



THE IMPACT OF CATSKILL/DELAWARE FILTRATION ON RESIDENTIAL WATER AND SEWER CHARGES IN NEW YORK CITY

New York City's drinking water supply is one of the few remaining large unfiltered water supplies in the United States. Over 90 percent of the supply comes from the Catskill/Delaware watershed, which is currently operating under a filtration waiver from the federal Environmental Protection Agency (EPA), granted through April 2002. In December 2001, EPA will review the city's progress in meeting federal water quality standards without filtration. The EPA will then either extend the current Filtration Avoidance Determination, or require that the city begin filtering the Catskill/Delaware water supply.

If the EPA determines that the city's water supply in the Catskill/Delaware watershed cannot continue to meet federal water quality standards without filtration, New York City will be required to build one of the largest filtration plants in the world, at a possible cost of \$6 billion. Thus, a full understanding of the financial impact of such a requirement is an important and timely issue. In this report, IBO estimates the impact of building a filtration plant on the cost of water and wastewater services to in-city ratepayers. The key findings of this analysis include:

- According to the EPA's Midcourse Review of the city's efforts to avoid filtration, New York City has made significant progress in implementing certain programs, but it needs to step up efforts in several key areas in order to continue to avoid filtration. Thus, it is too early to conclude either that the city will continue to avoid filtration or that it will be required to build a filtration plant.
- Without filtration, average annual household water and sewer rates for a single-family home will increase an inflation-adjusted 56 percent from \$454 currently to \$707 by 2018.
- Assuming that a filtration plant is built at a cost of \$4 billion, average annual household water and sewer charges would be 13 percent higher than without filtration in 2018, or \$800 for the average single-family home.
- If the cost of the filtration plant is in line with DEP's most recent estimates (\$2.74 billion), then the average single-family home would pay \$789 in annual water and sewer charges by 2018. A plant built at a cost of \$6 billion would increase the average water and sewer bill to \$864 annually.
- Financing for the plant would likely be through a combination of Municipal Water Finance Authority-issued revenue bonds and bonds issued by the New York State Drinking Water Revolving Fund, repaid by the Authority. Although the terms of each are quite different, the longer maturity on Authority debt tends to offset the lower interest rate on State Revolving Fund debt, so that the mix of financing sources has little impact on annual debt service or water rates.

Unless otherwise noted:

- References to years in both text and figures denote New York City fiscal years. Fiscal year 2001 begins July 1, 2000 and ends June 30, 2001.
- All dollar amounts are adjusted for inflation using fiscal year 2000 dollars.

In this report, IBO estimates the impact on the cost of water and wastewater services to in-city ratepayers of building a filtration plant for the Catskill/Delaware watershed. The report begins with an overview of the water/wastewater system and the Memorandum of Agreement governing filtration avoidance in the watershed. Next we detail the assumptions underlying the model and construct a baseline estimate of water and sewer charges if filtration is not required. Finally, we discuss the impact of constructing a filtration plant on water and sewer rates. The sensitivity of the results to changes in key assumptions is examined in an appendix.

The System

New York City's water and wastewater system is managed and operated by three entities: The New York City Municipal Water Finance Authority (MWFA or the Authority), the New York City Water Board (the Board), and the New York City Department of Environmental Protection (DEP). The MWFA is responsible for issuing debt to meet the capital needs of the water system. All the debt issued by the MWFA is backed by water system revenues—mainly user payments collected from in-city and upstate system customers. The Board sets the rates for water and sewer use to ensure adequate revenues to service debt and to cover the operating and maintenance of the system. Finally, DEP is responsible for the operation of the entire system.

The water system itself consists of two main watershed systems: the Croton watershed and the Catskill/Delaware watershed. In normal precipitation years, New York City receives 90 percent of its water from the Catskill/Delaware watershed and 10 percent from the Croton watershed. In total, New York City depends for its drinking water on 2,000 square miles of upstate watershed area that extends 125 miles north and west of the city.

There are 18 collection reservoirs with a total storage capacity of 547.5 billion gallons. Some 6,181 miles of water mains and 346 miles of water tunnels and aqueducts transport water from the two watersheds to the city. On average, system users (in-city and upstate watershed communities) consume 1.31 billion gallons of water per day—90 percent of that by New York City customers.

The Watershed Memorandum of Agreement

In 1997, New York City, New York State, the EPA, upstate watershed communities, and various environmental groups signed the Watershed

Memorandum of Agreement (MOA) in order to ensure that the city will enjoy high quality water well into the 21st century. The city agreed to meet requirements spelled out in the MOA in order to satisfy federal water quality standards. In exchange, the EPA continued to waive the requirement that New York City filter the Catskill/Delaware water, effective through 2002. The MOA requires the city to focus its efforts in three main areas: land acquisition in the watershed area, the promulgation of watershed regulations, and the development of watershed protection and partnership programs. If the EPA determines that the city's water no longer meets federal water quality standards, the EPA can at any time require that the city begin filtering the Catskill/Delaware watershed.

Filtration in the Watershed

In 1999, in response to federal requirements in the Safe Drinking Water Act mandating filtration of all "surface drinking water supplies," the city approved an application by the DEP to construct a water filtration plant for the Croton system. A site for the filtration plant has been identified and a Draft Environmental Impact Statement (DEIS) is currently being prepared. The estimated cost of the filtration plant for the Croton system is approximately \$900 million.¹

In the Catskill/Delaware system, the city is still operating under the filtration waiver and is attempting to have that waiver extended past 2002 by complying with the MOA's requirements. In May 2000 the EPA completed a mid-course review of the city's progress in meeting those requirements. The EPA acknowledged that the city has made strong progress in a number of areas, but found that the city needs to focus its efforts on two key requirements: acquiring land or conservation easements around the Kensico Reservoir and upgrading the treatment technology at the 102 non-city-owned sewage treatment plants located upstate that discharge into the watershed.

At this point, it is not clear whether the city will be able to fulfill all the requirements of the MOA within the established timeframes. If not, the city may well be required to begin filtering the water from the Catskill/Delaware watershed. Because of the sheer volume of water that flows from this watershed each day, a filtration plant with adequate capacity would be a major capital undertaking,

estimated to cost between \$2.74 billion (DEP's current estimate) and \$6 billion (Mayor's Office of Management and Budget's estimate) in construction and approximately \$100 million in annual operating costs. This analysis focuses on the impact of such an undertaking on the cost of water to in-city consumers.

The Current Cost of Water in New York City

The MWFA forecasts that water and wastewater system revenues will total \$1.48 billion in 2000, with user payments accounting for 92 percent of the system's total revenues. Projected expenses for 2000 total \$1.35 billion. Direct operating costs for the water and wastewater system are expected to be \$666.7 million, or approximately 50 percent of total system expenses. Debt service payments of \$530.1 million will account for 40 percent of system expenses in 2000. The MWFA forecasts an operating surplus of \$134.5 million for

2000. Figure 1 summarizes the system's revenues and expenses for fiscal years 1998 through 2000.

New York City enjoys a below-average cost for water as compared with 24 large U.S. cities. New York City residents currently pay an average of \$454 each year per single-family home, compared with the average of \$496 among these cities (Figure 2). It should be noted that, aside from Boston and Atlanta, all of these cities are filtering some or all of their water supplies.

The Baseline Estimate

We begin by estimating a no-filtration baseline against which to measure the impact of constructing and operating a filtration plant in the Catskill/Delaware system. The basic assumption underlying the baseline

Figure 1.

New York City Water & Sewer System Revenues and Expenses

Dollars in thousands

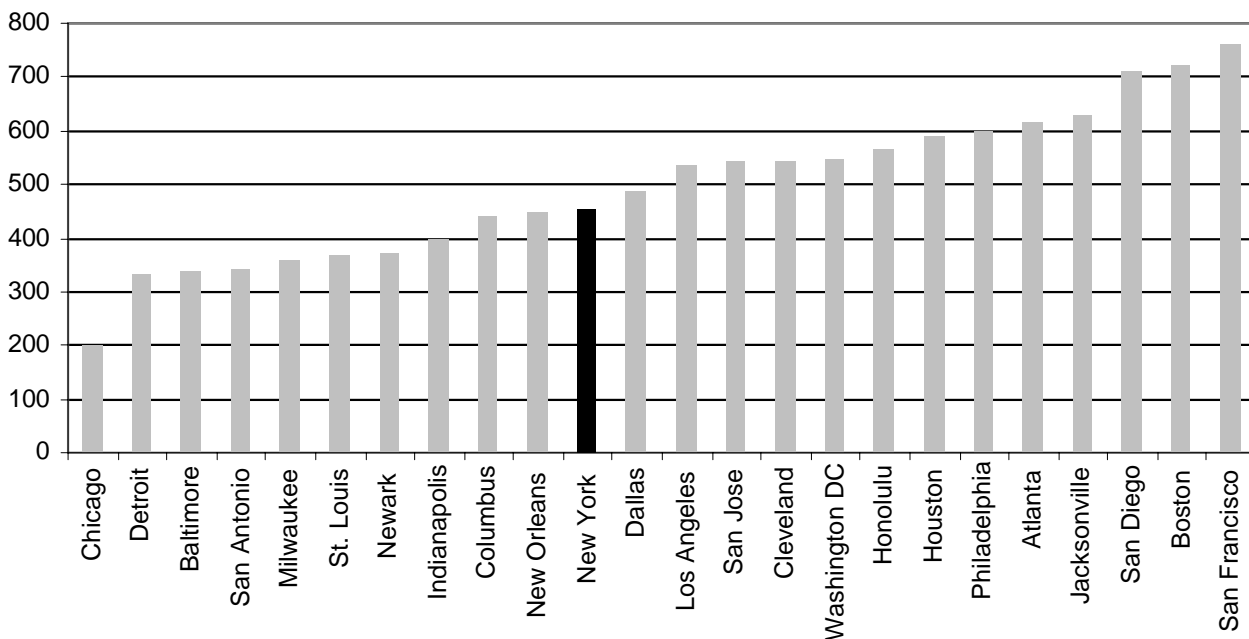
	1998	1999	2000p
Operating Revenues			
User Payments	\$1,275,485	\$1,301,777	\$1,365,846
Other Revenues	<u>145,173</u>	<u>145,354</u>	<u>117,909</u>
Total Revenues	\$1,420,658	\$1,447,131	\$1,483,755
Operating Expenses			
Authority/Board Operations	\$11,000	\$11,000	\$11,550
Water System	261,209	273,246	289,253
Wastewater System	385,842	377,599	377,496
Indirect Expenses	15,619	10,813	10,813
Judgements & Claims	28,500	12,000	10,000
Rental Payment to City	176,482	147,866	150,475
Cash Financed Capital Construction	35,000	--	--
Existing Debt Service	490,146	493,810	530,102
Authority Expense for Defeasance of Debt	--	85,000	40,000
Less: Trust Account Withdrawals	(15,000)	--	--
Less: Credit for Prior Year Excess O&M Payment	<u>(3,707)</u>	<u>(12,781)</u>	<u>(70,418)</u>
Total Expenses	\$1,385,091	\$1,398,553	\$1,349,271
Surplus/(Deficit)	\$35,567	\$48,578	\$134,484

SOURCES: New York City Municipal Water Finance Authority; Water and Sewer System Revenue Bonds: Fiscal 1998 Series D; Fiscal 1999 Series C; and Fiscal 2000 Series B.

NOTES: Figures for 2000 are projections. Other Revenues includes interest income, EFC subsidies, and upstate revenue.

Figure 2.
Comparative Annual Water & Sewer User Charges Per Single-Family Home (2000)

Average annual bill (\$)



SOURCE: Independent Budget Office, based on data from Raftelis' Water & Wastewater Rate Survey, Year 2000.

NOTE: With the exception of Boston and Atlanta, all of these cities currently filter some or all of their water.

is that filtration of the Catskill/Delaware system would not be required and that the city could continue to operate the system under a Filtration Avoidance Determination (FAD). DEP's 10-year, \$1.5 billion capital plan for avoiding filtration, begun in 1997, is built into the baseline.² The filtration-avoidance plan includes acquiring land, upgrading the upstate wastewater treatment plants that discharge into the watershed, upgrading water quality infrastructure watershed-wide, enhancing watershed surveillance and enforcement, and developing partnerships within the watershed community.

In order to project the rate increases required to operate the system and service MWFA debt for the next 18 years without filtration, we estimate revenues, expenditures, and debt service payments through 2018.

Assumptions

Current Board forecasts of rate increases, presented in the latest MWFA official statement to prospective bondholders, were used for the 2001-2005 period. However, it is necessary to make a number of

assumptions in order to develop the baseline for 2006 and beyond. Key assumptions include:

- Operation and maintenance expenses will increase at recent historical rates: MWFA and Board expenses increase 5 percent per year, water system costs rise 2 percent per year, and wastewater system costs increase 3 percent per year.
- The MWFA will issue new debt at its current rate of about \$1 billion a year through 2010. From 2011 on, however, IBO expects that debt issuance will decline to \$750 million per year and remain level through the rest of the forecast period. The majority of the system is currently just over 100 years old, and due to the aging of the system, there has been a greater need for capital construction at the 100-year mark than in previous years. As this overhaul is completed, we expect that capital construction requirements and debt issuance will decline.
- New debt will be issued at an interest rate of 6.2 percent (the rate on the Authority's most recent bond

issuances), rising to 7.0 percent after 2006, with a 30-year term.

- Pursuant to the lease agreement between the city and the Board, the rental payment by the Board to the city is assumed to equal 15 percent of the principal and interest on the Authority's debt for each fiscal year.³
- DEP will end each year from 2006 through 2018 with its operating budget in balance, without either surpluses or deficits.⁴
- Residential water consumption is assumed to remain constant at its current levels—100,000 gallons per year for single-family homes and 85,000 gallons per year for households in multifamily housing.⁵
- Indirect expenses and judgements and claims expenses are assumed to stay level at \$18 million per year throughout the forecast period.⁶
- There will be no further cash-financed capital construction after 2003 and no further trust account withdrawals after 2005.

Water Rates Without Filtration

Recent Board rate projections are used to construct the no-filtration baseline estimate for the 2001 through 2005 period. The Board instituted a 1.0 percent increase in water rates for 2001 with wastewater rates set at 159 percent of the water charges for each household. The Board currently forecasts an average rate increase of 7 percent each year from 2002 to 2005.⁷ It is important to note, however, that in recent years the Board's projections have overestimated required rate increases.

In order to construct the no-filtration baseline for 2006 on, IBO calculated the rates required to cover debt service payments and system operating expenses, while keeping the operating budget in balance without surpluses or deficits.

If construction of a filtration plant is not required, we project that average household charges will rise 56 percent by 2018, to an average of \$707 annually for a single-family home and \$601 for an apartment, in constant (inflation-adjusted) year-2000 dollars (see Figure 3). This translates into an average annual rate increase from 2006 through 2018 of 4.7 percent.

The Cost of Filtration

If the city is required to filter water from the Catskill/Delaware watershed, it will build a plant that uses processes known as pre-ozonation (a disinfection method) and high-rate direct filtration. In 1999, the city and the upstate watershed communities that use the system consumed 1.31 billion gallons of water on an average day. If, as expected, the plant has sufficient capacity to supply New York City with all of its water needs, it would be one of the largest filtration plants in the country. As required under the Watershed Memorandum of Agreement, the city is currently working on engineering designs for the facility.

Cost estimates for constructing a filtration plant vary widely. On the low end, DEP projects that construction would cost \$2.74 billion. On the high end, New York City's Office of Management and Budget estimates the cost at \$6.0 billion.⁸ For the purposes of this analysis, IBO assumes that the plant would cost \$4.0 billion—roughly midway between the two estimates. (See Appendix for the impact on water rates of lower and higher cost estimates.) The timeframe for constructing such a plant would be seven years, with work starting in 2008 and the plant going online in 2015.

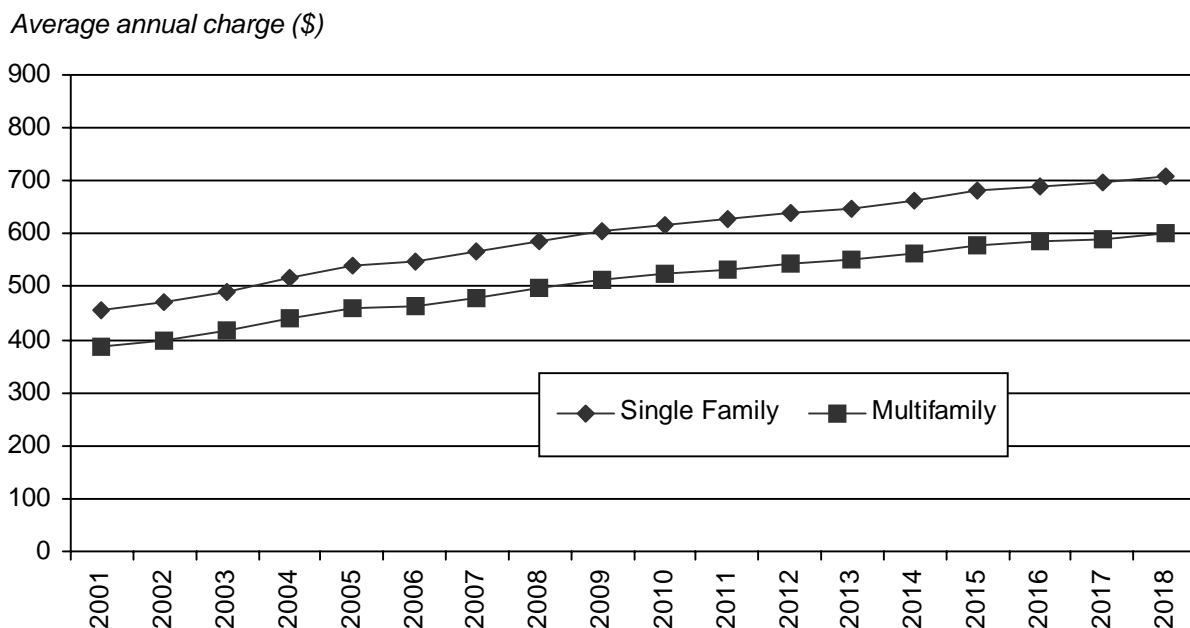
In addition to the costs of constructing the filtration plant, there would also be new annual costs associated with operating and maintaining the facility. DEP's most recent estimate of operating and maintenance costs for the completed plant is \$100 million per year. This includes an estimated \$50 million for PILOTs to upstate communities where the plant is sited.

Financing Construction

If the city is required to construct a plant to filter water from the Catskill/Delaware system, it would most likely be financed through a combination of debt issued by both New York City's Municipal Water Finance Authority (MWFA) and New York State's Drinking Water State Revolving Fund (SRF).

DEP currently projects that the State Revolving Fund, which is capitalized by federal and state contributions, would provide roughly one-third of the financing required to build a filtration plant in the Catskill/Delaware watershed—about \$1.33 billion under our \$4 billion cost assumption. The SRF would issue the debt for the filtration project through the Environmental Facilities Corporation (EFC) and the

Figure 3.
Average Annual Household Water & Sewer Charges Without Filtration



SOURCE: Independent Budget Office.

NOTE: Average annual charges are adjusted for projected inflation (constant 2000 dollars).

MWFA would be required to pay the principal and interest payments as they come due. The remaining two-thirds of the debt (\$2.67 billion) would be issued directly by the MWFA. Recent MWFA debt issues have been structured to take advantage of an overall decrease in system debt service payments beginning in 2031. The Fiscal 2000 Series B offering, for example, was structured to pay only interest for the first 30 years, followed by three balloon payments of principal and interest in 2031, 2032, and 2033.

Based on past financings, IBO expects that the \$1.33 billion in debt financed by the EFC would be structured so that the first principal payment would come due two years after the debt is issued. We assume that the bonds would have a term of 20 years and an interest rate of 6.6 percent. For the remaining \$2.67 billion in debt financed through the MWFA, IBO assumes a balloon payment structure, a 30-year term and an interest rate of 7.0 percent. (See Appendix for the impact of different financing assumptions.)

Under these assumptions, IBO projects that by 2018 filtration would add about \$93 to the average single-family home's annual water and sewer bill and \$79 for the average apartment, compared with the no-filtration baseline—13 percent higher than what would be required without filtration (Figure 4).

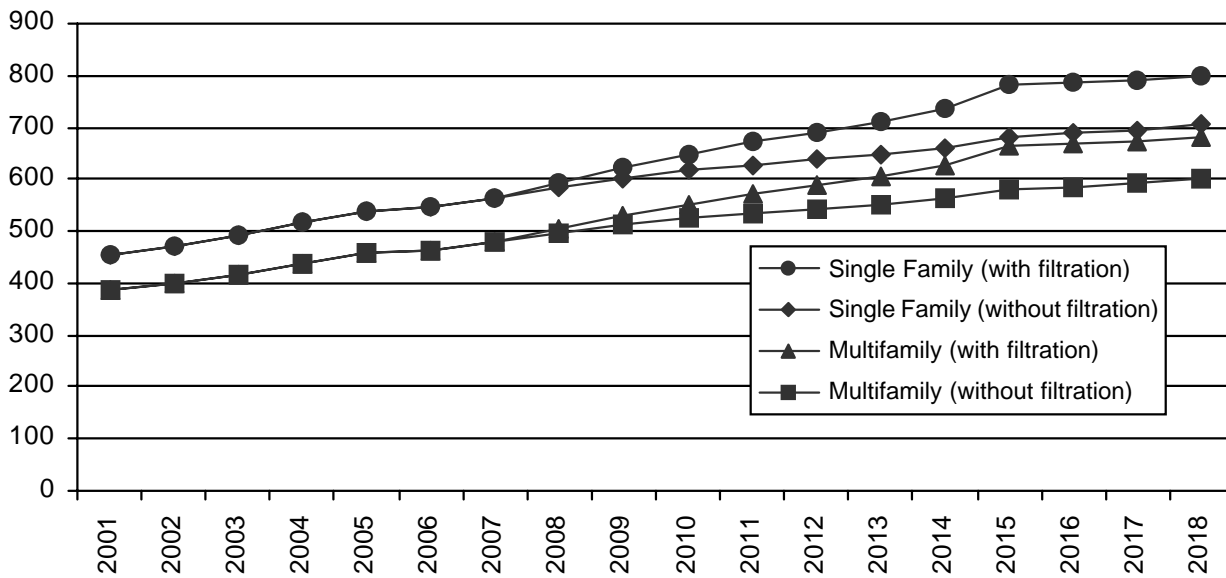
Conclusion: Water Rates with Filtration

The Water Board projects that water and sewer rates will rise an average of 5.5 percent per year between 2001 and 2005 (Figure 5), bringing the average single-family home's annual water and sewer bill to \$539 in 2005, compared with \$454 in 2000. Similarly, the average water and sewer charge for an apartment is expected to rise from \$386 to \$458 over the same period.

If the city is required to filter the Catskill/Delaware watershed, IBO projects that by 2018—three years after the plant begins operation—the average single-family home's water and sewer bill would reach \$800

Figure 4.
Average Annual Household Water and Sewer Charges With & Without Filtration

Average annual charge (\$)



SOURCE: Independent Budget Office.

NOTE: Average annual charges are adjusted for projected inflation (constant 2000 dollars).

(in constant dollars), which is \$93 or 13 percent more than they would have paid without filtration. The average water and sewer bill for an apartment would reach \$680 (in constant dollars), which is \$79 more than they would have paid without filtration.

Viewed in terms of rate increases, if filtration is required, we estimate that water and sewer rates would rise an average of 5.8 percent per year over the period 2006 to 2018.⁹ Without filtration, the increase in water and sewer rates would average 4.7 percent per year over the same period.

Figure 5.
Projected Average Annual Rate Increases

	Current Board Projections 2001 - 2005	IBO Projected 2006-2018
Without Filtration	5.5%	4.7%
With Filtration	5.5%	5.8%

SOURCE: Independent Budget Office.

Endnotes

¹ The estimated cost of operation for the Croton filtration plant is approximately \$17 million per year. For the purposes of this analysis, \$17 million has been added to the baseline water system operation expenses beginning in 2008 (the first year that the Croton plant is projected to be online).

² Note that since construction of the filtration plant would be an "add-on" to the current capital plan, none of the projected baseline capital needs would be reduced if filtration were required.

³ The Board leases the operating system from the city, and as required by the lease agreement, the Board will pay the city an annual rental payment until the city's general obligation debt for water and sewer purposes have been paid in full. The rental payment is set equal to no more than the greater of: 1) principal and interest for the fiscal year on city general obligation bonds issued for water and sewer purposes prior to the establishment of the MWFA, or 2) 15 percent of the principal and interest on Authority debt for the fiscal year.

⁴ DEP is projected to enjoy operating surpluses ranging from \$54 million to \$102 million over the 2001 to 2005 period. The Board does not set water rates to guarantee a surplus in DEP's budget, but rather to avoid operating at a deficit. Recent surpluses have resulted from cost savings and improved revenue collections.

⁵ In contrast, water consumption by single-family homes nationwide averages 146,000 gallons per year.

⁶ DEP currently pays about \$8 million in tort claims every year, mainly arising from accidents on construction sites. However, there are three large lawsuits (totaling roughly \$46 million) pending in the court system. These lawsuits arise from claims by upstate communities regarding the city's compliance with the requirements of the MOA. If the lawsuits succeed, the cost of judgements and claims would exceed the levels we have assumed for the baseline.

⁷ New York City Municipal Water Finance Authority, Water and Sewer System Revenue Bonds, Fiscal 2000 Series B.

⁸ The estimates are based on conversations with staff at DEP and OMB.

⁹ Once the plant goes on line, the additional \$100 million annual operating cost will require an increase in water and sewer rates of 9.1 percent in 2015.

Appendix: Sensitivity of Results to Changes in Assumptions

As noted in the main text of this analysis, there are a number of assumptions behind the calculations. In this appendix, several of the underlying assumptions are adjusted and the results of the new calculations are presented.

Cost of Filtration Plant

The current projections for the cost of the filtration plant range from \$2.74 billion to \$6 billion. If, in fact, the cost of the plant were \$2.74 billion (DEP's current projection), the average single-family annual water and sewer charges would be \$789, 1.4 percent lower in 2018 than the estimate of \$800 for a \$4 billion plant. However, if the filtration plant's cost were \$6 billion, the average single-family annual water and sewer charges for a single-family home would be \$864, or 8.0 percent higher than the estimate for a \$4 billion plant. Figure A-1 summarizes the comparison.

Financing Method

We assumed in our analysis that the filtration plant would be financed partly through the State Revolving

Fund's Environmental Facilities Corporation (EFC) and partly through MWFA debt issue. If, however, the filtration plant is entirely funded through EFC debt, the average household would be paying approximately \$19 more in 2018 than with the mixed-financing option. The difference can be attributed to two factors. First, EFC debt is structured so that only interest is paid for the first 18 months, with principal and interest payments becoming due two years after the bond is issued (as opposed to the balloon payment structure of MWFA-issued debt). Second, the term on EFC debt is currently 20 years (as opposed to 30 years on MWFA-issued debt). It should be noted that financing of the filtration plant entirely through the EFC would result in savings in interest paid on the debt over the life of the bonds.

On the other hand, if the filtration plant project does not receive any funding from the EFC, the average household would pay \$9 less in 2018 than with the mixed-financing option. Over this span of time, the higher interest rate would be offset by the payment of interest only on the outstanding principal amount. While this is ultimately more costly to ratepayers because of greater total interest paid, there would be little difference in terms of rates and average water bills until 2035, when the principal would begin to come due.

Figure A-1.

Comparison of Average Water & Sewer Bills in 2018 Under Varying Estimates of Filtration Plant Cost

	No-Filtration	Cost of Filtration Plant:		
	<u>Baseline</u>	<u>\$2.74 Billion</u>	<u>\$4 Billion</u>	<u>\$6 Billion</u>
Single Family	\$707	\$789	\$800	\$864
Multifamily	\$601	\$670	\$680	\$734

SOURCE: Independent Budget Office.

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