are approved by the Agency. The agreement requires the Agency to deposit $362,338 each year into the fund; this money will remain as the property of the Agency until an authorized expenditure occurs. Both the R&R payment and the base component of the annual service fee are modified each year through a cost inflation index system laid out in the agreement.

Nothing about this arrangement fundamentally changed the way rates are set by the Cities of Woodland and Davis. Woodland and Davis are responsible for all aspects of rate setting in their jurisdictions. This requires that rates take into consideration revenue requirements linked to the incurred debt and the operating charges for the new facilities.[21] See appendix A for a schematic of the financial flows associated with this project.

Financial Impact

Since the project proceeded with only one procurement option and there was ultimately only one final bidder, it is impossible to accurately quantify the financial impact of the decision to use the DBO method in relation to other options the Agency could have followed. However, the Agency and the Facilities Procurement Committee studied the results of DBO efforts across the country and incorporated the "anticipated savings" into their procurement process by setting ambitious not-to-exceed caps below the estimated cost of doing the project as a design bid build project. In the end, the price of the project met the price caps the Agency introduced.

Figure 1 shows a schematic prepared by the Agency that highlights what it believed to be the cost reductions that resulted from the implementation choices made during the overall water supply project, including the DBO agreement. (The DBO costs were also only one component of a larger project that included other investments.) In 2011, West Yost Associates estimated that the project would have cost $350 Million if it were built as it was originally conceived using a traditional design bid and build approach. The subsequent cost estimates shown in the figure take into account a combination of engineering changes and procurement decisions.

[20] *Service Contract for the Design, Construction, and Operation of the Woodland-Davis Regional Water Treatment Facility and Related Facilities*. Woodland-Davis Clean Water Agency and CH2M-Hill. October 10, 2013.

[21] *Amended and Restated Woodland-Davis Clean Water Agency Joint Powers Agreement.* Woodland-Davis Clean Water Agency. February 26, 2013.

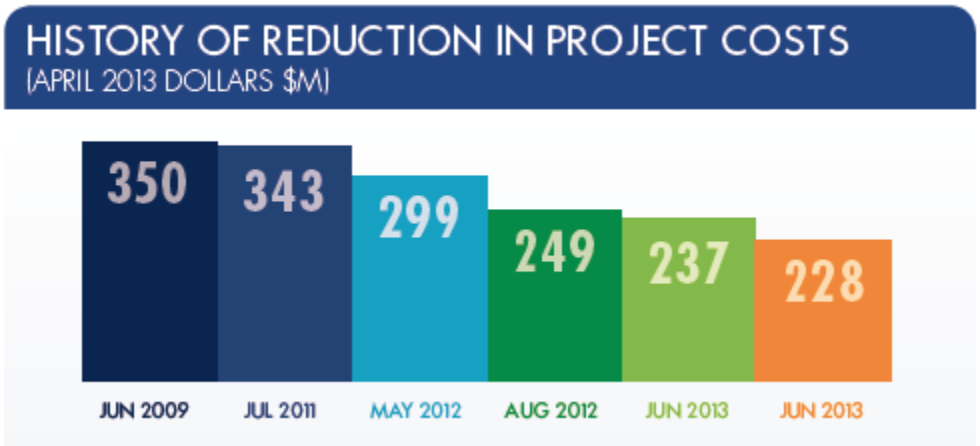

Figure 1. History of estimated reductions in project costs.[22]

The decrease in cost shown between July 2011 and May 2012 includes an assumed 10% reduction in estimated DBO portion of the capital costs attributed to the initial decision to use the DBO method. The decrease in cost between August 2012 and June 2013 includes a documented 10% reduction ($14.6 Million) due to a price cap set for the proposal bid that was required by the Agency in anticipation of there being only one final bidder.

The project began supplying water to the Cities of Woodland and Davis in June of 2016, three months earlier than the contractual project deadline that had already been set based on optimistic projections. The Agency General Manager estimates the DBO process shaved at least a year off the project schedule.[23]

[22] *History of Reduction in Project Costs*. Woodland-Davis Clean Water Agency. January 21, 2014. http://www.wdcwa.com/images/uploadsdoc/WDCWA_HistoryofProjectCostReductions_1_21_14.pdf

[23] Dennis Diemer (General Manager, Woodland-Davis Clean Water Agency), phone correspondence with author. June 16, 2016.

Appendix A. Simplified Project Financial Flows

Figure 2. Flow of Initial Project Outlays

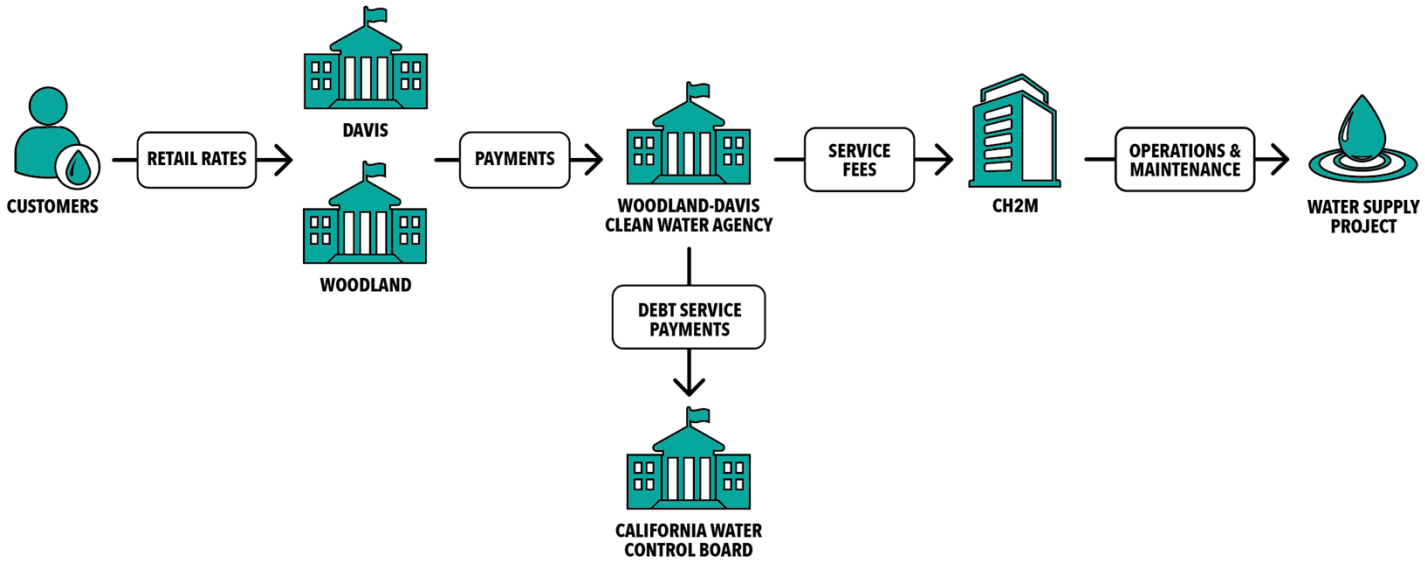

Figure 3. Recurring Financial Flows

Acknowledgements

Written by Jeff Hughes† and Carol Rosenfeld. October 2016.

This research was conducted by the Environmental Finance Center at The University of North Carolina under a cooperative agreement from the EPA Water Infrastructure Resiliency and Finance Center (WIRFC). This research was a collaborative effort within the EFC, WIRFC and other key partners including the West Coast Infrastructure Exchange. Special thanks to Dennis Diemer, General Manager of the Woodland-Davis Clean Water Agency, for his consultation. Thanks also to members of the USEPA's Environmental Finance Advisory Board who provided valuable insight. Lexi Kay Herndon and Allison Perch provided editorial assistance.

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We are grateful to the U.S. Environmental Protection Agency for funding this research.

Cover photo: Aerial View of Davis Woodland Water Supply Facility Used with permission from: https://www.ucdavis.edu/news/preparing-campuss-new-water-supply

† Jeff Hughes is a member of the United States Environmental Protection Agency's Environmental Finance Advisory Board.

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Rialto Water and Wastewater Concession Agreement: Capital Flows

The City of Rialto, California used a 30-year concession agreement to improve operations of its water and wastewater system and to raise a significant amount of capital from private equity partners and capital finance markets. The initial funds allowed the City to accelerate capital improvements in its water and wastewater system, pay itself deferred utility system lease payments, and fund several strategic reserve funds.

Note: The Rialto Water and Wastewater Concession generated an influx of capital to accelerate capital investments and to improve ongoing operation and maintenance of the water and wastewater system. This profile focuses primarily on the concession structure that Rialto employed to generate the initial outlay of funds; however, it does not cover the details or outcomes of the operating portion of the concession.

Table 1. Key Project Details

Project Title:	Rialto Water and Wastewater Concession
Primary Facility/Service:	Water and Wastewater System
Local Government Entity:	The City of Rialto/Rialto Utility Authority
Primary Partner:	Rialto Water Services Inc., Table Rock Capital (project lead and equity provider), Ullico Infrastruture Fund (equity provider), and Veolia Water (Operator)
City's Primary Advisors:	SAIC (business and technical advisory services), Fulbright and Jaworski LLP (legal services)
Delivery Model:	Concession
Contract Period:	30 years
Population Served:	50,000 (water service), 100,000 (wastewater service)
Major Initial Outlays:	$177,000,000 of initial capital raised or contributed. Major uses of funds included: initial concession payment, existing debt defeasance, short-term (5 year) capital improvements, funding for reserves, and project development/transaction costs.[1]
Flow of Revenues:	The City is responsible for setting rates that generate revenue to cover capital payments and operating costs associated with the concession. Rialto Water Services (RWS) is responsible for collecting and processing customer payments and disbursing revenue as required to the City. Assets are owned by the City and leased to a utility authority (Rialto Utility Authority) created and controlled by the City. Portions of the collected rates are used to cover the concession payments to RWS and lease payments to the City.

Background

The City of Rialto is located in Bernardino County, California, and as of 2010, it is home to approximately 100,000 people.[2] The City wastewater system provides wastewater services to the entire City population. The City water system provides water services to approximately 40% of the City population, primarily in the older downtown area, with the remainder of the City served by West Valley Water District and Fontana Water Company.[3] After a two and a half year competitive procurement process, in March of 2012 the City entered into a 30-year concession contract with Rialto Water Services.[4] Prior to entering into the agreement, the City had determined that the water and wastewater system needed a significant influx of capital to continue to provide quality service to current and future customers. The City's wastewater treatment facility had reached the end of its effective life and needed a major upgrade. Further, many aspects of the water distribution and wastewater collection systems needed major capital repairs. In addition to problems associated with the condition of system assets, water contamination issues linked to perchlorate associated with a weapons storage facility had plagued the City. Under the backdrop of these challenges, the City decided to turn to a public-private service delivery model (concession agreement) in order to improve, manage, and operate its water and wastewater assets.[5]

Prior to entering into the concession agreement, the City provided water and wastewater services through a combination of direct city operation and service agreements with private operators. In 2001, the City created another unit of government, the Rialto Utility Authority (RUA), to serve as a system intermediary that would facilitate the City earning a rate of return for the equity it had accumulated in the water and wastewater systems over the years.[6] Under the arrangement, this was achieved by allocating a portion of revenue from customer charges to pay system operation

[1] *Agenda Report for the City Council/RUA Meeting of March 27, 2012.* City of Rialto. March 22, 2012.
[2] *About Rialto*. The City of Rialto, California. http://yourrialto.com/city-hall/about-rialto/
[3] Tom Crowley (City Utilities Manager), telephone interview with author, November 22, 2016.
[4] *Agenda Report for the City Council/RUA Meeting of March 27, 2012.* City of Rialto. March 22, 2012.
[5] *ibid.*
[6] *Agenda Report for the City Council/RUA Meeting of March 27, 2012.* City of Rialto. March 22, 2012.

costs as well as annual lease payments to the City.[7] Immediately after creating RUA, the City established targeted annual lease payments that were significantly lower than the maximum allowed by California Law based on the valuation of the City's assets. The revenues collected by the RUA between 2001 and 2010 were only sufficient to pay a portion of the City's targeted lease payments. The City is also one of approximately 100 local governments in California that assesses a Utility User Tax on water and/or wastewater services. The tax is currently 8% of water and wastewater charges and has to be reapproved every five years. The last voter approval occurred in 2013.[8] The tax on water and wastewater services was projected to generate approximately $4.6 million in revenue for the 2016/2017 budget, which includes payments from Rialto Water Services customers as well as West Valley Water, another utility that serves a portion of the City.[9]

In December of 2010, the City entered into a letter of agreement with Rialto Water Services (RWS), a partnership led by Table Rock Capital, a California based Equity Firm and American Water, an international water service provider, to negotiate a concession agreement. The letter of agreement guaranteed the City would reimburse RWS for costs associated with preparing the project ("due diligence") if a financial agreement was not reached for an amount not to exceed $1.7 Million.[10] The City of Rialto, RUA and RWS entered into a 30-year concession agreement in March of 2012. Shortly after the agreement was signed, a public campaign was initiated with support from the Utility Workers Union to exclude American Water from the project. Later in 2012, it was announced that Veolia Water would assume the operating responsibility for RWS.[11] Figure 1 shows the relationship between the different entities involved in the project.

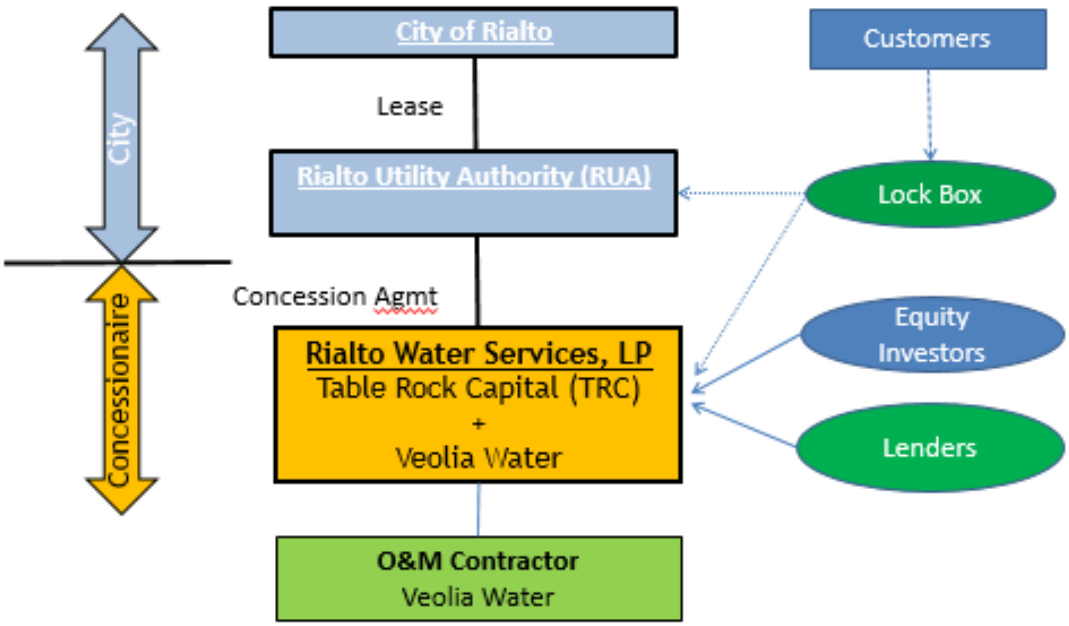

Figure 1. Rialto transaction structure.[12]

[7] *ibid.*
[8] Dulaney, Josh. Rialto Voters pass $11 million utility-users tax. Whittier Daily News. March 6, 2013.
[9] 2016/2017 budget
[10] *Agenda Report for the City Council/RUA Meeting of March 27, 2012.* City of Rialto. March 22, 2012.
[11] Steinberg, Jim. *American Water is out as operator for Rialto.* Pasadena Star News. July 10, 2012.
[12] *A Tale of Two Cities: The Rialto and Allentown Water/Wastewater System Transactions*. City of Rialto, CA, Leidos, PFM, K&L Gates. Presentation at the National Conference for Public-Private Partnerships P3 Connect in Denver, Colorado. July 29, 2014.

Concession Capital Flows

Under the agreement, RWS was responsible for raising over $170 million in initial capital funds. The funds were generated through private equity ($26 million) and the issuance of a $146 million of 30-year fixed-rate privately placed debt. The debt was rated A-. Private equity was provided by Table Rock Capital ($6 million) and the Ullico Infrastructure Fund ($19.85 million).[13] The Ullico Infrastructure Fund is an investment fund of the Union Labor Life Insurance Company, a company created to serve unions and their employees.[14] A schematic in the appendix shows a simplified flow of funds resulting from the agreement for the initial outlays and recurring payments.

The entire capital cost for the project was initially presented to the City Council as $177 million and included $7 million in reserves from RUA. According to a financial analysis presented to the City Council, the project capital structure incorporated a pre-tax return requirement of 19.6% for the equity contribution (13.6% after tax).[15] The overall maximum blended rate (taking into consideration the private activity bond portion) was conservatively presented as 8.6% with the expectation it could be as low as 8.1%.[16]

The raised funds were initially presented as covering the following:

- Transaction Related Costs: $24.3 million
- Debt Defeasance: $27.4 million
- Due Diligence and Transition Expenses: $11.2 million
- Catch-up Payments to the City in the form of an upfront concession payment: $30 million
- Capital investments to improve the water and wastewater system: $41 million
- Operational Funding: $43.1 million

The uses presented above were based on expectations prior to the financial close. After the project was underway and financing was finalized, actual uses were reported to be slightly different. For example, the City concession fee was reported to be $35 million.[17] The concession is structured to reimburse RWS for providing the initial capital through periodic concession capital payments. At the time the concession agreement was approved, the maximum annual payments were presented as $13 million for wastewater and $3.25 million for the water system.[18]

The City maintains authority for setting rates, but the agreement will influence the City's revenue requirements moving forward and will have a significant impact on what customers are asked to pay. Rates are required to be set at levels necessary to generate revenue sufficient to cover annual concession capital payments, operating costs, lease payments from RUA to the City, funds for operating and capital reserves, and reimbursement for City incurred management costs. Rates also must generate sufficient revenue for debt service coverage requirements for outstanding debt.

At the time the agreement was approved, City staff estimated that the agreement would result in a 115% water and wastewater rate increase over the first four years.[19] After implementing the first three of four planned rate increases, the City decided to defer the last planned rate increase for a year to go into effect in 2017.[20] Analyses presented during the project development stage concluded that the rate increase associated with the concession was comparable or even favorable to rate increases that would be needed to provide the same level of service and same lease payment revenue

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[13] Scott, Ed, and Axter, Sonia. *Overview of 30-Year Water and Wastewater Concession in Rialto, CA*. City of Rialto, Ullico. June 2015.
[14] *Supporting the American Worker for More than 85 Years.* Ullico. http://www.ullico.com/about-ullico/ullico-difference
[15] *Agenda Report for the City Council/RUA Meeting of March 27, 2012.* City of Rialto. March 22, 2012.
[16] *ibid.*
[17] Scott, Ed, and Axter, Sonia. *Overview of 30-Year Water and Wastewater Concession in Rialto, CA*. City of Rialto, Ullico. June 2015.
[18] *Agenda Report for the City Council/RUA Meeting of March 27, 2012.* City of Rialto. March 22, 2012.
[19] *ibid.*
[20] Tom Crowley (City Utilities Manager), telephone interview with author, November 22, 2016.

stream to the City.[21] The resulting rate was also reported to be equal to or lower than the rate residents who live in areas of the City served by other water utilities pay.[22] The 2016/2017 Rialto Annual Budget projects rates will generate lease and contract payments to the City's General Fund of $3.14 million.[23] Portions of these payments are used to cover the City's concession oversight and remaining water and wastewater responsibilities (e.g. long term capital planning and water resource planning).

[21] *ibid.*
[22] Tom Crowley (City Utilities Manager), telephone interview with author, November 22, 2016.
[23] *Proposed Budget for the Fiscal Year July 1, 2016 – June 30, 2017.* City of Rialto California. 2016.

Appendix A. Simplified Project Financial Flows

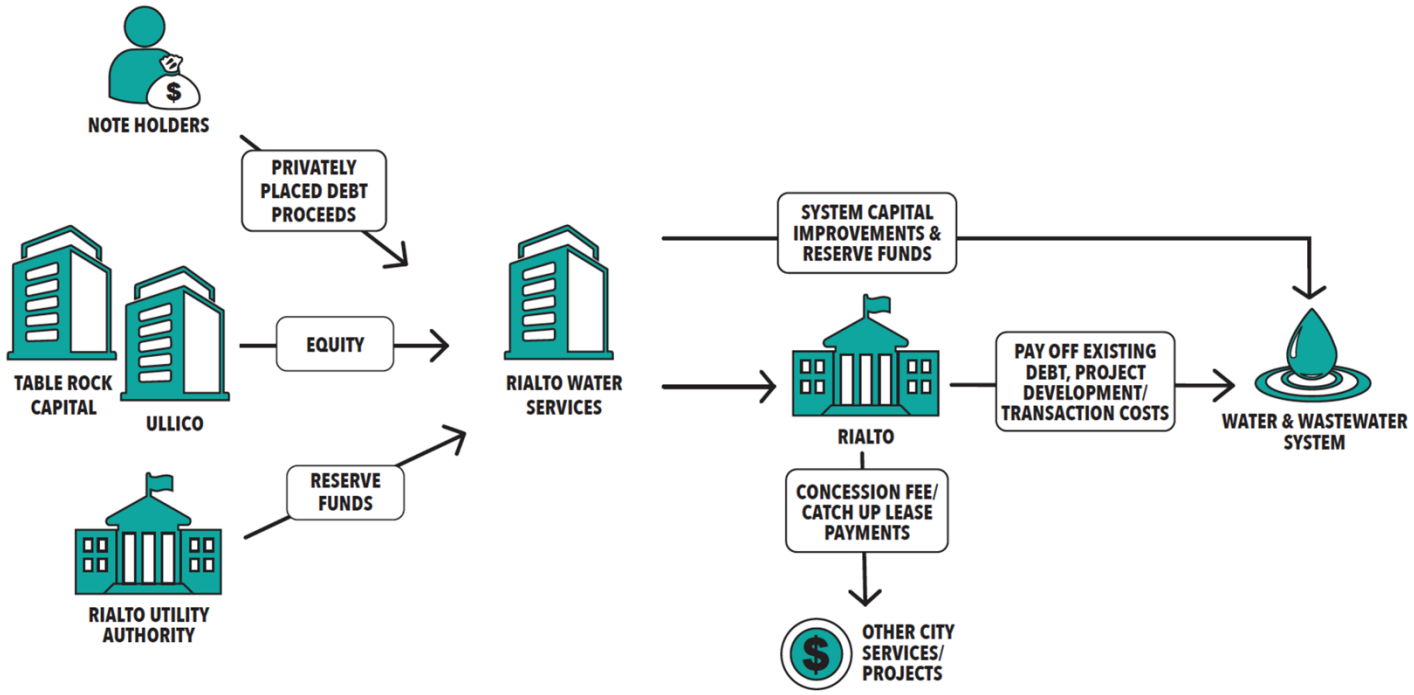

Figure 2. Flow of Initial Project Outlays

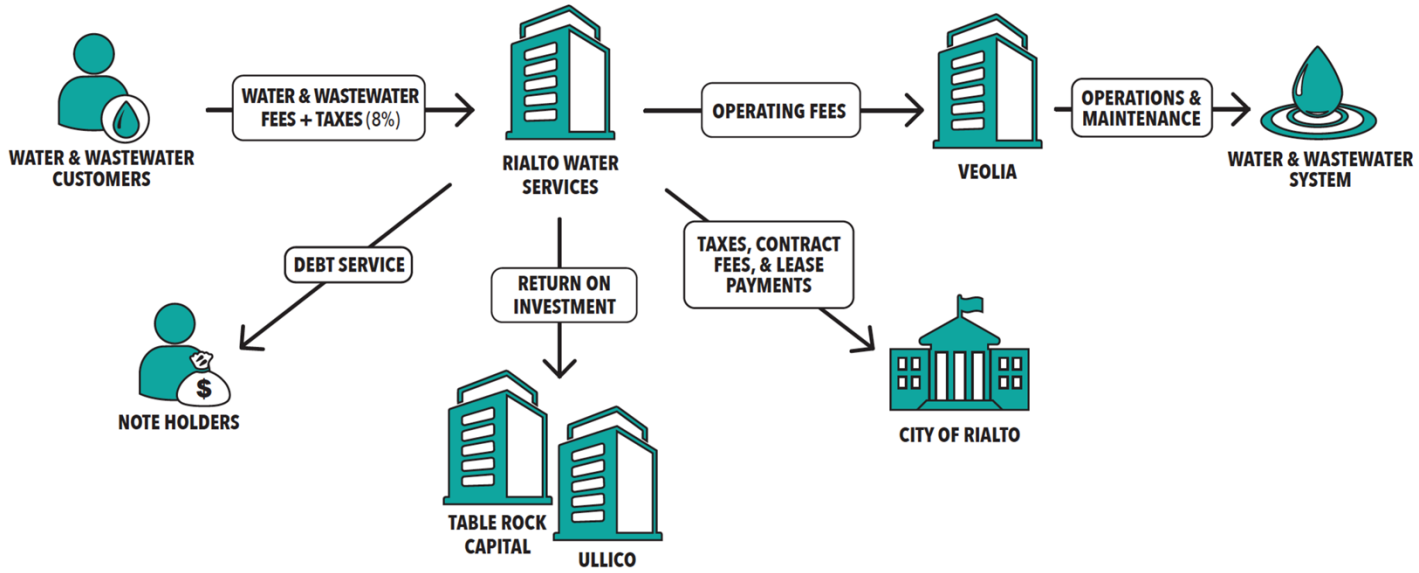

Figure 3. Recurring Financial Flows

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Written by Jeff Hughes.† November 2016.

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Cover photo: Veolia http://www.veolianorthamerica.com/en/rialto-california

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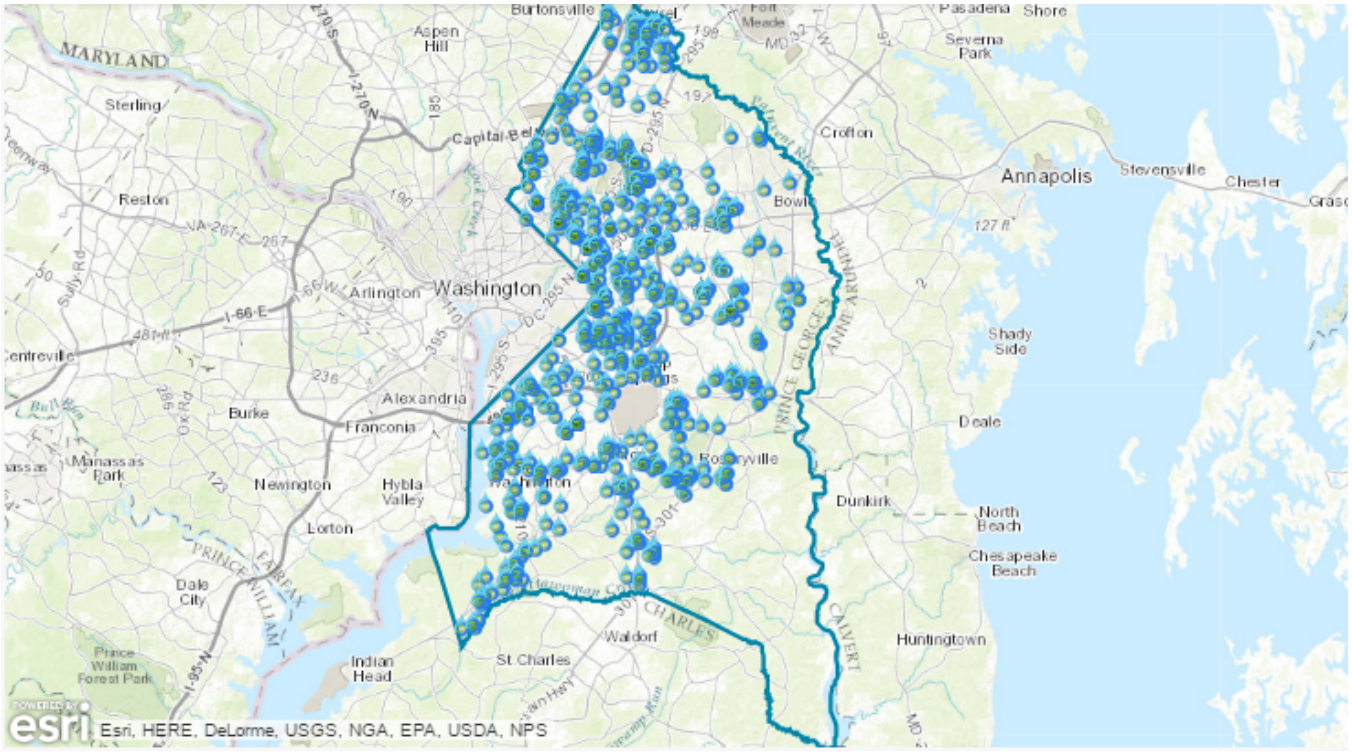
Prince George's County Urban Stormwater Retrofit Public Private Partnership



The Prince George's County Urban Stormwater Retrofit Public Private Partnership is a Pay for Performance service delivery model designed to improve water quality through installation of high impact stormwater control measures throughout Prince George's County. The approach delegates project selection, design, construction, operation, and maintenance responsibility to a team of private partners. The agreement also requires the development and implementation of social and economic development programs. The County relies primarily on stormwater utility fees to back debt issuances for the initial installations and to cover ongoing operation and maintenance costs.

Background

The Prince George's Urban Stormwater Retrofit Public Private Partnership ("The Clean Water Partnership") is a 30-year public private partnership between Prince George's County, Maryland and Corvias Solutions. The Clean Water Partnership is an alternative delivery approach to municipal stormwater management created to comply with several regulatory requirements, including the County's Municipal Separate Storm Sewer System ("MS4") stormwater permit, the County's allocation of Chesapeake Bay Total Maximum Daily Load ("TMDL"), and the subsequent Maryland Phase II Watershed Improvement Plan. Through a "Master Program Agreement", the County has committed to investing $100 million in stormwater management installations during an initial three-year period. The table below summarizes the key features of the approach.

Table 1. Key Project Details[1][2]

Project Title:	**Prince George's County Urban Stormwater Retrofit Public Private Partnership**
Primary Facility/Service:	Distributed Best Management Practices (BMPs) covering 2,000 acres (with possible expansion to 4,000 acres)
Local Government Entity:	Prince George's County
Primary Partner:	Corvias Prince George's County (Program Manager), CH2M Hill Constructors Inc. (General Contractor), Bowman Consulting Group, Ltd and CH2M Hill Engineers, Inc. (Design Engineers), Stormwater Maintenance LLC (Maintenance)
Delivery Model:	Design, Build, Operate, and Maintain ("DBOM")
Contract Period:	3 years (Program Agreement), 30 years (Maintenance Agreement)
Population Served:	909,535[3]
Major Initial Outlays:	$100 million over a three period to cover development and installation costs for stormwater control measures.
Flow of Revenues:	Prince George's County collects stormwater revenues from county residents through stormwater fees. Revenue is used to secure debt, the proceeds of which were used to pay private partners for program implementation.

Corvias Solutions is considered the manager of the partnership and is charged with overseeing all subcontractors throughout the design, construction, and maintenance of stormwater improvement projects. Corvias oversees a team that includes the following organizations:

- **CH2M Hill Constructors, Inc.**: serves as the "general contractor" and is responsible for procuring subcontractors to supply materials and implement proposed projects.
- **Bowman Consulting Group, Ltd and CH2M Hill Engineers, Inc.**: serve as the "design engineers" and are responsible for planning the design of proposed projects.
- **Stormwater Maintenance LLC**: serves as the "Prime Maintenance Contractor" responsible for completing all O&M work.
- **Maryland Environmental Service**: an independent self-supporting state agency, serves as the "Completion Certifier" and "Maintenance Monitor" responsible for inspecting and accepting completed projects, issuing Impervious Area Credit Certificates, and inspecting operations and maintenance work.

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[1] *Summary of Principal Terms: Master Program Agreement for the Urban Stormwater Retrofit Program Public-Private Partnership between Prince George's County and Corvias Prince George's County Stormwater Partners, LLC.* October 17, 2014.

[2] *Summary of Principal Terms: Master Maintenance Agreement for the Urban Stormwater Retrofit Program Public-Private Partnership between Prince George's County and Corvias Prince George's County Stormwater Partners, LLC.* October 17, 2014.

[3] U.S. Census Bureau (year data was published). *2015 Population.* Retrieved from http://census.gov/topics/population.html

The scope of Corvias' agreements with the County includes completing projects on an initial program area of 2,000 publicly owned impervious acres. Corvias becomes eligible to oversee the expanded program area of 2,000 additional acres if it achieves a set of program performance milestones related to project delivery and socioeconomic benefits. Project delivery milestones include measures related to the generation and delivery of modified and improved land area ("Impervious Area Credits") to the County, adherence to the scheduled construction timeline and budget, and successful implementation of social and economic development programs. Socioeconomic milestones include measures related to participation of County residents and local small, minority, veteran, disabled and woman owned businesses as well as the implementation of a mentor-protégé program for the County workforce.

Under the Master Maintenance Agreement, Corvias is responsible for overseeing the ongoing operations and maintenance (O&M) of accepted projects (those deemed complete by the Completion Certifier). In addition to providing management and oversight, Corvias prepares Project Maintenance Plans, prepares annual O&M plans and budgets, and manages the Prime Maintenance Contractor and Maintenance Monitor. Project Maintenance Plans describe the long-term maintenance needed for each type of project constructed and provide the basis for annual O&M plans. Project Maintenance Plans are developed in conjunction with the budgets for each O&M project. The prime maintenance contractor is responsible for carrying out O&M work and the maintenance monitor is responsible for inspecting each O&M project annually at a minimum.

Workflow

The installation workflow of the Clean Water Partnership consists of four primary stages:

1. **Annual planning:** Corvias specifies the projects being considered for the upcoming fiscal year. Each annual plan includes estimates for the total cost and maximum design cost for each project. Annual plans also highlight the planned actions for social and economic development programs and maximum costs for those programs.
2. **Development period:** Corvias engages the Design Engineer and General Contractor to begin design and preconstruction planning and to solicit subcontractors to provide needed materials and construct budgeted projects. Before commencing work, Corvias prepares a budget book for each project, which includes the number of impervious area credits to be delivered and Best Management Practices (BMPs) to be constructed or installed, a milestone and performance schedule, maximum project cost, and scheduled acceptance date.
3. **Construction Period:** Corvias constructs projects that the county approved in the previous stage.
4. **Acceptance:** The Completion Certifier inspects and evaluates the projects to ensure that they comply with design specifications and provides an "Impervious Area Credit Certificate" for the accepted acres of the project. If the Completion Certifier determines the project, as designed and installed, falls short of Impervious Area Credits compared to the proposed amount in the budget book, Corvias is required to solve the issue with the project at its own expense.

Flow of Funds

Under the Master Program Agreement and Master Maintenance Agreement, the County makes different types of payments for initial project implementation and on-going maintenance. Payments include:

- **Initial payment**: $1,000,000 upon completion of the Master Program Agreement to reimburse initial costs and advance a portion of Corvias' fees.
- **Design and Construction Fees**: The County also pays Corvias as design and construction costs are incurred and milestones are met. Design costs are paid at four milestones (30%, 60%, 90% and 100% of design completion). Construction milestones vary from project to project.
- **Base and Incentive Fees**: Corvias is permitted to charge a base fee on all project costs including those related to the social and economic programs, and an incentive fee based on performance related to several criteria.
- **Final Project Payment**: For final payment of a project under the Master Program Agreement, Corvias must submit the required Impervious Area Credit Certificate (issued by Maryland Environmental Service). If Corvias was not granted the certificate, it must correct the issue at its own expense in order to earn the certificate and receive final payment.

- **Maintenance Costs**: Under the Master Maintenance Agreement, the County is obligated to pay Corvias for all the annual O&M costs and program expenses excluding the Maintenance Monitor costs that are paid directly to the Maintenance Monitor by the County. The agreement also includes the payment of a "Base Fee" equal to 5% of the annual O&M costs and expenses (excluding their bond and Insurance expenses). Corvias is also able to earn "Incentive Fees" up to an additional 5% of the annual O&M costs and expenses (excluding their bond and Insurance expenses). Incentive fees are based on Corvias' ability to meet specified performance goals.

While the Master Program Agreement encourages opportunities for privately arranged financing, the initial installations are being financed almost exclusively through County issued debt.[4] The County also hopes to begin funding a portion of the installations with below market rate loans from the State's Clean Water Revolving Loan Fund ("SRF"). [5] The County will also rely on County-issued Revenue Bonds to fund project installations. The Bonds will be backed and retired with revenue from stormwater utility fees (the "Clean Water Act Fees") that are implemented by the County to provide funding to address federal Clean Water Act requirements.

The Clean Water Act Fees are collected from property owners across the County. The Clean Water Act Fee consists of a flat administrative fee of $20.58, per tax account, per year and a variable impervious area fee at a rate of $20.90 for every 2,465 square feet of impervious area[6]. Impervious areas on private property are determined by analysis of aerial photography, measurement from engineer drawings, field surveys, and inspections by the Department of the Environment[7]. Exemptions to the fee can be granted to certain parties via a financial hardship program, and property owners can receive fee reduction credits for installing BMPs on their property, including rain barrels, permeable pavement and rain gardens. The fee is collected from local property owners annually as a line item in their annual tax returns. Revenue from the fees will also be used to cover ongoing maintenance payments.

According to the project manager, Jim Lyons, private sector financing was not a primary driver of the program. The program was designed to tap into the expertise of the private sector in evaluating different project opportunities and for implementation efficiencies. The project was designed to meet environmental goals in an economically efficient manner while aggressively encouraging local economic and community goals. While still in its early phases, the project has already provided key opportunities to local small, minority, veteran, disabled and woman owned businesses job opportunities for community members.[8]

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[4] *Summary of Principal Terms: Master Program Agreement for the Urban Stormwater Retrofit Program Public-Private Partnership between Prince George's County and Corvias Prince George's County Stormwater Partners, LLC.* October 17, 2014.

[5] According to Jim Lyons (Program Manager, Prince Georges County), as of November 2016, the County was in discussions with the State to obtain an SRF loan. Interview with Author, November 22, 2016.

[6] *Fee Structure.* Prince George's County. http://www.princegeorgescountymd.gov/276/Fee-Structure

[7] *Prince George's County Clean Water Act Fee Regulation.* Prince George's County. 2013. http://www.princegeorgescountymd.gov/DocumentCenter/View/16231

[8] Jim Lyons, Program Manager, Prince Georges County. Interview with Author. November 22, 2016.

Acknowledgements

Written by Jeff Hughes† and Andrew Alexandrovich.* December 2016.

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Cover photo: Courtesy of Prince George's County Clean Water Partnership http://thecleanwaterpartnership.com/current-projects/

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About the Environmental Finance Center

The Environmental Finance Center at the University of North Carolina, Chapel Hill is part of a network of university-based centers that work on environmental issues, including water resources, solid waste management, energy, and land conservation. The EFC at UNC partners with organizations across the United States to assist communities, provide training and policy analysis services, and disseminate tools and research on a variety of environmental finance and policy topics.

The Environmental Finance Center at the University of North Carolina, Chapel Hill is dedicated to enhancing the ability of governments to provide environmental programs and services in fair, effective, and financially sustainable ways.
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About the Water Infrastructure Resiliency Finance Center

The Water Infrastructure and Resiliency Finance Center identifies financing approaches to help communities make better-informed decisions for drinking water, wastewater, and stormwater infrastructure that are consistent with local needs.
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Santa Paula Water Recycling Facility

The City of Santa Paula, California relied on an innovative project delivery model to build a new privately-owned and operated wastewater treatment facility, taking advantage of private capital as well as integrated design, construction and operations. While the plant came online ahead of schedule and was recognized for its innovative, high performance design, perceptions about the high cost of private capital led the City to issue tax-exempt debt to buy back the facility five years after its completion.

The Santa Paula Water Recycling Facility is an example of a performance-based infrastructure project delivery mechanism. Faced with very aggressive and potentially costly wastewater discharge compliance deadlines ($8 million in potential fines), the City of Santa Paula entered into a Design Build Operate and Finance (DBOF) agreement with a private entity. An important goal of using the DBOF model was to shift key elements of construction and finance risk to the private sector with the goal of expediting construction and encouraging cost effective creativity and innovation. The plant went online well in advance of the compliance deadline and was recognized by multiple organizations for its creativity and design. The City then decided to exercise a contractual buyout clause and purchase the facility from the private owners five years into the 30-year contract, a possibility that was envisioned at the outset of the project. City staff, their advisors, project bidders, and members of the City Council heavily debated the financial value and benefits of different risk allocation decisions, both during project procurement and after the project was completed. Ultimately, the

City chose to take over a significant amount of risk associated with capital replacement and operation from the private sector and lower capital cost by funding the buyout with low interest tax-exempt revenue bond financing.

Key Project Details

Table 1. Key Project Details

Project Title:	**Santa Paula Water Recycling Facility**
Primary Facility/Service:	Wastewater treatment and water reuse (3.4 MGD, expandable to 4.2 MGD)
Local Government Entity:	Santa Paula Utility Authority and City of Santa Paula
Primary Partner:	Santa Paula Water, LLC, a special purpose entity owned by Alinda Capital Partners (capital investor) and contracted with PERC Water Corporation (project developer and DBO firm)
Project Lenders:	DZ Bank and CoBank (lenders to Santa Paula Water, LLC)
City's Primary Advisors:	Carollo Engineers (engineering), FCS (financial analysis), and Richards, Watson, and Gershon (legal services)
Delivery Model:	Design Build Operate Finance (DBOF)
Contract Period:	30 years
Population Served:	Approximately 29,000 people; 7,000 residential and non-residential connections[1]
Major Initial Outlays:	$62 million (initial capital cost of the Water Recycling Facility and related facilities)
Flow of Revenues:	Santa Paula collects wastewater fees from retail customers and uses revenue to pay contractually required capital and operating fees. In addition, the City collects development impact fees and connection fees from new customers.

Background

The City of Santa Paula in Ventura County, California promotes itself as the "Citrus Capital of the World." The City's Public Works Department directly manages a drinking water system that includes two treatment plants and serves 29,000 people. The Public Works Department also administers an operations contract with American Water to manage the wastewater collection system.[2]

Prior to 2010, the City relied on a wastewater treatment plant that had originally been constructed in 1939 and was not meeting regulatory standards.[3] It also did not have sufficient capacity to meet the future growth needs of the City. In 2006, the Los Angeles Regional Water Quality Control Board threatened to fine the City over $8 million if it did not stop releasing non-compliant discharges into the Santa Clara River.[4] In September of 2007, the City entered into a consent decree with the Regional Water Quality Control Board. To avoid fines, Santa Paula needed to come into compliance by December 2010.[5]

In order to construct new, compliant facilities, the City decided to abandon the Design-Bid-Build (and public ownership) approach in favor of a Design-Build-Operate-Finance (DBOF) public-private partnership. After an approximate 9 month procurement process, the City entered into an agreement with Santa Paula Water, LLC, a team made up of PERC Water Corporation (PERC Water) and Alinda Capital Partners, a large infrastructure investment fund, to design, construct, finance, own and operate a new wastewater treatment facility (referred to as a water recycling facility) with high quality effluent that could be recycled for beneficial purposes. The resulting Santa Paula Water Recycling Facility went online in 2010, seven months ahead of the compliance deadline.

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[1] *2015 Wastewater Enterprise Revenue Bonds Official Statement, Series A and Series B.* Santa Paula Utility Authority. April 14, 2015.
[2] *Public Works Department Description.* City of Santa Paula. http://ci.santa-paula.ca.us/PublicWorksDept.htm
[3] *2015 Wastewater Enterprise Revenue Bonds Official Statement, Series A and Series B.* Santa Paula Utility Authority. April 14, 2015
[4] *Final Report: Santa Paula Waste Water Treatment Plant.* Ventura County Grand Jury. June 26, 2013. http://vcportal.ventura.org/GDJ/docs/reports/2012-13/Santa_Paula_Waste_Water_Treatment_Plant.pdf
[5] *2015 Wastewater Enterprise Revenue Bonds Official Statement, Series A and Series B.* Santa Paula Utility Authority. April 14, 2015.

The plant was built entirely with private capital. The City did not have to borrow funds or contribute any upfront capital.[6] According to some sources, the Santa Paula Water Recycling Facility was the first fully privately-funded wastewater treatment/water recycling facility in the country,[7] as well as the first facility created under California's Government Code Section 5956, which authorizes public-private partnerships for specific types of infrastructure projects.[8]

The plant blends in with the nearby community. The entire facility footprint uses less than two acres of land but provides capacity of 4.2 MGD, with all process tanks constructed underground. The underground plant includes an influent sewer lift station, three digester tanks, three anoxic tanks, three aerobic tanks, a UV disinfection system, a foam control system, two flow equalization tanks, a membrane bioreactor, bio solids treatment, and an odor control system. Treated effluent from the plant is recycled into the environment in outdoor percolation ponds within a larger 13-acre site.[9]

In 2011, the project received a P3 innovation award from the National Council for Public-Private Partnerships.[10] The project has also received awards from the Design-Build Institute of America, Global Water Intelligence, and the Environmental Business Journal.[11]

While the plant meets most effluent standards, it was not designed or intended to reduce the discharge of chlorides (attributed to the use of private household water softeners), leading to disagreement between the City and Santa Paula Water, LLC as to whether the facility should treat for chloride removal. A Ventura County Grand Jury found that installing technology at the plant to remove the chlorides was not part of the Request for Proposals (RFP) or DBOF contract. The Grand Jury report also recommended that the City take advantage of low interest tax-exempt bonds and buy the plant from Santa Paula Water, LLC.[12] Since the buying of the facility, the City has embarked on its previously planned water softener repurchase program, a strategy the City originally intended to use to comply with its chloride discharge requirements.[13]

In April 2015, the Santa Paula City Council approved issuing bonds to buy back the facility from Santa Paula Water, LLC. PERC Water continued to operate the plant. The City intended to enter into a new operating agreement in 2016 with one of three operators, including PERC Water.

Project Development and Procurement

The City engaged a local engineering firm to develop plans for a new wastewater treatment facility in the early 2000s. The engineer developed a 30 percent complete design and calculated cost estimates for the eventual construction price. The early estimates were between $80 and $100 million dollars, leading to significant concern over the City's ability to afford the facility.[14]

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[6] *Santa Paula Water Recycling Facility Receives Prestigious 2011 Public-Private Partnership Award For Innovation.* Water Online. August 24, 2011. http://www.wateronline.com/doc/santa-paula-water-recycling-facility-receives-0001

[7] *Santa Paula Water Recycling Facility Receives Prestigious 2011 Public-Private Partnership Award For Innovation.* Water Online. August 24, 2011. http://www.wateronline.com/doc/santa-paula-water-recycling-facility-receives-0001

[8] *Santa Paula Water Recycling Facility, United States of America.* Water Technology. http://www.water-technology.net/projects/santapaularecyclingf/

[9] *Santa Paula Water Recycling Facility Receives Prestigious 2011 Public-Private Partnership Award For Innovation.* Water Online. August 24, 2011. http://www.wateronline.com/doc/santa-paula-water-recycling-facility-receives-0001

[10] *ibid.*

[11] *ibid.*

[12] http://vcportal.ventura.org/GDJ/docs/reports/2012-13/Santa_Paula_Waste_Water_Treatment_Plant.pdf

[13] Boyd-Barrett, Claudia. *Santa Paula launches water softener buyback program.* Ventura County STAR. September 18, 2015.

[14] John Quinn (Former Finance Director, City of Santa Paula), Email Correspondence with Author, October 13, 2016.

The City was considering alternative options when the Regional Water Quality Board began to threaten significant fines for non-compliance. The consent decree that the City eventually entered into with the Regional Water Quality Board had such an aggressive timeline that the City believed it would be unable to complete the project following a traditional procurement method.[15]

In October 2007, the City selected four teams to receive the Request for Proposals for the new facility. The four teams were EPCOR, Veolia, PERC Water, and American Water. The Environmental Impact Report (EIR) and Request for Proposals specified the type of treatment technology (Membrane Bioreactor), but left many design elements open and encouraged "creativity" and innovation.[16]

On February 4, 2008 PERC Water and Veolia Water submitted proposals for the new facility. American Water and EPCOR declined to participate, citing scheduling constraints. After receiving the two proposals, the City negotiated independently with each team to reduce costs through further innovation. On March 17, 2008 PERC Water and Veolia submitted Best and Final Offers. According to the City, both proposals were technically in compliance with the RFP and showed innovation.

City staff prepared a selection memo for an April 7, 2008 City Council meeting recommending that the City Council select the Veolia team. The memo included detailed technical memos from the City's technical advisor (Carollo Engineers) and finance advisors (FCS). The analysis presented in the memo identified strengths of both proposals and referred to both proposals as being "thoughtful" and "creative", but the memo concluded that the experience of Veolia and the cost of the project in the form of a lower calculated Net Present Value (NPV) supported the Veolia team.[17] The financial analysis included in the selection memo listed the calculated NPV of PERC Water as $169,549,150 and the NPV of the Veolia proposal as $145,562,570.[18] One of the financial advisors who helped evaluate the project commented that comparing the two proposals was challenging as PERC Water provided a set stream of anticipated capital payments and Veolia proposed that the City take responsibility for financing the project with tax-exempt debt, something that had not originally been envisioned in the RFP.[19] In addition, the teams proposed multiple payment stream options, including one that involved level payments over the course of the contract term and another that involved payments that increased over time to allow for more gradual rate impacts.[20]

City Council convened at its regularly scheduled meeting on April 7, 2008, discussed the project without making a formal selection decision, and asked staff to compile additional information. Both Veolia and PERC Water submitted additional information on April 10th, and the City Council reconvened on April 15th, the day the City was required to notify the Regional Water Control Board that the selection had been made. After reviewing the information, City staff and the City's advisors prepared an additional memo for the City Council including a recommendation for the project to be awarded to Veolia.[21] However, there was no clear consensus at the City Council meeting on April 15th. In the end, City Council voted 3 to 2 to proceed with PERC Water and instructed staff to negotiate an agreement.[22] The progress of the negotiation was discussed at an April 28th City Council Meeting and the City Council directed staff to continue negotiations with the PERC Water/Alinda team. City Council also asked staff to solicit an alternative proposal from PERC Water for a DBO delivery method using City-provided capital (i.e. tax-exempt bonds), which was submitted by PERC Water on May 2, 2008.

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[15] *ibid.*
[16] *Memorandum: Water Recycling Facility (WRF) – Selection of Team to Design, Build, Operate, and Finance the new WRF*. City of Santa Paula. April 2, 2008.
[17] *ibid.*
[18] *ibid.*
[19] Ed Cebron (Former Principle in Charge, FCS Group), phone correspondence with author, October 6, 2016.
[20] *Memorandum: Water Recycling Facility (WRF) – Selection of Team to Design, Build, Operate, and Finance the new WRF*. City of Santa Paula. April 2, 2008.
[21] *Memorandum: Water Recycling Facility (WRF) – Selection of Team to Design, Build, Operate, and Finance the new WRF*. City of Santa Paula. April 13, 2008.
[22] *Special City Council Meeting Minutes.* City of Santa Paula. April 15th, 2008.

At the May 5, 2008 City Council Meeting, Staff recommended that the City Council award the DBOF Contract to PERC Water team doing business as Santa Paula Water, LLC stating, "…staff believes that there have been significant improvements to the PERC Water/Alinda Best and Final Officer approved by the City Council on April 15, 2008". The City Council voted 3-2 to award the DBOF Contract to Santa Paula Water, LLC. The final calculated NPV of the Santa Paula Water, LLC team was $125.5 million compared to Veolia's $127.7 million.

Santa Paula Water, LCC maintained financial ownership of the facility. Alinda Capital owned 100 percent of Santa Paula Water, LLC, and PERC Water had an option to purchase a 10 percent interest in Santa Paula Water, LLC; however, PERC Water did not exercise its option. Under the DBOF agreement, PERC Water was the lead developer, designer, builder and designated operator for the facility, and Alinda was responsible for providing initial and future project capital.

The debates around the selection of PERC Water and the later disagreements over chloride treatment responsibility contributed to the creation of a special County Grand Jury to examine the project and bidding process. In June of 2013, the Grand Jury issued a report that found that the "Council's actions have been made with the best interest of the City," and that "there was no evidence of wrong doing" and that "high levels of discharged chlorides which have plagued the Santa Clara River and local agriculture was not addressed in the original proposal or contract." The Grand Jury also recommended that the City purchase the plant from Santa Paula Water and take steps to address high levels of chloride.[23]

According to the John Quinn, the former Santa Paula Finance Director, the city incurred substantial costs in developing and managing the project with approximately $1.3 million going towards the 30 percent design and an additional $1 million for project management and development costs.[24]

[23] *Final Report: Santa Paula Waste Water Treatment Plant.* Ventura County Grand Jury. June 26, 2013. http://vcportal.ventura.org/GDJ/docs/reports/2012-13/Santa_Paula_Waste_Water_Treatment_Plant.pdf

[24] John Quinn (Former Finance Director, City of Santa Paula), Email Correspondence with Author, October 21, 2016.

Timeline

Table 2. Project milestones

Date	Milestone
September 27, 2007	Date of consent decree between City and Regional Water Quality Control Board that requires that new wastewater treatment facility go into service by December 2010[25]
October 2007	RFP sent to four firms[26]
February 4, 2008	Two firms submit proposals in response to RFP
March 17, 2008	PERC Water and Veolia submit Best and Final Offers
April 2, 2008	Staff recommend selecting Veolia in staff memo[27]
April 15, 2008	City Council votes 3-2 to select PERC Water
May 5, 2008	Staff recommends approving contract with Santa Paula Water, LLC (PERC and Alinda Capital) and City Council votes 3-2 to award DBOF Agreement to Santa Paula Water, LLC
June 16, 2008	DBOF agreement reached between the City of Santa Paula, Santa Paula Water, LLC and PERC Water[28]
November 9, 2009	City creates Santa Paula Utility Authority to serve as public utility bonding and management conduit entity
May 2010	Plant is completed and begins treating wastewater seven months prior to the December 2010 deadline set by the Regional Water Quality Control Board
June 2013	A Ventura Grand Jury Report recommends that the Santa Paula purchase the plant from Santa Paula Water to "take advantage of historic low interest rates"[29]
September 2013	City initiates an arbitration proceeding against Santa Paula Water over disagreement concerning chloride treatment removal responsibility[30]
April 30, 2015	City closes on issuance of tax-exempt bonds and purchases facility from Santa Paula Water, LLC for negotiated price of $70.8 million (the DBOF agreement allowed for a purchase of the facility in an agreed upon amount of $73.5 million in 2015 and $67.1 million in 2016)
February 26, 2016	The City of Santa Paula issues a Request for Services to enter into a short term Operations and Maintenance Agreement for the plant.

[25] *ibid.*
[26] April 2, 2008, Santa Paula Staff Memo to City Council regarding Selection of Team.
[27] *ibid.*
[28] *2015 Wastewater Enterprise Revenue Bonds, Series A and Series B.* Santa Paula Utility Authority. April 14, 2015.
[29] *Final Report: Santa Paula Waste Water Treatment Plant.* Ventura County Grand Jury. June 26, 2013. http://vcportal.ventura.org/GDJ/docs/reports/2012-13/Santa_Paula_Waste_Water_Treatment_Plant.pdf
[30] *2015 Wastewater Enterprise Revenue Bonds Official Statement, Series A and Series B.* Santa Paula Utility Authority. April 14, 2015.

Key Financial Features and Outcomes

The City of Santa Paula entered into a DBOF agreement with Santa Paula Water to provide the City with wastewater treatment and water recycling services over a period of up to 30 years. Santa Paula Water was responsible for constructing, owning and operating the facility, and in return the City agreed to pay an established series of capital and operating fees. The figure below shows a schematic of the ownership model. [31]

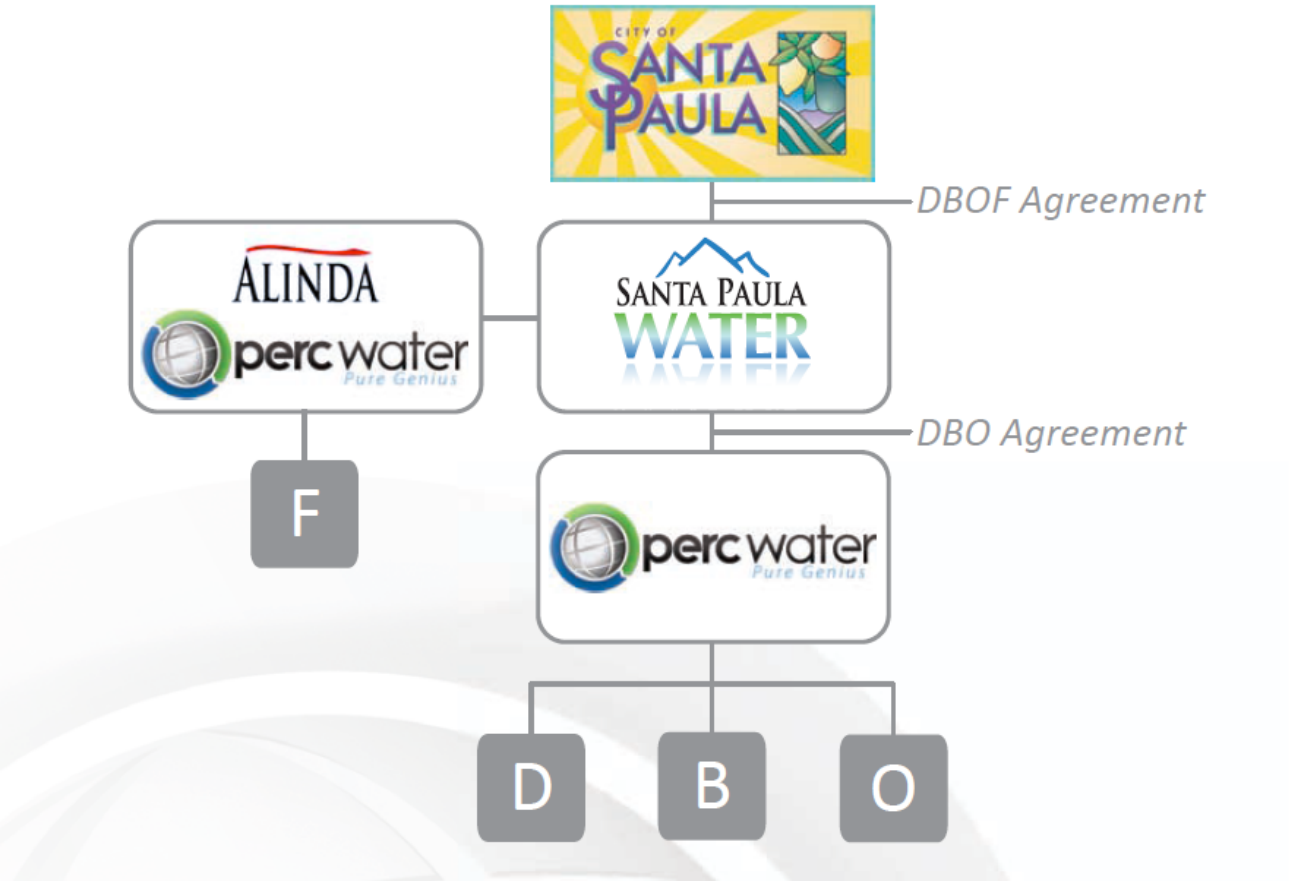

Figure 1. Partnership ownership model.[32]

The model agreement was labeled a Design Build Operate and Finance contract; however, the structure of this particular agreement could also be characterized as Design, Build Own, Operate and Transfer (DBOOT) or a wastewater treatment purchase/service agreement. This model resulted in significant responsibility and risk being transferred from the City of Santa Paula to Santa Paula Water, LLC (see Table 3).

Table 3. Project Risks for Public and Private Entities.

[31] *Santa Paula Water Recycling Facility: Public Private Partnership Overview.* PERC Water. http://www.laytonconstruction.com/PDF%20Files/Santa%20Paula%20Executive%20Summary-Project%20Overview_email.pdf

[32] *ibid.*

Risk Category	Responsible Parties	Description
Permitting and Regulatory Fines	Santa Paula Water, LLC (Project Company)	Responsible for obtaining necessary construction permits and meeting contractually specified discharge requirements.
	City of Santa Paula	Remained liable for costs of chloride compliance, according to ruling from Ventura Grand Jury that DBOF proposal and contract did not address chloride reduction
Initial Construction and Capital Replacement	Santa Paula Water, LLC (Project Company)	Responsible for construction and plant ownership. DBOF agreement stipulated approximately $30 million dollars in future scheduled capital improvements and funding over the 30 year contract
	City of Santa Paula	City agreed to pay design/build service fees to reimburse developer for capital costs only after plant was able to provide contractually required wastewater treatment services
Operations & Maintenance	PERC Water	Responsible for treating wastewater to contract specifications; responsible most operating costs including chemicals; responsible for electricity costs that exceed a guaranteed maximum
	City of Santa Paula	Responsible for paying established operating fees for contractually specified performance; responsible for increased costs due to "changes in law" and increases due to increased sludge disposal costs[33]
Revenue/Demand	Santa Paula Water, LLC (Project Company)	DBOF established guaranteed capital fee payment stream regardless of volume of wastewater treated. Operating fees are largely independent of volume and protect operator from sudden reductions.
	City of Santa Paula	Responsible for raising revenue needed to pay required capital and operating fees. Operating fees include a relatively modest variable component that fluctuates with demand; however, most of the required operating expenditures will not be reduced if demand is much lower than anticipated.
Finance/Debt	Santa Paula Water, LLC (Project Company)	Responsible for all construction and long-term project financing
	City of Santa Paula	Water Recycling Facility is completely financed by private owner. City is obligated to make capital and operating fee payments as long as plant provides contractually specified services.

The DBOF agreement

The total initial capital cost of the project incurred by the private partnership was $62.6 million and included plant construction, capitalized interest during construction, and design as well as some project development costs. PERC

[33] *Design, Build, Operate and Finance Agreement.* City of Santa Paula, Santa Paula Water, LLC, and Pacific Environmental Resources Corp. June 16, 2008.

Water and Alinda were responsible for construction and long-term financing for the facility.[34] Alinda worked with CoBank and DZ Bank to arrange debt financing for the facility in the midst of a turbulent capital market (2008).[35] The final financing arrangement included a mix of approximately $47 million in private debt from CoBank, DZ Bank and $15 million of Alinda equity. PERC Water had an option to obtain an equity interest in the plant by foregoing part of their contractual construction payments in exchange for an equity share. This equity option was never executed and as a result, Alinda maintained full ownership of the plant after construction.[36]

The DBOF agreement included a specified series of capital payments designed to recover the initial capital outlays as well as the cost of capital financing, future planned capital expenditures of $30 million, and recurring costs such as property tax and property/liability insurance. The City calculated the cost of capital for the project as approximately 8 percent; however, the annual capital payments included future capital replacement reserves, property tax, and property/liability insurance, which do not contribute to the developer's return on investment. The net capital payments to Santa Paula Water, LLC resulted in a blended rate of return of approximately 6 to 6.5 percent, according to PERC's president.[37]

The DBOF agreement also specified the schedule of subsequent capital improvements that would be made over the term of the contract, including a stipulation that PERC Water, on behalf of Santa Paula Water, LLC, would expand the plant to 4.2 MGD from 3.4 MGD at no additional cost to the City once the plant reached 90 percent of its 3.4 MGD capacity in a given year. The agreement also provided an option for the City to buy the plant at five-year intervals during the 30-year contract period based on agreed-upon buyout fees.[38]

The operating portion of the agreement included a fixed rate component of approximately $100,000 per month to Santa Paula Water adjusted annually at the CPI.[39] Approximately $75,000 of the fixed operating payment went to pay PERC Water operating fees, and $25,000 was used by Santa Paula Water to cover facility administrative costs. The agreement specified that if the City exercised its buy out option and became owner of the facility, it would take over payment of the administrative portion of the fee, thereby reducing the fixed operating fee to approximately $75,000 per month. The operating agreement also included a variable rate component of $0.43 per 1,000 gallons adjusted annually at the CPI.[40] The DBOF agreement includes a fee ($940,000) for terminating the O&M contract early that is reduced in 5-year increments during the course of the contract (it is currently $830,000). See appendix for a schematic that shows a simplified flow of funds involved in the initial outlays and recurring payments.

The DBOF agreement placed the risk for any excess energy consumption on PERC Water; however, it requires that documented savings and efficiencies below the PERC Water performance guarantee be shared equally between PERC Water and the City. In the first 6 years of operations, the energy consumption has averaged 30 percent below the maximum consumption under the performance guarantee.

The City of Santa Paula's current and future wastewater customers as well as future property developers are ultimately responsible for all of the costs of constructing and operating the wastewater treatment plant. The City must adhere to state constitutional rate setting requirements that provide customers with the opportunity to contest and deny rate

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[34] Brian Cullen (President, PERC Water), Email Correspondence with Author, October 10, 2016.
[35] *Testimony of David Dornbirer Before the Subcommittee on Water Resources and Environment Committee on Transportation and Infrastructure U.S. House of Representatives on A Review of Innovative Financing Approaches for Community Water Projects.* March 21, 2012.
[36] Brian Cullen (President, PERC Water), Phone conversation with Author, October 25, 2016
[37] Brian Cullen (President, PERC Water), Email Correspondence with Author, October 10, 2016.
[38] *Final Report: Santa Paula Waste Water Treatment Plant.* Ventura County Grand Jury. June 26, 2013. http://vcportal.ventura.org/GDJ/docs/reports/2012-13/Santa_Paula_Waste_Water_Treatment_Plant.pdf
[39] *Design, Build, Operate and Finance Agreement.* City of Santa Paula, Santa Paula Water, LLC, and Pacific Environmental Resources Corp. June 16, 2008.
[40] ibid

adjustments ("Prop 218"). The City's former Finance Director stresses that "rate setting" risk is significant in California and that this risk remained with the City after the DBOF agreement was executed.[41]

After the facility went into operation, wastewater rates were adjusted to provide sufficient revenue to meet the long-term capital and operating costs of the facility. Santa Paula's wastewater rates were structured in a way that reduces the demand risk associated with current residential customers in that a majority of the revenue is collected from fixed customer fees rather than variable fees. In 2015, a residential customer paid a $77.21 base charge and a variable price of $1.12 per hundred cubic feet (hcf). Nonresidential rates carry a much larger demand risk with a variable price of $8.40 per hcf. [42]

DBOF converted to public ownership and an O&M agreement

After three years of plant operations, the city entered into arbitration with Santa Paula Water, LLC over a disagreement related to the responsibility for meeting chloride discharge requirements. Instead of proceeding with the arbitration with Santa Paula Water, LLC, the City decided to execute its option to buy the facility at a negotiated purchase price of $70.8 million compared to the contractually stated price of $73.5 million.[43]

The City issued $76.6 million in tax-exempt revenue bonds to cover the purchase price and ancillary costs associated with the purchase (issuance costs, prepayment of future lease payments to the City, reserve funds). Approximately $970,000 of the tax-exempt portion of the bond was used to cover the issuance costs of the bonds. The bonds are structured to spread the debt service over 35 years (through 2050) at a weighted average interest rate of approximately 3.75 percent.[44] As part of the 2015 bond issue, the City also issued a smaller amount of taxable bonds to cover the early operation agreement termination fee associated with the PERC Water operating contract that was not eligible for tax-exempt financing. The bonds were rated as A+ by S&P and were formally issued by the Santa Paula Utility Authority, not the City.[45] Bond security consisted of a pledge of the net revenues of the wastewater enterprise. Additional security was provided from a 1.2 times rate coverage covenant requirement. The City of Santa Paula created the Santa Paula Utility Authority in 2009 to support provision of water and wastewater services and to serve as the City's bonding entity. The Authority owns or controls many of the City's key water and wastewater assets, and it has standing as a separate unit of government. However, the Authority's governing board is comprised of the City Council.

PERC Water's operating contract with Santa Paula Water, LLC was assigned to the City upon the purchase of the facility, and PERC Water continued to operate the facility under the original operating agreement terms, however the City selected a new operator (American Water) in late 2016 who will take over operation responsibilities in 2017. Due to requirements under the bond documents, and due to the City's compliance requirements with Internal Revenue Code 97-13, the City had issued a Request for Proposals for a new 4-year Operation and Management contract in February of 2016.[46]

Assessing the financial impact

As the project progressed, the framing of the financial impact of constructing and operating the facility shifted. The initial decision to proceed with an alternative project delivery mechanism was made in response to concern over the rising estimated project cost that was presented by the City's previous consulting engineer and the belief that an

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[41] John Quinn (Former Finance Director, City of Santa Paula), Email Correspondence with Author, October 21, 2016.
[42] *2015 Wastewater Enterprise Revenue Bonds Official Statement, Series A and Series B.* Santa Paula Utility Authority. April 14, 2015.
[43] Brian Cullen (President, PERC Water), Email Correspondence with Author, October 10, 2016.
[44] *2015 Wastewater Enterprise Revenue Bonds Official Statement, Series A and Series B.* Santa Paula Utility Authority. April 14, 2015.
[45] *ibid.*
[46] *Request for Proposal to Provide Services*. City of Santa Paula. February 2, 2016.

alternative delivery model could produce the facility faster and in a more cost effective, innovative manner.[47] The initial estimate for the services to be provided by a City-owned, traditionally procured facility was $80 to $100 million.[48]

Later, as the City evaluated the final two competitive P3 proposals, the financial impact was framed primarily in terms of the NPV of the two proposals; however, there were references to an underlying concern over the different potential financing risks associated with the two proposals. While the NPV of the Veolia bid ($145,562,570) was presented to City Council as lower than the NPV of the PERC Water bid ($169,549,570), in the first selection recommendation memo for the April 7th City Council Meeting, staff and their financial consultants underscored that some elements of the different approaches were difficult to compare, such as the uncertainty regarding the proposed financing costs of the Veolia bid which relied on the City issuing its own debt.[49]

The initial financial analysis and selection recommendations presented to the City Council focused primarily on the projected payment requirements that were provided by the two proposal teams. The analysis did not quantify the costs of risk associated with the City taking responsibility for financing the plant (as was proposed by Veolia).[50] Under the financial plan proposed by Veolia, the City would have had to successfully issue significant revenue bonds in October 2008 in order for the facility to be completed. PERC Water believed that this risk should be taken into account in the analysis and believed it would have resulted in PERC Water's proposed NPV comparing more favorably to Veolia's.[51] Other Communities that have valued the risk reductions associated with an integrated financing structure such as PERC's have assigned monetary values to risk reductions that were included in their financial analyses.[52] Eventually, the majority of the City Council decided to choose PERC Water, believing that PERC Water's additional pledged cost proposal provided the best value and avoided uncertainty around Veolia's financing risk. The City Council instructed staff to proceed with PERC despite a lack of clear consensus among Council members, staff and their advisors.[53]

The competitive pressure of the award process led to clear reductions in costs. After requesting further cost reductions between April 7 and April 15, both Veolia and PERC Water adjusted their proposals. The April 15th Report to City Council listed the NPV of the Veolia bid as $127,438,097 and the PERC Water of the PERC bid as $149,718,750. During the negotiation period between the time the City voted to select the PERC Water team and completion of the final agreement, additional changes were made to the final payment terms that together with a change in financial analysis discount factor assumptions led to a final Net Present Value for the project of $125.5 million, $24.2 million less than the NPV presented at the April 15, 2008 Council Meeting.[54]

The plant's initial operator, PERC Water, reports that the project delivery method and innovative design it endorsed helped encourage a plant with much lower operating costs than many similar plants.[55] During the final phases of plant construction, PERC Water identified several energy saving modifications that were successfully implemented, resulting in significant energy savings that were shared between PERC Water and the City – estimated to be as much as $200,000 per year.[56] The structure of the DBOF agreement created an incentive for PERC Water to invest in more expensive equipment since it would be able to recoup significant savings based on the terms of the operating payments. This incentive during construction would not have existed had the plant been built with a traditional design-bid-build model.

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[47] *Final Report: Santa Paula Waste Water Treatment Plant.* Ventura County Grand Jury. June 26, 2013. http://vcportal.ventura.org/GDJ/docs/reports/2012-13/Santa_Paula_Waste_Water_Treatment_Plant.pdf
[48] *Santa Paula Private Plant Shines.* Public Works Financing, Volume 255. December 2010.
[49] *Memorandum: Water Recycling Facility (WRF) – Selection of Team to Design, Build, Operate, and Finance the new WRF*. City of Santa Paula. April 2, 2008.
[50] *Project Memorandum attached to April 13, 2008 Staff Memo.* FCS Consultants. April 12, 2008
[51] *ibid.*
[52] *City of Regina Wastewater Treatment Plant Expansion & Upgrade Project: Value for Money Report.* Deloitte. July 24, 2014.
[53] Minutes of April 15th, 2008 Santa Paula Town Council Meeting
[54] May 4, 2008, Santa Paula Staff Memo to City Council regarding Approval of Award to PERC Water.
[55] Brian Cullen (President, PERC Water), Email Correspondence with Author, October 10, 2016.
[56] *Santa Paula Private Plant Shines.* Public Works Financing, Volume 255. December 2010.

After the plant was completed, the City's concern over financial impacts shifted from the construction cost to the perceived financing costs associated with private ownership versus a government owned and financed model. One of the major justifications for the decision to purchase the facility from Santa Paula Water was that it enabled the City to reduce wastewater rates, reflecting the difference between the cost of tax-exempt debt service payments for the facility and the capital payments due to Santa Paula Water, LLC under the DBOF agreement. At the time of the decision, the local paper published a story that the purchase would reduce the wastewater bills of Santa Paula residents by as much as $450 per year. This story, as well as other stories published at the time, focuses on a comparison of the 3.75 percent tax-exempt rate the City was able to get, with an imputed (estimated) total cost of capital of approximately 8 percent. According to PERC Water, the higher rate was not exactly comparable, as the capital payments to Santa Paula Water, LLC included significant non-financing costs such as future capital investments, property tax payments and property/liability insurance which represented approximately $63 million over 30 years.[57] The City's decision to take over ownership of the facility will transfer the full cost of future capital replacement (scheduled for $30 million) back to the City. The City will likely forego receiving a portion of property tax on the facility, and will need to purchase the comparable property/liability insurance previously held by Santa Paula Water, LLC. The City also had to cover the financing transaction costs associated with the bond issue in addition to the early termination fee. The decision to take over ownership and use tax-exempt financing also resulted in a longer remaining term of repayments (35 years vs. 25 years remaining in the DBOF contract).

The shift from a privately-owned, privately funded facility to a tax-exempt bond funded facility leads to other interesting financial impacts that are difficult to quantify. For example, the bond covenant will require the City to collect additional revenues beyond the debt service payments to comply with requirements for debt service coverage.[58] Also, the City was released from asset management and investment under a performance based service agreement payment structure, but the City will now maintain that risk as a direct owner. It is not clear what the cumulative impact of all of these issues will have on the actual long term "savings" to wastewater customers; however, in the short term, the City made a point of offering customer rebates after the purchase agreement was finalized.[59]

Taking into consideration the full series of events beginning with the decision to employ an alternative service delivery method, there is documented evidence that suggests the decision had a positive financial impact on the City. The City paid $71 million for a plant that was originally estimated to cost much more than that, and received a facility with more capacity, that uses less electricity and takes up less land than was originally planned under the traditional approach. The competitive process of negotiations between the two proposal teams led to a reduction in the final offer and acceptance price. Advocates for greater private sector participation in the water sector cite multiple benefits, including costs savings from more innovative, integrated design, as well as cost efficiencies from strategic risk allocation between the public and private sector. The Santa Paula experience demonstrates some of the potential for cost savings during the construction and early phase of the project. The early purchase of the plant and transfer from the private sector to public sector in some ways ends an interesting service delivery experiment. It will be interesting to see how the diverse costs, which are now the responsibility of the City, will compare over time to the "all-in" costs under the original model.

[57] Brian Cullen (President, PERC Water), Phone Correspondence with Author, October 7, 2016.
[58] *2015 Wastewater Enterprise Revenue Bonds Official Statement, Series A and Series B.* Santa Paula Utility Authority. April 14, 2015.
[59] Kelly, Peggy. *Council Approves Wastewater Customer Rebate Program*. Santa Paula Times. March 11, 2016.

Appendix A.

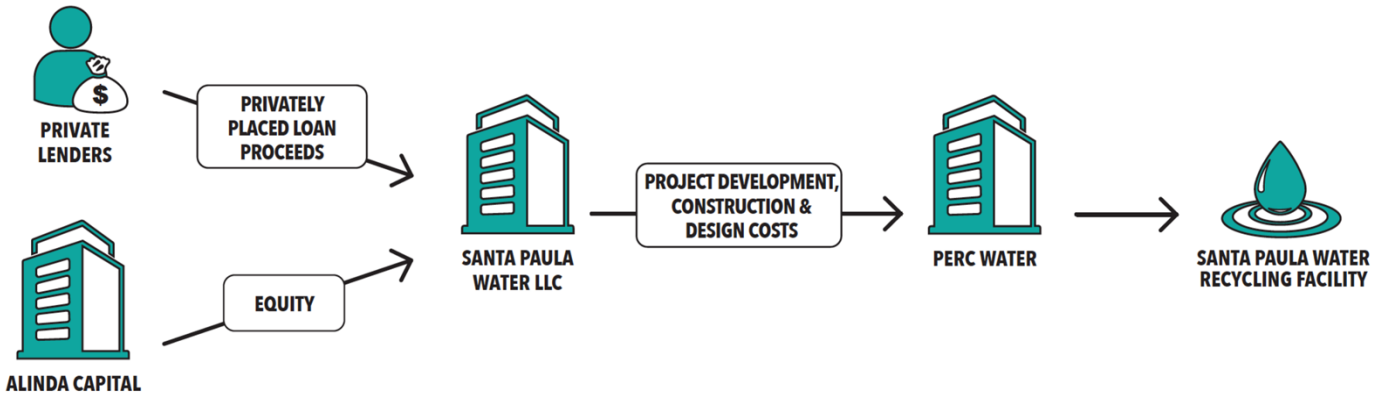

Figure 2. Flow of initial outlays under DBOF service delivery model.

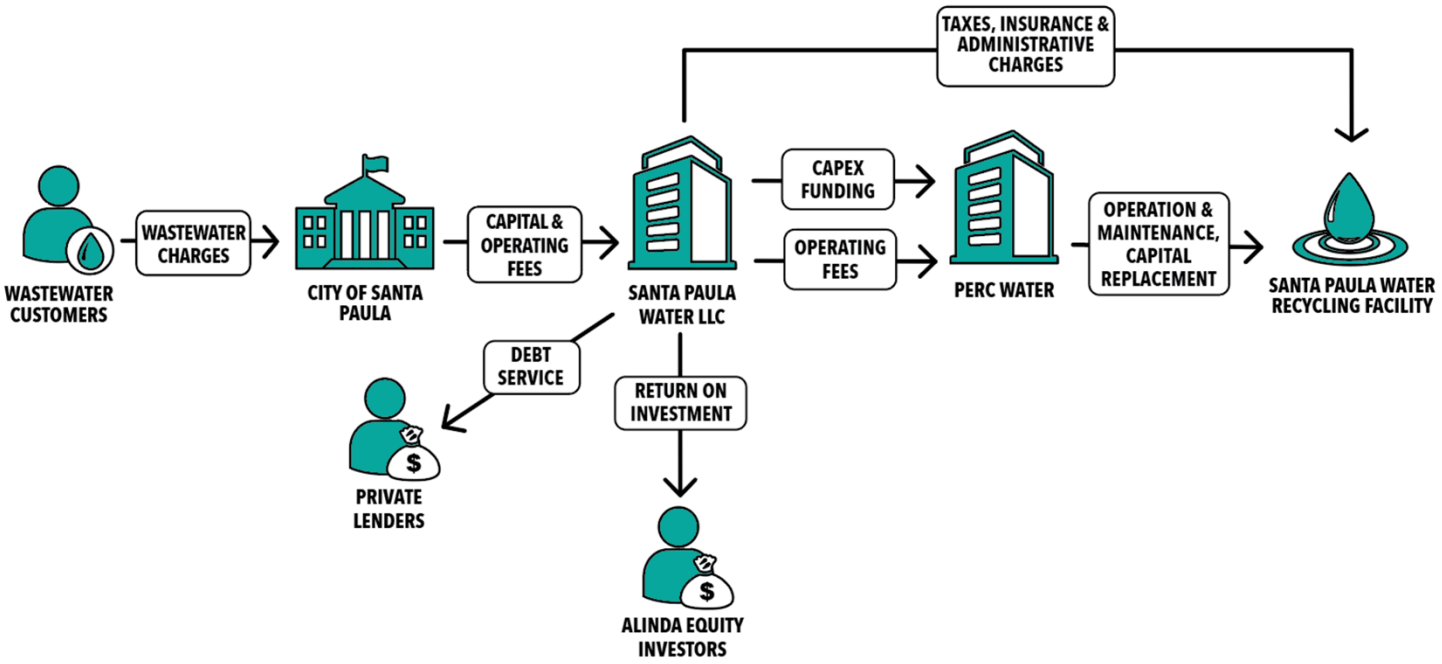

Figure 3. Recurring financial flows under DBOF service delivery model.

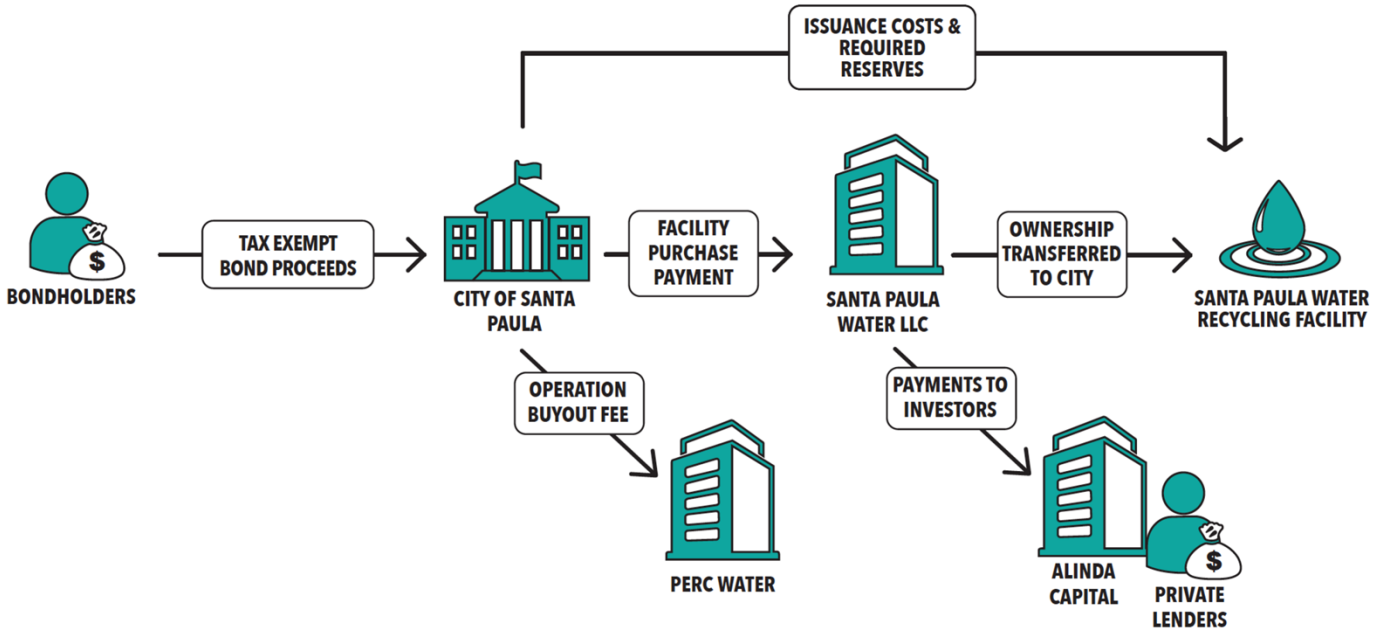

Figure 4. Flow of initial outlays under city-owned service delivery model.

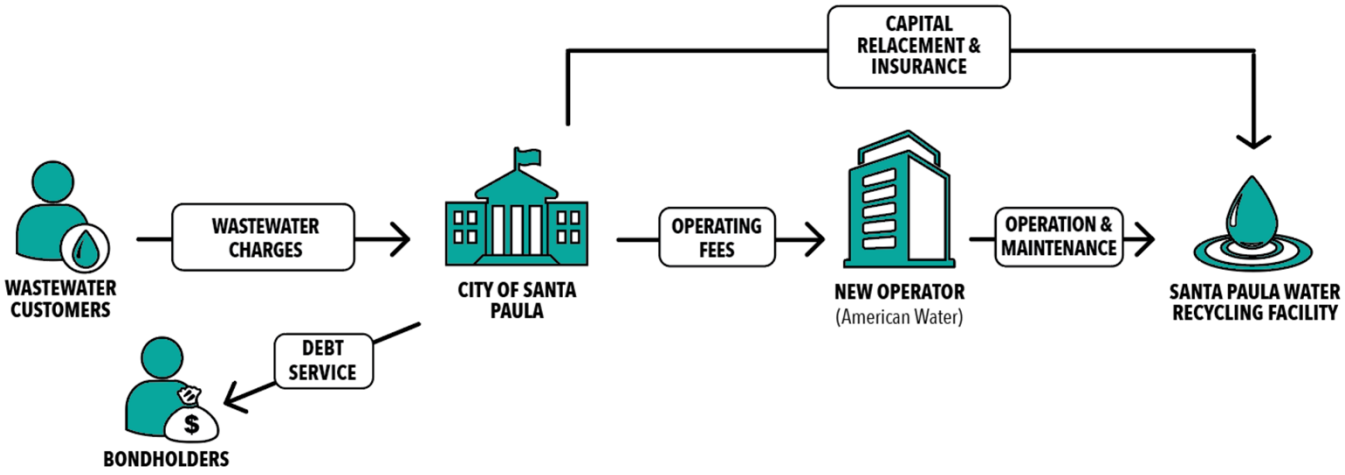

Figure 5. Recurring financial flows under city-owned service delivery model.

Acknowledgements

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† Jeff Hughes is a member of the United States Environmental Protection Agency's Environmental Finance Advisory Board.

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Tampa Bay Water Desalination Plant

In Tampa Bay Region, multiple service delivery methods, each with different risk sharing approaches, contributed to the construction of one of the nation's largest seawater desalination plants.

Tampa Bay Water, A Regional Water Supply Authority's ("Tampa Bay Water's") Desalination Plant is currently an integral part of the utility's water supply portfolio. The utility's experience in developing the plant illustrates how public private partnership agreements can be structured to reduce a public entity's exposure to various risks associated with constructing and operating a major water facility. However, the experience also shows that partnership models are not necessarily guaranteed to shield a public entity from all transferred risks. Despite its overall final success, the project was not without challenges, including multiple contract terminations and re-negotiations, two private partner bankruptcies, lawsuits, and multiple project delays. The project began as a comprehensive 30-year Design, Build, Operate, Own, and Transfer (DBOOT). Over time, the project transitioned to a modified Design, Build and Operate (DBO) model, and it finally finished as (and remains) an Operation, Management, and Maintenance (OM&M) agreement. Despite the challenges associated with the original DBOOT model, it provided Tampa Bay Water with important benefits during the early planning and construction phases, by transferring extensive regulatory and permitting risks to the private sector. After being developed and operated for ten years under multiple agreements and service delivery models, the plant met its final performance targets in 2010, and the completed plant can provide more than 2.5 million people with up to 10 percent of their drinking water. [1] The current unit cost to produce water is considerably higher than initial projections as a result of higher construction costs as well as drops in customer demand that have resulted in the plant running at lower production levels than anticipated.

[1] *Tampa Bay Seawater Desalination Plant.* The National Council for Public-Private Partnerships. http://www.ncppp.org/resources/case-studies/waterwastewater-infrastructure/tampa-bay-seawater-desalination-plant/

Table 1. Key Project Details

Project Title:	Tampa Bay Water Desalination Plant
Primary Facility:	Seawater desalination plant (25 Million Gallons per Day)
Local Government Entity:	Tampa Bay Water, A Regional Water Supply Authority
Primary Partner(s):	*Initial:* S&W Water, LLC, a partnership of Stone & Webster and Poseidon Resources Corporation *Intermediate:* Tampa Bay Desal, a partnership of Poseidon Resources Corporation and Covanta Tampa Construction *Current:* American Water-Acciona, a joint venture of American Water and Acciona Agua
Delivery Model:	Conceived as a Design Build Own Operate Transfer (DBOOT) project, later transformed to a modified Design Build Operate (DBO) model, and completed as an Operations, Management, and Maintenace Contract (OM&M)[2]
Contract Period:	Original DBOOT 30 years, terminated after 3 years; Current OM&M 20 years
Population Served:	More than 2.5 million people[3]
Major Initial Outlays:	$158 million ($110 million prior to remediation and $48 million for remediation)[4]
Flow of Revenues:	Tampa Bay Water sells wholesale water to retail water distributors and uses revenues to pay debt service and make OM&M contract payments

Background

Florida's Tampa Bay region has historically relied primarily on groundwater to meet potable water needs.[5] As the region experienced rapid growth, increased groundwater pumping to meet increased demand led to a variety of environmental problems, including saltwater intrusion, sink holes, and vanishing wetlands.[6] By the 1990s, population growth had outpaced the development of new drinking water supplies.[7] In 1995, the West Coast Regional Water Supply Authority approved a Master Water Plan that included a seawater desalination plant as well as several other new alternative sources of water for the region.[8] In 1998, the West Coast Regional Water Supply Authority became Tampa Bay Water. Shortly thereafter, Tampa Bay Water and its member governments entered into a partnership agreement with the Southwest Florida Water Management District (SWFWMD) to reduce groundwater pumping and develop alternative water supplies.[9]

Tampa Bay Water decided to construct a seawater desalination plant to serve as one of the future water sources for the region. The project began as a Design Build Own Operate Transfer (DBOOT) facility, but eventually evolved into a model in which Tampa Bay Water would finance the construction, own the facility, and rely on a private operator for operations, management, and maintenance. The change in partnership models occurred because two construction firms

[2] *Tampa Bay Seawater Desalination Water Treatment Plant Operation, Maintenance and Management Services Agreement.* Tampa Bay Water and American Water-Pridesa LLC. November 15, 2004.
[3] *Tampa Bay Seawater Desalination Plant.* American Water. http://files.shareholder.com/downloads/AMERPR/0x0x189111/e8c4687e-03db-487e-a2be-8f7b185a17b5/AMER0158_Project%20Sheets_Tampa-2.22.pdf
[4] *Tampa Bay Seawater Desalination Plant.* The National Council for Public-Private Partnerships. http://www.ncppp.org/resources/case-studies/waterwastewater-infrastructure/tampa-bay-seawater-desalination-plant/
[5] *Tampa Bay Seawater Desalination Plant.* American Water. http://files.shareholder.com/downloads/AMERPR/0x0x189111/e8c4687e-03db-487e-a2be-8f7b185a17b5/AMER0158_Project%20Sheets_Tampa-2.22.pdf
[6] *Tampa Bay's Water Wars*. Hillsborough Water Works, Hillsborough County, Florida. http://www.hillsboroughwaterworks.com/water-wars/0103.html
[7] *Tampa Bay Seawater Desalination Plant.* American Water. http://files.shareholder.com/downloads/AMERPR/0x0x189111/e8c4687e-03db-487e-a2be-8f7b185a17b5/AMER0158_Project%20Sheets_Tampa-2.22.pdf
[8] *The Tampa Bay Seawater Desalination Plant*. Tampa Bay Water. http://www.tampabaywater.org/watersupply/tbdesaloverview.aspx
[9] *The Tampa Bay Seawater Desalination Plant*. Tampa Bay Water. http://www.tampabaywater.org/watersupply/tbdesaloverview.aspx

tasked with constructing the facility went bankrupt (for reasons not solely related to this project). In 2007, the final private partner completed the plant and began supplying the region with treated water.[10]

Despite continued population growth, water demand has continued to fall in the Tampa Bay Water region due to loss of large customers and increased adoption of water efficiency practices. Tampa Bay Water anticipates that it will sell an average of 164 million gallons a day (mgd) in 2016, which is 3.6 mgd less than what was sold in 2015 and 30 mgd less than in 1998 when Tampa Bay Water began developing the desalination plant.[11]

Project Development and Procurement

The procurement process started with West Coast Regional Water Supply Authority's original Request for Proposals (RFP). Six firms responded to the original RFP in 1997 (see timeline of key events). The RFP allowed developers to select their own project site, facility size, and desalination technology.[12]

By 1998, the newly formed entity, Tampa Bay Water, selected four teams based on analysis and ranking of proposals by its engineering consultant, PB Water. These rankings incorporated evaluations of each proposal's environmental impact, capability of meeting water quality standards, cost, ease of permitting, and design. After the finalists resubmitted their best and final offers, PB Water again ranked the proposals. Tampa Bay Water awarded the contract to S&W Water, LLC, a development partnership between Stone & Webster and Poseidon Resources Corporation. Shortly after being awarded the contract in 2000, Stone & Webster went bankrupt. Poseidon took over full ownership of the project, as well as ownership of S&W Water (which was later renamed Tampa Bay Desal). Poseidon subsequently replaced Stone & Webster with Covanta Tampa Construction.[13]

In December 2001, Covanta failed to post a required construction bond, thereby postponing the sale of private activity bonds to fund the construction of the project.[14] Tampa Bay Water proceeded to resume ownership of the project in March 2002 in order to secure long-term financing. Covanta continued as a construction contractor, but it failed to meet two construction related milestones in 2003 and declared bankruptcy later that year.

In 2004, Tampa Bay Water sought new proposals to repair and operate the plant. Tampa Bay Water contracted with American Water-Acciona, a joint venture of American Water and Acciona Agua. American Water-Acciona was able to complete the plant in 2007 and meet all agreed upon milestones by 2010. By completion, the various procurement difficulties had ultimately caused a nearly six year delay in the completion of the plant.[15]

Table 2. Select Project Milestones[16]

Date	Milestone

[10] Herd, Ken. *Tampa Bay Water: A Case Study*. Presentation to Council of Infrastructure Financing Authorities 2015 SRF National Workshop. November 2, 2015. http://www.cifanet.org/documents/15Workshop/KenHerd.pdf.
[11] *Annual Operating Budget Fiscal Year 2016.* Tampa Bay Water. June 15, 2015.
[12] *Tampa Bay Seawater Desalination Plant: Project History.* Tampa Bay Water. http://www.tampabaywater.org/documents/fact-sheets/desal-fact-sheet.pdf
[13] *The Tampa Bay Seawater Desalination Plant*. Tampa Bay Water. http://www.tampabaywater.org/watersupply/tbdesaloverview.aspx
[14] *Fact Sheet: Tampa Bay Seawater Desalination Plant.* American Water. http://www.amwater.com/files/TampaBay_Desal_FactSheet_v10.pdf
[15] *Tampa Bay Seawater Desalination Plant.* The National Council for Public-Private Partnerships. http://www.ncppp.org/resources/case-studies/waterwastewater-infrastructure/tampa-bay-seawater-desalination-plant/
[16] *Fact Sheet: Tampa Bay Seawater Desalination Plant.* American Water. http://www.amwater.com/files/TampaBay_Desal_FactSheet_v10.pdf

Winter 1997	West Coast Regional Water Supply Authority issues RFP
August 1998	West Coast Regional Water Supply Authority becomes Tampa Bay Water
February 1999	S&W Water, a partnership between Poseidon Resources Corporation and Stone & Webster, submits a best and final offer to sell desalinated water to Tampa Bay Water
July 1999	Tampa Bay Water's Board of Directors awards the final construction contract and water purchase agreement to S&W Water
July 2000	Stone & Webster declares bankruptcy, Poseidon takes 100 percent ownership of S&W Water and partners with Covanta
December 2001	Covanta fails to post a required construction bond for the project
March 22, 2002	Tampa Bay Water receives authorization from its Board of Directors to purchase the plant from Tampa Bay Desal (design, permitting, and 30 percent of construction is complete). Tampa Bay Water contracts Covanta to finish the project
April 2002	Tampa Bay Water purchases incomplete plant from Tampa Bay Desal
September 2003	Covanta fails to meet the new acceptance test deadline
October 2003	Covanta declares bankruptcy
February 2004	Tampa Bay Water assumes full control of the plant through a mediated settlement
March 2004	Tampa Bay Water seeks proposals from qualified teams to repair and operate the desalination plant
November 2004	Tampa Bay Water's Board of Directors approves contracts with American Water-Acciona, a joint venture between American Water and Acciona Agua, to repair and operate the plant
September 2007	Plant remediation is complete, plant run-in period begins
November 2007	Plant passes acceptance testing
December 2007	Operation begins[17]
December 2007	Project achieves first funding milestone and receives $21.25 million from SWFWMD[18]
December 2008	Plant achieves 12.5 MGD 12-month average, the second funding milestone, and receives $42.5 million from SWFWMD[19]
February 2010	Plant achieves 20 MGD 12-month average and four consecutive months at 25 MGD, the third and fourth funding milestones, and receives $21.25 million from SWFWMD, for a total of $85 million[20]

[17] *Tampa Bay Seawater Desalination Plant.* The National Council for Public-Private Partnerships. http://www.ncppp.org/resources/case-studies/waterwastewater-infrastructure/tampa-bay-seawater-desalination-plant/

[18] *Tampa Bay Seawater Desalination Plant: Project History.* Tampa Bay Water. http://www.tampabaywater.org/documents/fact-sheets/desal-fact-sheet.pdf

[19] *ibid.*

[20] *ibid.*

Key Financial Features and Outcomes

Tampa Bay Water initially conceived and bid the project as a long-term Design, Build, Own, Operate and Transfer (DBOOT) and water purchase contract. The structure of this agreement highlighted the risk transfer characteristics of many DBOOT models, in which most responsibilities and the risks associated with them are delegated to the developer:

> **"Tampa Bay Water is not the owner or co-owner, lessee or co-lessee, nor a partner in, nor joint venture with [the] Water Developer in the ownership or operation of the Facilities. Rather Tampa Bay Water is to be a customer of [the] Water Developer. [The] Water Developer shall own and operate all Facilities as principal for its own account and not as manager or agent of Tampa Bay Water."[21]**

The agreement covered the initial permitting, design, land acquisition, and capital construction costs associated with the plant, which were estimated to be approximately $88 million when the agreement was signed in 1999. The total upfront cost of the facility, at the time, was estimated to be $110 million (after taking into consideration supplemental design, advising, and transaction costs). Under the agreement, the developer was responsible for putting up 10% ($8 Million) of its own funds towards the project that would remain as equity in the project after construction was completed.[22] Tampa Bay Water intended for the remainder of the project costs to be financed with short-term debt during the construction phase, which would then be transferred to long-term private activity tax-exempt debt once the plant was operational. Tampa Bay Water arranged the long-term debt, but gave full responsibility for making the debt service payments to the developer, who would apply revenue receipts from a long-term water purchase agreement with Tampa Bay Water.[23] According to the Tampa Bay Finance Officer at the time, the bond was ready to be issued and had received a provisional AA rating.[24]

The water purchase component of the agreement guaranteed the developer a long-term revenue stream once the plant became operational. Under the original terms of the agreement, Tampa Bay Water was obligated to purchase treated water in an amount equal to the design capacity of the plant (25 MGD). If Tampa Bay Water was unable to purchase 25MGD, it was required to pay a significant "Standby Compensation Rate" calculated to cover all of the fixed costs associated with the facility. Such fixed costs included property taxes, debt service payment (projected at terms of 5.2% over 30 years) and operating costs. Table 3 shows the complete list of Estimated Base Compensation items in the original DBOOT agreement. [25]

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[21] *Agreement for the Construction and Operation of a Seawater Desalination Plant and Water Purchase Agreement*. Tampa Bay Water and S&W Water, LLC. July 21, 1999.
[22] *ibid.*
[23] Koni Cassini (Former Finance Director, Tampa Bay Water), interview with author, Jun 24, 2016.
[24] *ibid.*
[25] *Agreement for the Construction and Operation of a Seawater Desalination Plant and Water Purchase Agreement*. Tampa Bay Water and S&W Water, LLC. July 21, 1999.

Table 3. Estimated Base Compensation Items in Original DBOOT Agreement (never used)

Component	Rate per 1,000 Gallons
Cash Contribution Investment Recovery	$0.107
Estimated Debt Recovery	$0.620
Property Taxes	$0.147
Membrane Replacement	$0.009
Energy Costs	$0.490
Chemicals and Other Consumables	$0.074
Insurance and Bonds	$0.016
Water/concentrate disposal access charges	$0.022
Rent or Lease	$0.004
Operation/Maintenance	$0.101
Additional compliance monitoring	$0.011
Labor	$0.074
Developer/operator fee	$0.036
Total First Year	$1.712

Transitioning from DBOOT/Water Purchase Agreement to DBO

Once Tampa Bay took ownership of the plant, the project service delivery model effectively transitioned from a DBOOT model to a modified DBO model. The plan, at the time, was to retain Covanta as the primary construction company and to use Covanta's sister entity, Covanta Tampa Bay Inc., to operate the facility.

While Tampa Bay Water did not purchase a fully functioning plant, it did acquire a plant that had already been granted a large number of permits. This is important because at the outset of the project, one of the primary objectives for relying on a public private partnership model was to shift some of the substantial permitting challenges and risks to the private sector. Appendix A illustrates the long list of permits that were transferred at the time of the sale (as described in the asset transfer agreement).[26] From this perspective, the transfer of permitting risk to the private sector was successful.

The new construction firm (Covanta) also encountered problems. After additional delays and performance problems, Covanta failed to meet its performance requirements and to correct plant deficiencies. Before Tampa Bay Water could formally terminate its contract, Covanta declared bankruptcy, requiring Tampa Bay Water to reach a settlement to assume full control of the incomplete plant. A settlement was reached in February 2004, effectively giving Tampa Bay Water control of the plant, which was further along in the development process, but still unable to operate as designed. The $75.5 million settlement was substantially lower than the $91 million Covanta reportedly spent on plant construction.[27] In one respect, the difference ($15 million) can be viewed as a monetization of construction risk that materialized which had been transferred to Covanta.

At this point in the process, Tampa Bay Water realized that it would have to make significant additional investments to assure it could meet the required alternative water supply requirements.[28] Contractually, Tampa Bay Water had been theoretically protected from much of the construction and technology risk and could have conceivably walked away from the project. However, the structure of the contract did not change the fact that Tampa Bay Water was under a regulatory obligation and strict timeline to complete the plant and reduce dependence on groundwater. Table 4 shows a summary of how some of the key project risks were allocated under the initial DBOOT agreement. When asked about lessons learned from the procurement process, the Tampa Bay Water Construction and Contracts Section Leader

[26] *Asset Purchase and Sale Agreement for Seawater Desalination Plant and Related Assets.* Tampa Bay Desal, LLC and Tampa Bay Water. April 29, 2002.

[27] *Tampa Bay Seawater Desalination Plant: Project History.* Tampa Bay Water. http://www.tampabaywater.org/documents/fact-sheets/desal-fact-sheet.pdf

[28] Ken Herd (Director of Operations and Facilities, Tampa Bay Water), email correspondence with author, June 27, 2016

stressed the importance of realistic risk allocation. He believes that for some projects, no amount of contractual clauses can truly insulate the public sector from certain risks.[29]

> **"Looking back on our experience at Tampa Bay Water, selection of the most suitable delivery method and partner is vital to achieving project success. Clearly identifying each project's individual risk profile and understanding how best to allocate those risks between the public and private sector is fundamental to delivering a project that best meets the needs of our customers."**
>
> *- Ken Herd, Construction and Contracts Section Leader, Tampa Bay Water*[30]

Table 4. Risks and Responsible Parties under the initial DBOOT Agreement

Risk Category	Responsible Parties	Description
Permitting Risk	S&W Water	Responsible for obtaining permits
	Tampa Bay Water	Responsible for assisting developer in obtaining permits
Construction	S&W Water	Responsible for the majority of construction risks under the DBOOT agreement (developer was not to be paid until plant was complete and met performance targets)
	Tampa Bay Water	Protected from most construction risk under normal circumstances, but became exposed to risk once two construction companies declared bankruptcy
Operations and maintenance, including costs associated with regulatory changes	S&W Water	Responsible for obtaining permits for the project
	Tampa Bay Water	Relied on the outputs of the plant to meet regulatory requirements
Demand	S&W Water	Guaranteed payment regardless of actual demands; defined as "Take or Pay" fees in the agreement
	Tampa Bay Water	Responsible for demand risk: if circumstances led to reduced demands, the utility was still required to pay fees based on higher demands
Financial/Debt	S&W Water	Responsible for all financing during construction; responsible for investing 10% of estimated initial capital cost as equity
	Tampa Bay Water	Minimally responsible for acquiring financing under initial agreement; once plant was operating, developer's debt service would be retired by Tampa Bay Water's Take or Pay fees.

Shifting to an Operate, Manage, and Maintain (OM&M) Model

[29] *ibid.*

[30] Ken Herd (Director of Operations and Facilities, Tampa Bay Water), interview with author November 2, 2015.

After the DBOOT and first DBO approach were unsuccessful, Tampa Bay Water evaluated alternative management and operation models to finish the plant. It decided to pursue a modified approach which involved hiring a company to complete construction of the plant under one contract and then enter into a separate contract to operate, manage and maintain it (OM&M). Given the technical and operational problems with the project to date, Tampa Bay Water required potential partners to carry out extensive pilot treatment tests and use the results to make informed recommendations on how to complete the plant. Two competing firms participated in this process. Tampa Bay Water ultimately selected American Water-Acciona Aqua (previously American Water –Pridesa) to complete the construction and serve as contract operator. Tampa Bay Water entered into separate agreements for the construction and OM&M phase of the project.

The final construction contract costs for repair and completion were approximately $30 Million. By the time plant acceptance testing was complete in 2007, Tampa Bay Water reported that the final plant remediation had added $48 million to the project, resulting in a total project development cost of $158 million.[31]

The total project cost included a wide array of outlays to diverse groups over an eight-year period, making it difficult to precisely track the flow of funds for this project. The original plan was to finance the majority of the project's capital costs through private activity bonds in which the debt service payments were included in the required water purchase fees. Prior to entering into the agreement, Tampa Bay Water had secured a large grant commitment from the Southwest Florida Water Management District (SWFWMD) for the balance of project capital. SWFWMD is funded through ad valorem taxes and serves as a regional environmental regulator as well as a funder for projects that address regulatory goals.

Since state laws prohibited the grant funds from being disbursed directly to the private entity for a privately owned facility, Tampa Bay Water worked with SWFWMD to develop an innovative approach that would have involved placing the grant funds in escrow and drawing down the funds to offset the capital component of the water price. However, this plan was not needed after Tampa Bay Water took over direct ownership of the plant. In the end, Tampa Bay Water arranged and serviced the capital financing directly. The amount Tampa Bay Water had to borrow was greatly reduced by its participation in the SWFWMD Partnership Plan. The SWFWMD funding was disbursed in phases as the plant met its performance milestones. SWFWMD made the final disbursement to Tampa Bay Water in February 2010.

The tax-exempt bonds issued by Tampa Bay Water were rated AAA by S&P.[32] The bonds were structured fixed rate revenue bonds serial and term bonds due 2008-2036 with coupon rates between 4% and 5% (with an all in true interest cost reported as 4.63%).[33] Tampa Bay Water's strong credit rating has supported on-going access to low-cost capital. According to Tampa Bay Water staff, the primary driver of its choice of service delivery method was not to access capital, but rather to transfer risk. As the project advanced and various risks (such as regulatory and technology risks) were reduced, Tampa Bay Water was more willing to follow traditional tax-exempt bonding methods, particularly given its credit rating.[34]

Unlike the original DBOOT agreement, in which capital costs were rolled into the long-term water purchase agreement, the current OM&M agreement with American Water-Acciona does not include any of the initial capital cost in the volumetric price paid by Tampa Bay Water. The agreement requires the payment of a "Service Fee" that includes a base OM&M fee and a number of pass-through payments for items such as electricity and chemicals.[35] The base OM&M charge is a fixed charge calculated to cover all labor, laboratory, vehicles, ordinary repair, waste disposal and cartridge filter replacement.

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[31] *Tampa Bay Seawater Desalination Plant.* The National Council for Public-Private Partnerships. http://www.ncppp.org/resources/case-studies/waterwastewater-infrastructure/tampa-bay-seawater-desalination-plant/

[32] This is the insured rating, underlying rating was AA-.

[33] *Annual Operating Budget Fiscal Year 2016.* Tampa Bay Water. June 15, 2015.

[34] Ken Herd (Director of Operations and Facilities, Tampa Bay Water), email correspondence with author, June 27, 2016

[35] *Tampa Bay Seawater Desalination Water Treatment Plant Operation, Maintenance And Management Services Agreement.* Tampa Bay Water and American Water-Pridesa LLC. November 15, 2004.

Pass-through charges include the cost of residual disposal, electricity, and chemicals. Membrane replacement and major renewal, repairs, and replacements are supported through separate sinking funds created as part of the agreement. Sinking funds follow a set schedule and are paid to the operator to support the above costs.[36] American Water-Acciona must have written approval from Tampa Bay Water to withdraw these funds. The FY 2017 Tampa Bay Water budgeted Service Fee is $6,664,000; the pass through chemical budget is $1,303,000; and the power budget is $3,399,000, based on a plant average production level of 8 mgd over a 12 month period.

The agreement allows American Water-Acciona to invest in new capital improvements that will generate savings. American Water-Acciona is able to retain the savings until it pays off its investments, after which Tampa Bay Water retains 40% of the savings.[37] The agreement also allows Tampa Bay Water to initiate and pay for cost saving improvements, thus allowing Tampa Bay Water to retain the savings until its investment has been fully recovered. The OM&M agreement was structured so that the operator was guaranteed a significant payment even if Tampa Bay Water did not need water. This has placed significant demand risk on Tampa Bay Water (see next section).

The creation of the desalination facility created approximately 447 temporary jobs, 370 of which were within the Tampa Bay Water service counties of Hillsborough, Pinellas, and Pasco. The Tampa Bay Seawater Desalination Plant itself directly employs 22 workers.[38]

Lower Water Demand and the Ultimate Financial Outcome

The financial outcome of this project was considerably less favorable than had originally been projected. However, Tampa Bay Water did not promote the project or the service delivery model primarily as a cost savings strategy. The utility believed the DBOOT approach would be an effective method of developing a new technology and transferring risk under complex circumstances. It is impossible to know what the outcome would have been if Tampa Bay Water had utilized a more traditional procurement approach from the outset, and specifically, it is unclear whether the permitting process would have been faster. Further, it is uncertain how quickly construction would have proceeded if Tampa Bay Water had hired an engineering firm to do the design and put a separate bid for the construction.

There are relatively few desalination plants operating in the United States. Each one operates in a unique cost environment with different electricity and environmental issues; therefore, comparing unit costs is challenging. In the end, the project cost significantly more than was projected under the original approach and the structure of the flow of funds was radically different than originally envisioned. (see schematic in Appendix B). An analysis by Tampa Bay Water staff shows that depending on the average flow, the operating cost per 1,000 gallons can vary from approximately $2.20 to almost $4.00 (see Figure 1). To put this in perspective, Tampa Bay Water's current member "all in" wholesale rate is $2.559 per 1,000 gallons, meaning that Tampa Bay Water is not able to cover the operating cost of the plant with its wholesale rate. The high cost of Tampa Bay Water's desalinated water is balanced by its other lower cost water supplies.

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[36] *ibid.*

[37] *Tampa Bay Seawater Desalination Water Treatment Plant Operation, Maintenance And Management Services Agreement.* Tampa Bay Water and American Water-Pridesa LLC. November 15, 2004.

[38] *The Tampa Bay Seawater Desalination Plant*. Tampa Bay Water. http://www.tampabaywater.org/watersupply/tbdesaloverview.aspx

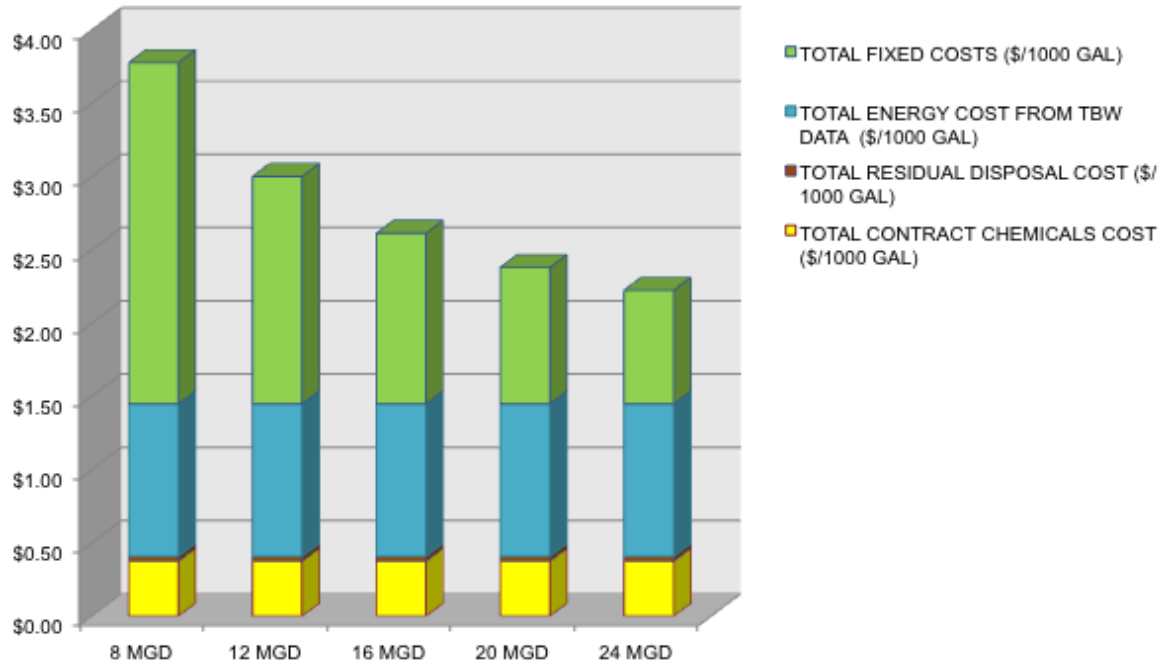

Figure 1. Desalination Costs vs. Production Rate ($/1000 gal)[39]

One of the financial implications of the current operations agreement (as well as the original DBOOT contract) is that Tampa Bay Water retains a high level of demand risk. If falling demand leads Tampa Bay Water to use significantly less water from the plant than projected, it will have more limited control in reducing expenditures than if it operated the plant itself. From the perspective of Tampa Bay Water, operating the plant now has two components: fixed costs and variable costs. The negotiated fee structure assumed that Tampa Bay Water would need more water than it has needed. As a result, the negotiated fixed fees were likely calculated taking into consideration more repairs and staff time than current demand requires. If Tampa Bay Water operated the plant itself, it could potentially have flexibility to reduce operating costs below its current fixed OM&M payments.[40]

Despite the continued growth of the region, Tampa Bay Water has seen its water demand decline. Tampa Bay Water projects an additional 3.6 mgd decline in 2016 leading to a total drop in demand since 2008 of 30 mgd.[41] At present, since Tampa Bay Water does not need the desalination water to meet its current demands, it is in a situation where it can decide how much desalination water to use each year in order to optimize its overall expenditures. The variable costs of operating the plant are high compared to Tampa Bay Water's other source waters, and for that reason, Tampa Bay Water has a financial incentive to run the plant at levels below the maximum capacity. Tampa Bay Water estimates it costs $0.55 cents in variable costs to produce 1,000 gallons of water from their non-desalination surface plant and $0.28 cents in variable costs to produce 1,000 gallons from their groundwater systems. Figure 1 shows that the variable costs associated with desalination water are much higher than this, even at high production levels. As a result, Tampa Bay Water has developed an operating plan that only uses enough desalination water to keep the plant functioning well. In 2017, it will likely operate the plant at 12 mgd for nine months of the year and in a zero production mode for three months (leading to an average annual daily production rate of 8 mgd). Tampa Bay Water has also engaged several consulting firms to evaluate additional methods for optimizing costs, and to evaluate the potential to renegotiate its agreement with American Water.[42]

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[39] Herd, Ken. *Tampa Bay Water: A Case Study*. Presentation to Council of Infrastructure Financing Authorities 2015 SRF National Workshop. November 2, 2015. http://www.cifanet.org/documents/15Workshop/KenHerd.pdf.
[40] Ken Herd (Director of Operations and Facilities, Tampa Bay Water), email correspondence with author, June 27, 2016
[41] *Annual Operating Budget Fiscal Year 2016.* Tampa Bay Water. June 15, 2015.
[42] Ken Herd (Director of Operations and Facilities, Tampa Bay Water), email correspondence with author, August 30, 2016

The Tampa Bay experience is a lesson for utilities that want to better understand the reality of risk transfer under different service delivery models. The first half of Tampa Bay Water's experience was dominated by the impacts of permitting, construction, and technology risk. More recently, Tampa Bay Water has been experiencing the repercussions of how it allocates demand risk in an O&M agreement. The risk allocations and agreements were made based on the best available assumptions at the time, which in the end, as is possible with any assumptions, did not materialize. However, it is clear that as more communities experience water stress, desalination is increasingly being considered as a potential source of potable water. Tampa Bay Water was an early adopter of this technology and always anticipated that water from the desalination plant would cost more than other sources. Tampa Bay Water continues to view the desalination plant as an essential component of a broader water portfolio that it believes will eventually be needed given the region's continued rapid growth.[43]

[43] Ken Herd (Director of Operations and Facilities, Tampa Bay Water), interview with author, November 2, 2015.

Appendix A. Permits transferred at the sale of Tampa Bay Desal from Covanta to Tampa Bay Water

Schedule 2.2(a)(iv) - Transferable Permits			
I. Desalination Facility Permitting Requirements			
Permit	**Issuing Agency**	**Date Issued**	**Status**
FDEP Water Facility Construction Permit	Hillsborough County Health Department	11/21/2000	Issued #0169063-001-WC/01
Industrial Wastewater Permit	FDEP Tallahassee	11/27/2001	Issued #FL0186813
Standard General ERP	FDEP Tampa	1/31/2001	Issued #29-0178169-001
Development Review	Hillsborough County	1/4/2001	Issued
EPC Review	Hills. Co. EPC	1/3/2000	Issued
Domestic Wastewater Permit	Hills. Co. EPC	11/30/2000	Issued #017027-001-DWC
Stormwater NPDES NOI	FDEP Tampa	3/21/2001	Issued #FLR101035
Air Pollution Permit	Hills. Co. EPC	3/1/2001	Issued 0571256-001-AC, extended
Natural Resources Permit	Hillsborough County	2/16/2001	Issued #51476
Industrial User Permit	Hillsborough County Water Dept.	4/20/2001	Permit #0044
Right-of-Way Use	Hillsborough County	1/4/2001	Issued ROW 02647
II. Water Transmission Pipeline Permitting Requirements			
Permit	**Issuing Agency**	**Date Issued**	**Status**
Individual ERP	FDEP Tampa	1/8/2001	Issued #29-01709603-002-DS/C
Dredge & Fill Permit Nationwide	ACOE NW-12	3/20/2001	Issued
Dredge and Fill General	SAJ14	3/20/2001	Issued
FDOT Permits	FDOT		
State Road 60		6/19/2000	Extended #00-H-796-0158
US 301 (SR 43)		6/19/2000	Extended #00-H-796-0159
US 41 (SR 45)		6/19/2000	Extended #00-H-796-0160
Lee Roy Selman Expwy		12/27/2000	Issued #00-H-796-157, extended
Natural Resources Permit	Hillsborough County	2/21/2001	Issued #44546
Right-of-Way Use Permit	Hillsborough County	2/20/2001	Issued ROW 02363
Development Review	Hillsborough County	2/21/2001	Issued
EPC Review	Hills. Co. EPC	10/2/2000	Issued
CSX Railroad Permits	CSX		
	1st Crossing	5/8/2000	Issued CSX-038367
	2nd Crossing	5/8/2000	Issued CSX-038368
	3rd Crossing	5/8/2000	Issued CSX-038369
Tampa Port Permit for Crossing Alafia/Bullfrog Creek	Tampa Port Authority	4/13/2001	Permit #01-017 issued to Tampa Bay Water for Crossing of Alafia River and Bullfrog Creek

Appendix B. Simplified Project Financial Flows

Figure 2. Flow of anticipated initial outlays (under the DBOOT model)

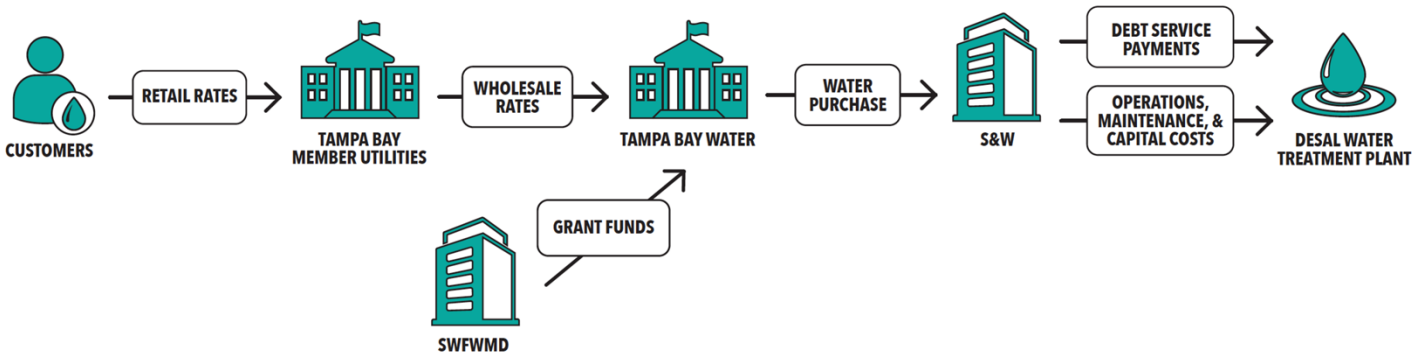

Figure 3. Anticipated recurring financial flows (under the DBOOT model)

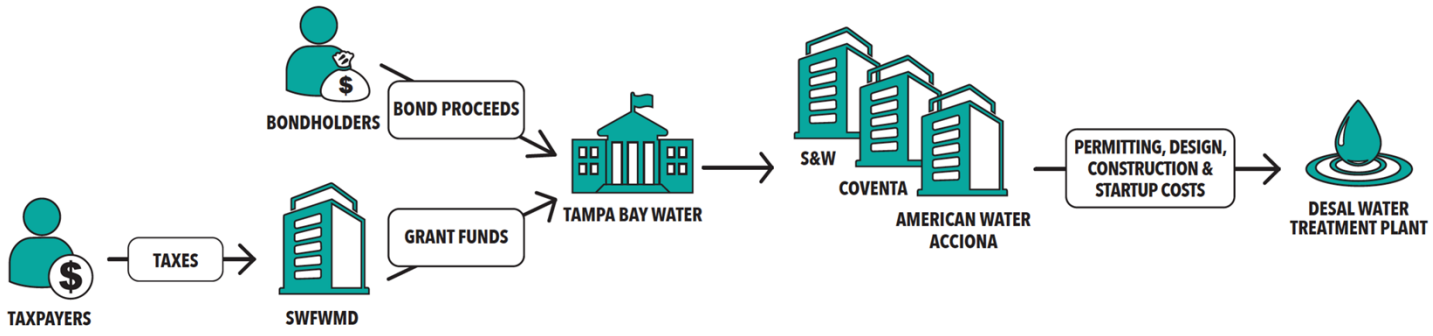

Figure 4. Flow of actual initial outlays

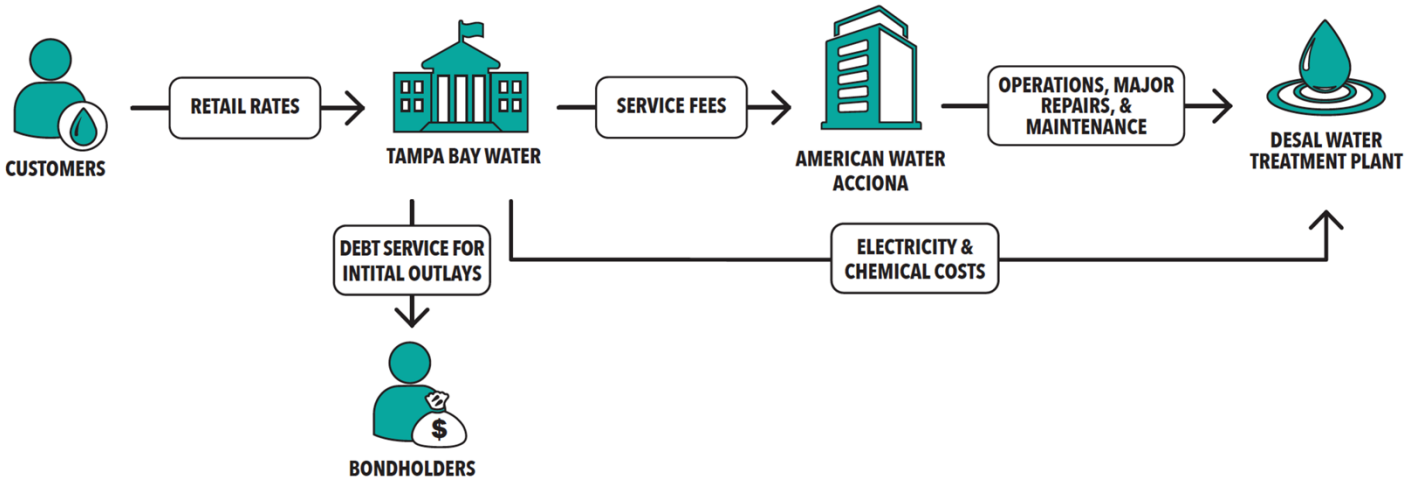

Figure 5. Actual recurring financial flows

Acknowledgements

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Cover photo: Construction to upgrade Regina Wastewater Treatment Plant. Used with permission from Rob Court, City of Regina.

[†]*Jeff Hughes is a member of the United States Environmental Protection Agency's Environmental Finance Advisory Board. At the time of writing, Jeff Hughes was under contract with Tampa Bay Water to carry out a policy analysis related to bond funding of conservation initiatives.*

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