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Public-Private-Partnerships - US

Conditions Are Ripe for More PPPs in the US Water and Wastewater Infrastructure Sector

Complex projects lend themselves well to a Public-Private-Partnership (PPP or P3) procurement process. The American Water Works Association estimates the amount needed for investments in US drinking water infrastructure is about $1 trillion.[1] The PPP procurement model is being considered for several projects in development but only a few water and wastewater PPP projects have reached financial close in recent years. This report discusses the pipeline and challenges hindering investment in the sector.

» **Pipeline of scalable water infrastructure projects is slowly building**. The pipeline is primarily focused on complex stormwater infrastructure projects, as well as drinking water supply projects in California, a state impacted severely by drought in recent years. Successfully procured projects in the past include the Poseidon Resources (Channelside) LP (Baa3 stable) desalination plant. A PPP project needs to have an identified funding source and be creditworthy to attract interest from private developers and investors.

» **Extensive environmental regulations and procuring authorities' limited PPP experience present unique challenges**. The PPP agreement typically establishes performance standards, consequences of noncompliance with these standards, risk of changing environmental standards, permit delays or legal challenges against the project. A public authority may find it challenging to determine the optimal risk allocation.

» **Lack of funding commitment, rather than financing capacity, remains the main hindrance to investments.** Independent of the procurement method, a project's costs need to be funded through excess cash, debt, grants or an increase in fees charged to customers. Public utilities with strong financial metrics, a robust economic area and low water rates are well positioned to finance investments and increase rates.

» **Increased regional co-operation could support execution of more water and wastewater infrastructure projects.** Co-operation supports sharing of best practices among procuring authorities, can shorten the procurement process, and can increase economies of scale, which is often needed to fund large capital expenditures.

» **New financing options like the Water Infrastructure Finance and Innovation Act (WIFIA) are expected to complement traditional funding sources.** WIFIA could boost investment in water and wastewater infrastructure, but it is uncertain if it can replicate the success of the Transportation Infrastructure Finance and Innovation (TIFIA) loan program.

Introduction

The American Water Works Association estimates that the amount needed for investments in the US drinking water infrastructure is around $1 trillion, as a significant portion of infrastructure is reaching its first renewal cycle. Despite the need for investments, local governments in the US have decreased their funding for water and wastewater infrastructure by 22% between 2009 and 2014, according to the American Society of Civil Engineers (ASCE).

Against this backdrop of inadequate investment in the US aging water and wastewater infrastructure, there are an increasing number of complex projects that can lend themselves well to a Public-Private-Partnership (PPP or P3) procurement process.

The procuring authority can benefit most from transferring risks to the private contractor through a PPP arrangement if the project is of high complexity, significant scale or offers technological innovation. However, a PPP project will need to have an identified funding source and be creditworthy to attract interest from private developers and investors.

Projects procured as a PPP include the San Antonio Water Vista Ridge System pipeline and water treatment plant project (estimated project cost around $923 million), which was the only PPP water project to reach financial close in 2016, or the Carlsbad desalination plant (Poseidon Resources (Channelside) LP, Baa3 stable) near San Diego that started commercial operations at the end of 2015. Other water related PPP projects include the Bayonne and Rialto water and wastewater system PPP projects that closed in late 2012 and the public-to-public partnership project for the municipal water and wastewater systems of the City of Allentown (Allentown (City of) PA, A3 stable GO bonds) that closed in 2013.

Experience with the PPP procurement method is still limited in the sector. More inexperienced procuring authorities will likely find it challenging to determine the optimal risk allocation between the private developer and the procuring authority in a PPP and might not have the legal expertise to consider all contingent liabilities. As experience with the PPP procurement method grows, we expect that the PPP-specific challenges will be reduced over time.

However, largely independent of the procurement method, the waste and wastewater sector needs to overcome certain challenges to close the current investment gap. These challenges include lack of political support to increase water rates in order to fund the project or lack of other funding sources such as internal reserves or grants, as well as extensive environmental regulations and requirements.

Regional co-operation could help to increase economies of scale, and support sharing of funding commitments and best practices in the sector. This should also have a positive bearing on the amount of time a PPP water and wastewater project requires before it reaches financial close. The Water Infrastructure Finance and Innovation Act (WIFIA) loan program could boost additional investment in water and wastewater infrastructure, but it is uncertain if it can replicate the success of the Transportation Infrastructure Finance and Innovation (TIFIA) loan program.

How does Moody's define a Public-Private Partnership?

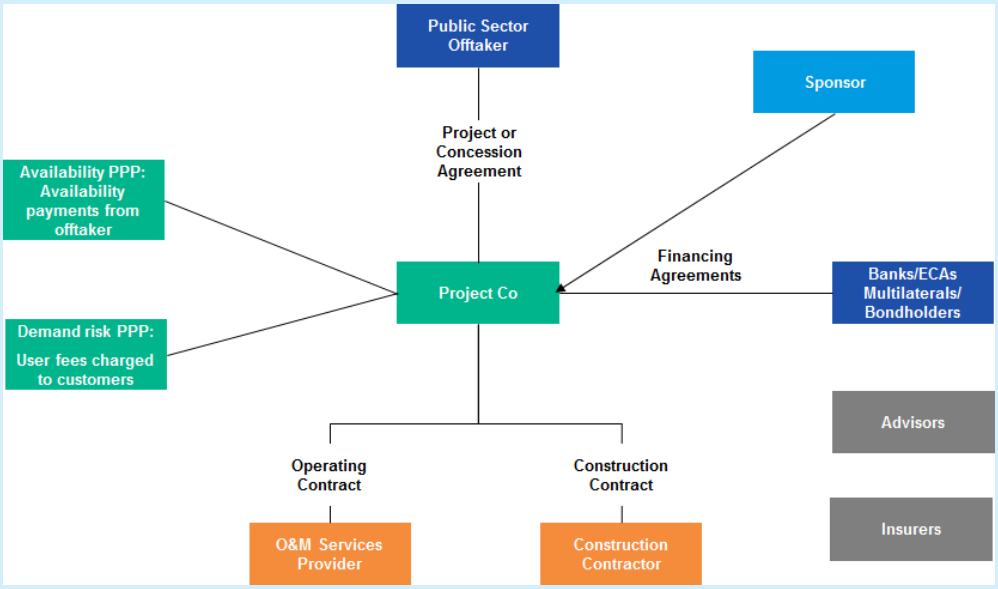
No standard definition of what constitutes a PPP exists globally. We define a PPP as a long-term contractual agreement between a public sector governmental entity and a private developer to design, build, finance, operate and/or maintain an infrastructure asset for a specific period. The governmental entity generally maintains ownership of the asset throughout the contract term but shares long-term rehabilitation and life-cycle risks with the private developer. At the end of the contract, the asset often reverts back to the government in the condition the government has specified in the contract. A PPP project is undertaken by a special purpose entity (SPE) that can only engage in the business of the project with project scope defined in the project agreement. The SPE often raises project finance debt to finance upfront construction works, which is then repaid solely or primarily from the project's cash flows. During the design and construction phases, the public entity might make certain milestone payments contingent on the private entity's progress toward construction completion.

We do not consider the privatization of public assets through an asset sale to an investor-owned utility a PPP. In addition, performance-based operating contracts such as the 20-year wastewater management agreement between Nassau County, NY (A2 stable GO bonds) and United Water are not PPPs, according to our definition, but are a contracted way to work in partnership with the private sector.

- **Availability-based payment PPP:** Following completion of construction, the private developer is entitled to payments from the government as long as contract conditions are fulfilled. Availability payments are sized to cover operating and maintenance costs, debt service costs and equity returns as the private entity operates the project. Availability payments are not subject to swings in demand, such as water consumption, and are adjusted typically only for lack of performance or lack of availability of the asset to the public. Examples include the Stirling Water project in the UK (Stirling Water Seafield Finance Plc, Baa1 stable).
- **Demand risk PPP or concessions**: Under a concession or demand risk PPP, the project is largely financed by user fees, and the government takes on no or only limited demand risk. This model is often applied for toll roads or water, gas and electricity PPPs. A pure user-funded demand risk PPP will not create a contractual financial obligation for the procuring authority.
- **Hybrid forms**: PPP arrangements can have characteristics of both an availability-based payment and a demand risk PPP. The procuring authority, or sometimes called the offtaker, need to be aware that hybrid PPP can expose them to explicit obligations such as availability payments as well as to contingent obligations such as financial guarantees, termination payments, subsidies if demand falls under certain thresholds, and more remote contingent obligations such as the risk of contract renegotiations or takeover of the project in case of default of the special purpose entity. Examples for hybrid PPPs include the Carlsbad desalination plant project in California, Poseidon Resources (Channelside) LP or Wyuna Water Pty Limited (A2 stable) in Australia. Both projects benefit from availability-like cash flow streams normally seen in availability-based payment PPPs but also have certain characteristics of a demand risk PPP.

Exhibit 1

Typical simplified Public-Private-Partnership Structure



Source: Moody's Investors Service

Pipeline of Scalable Water Infrastructure Projects Is Slowly Building

The current pipeline (exhibit 2) for water and wastewater PPP projects is primarily focused on complex stormwater infrastructure projects as well as drinking water supply projects in California, a state that has been impacted severely by drought over the past few years.

The largest project in the pipeline is the stormwater project Fargo-Moorhead Area Flood Diversion in North Dakota (estimated project size $1.8 billion), which aims to establish permanent flood protection measures and includes the construction of 30 miles of channels, two aqueducts, two river inlets, a number of bridges, and the channel outfall. This project is the largest PPP water and wastewater project in development in the US.[2] Three teams have been short listed for the project and a selection of a preferred proponent is expected in early 2018.

Drinking-water supply projects in California include the Doheny desalination plant in South Orange County for around 15 million gallons per day of drinking water and the Huntington Beach desalination plant for around 50 million gallons per day. The regulatory requirements and required environmental permits are extensive for desalination plants in California, which leads to a longer procurement process than for other water and wastewater projects. Political support for desalination plants is also at risk in case of periods of increased rainfall. Other large projects include the Santa Clara Expedited Purified Water project, which aims to provide up to 45,000 acre-feet per year[3] of purified water to supplement existing water supply.

The US Bureau of Reclamation, which is a federal agency that oversees water resource management, also recently announced a Request for Information (RFI) for water and resource PPP projects which are mostly focused on states in the West and include the Arkansas Valley Conduit project in Colorado, the Eastern New Mexico Rural Water System in New Mexico, the Kachess Drough Relief Pumping plant in Washington State, the Paradox Valley Unit in Colorado and the Yuma Desalting Plant in Arizona. The involvement of more federal agencies like the US Bureau of Reclamation and the US Army Corps of Engineers could lead to the first federally procured PPP in the sector.

Exhibit 2

Project Pipeline is slowly building but reaching financial close will remain a challenge

Pipeline of availability, demand and hybrid PPP water and wastewater projects

Transaction Name	Location	Status	Status as of	Estimated transaction size ($ million)	Local Government	Sub-sector
Arkansas Valley Conduit	Colorado	Request for Information	April-17		US Bureau of Reclamation	Water
Eastern New Mexico Rural Water System	New Mexico	Request for Information	April-17		US Bureau of Reclamation	Water
Kachess Drought Relief Pumping Plant	Washington	Request for Information	April-17		US Bureau of Reclamation	Water
Paradox Valley Unit	Colorado	Request for Information	April-17		US Bureau of Reclamation	Water
Yuma Desalting Plant	Arizona	Request for Information	April-17		US Bureau of Reclamation	Water
Doheny Desalination Plant - South Orange County	California	Pre-Launch	March-17	88	Orange County Water System	Water
Los Angeles Satellite Water Reclamation Facility	California	Expressions of Interest	January-17		Los Angeles Bureau of Sanitation	Water
Pennsylvania Stormwater Runoff System P3	Pennsylvania	RFQ returned	October-16		Chester, Pennsylvania Stormwater Authority	Stormwater
Fargo-Moorhead Area Diversion P3	North Dakota	Shortlisted Proponents	October-16	1,800	Flood Diversion Board of Authority	Stormwater
Grand Prairie Irrigation P3	Arkansas	Expressions of Interest	June-16	200	White River Regional Irrigation Water Distribution District (WRID)	Water
Santa Clara Expedited Purified Water P3	California	Shortlisted Proponents	May-16	950	Santa Clara Valley Water District	Water
Huntington Beach Desalination Plant	California	Preferred Proponent	April-16	1,000		Water
Louisiana Parish Wastewater Facility	Louisiana	RFP Returned	November-15	300	Ascension Parish	Wastewater
East/West 84 inch Force Main	Florida	Pre-Launch	August-15	180	Miami-Dade County	Wastewater
Miami-Dade Water Distribution System Storage Tank & Main replacements	Florida	Pre-Launch	August-15	70	Miami-Dade County	Wastewater/Water
Peak Flow Management Facilities	Florida	Pre-Launch	August-15	310	Miami-Dade County	Wastewater
Northwest Wellfield Water Treatment Plant	Florida	Pre-Launch	August-15	450	Miami-Dade County	Water
West District Wastewater Treatment Plant	Florida	Pre-Launch	August-15	2,100	Miami-Dade County	Wastewater
Indianapolis Airport Water Improvement	Indiana	Shortlisted Proponents	August-15		Indianapolis Airport Authority	Wastewater/Stormwater
Michigan Highway Pump Station	Michigan	Pre-Launch	July-15	165	Michigan Department of Transportation (MDOT)	Stormwater
Phoenix Stormwater Pump Rehabilitation Project	Arizona	Pre-Launch	July-15		Arizona Department of Transportation (ADOT)	Stormwater
South Miami Heights Water Treatment Plant	Florida	Transaction Launch	May-15		Miami-Dade Water and Sewer Department	Wastewater
City of Wichita Water System	Kansas	Pre-Launch	May-15	1,600	City of Wichita	Wastewater/Water

The projects above have been identified as potential PPP projects and include demand risk, availability-payment and hybrid PPPs. However, not all of these projects might qualify as a PPP according to Moody's definition. Transaction sizes are estimates.

Source: Infradeals, Moody's Investors Service.

Other potential benefits of PPPs include the transfer of the construction and operating risks to the private sector under a customized project agreement that typically includes a fixed price, date certain promise that limits the risk of cost overruns and delays. A true design, build, finance, operate and maintain PPP provides a cost assessment of the total project cost over the 25 to 35 year term of the project agreement, and the private sector will return the asset back to the public authority according to specifications defined in the project agreement. This is a key benefit as an upfront identified revenue stream used to continuously maintain the asset in good working condition reduces deferred maintenance that can result in weaker asset performance and a growing backlog of required capital investment. Typically, the public procuring authority aims to maintain significant control over water and wastewater rate setting or define certain limits on future rate increases for a specified period of time.

We expect that smaller projects of low complexity with limited risk of cost overruns will continue to be executed through a traditional procurement method.

The project pipeline (exhibit 2) also includes several projects in Florida that were announced in August 2015, and it is uncertain if these projects will move forward as PPP projects.

The current pipeline also highlights some of the hurdles for future expansion. The procurement process can take significant time, a risk that private developers need to take into account when bidding for a project. However, as experience with the PPP procurement method increases in the sector, some of these hurdles should decline over time.

Extensive Environmental Regulations and Limited PPP Experience of Procuring Authorities Present Unique Challenges

Projects in the water and wastewater sector need to comply with stringent environmental regulations that can change throughout the contract term. The PPP agreement needs to clearly define how risks are shared when it comes to changing environmental regulations, potential permit delays or legal challenges against the project. A procuring authority with no experience with the PPP procurement process will likely require more time to negotiate the optimal risk allocation with the private partner.

The project agreement typically establishes up-front clearly defined performance standards and defines consequences of noncompliance with these standards as a result of, for example, contaminated water, earthquakes, flooding or other extreme weather events, permit delays, changes to permit standards, parameters governing quality being exceeded or requiring updates, risks associated with new technologies such as commissioning, start-up risks, and risks associated with brownfield operations and existing infrastructure.

A PPP legal framework and contractual arrangement that exposes the government to hidden contingent risks would be negative for both the procuring government as well as the project company, as it could result in lengthy disputes and PPP legal frameworks are often tested during periods of economic stress. The procuring authority might not aim to load all risks onto the private sector or create an excessively punitive penalty regime to ensure compliance with performance standards under the long-term contractual agreement.

Water and Wastewater Is a Highly Regulated Sector

Water and Wastewater systems are mostly the responsibility of local governments but are regulated on a state and federal level. Regulations can vary from state to state. Public Utilities Commissions often regulate rates charged by private utilities and in a limited number of states also those charged by public utilities. On the federal level, water and wastewater are regulated by the United States Environmental Protection Agency (EPA). Key regulations include the Clean Water Act, adopted in 1972 and amended in later years, which focuses on wastewater collection and treatment infrastructure, and the Safe Drinking Water Act, adopted in 1974 and amended in later years, which regulates public water systems.

The Clean Water Act is a pollution control program that prohibits the discharge of any pollutant from sources such as pipes into waterways without a permit. Individual homes do not require a permit but the facilities that process wastewater from these homes do. It also give the Office of Water at the EPA the authority to set water quality standards for all contaminants in surface waters.

The Safe Drinking Water Act gives the EPA the authority to set enforceable standards for public water systems and prescribe acceptable levels for a number of contaminants that can occur in water.

Lack of Funding Commitment, Rather Than Financing Capacity, Remains Main Hindrance to Investments

Independent of the procurement method, a project's costs ultimately need to be funded through the public procuring authority's excess cash, debt, grants or through an increase in user fees charged to customers. PPP projects can mitigate the impact of the project on the offtaker's financial capacity as financial commitments are often spread out over a longer time frame than under a traditional procurement. However, the PPP procurement model is not a new source of funding. We may consider availability-based payment obligations under a PPP as debt-like obligations.

Public utilities with strong financial metrics that are located in a robust economic area with currently low water rates are well positioned to finance investments in their water or wastewater infrastructure and to increase rates charged to customers, if necessary. Public utilities that are highly leveraged, have limited liquidity reserves and are located in a weak economic area with declining population will be least likely to be able to afford investments in water or wastewater infrastructure and to increase rates.

The Success of the Bayonne PPP

At the end of 2012, the Bayonne Municipal Utilities Authority, NJ of Bayonne (City of), NJ (A3 GO bonds) reached financial close with United Water and private investment firm KKR Global Infrastructure Investors for a 40-year concession of its water and wastewater systems.

The Bayonne PPP is a successful example of a PPP executed by a public procuring authority that faced limited internal financial flexibility to renew and maintain its aging water and wastewater infrastructure and challenges such as declining consumption. The city projected that significant water and wastewater rate increases would have been necessary independent of the PPP to maintain the system.

Under the concession, Bayonne retained oversight of the systems, the concessionaire would upgrade and maintain the assets in a state-of-good repair, and return the assets at the end of the concession. The concession provided predictable guaranteed revenues to the concessionaire but no return guarantee, i.e. the concessionaire would not be able to increase its return on the project by rate increases beyond the agreed scheduled. The agreed schedule also provided rate payers with good visibility of future rate increases. There is no state regulation of water and wastewater rates in New Jersey.

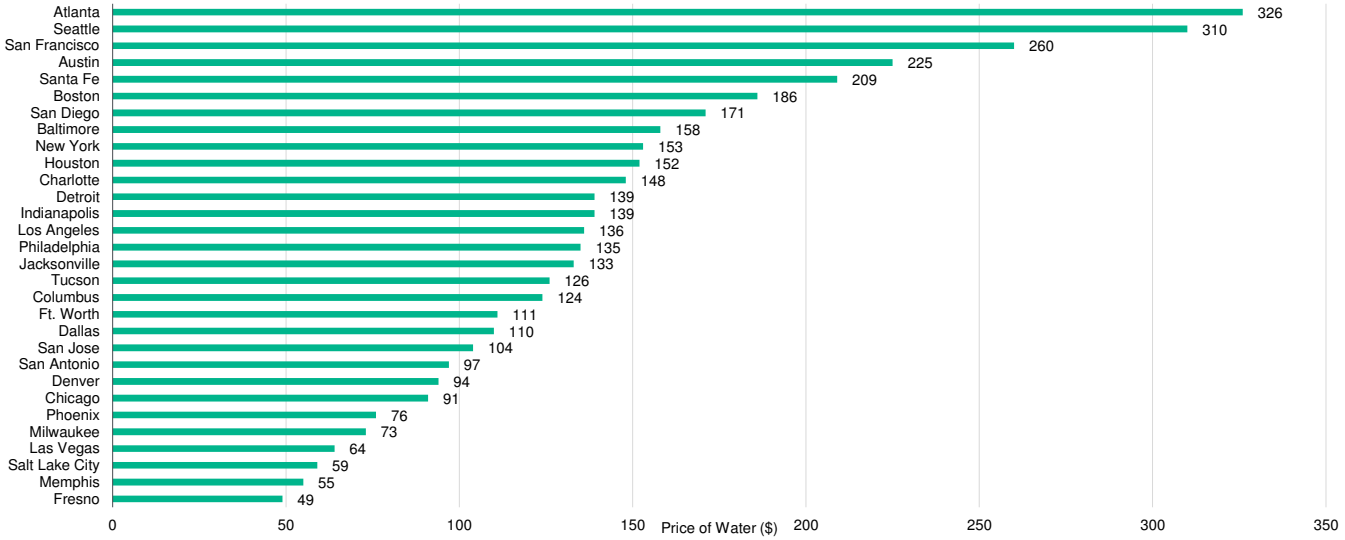
They city used $125 million of a concession fee to retire debt.

Exhibit 3 provides an overview of combined average water, sewer and stormwater prices in 30 major cities in the US.

Exhibit 3

Combined average water, wastewater and stormwater prices in 30 major cities in the US

Average monthly bill for a family of four using 100 gallons of water per day



Note: Rates as of April 1, 2015. Not all cities charge storm water fees. Water prices cover usually the supply and treatment required for the delivery of water while wastewater prices cover the cleaning of used water, which is often more energy-intensive and costly than the delivery of water. Atlanta and Seattle have the highest total monthly bills as a result of large capital expenditures to comply with federal requirements for the treatment of wastewater. Santa Fe has the highest water price which is a reflection a of large pipeline project.
Source: Circle of blue.

Many public water and wastewater utilities have not built up sufficient excess liquidity reserves to fund large capital expenditure projects in an effort to keep rates low. Public utilities often charge water and wastewater rates based on a consumption level but the majority of their costs are fixed. This can create a challenge if fixed-cost recovery is reduced as a result of changing consumption, declining population, more efficient water use or weather events such as heavy rain fall.

In addition, in setting water and wastewater rates, most system owners will balance the need to cover the true cost of service against the need to provide an affordable service to lower-income households. Therefore, long-term political support extending beyond election cycles is critical to support future rate increases that might be required to fund larger capital investments. For instance, Austin Water (City of Austin Water and Wastewater System, TX, Aa1 stable) made changes to its fixed fee charged to customers and implemented rate increases after a decline in revenue and a resulting operating loss in 2010 that resulted from heavy rainfall and a decline in consumption.

Increased Regional Co-operation Could Support Execution of More Water and Wastewater Infrastructure Projects

The US has nearly 52,000 community water systems and 97,000 wastewater systems, of which many lack the scale to finance larger capital investments in their water and wastewater infrastructure. Regional co-operation among different water and wastewater systems or between different levels of government can increase economies of scale and support regional solutions for funding water and wastewater infrastructure. It can facilitate sharing expertise in terms of executing a PPP project, asset management programs and maintaining assets in a state of good repair, as well as best practices in fixed-cost recovery and setting water and wastewater tariffs.

Recent examples of regional co-operation include:

» Denver Water Colorado River Cooperative Agreement: In 2013, Denver Water signed an agreement with West Slope Water, several local governments and ski areas to protect watersheds in the Colorado River Basin while allowing Denver Water to develop future water supplies.

» Flint, Michigan: Federal aid for repairing corroded water system was passed only after several groups representing citizens, businesses and utilities organized to support the urgency of the project.

New Financing Options Like WIFIA Are Expected to Complement Traditional Funding Sources

Water and wastewater projects in the US are funded mostly through tax-exempt municipal debt, excess liquidity reserves and through State Revolving Funds. State and municipal governments shoulder the majority of the burden to fund water and wastewater projects. These funding sources will likely be complemented in future by PPP financing options, by green bonds and by the WIFIA loan program.

The WIFIA loan program could stimulate investments in water and wastewater infrastructure to the same degree as the TIFIA loan program has done for the transportation sector, if executed successfully. We note that water and wastewater projects often tend to be of smaller scale than transportation projects such as toll roads. In 2016, Congress appropriated $17 million in funds for the program. It is estimated that, using WIFIA's full financial leveraging ability, a single dollar in the program could create $50 for project lending which, according to the EPA, could enable the program to facilitate around $1 billion in credit assistance and stimulate around $2 billion in water infrastructure investments.[4] WIFIA could help to finance higher-risk, larger-scale, more complex projects and lower the cost of capital for these projects which in turn could stimulate the execution of PPP water and wastewater infrastructure projects.

Key Project Eligibility Water Infrastructure Finance and Innovation Act

WIFIA is a federal credit program administered by the EPA that will provide low-interest loans to eligible projects. Though the details are uncertain at this stage, we expect that, similar to the TIFIA program, WIFIA would be a subordinated lender to help stimulate senior lending.

PROJECTS NEED TO FULFILL THE FOLLOWING REQUIREMENTS:

- Eligible borrowers: local, state, tribal, and federal government entities; partnerships and joint ventures, corporations and trusts, Clean Water and Drinking Water State Revolving Fund (SRF) programs
- Minimum project size (large communities): $20 million
- Minimum project size (small communities, population equal or below 25,000): $5 million
- Maximum portion of project costs that WIFIA funds: 49% (similar to TIFIA). Total federal assistance may not exceed 80% of eligible project costs
- Maximum loan maturity date: 35 years from substantial completion. Repayment can be deferred for a maximum of 5 years after substantial completion
- Interest rate: Equal or greater than the U.S. Treasure rate of a similar maturity at date of closing
- Projects must be creditworthy and benefit from a dedicated source of revenue

Source: EPA WIFIA program overview

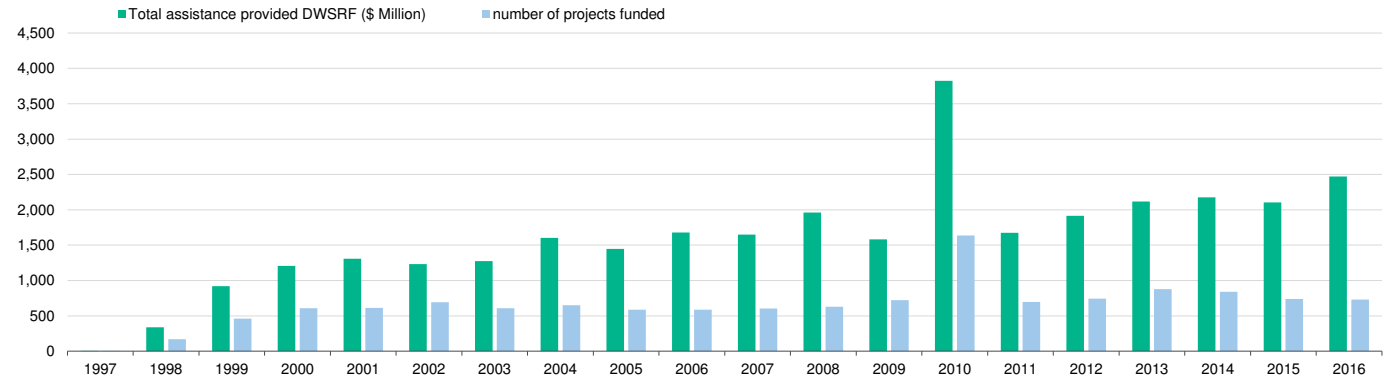
Another option is the use of green bonds. DC Water (District of Columbia Water and Sewer Authority, Aa1 stable) has taken advantage of growing interest from investors in green bonds and issued its first 100-year green bond to finance a portion of its DC Clean River Project in 2014. The issuance was the first municipal century bond issued by a water/wastewater utility in the US. DC Water issued additional green bonds beginning of 2017 which also received a green bond assessment by Moody's Investors Service of GB1 (excellent).

These amounts are, however, small relative to funds provided by traditional financing sources. The Drinking Water State Revolving Funds program has provided around $32.5 billion in loan assistance since 1997. The Clean Water State Revolving Funds program has provided around $102.1 billion in assistance during the same period from 1997 to 2016. Assistance by both state revolving fund programs peaked in 2010. The National Association of Clean Water Agencies (NACWA) estimates that in 2016 alone nearly $38 billion was issued in municipal bonds to finance water and wastewater infrastructure. The Clean Water and Drinking Water State Revolving Funds provide low-interest loans to state and local water infrastructure projects and each state provides a 20% match to the funds that

have been allotted by the EPA for the respective state. The State Revolving Funds leverage their funds by issuing municipal bonds which increases the available capital for the loan program and the majority of State Revolving Funds are rated Aaa with a stable outlook.

Exhibit 4

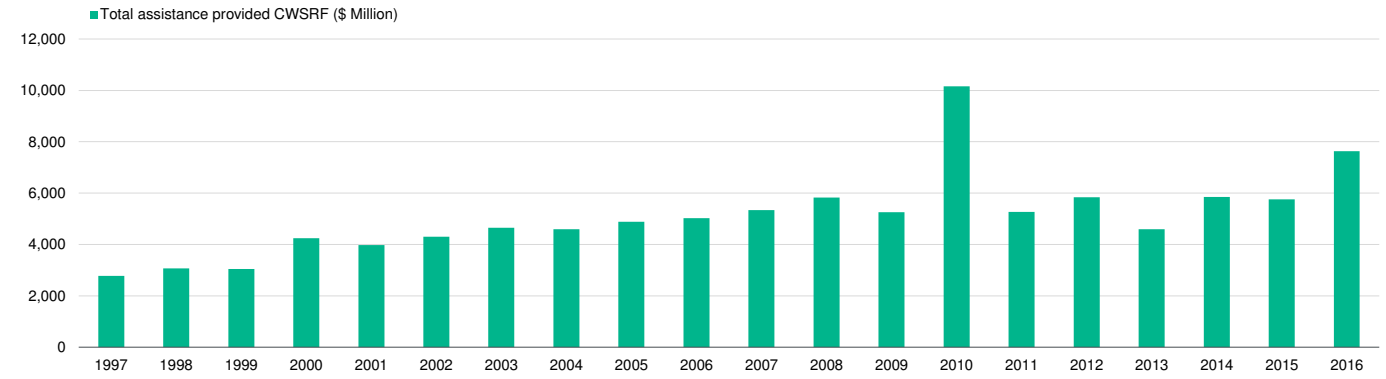
Assistance provided by Drinking Water State Revolving Fund (DWSRF) Program 1997-2016Assistance has shown modest increases since peak in 2010



Fiscal year ends June 30 of each year.
Source: EPA

Exhibit 5

Assistance provided by Clean Water State Revolving Fund (CWSRF) Program 1997-2016 Assistance has been steady with exception to peaks in 2016 and 2010



Fiscal year ends June 30 of each year.
Source: EPA

Exhibit 6

List of rated State Revolving Funds

Issuer Name	Program Name	Rating	Outlook
Arizona Water Infrastructure Finance Authority	Water Quality Revenue Bonds	Aaa	Stable
California Infrastructure and Economic Development Bank	Clean Water State Revolving Fund Revenue Bonds	Aaa	Stable
	Infrastructure State Revolving Fund (2014 Indenture)	Aaa	Stable
	Energy Efficiency Master Trust Revenue Bonds	Aa3	Stable
Colorado Water Resources and Power Development Authority	Clean Water	Aaa	Stable
	Drinking Water	Aaa	
	Clean Water Refunding Bonds	Aaa	
	Drinking Water Refunding Bonds	Aaa	
Connecticut (State of) State Revolving Fund	General Revenue Bonds	Aaa	Stable
Florida Water Pollution Control Financing Corporation	Water Pollution Control Revenue Bonds	Aaa	Stable
Iowa Finance Authority	State Revolving Fund Revenue Bonds	Aaa	Stable
Indiana Finance Authority	Drinking Water and Wastewater	Aaa	Stable
Kentucky Infrastructure Authority	Wastewater and Drinking Water Revolving Fund	Aaa	Stable
Massachusetts Clean Water Trust	Master Trust Agreement	Aaa	Stable
	Pool Program	Aaa	
	Mass. Water Resources Authority (MWRA)	Aaa	
Maryland Water Quality Financing Administration	Water Quality Revolving Loan Fund (2008 Indenture)	Aaa	Stable
Maine Municipal Bond Bank	Sewer and Water Revenue Bonds	Aaa	Stable
Michigan Municipal Bond Authority	Clean and Drinking Water	Aaa	Stable
Minnesota Public Facilities Authority	State Revolving Fund	Aaa	Stable
	Water Pollution Control Revenue Bonds		
	Clean Water Revenue Bonds		
	Drinking Water Revenue Bonds		
Missouri State Environmental Improvement and Energy Resources Authority (EIERA)	Water Pollution Control and Drinking Water Bonds	Aaa	Stable
North Dakota Public Finance Authority	State Revolving Fund Program Bonds	Aaa	Stable
	North Dakota Public Finance Authority		Stable
New Jersey Environmental Infrastructure Trust	Environmental Infrastructure Bonds	Aaa	Stable
New York State Environmental Facilities Corporation	Clean Water and Drinking Water (2010 Master Financing Program)	Aaa	Stable
	Clean Water and Drinking Water (NYC Municipal Water Finance Authority Projects - Second Resolution Bonds) Bonds	Aaa	Stable
	Clean Water and Drinking Water (NYC Municipal Water Finance Authority Projects - Second Resolution Bonds) Subordinate Bonds	Aaa	Stable
Ohio Water Development Authority	Water Pollution Control Loan Fund - 2014 General Bond Resolution	Aaa	Stable
	Water Pollution Control Loan Fund - Water Quality Bonds	Aaa	
	Drinking Water Assistance Fund - 2016 Trust Agreement	Aaa	
	Drinking Water Assistance Fund Leveraged Bonds - 2002 Trust Agreement	Aaa	
	Community Assistance Program	Aa1	
	Fresh Water Program	Aaa	
Rhode Island Infrastructure Bank (formerly known as Rhode Island Clean Water Finance Agency)	Water Pollution Control Bonds	Aaa	Stable
	Drinking Water Bonds	Aaa	Stable
South Dakota Conservancy District	State Revolving Fund Program	Aaa	Stabe
Texas Water Development Board	State Revolving Fund Revenue Bonds	Aaa	Stable
Virginia Resources Authority	Clean Water SRF Program	Aaa	Stable
Wisconsin State Revolving Fund	Clean Water	Aa1	Stable
Oklahoma Water Resources Board	Clean and Drinking Water SRF Program	Aaa	Stable

Note: All ratings as of April 24, 2017.
Source: Moody's Investors Service

Moody's Related Research

Methodologies:

- Construction Risk in Privately-Financed Public Infrastructure (PFI/PPP/P3) Projects, June 2016 (190464)
- Operational Privately Financed Public Infrastructure (PFI/PPP/P3) Projects, March 2015 (176194)
- Green Bond Assessment (GBA), March 2016 (188333)
- U.S. State Revolving Fund Debt, March 2013 (148698)

PPP Research:

- Poseidon Resources (Channelside) LP Credit Opinion, March 2017 (1060392)
- Credit Trends in New P3's: Convergence, Divergence, Pressure Points, April 2016 (1012878)
- US P3 Market Slowly Builds on Four Fronts, March 2016 (1018221)
- PPP Impact on Debt Metrics of Governments — Global Examples, February 2016 (1012282)
- Public-Private Partnerships: Frequently Asked Questions, September 2015 (1004733)

Endnotes

1 This estimate refers to the necessary investment to maintain and expand service over the next 25 years. The EPA published in January 2017 an estimate that around $660 billion in investments are needed for drinking water, wastewater, and stormwater infrastructure over the next 20 years. Please see EPA's January 10, 2017 news release for further details.

2 In this report we consider stormwater project as well when discussing water and wastewater projects.

3 One acre-foot of water equals 325,851 gallons of water or sufficient water to cover one acre of land.

4 Please see EPA's January 10, 2017 news release for further details.

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