CONGRESSIONAL BUDGET OFFICE
U.S. Congress
Washington, DC 20515

January 31, 2003

Honorable Don Young
Chairman
Committee on Transportation
and Infrastructure
U.S. House of Representatives
Washington, DC 20515

Honorable James L. Oberstar
Ranking Member
Committee on Transportation
and Infrastructure
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman and Dear Congressman:

The Congressional Budget Office's (CBO's) recent analysis titled *Future Investment in Drinking Water and Wastewater Infrastructure* confirms that current funding from all levels of government and current revenues generated from ratepayers will not be sufficient to meet the nation's future demand for water infrastructure. That analysis highlights the major uncertainties involved in projecting the level of future spending by providing both low-end and high-end estimates of average annual costs of investment and operations and maintenance from 2000 to 2019.

The Environmental Protection Agency (EPA) also recently published low-end and high-end estimates of the future costs of water infrastructure in its report titled *The Clean Water and Drinking Water Infrastructure Gap Analysis*. Following your request of October 2002, CBO has analyzed how its estimates compare with those published by EPA. The report attached to this letter highlights key similarities and explains important differences in the estimates offered by the two agencies.

Natalie Tawil of CBO's Microeconomic and Financial Studies Division wrote the report under the supervision of Perry Beider, David Moore, and Roger Hitchner. Christine Bogusz edited the report, Leah Mazade proofread it, and Kathryn Winstead prepared it for publication. Annette Kalicki produced the electronic versions for CBO's Web site (www.cbo.gov).

I hope this report will be useful to you. Please call me if you have any questions, or have your staff contact the author directly at (202) 226-2940.

Sincerely,

Barry B. Anderson
Acting Director

Attachment

Future Spending on Water Infrastructure: A Comparison of Estimates from the Congressional Budget Office and the Environmental Protection Agency

January 2003

Notes

All costs in this report are in 2001 dollars.

Numbers in the text and table may not add to totals because of rounding.

Summary

Both the Congressional Budget Office (CBO) and the Environmental Protection Agency (EPA) conclude that projections of the future costs associated with drinking water and wastewater infrastructure are highly uncertain. Because available data are limited, the agencies must use many assumptions to develop their projections, and the 20-year projection window provides ample opportunity for unforeseen developments to influence costs. Data limitations make it impossible for the agencies to know even baseline investment costs with certainty.

Given that level of uncertainty, the differences between EPA's and CBO's projections of total investment costs are not especially significant; both EPA's $46.5 billion high-end estimate and CBO's $41.0 billion high-end estimate reflect a near doubling of baseline investment costs through 2019. The agencies' low-end estimates ($25.0 billion and $24.6 billion, respectively) reflect less than a 15 percent increase in costs through 2019 for investment in drinking water and wastewater.[1]

Despite the similarity between EPA's and CBO's estimates of future investment costs, a few distinctions are worth noting. On the high end, if EPA had incorporated investment efficiency savings and made a more plausible assumption about the extent to which drinking water systems will use debt financing for investments from 2000 to 2019, its estimate for investment in drinking water infrastructure ($23.8 billion) would be closer to CBO's ($20.1 billion). On the low end, a case might be made for EPA's lower drinking water estimate ($8.9 billion) and CBO's lower wastewater estimate ($13.0 billion). EPA's lower estimate for drinking water merits attention because the agency's relatively low $52 billion estimate of 20-year pipe costs is the only one based on actual data on the ages of pipes from multiple systems. On the wastewater side, CBO's lower estimate reflects savings from increased efficiency in investment based on domestic and international evidence. EPA does not include such efficiency effects.

The agencies' high-end estimates of operations and maintenance (O&M) costs represent the most important point of divergence in their projections (*see Figure 1*). That difference stems from the investment side where, in CBO's view, EPA adopts the unrealistic assumption that drinking water infrastructure is replaced in large quantities early in the 20-year period rather than being replaced more evenly throughout the span. That

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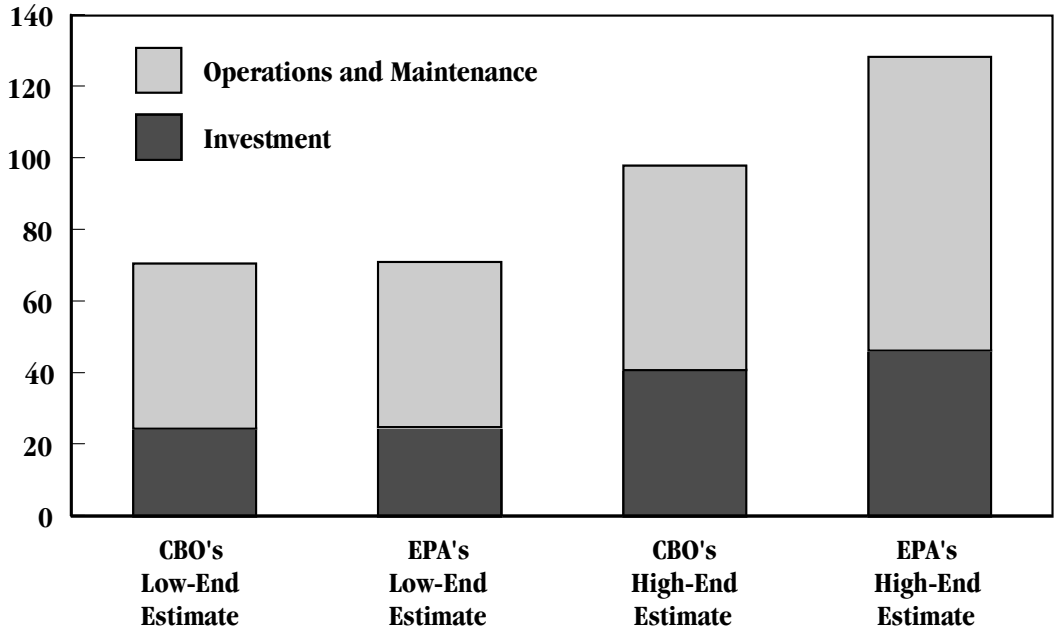
1. The similarity between EPA's and CBO's estimates (a reasonable result given the many assumptions that the agencies use to develop their projections and the commonalities in their methodologies) should not be overemphasized; in fact, future costs could fall outside the ranges defined by the estimates. Estimates of investment resource costs that reflect assessments of the needs of individual water systems —either all systems nationwide or a sample of systems—are well below EPA's and CBO's low-end estimates when expressed in comparable terms. For a full discussion of that issue, see Congressional Budget Office, *Future Investment in Drinking Water and Wastewater Infrastructure* (November 2002), available at www.cbo.gov.

Figure 1.

Estimated Average Annual Costs as Financed for Water Systems, 2000-2019

(In billions of 2001 dollars)



Source: Congressional Budget Office.

assumption, together with an estimating methodology that predicts future O&M spending on the basis of the historical relationship between O&M expenditures and the capital stock, yields a high-end O&M estimate that exceeds CBO's by $25 billion on an average annual basis, or $500 billion over 20 years. Consequently, EPA's high-end estimate of the increase in future investment and O&M spending from 2000 to 2019 ($59.4 billion on an average annual basis or $1.2 trillion over the 20-year period) is 58 percent higher than CBO's ($37.5 billion on an average annual basis or $750 billion over the 20-year period). In contrast, EPA's high-end estimate of the increase in future investment costs alone ($23.1 billion on an average annual basis or $462 billion over 20 years) is only 19 percent higher than CBO's ($19.4 billion on an average annual basis or $388 billion through 2019).

Comparing CBO's and EPA's Estimates of Future Spending on Water Infrastructure

The nation's drinking water and wastewater systems, and their ratepayers, face a major challenge in funding the replacement and maintenance of aging infrastructure over the

next several decades. Assessing the amount and timing of future costs is difficult because information about existing water infrastructure on a national scale is scarce. For example, there is no accessible inventory of the age and condition of pipes for even the relatively few large systems that serve most of the country's households. Furthermore, there are many uncertainties inherent in long-range projections.

The Congressional Budget Office and the Environmental Protection Agency have each published estimates of projected costs of investment and operations and maintenance for the nation's water system infrastructure during the two decades from 2000 to 2019.[2] Both CBO and EPA believe that to best convey the challenge facing water systems and their ratepayers at a given time, investments should be measured in terms of costs as financed. Costs as financed conveys the full costs of investments made out of funds on hand (on a pay-as-you-go basis) during the period analyzed and the debt service (principal and interest) paid in those years on new and prior investments that were financed through borrowing.[3]

CBO's and EPA's low-end and high-end estimates of costs as financed reflect the significant uncertainty underlying the projections.[4] Compared with estimates of baseline expen-

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2. For detailed explanations of the derivations of the estimates, see Congressional Budget Office, *Future Investment in Drinking Water and Wastewater Infrastructure*; and Environmental Protection Agency, *The Clean Water and Drinking Water Infrastructure Gap Analysis* (September 2002), available at www.epa.gov/safewater/gapreport.pdf.

3. Too often, estimates that do not reflect costs as financed are compared with estimates that do. Just such an error is in play when the Water Infrastructure Network (WIN) claims that its $514 billion estimate of the 20-year increase in future costs over baseline expenditures is consistent with EPA's $533 billion (average) estimate. Compounding the error is the fact that WIN's estimate reflects projected expenditures for investment only, whereas EPA's estimate reflects projected expenditures for investment ($224 billion) and O&M ($309 billion). For a complete discussion of WIN's estimates published in Water Infrastructure Network, *Clean and Safe Water for the 21st Century: A Renewed National Commitment to Water and Wastewater Infrastructure* (Washington, D.C.: WIN, April 2000), see Congressional Budget Office, *Future Investment in Drinking Water and Wastewater Infrastructure*.

4. EPA also reports point estimates of investment and O&M costs for drinking water and wastewater systems, which it derived by averaging the results from hundreds of scenarios that mix and match alternative assumptions for the values of various uncertain factors. But policymakers must be cautious in focusing too narrowly on the point estimates as appropriate summaries of EPA's analysis, for two reasons. First, the estimates themselves provide no indication of the amount of uncertainty surrounding them. Second, the averages give equal weight to each of EPA's hundreds of scenarios, although there is no empirical basis for doing so. If the assumptions underlying EPA's high-end scenarios are less likely than those underlying its low-end scenarios, then EPA's point estimates are biased on the high side, all other things being equal.

Table 1.

Estimated Costs as Financed for Water Infrastructure

	CBO		EPA	
	Low-End Estimate	High-End Estimate	Low-End Estimate	High-End Estimate
Average Annual Cost from 2000 to 2019 (Billions of 2001 dollars)	70.7	98	71.1	128.4
Investment	24.6	41	25	46.5
Operations and maintenance	46.1	57	46.1	82
Average Annual Increase Above Baseline from 2000 to 2019 (Billions of 2001 dollars)[a]	10.1	37.5	1.9	59.4
Investment	3	19.4	1.6	23.1
Operations and maintenance	7.1	18.1	0.3	36.3
Increase Above Baseline (Percent)	16.7	62	2.8	85.8
Investment	13.9	89.8	6.8	98.7
Operations and maintenance	18.3	46.5	0.7	79.3

Source: Congressional Budget Office.

a. For baseline expenditures, CBO's estimates for wastewater and drinking water come from 1999 spending, which totaled $60.5 billion—$21.6 billion for investment and $38.9 billion for operations and maintenance. The Environmental Protection Agency's estimate of baseline expenditures for wastewater comes from 1996 figures; its estimate of baseline expenditures for drinking water is the average value over the 10 years before 1996. At $69.2 billion, EPA's spending estimate comprises $23.4 billion for investment and $45.8 billion for operations and maintenance.

ditures (annual expenditures before 2000), EPA's projections imply an average annual increase in costs over the 2000-2019 period that ranges from 2.8 percent to 85.8 percent for investment and operations and maintenance combined (*see Table 1*). The implied increase in investment costs ranges from 6.8 percent to 98.7 percent; the implied increase in O&M spending ranges from 0.7 percent to 79.3 percent.

EPA's low-end projection of total investment and O&M expenditures ($71.1 billion) does not differ greatly from CBO's ($70.7 billion); for investment and O&M separately, EPA's low-end projections basically match those of CBO. In contrast, at $128.4 billion, EPA's high-end projection of investment and O&M expenditures exceeds CBO's by $30.4 billion—a cumulative difference of $608 billion over 20 years. The two agencies' high-end estimates of investment costs do not differ dramatically; each estimate represents nearly a doubling of (admittedly uncertain) baseline expenditures through 2019.[5] But EPA's projected O&M expenditures exceed CBO's by $25 billion on the high end—a cumulative difference of $500 billion over the 20-year period. To evaluate the relative importance of the differences between EPA's and CBO's estimates, this report first assesses the key factors that contribute to those differences.

5. Because of limitations in the available data, baseline investment costs as financed are uncertain.

Investment Costs as Financed from 2000 to 2019

Compared with CBO's projections and measured against a relatively similar baseline estimate, EPA's low-end and high-end projections of future increases in investment costs for water infrastructure portray a greater range of uncertainty (*see the top panel of Figure 2*). EPA's low-end estimate for total investment from 2000 to 2019 essentially matches CBO's; the agencies' slightly different estimates of baseline expenditures result in projected low-end increases of $1.6 billion ($25.0 billion minus $23.4 billion) for EPA and $3.0 billion ($24.6 billion minus $21.6 billion) for CBO. The agencies' high-end projections differ from each other to a greater extent. EPA's $23.1 billion estimate ($46.5 billion minus $23.4 billion) of the increase in costs exceeds CBO's $19.4 billion estimate ($41.0 billion minus $21.6 billion) by $3.7 billion, resulting in a total difference of $74 billion over the 20-year span.

In generating their estimates, EPA and CBO make assumptions about the values of many factors that influence future costs. For most factors, a strong case cannot be made for the choices of one agency over the choices of the other; one can, however, point to and evaluate a few choices that contribute significantly to the differences between EPA's and CBO's estimates.

Drinking Water

Low-end estimates of future investment costs for drinking water systems are below baseline estimates of expenditures in both EPA's and CBO's analyses (*see the middle panel of Figure 2*). EPA projects a change in costs of -$1.5 billion ($8.9 billion minus $10.4 billion), and CBO projects a change of -$0.2 billion ($11.6 billion minus $11.8 billion).[6] Again, the agencies' high-end projections differ from each other to a larger degree. EPA's estimate of a $13.4 billion increase over its baseline ($23.8 billion minus $10.4 billion) exceeds CBO's $8.3 billion estimated increase ($20.1 billion minus $11.8 billion) by $5.1 billion, resulting in a $102 billion difference over the 20-year period. That $102 billion is 138 percent of the difference between EPA's and CBO's high-end estimates of the increase in total investment costs.

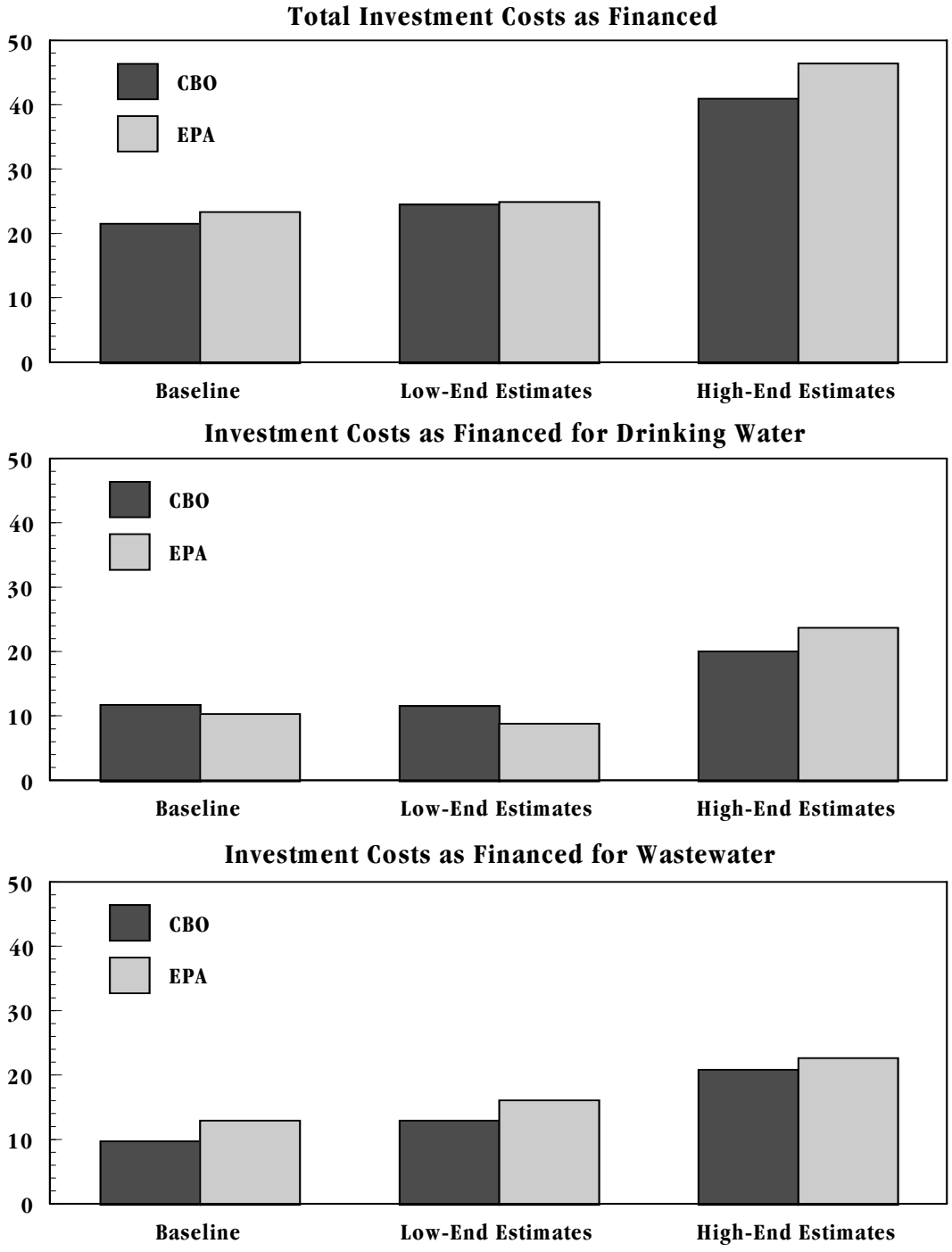
Four key factors drive the wider range of costs that EPA projects relative to CBO's estimated costs. First, on the low end, EPA's estimate of investment in drinking water pipes is 71 percent below CBO's. EPA's estimates of 20-year pipe costs range from $52 billion to $352 billion; CBO's range from $178 billion to $331 billion. The discrepancy

6. Calculating the change by comparing the $8.9 billion and $10.4 billion estimates reported by EPA yields a result of -$1.5 billion. However, EPA reports the difference between its average annual low-end projection and its estimate of prior-year expenditures as -$0.85 billion. See Environmental Protection Agency, *The Clean Water and Drinking Water Infrastructure Gap Analysis*, p. 6, footnote 5.

Figure 2.

Investment Costs as Financed for Drinking Water and Wastewater

(Average annual costs in billions of 2001 dollars)



Source: Congressional Budget Office.

between the agencies' low-end estimates is attributable to different time profiles for the replacement of existing pipes. EPA's estimate reflects an annual rate of pipe replacement (determined by the projected aging of transmission and distribution lines) based on data on the ages of pipes from 20 systems.[7] Relative to the approaches of estimating the cost of pipe replacement taken by CBO and by EPA in its other scenarios, EPA's low-end estimate has more investment in pipes occurring after 2019.[8] Its figure of $52 billion is less than half of the next-lowest estimate of $120 billion, an alternate EPA estimate of pipe replacement costs that reflects survey results that were adjusted to compensate for documented underreporting of 20-year needs by medium-sized and large drinking water systems.[9] CBO's approach, which is based on information from Stratus Consulting, essentially applies assumptions about the average annual rate of pipe replacement (0.6 percent at the low end and 1.0 percent at the high end) to an estimate of the national pipe inventory at a cost per foot based on pipe size.[10] EPA also uses that basic approach to generate some of its other estimates, making alternate assumptions about the average annual rate of pipe replacement and using different estimates of the national pipe inventory and the cost per foot.

Second, EPA's high-end estimate of investment costs for drinking water exceeds CBO's partly because EPA's estimate of 20-year nonpipe costs and the costs of recently promulgated and proposed regulations ($97.6 billion combined) is 25 percent higher than CBO's high-end estimate ($78.1 billion).[11] Both agencies based their estimates on figures from EPA's *1999 Drinking Water Infrastructure Needs Survey*. EPA adjusted those figures upward to compensate for the documented underreporting of 20-year nonpipe costs by medium-sized and large drinking water systems.[12] CBO agrees that some adjustment to the survey data is appropriate given the limitations of the reported figures;

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7. Data on the ages of pipes come from American Water Works Association, *Dawn of the Replacement Era: Reinvesting in Drinking Water Infrastructure* (May 2001).

8. When the time frame for the cost estimate is extended to 2029, the associated cost is $249 billion.

9. Environmental Protection Agency, Office of Drinking Water, *Drinking Water Infrastructure Needs Survey: Second Report to Congress*, EPA 816-R-01-004 (February 2001).

10. Stratus Consulting, *Infrastructure Needs for the Public Water Supply Sector* (report prepared for the American Water Works Association, December 22, 1998).

11. Nonpipe costs are those associated with infrastructure for water sources, treatment, and storage.

12. EPA increased the estimates for medium-sized and large systems by 49 percent on the basis of follow-up visits to 200 such systems after the initial drinking water needs survey in 1995. Because professional water system engineers conducted on-site inspections of small systems for the 1999 survey, EPA assumed that the figure for small systems did not need to be adjusted for underreporting.

many respondents, relying on planning documents covering one to 10 years, may have been unable to adequately document costs associated with investments slated for later in the 20-year period. The lack of such an adjustment in CBO's analysis lowers its estimate relative to EPA's.

Third, EPA does not allow for savings from increased efficiency in investment, but CBO does. CBO's high-end estimate reflects 5 percent savings attributable to factors such as asset management and innovative contracting for construction. Evidence of the potential impact of efficiency savings on investment costs comes from systems abroad as well as from domestic systems.[13]

Fourth, on the high end, EPA assumes that drinking water systems will use debt to finance only 35 percent of their investments from 2000 to 2019; in contrast, CBO assumes that systems will do more to defer 20-year costs, using debt to finance 70 percent of their investments.[14] As investment programs grow in size, systems aiming to keep rates low can reduce their use of pay-as-you-go financing in favor of borrowed funds; at present, systems undertaking large amounts of investment generally use debt financing for all but a small share (often just a few percent) of the total.[15]

Although EPA's $52 billion estimate of 20-year pipe costs is an outlier compared with other estimates, it is the only one based on actual data on the ages of pipes from multiple systems. Even though those data are drawn from a rather small sample of 20 systems, EPA asserts that the sample "likely represent[s] a broad range of systems of various ages from across the country." Accordingly, EPA's low-end estimate of drinking water systems' investment costs warrants serious consideration. Conversely, EPA's high-end estimate

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13. See Congressional Budget Office, *Future Investment in Drinking Water and Wastewater Infrastructure*, p. 22.

14. EPA's assumption of a 20-year repayment period, compared with CBO's 25-year repayment period, also contributes to its larger high-end estimate. Industry experts told CBO that maturities of water bonds have lengthened overall and that 30 years is now the standard term. For that reason, as well as others discussed on page 48 of CBO's report *Future Investment in Drinking Water and Wastewater Infrastructure*, CBO considers a 25-year repayment period to be an adequately pessimistic assumption for the average dollar borrowed over the 2000-2019 period.

15. Evidence from a 1999 survey of 76 privately owned drinking water systems (many belonging to the same parent companies) suggests that debt financing was used for 62 percent of construction spending. The systems reported total construction expenditures of $846 million and total gross cash flow from financing activities (before subtracting debt repayment and dividends) of $526 million (62.2 percent). Presumably, pay-as-you-go financing accounts for the remaining $320 million (37.8 percent). See National Association of Water Companies, *1999 Financial and Operating Data for Investor-Owned Water Utilities* (Washington, D.C.: NAWC, 2000).

of those costs may be too high. Adjusting CBO's high-end estimate for documented underreporting of nonpipe investment costs in the *Drinking Water Infrastructure Needs Survey* would boost it to $21.0 billion—still $2.8 billion lower than EPA's estimate ($56 billion lower over the 20-year projection period).[16] If EPA had incorporated efficiency savings and made an assumption that was more consistent with current practices about the extent to which drinking water systems would use debt financing for investments from 2000 to 2019, its high-end estimate would more closely match CBO's.

Wastewater

The agencies' low-end projections of investment costs for wastewater systems differ from estimated baseline expenditures by $3.1 billion (EPA) and $3.2 billion (CBO); however, EPA's low-end projection and its baseline estimate are higher than the corresponding estimates in CBO's analysis (*see the bottom panel of Figure 2 on page 6*). The agencies' high-end projections of the systems' increased costs differ from baseline expenditures to a greater degree; but in this case, although EPA's high-end projection exceeds CBO's by $1.8 billion, its estimate of baseline expenditures exceeds CBO's by $3.2 billion. As a result, EPA's high-end estimate of a $9.7 billion increase ($22.7 billion minus $13.0 billion) in expenditures is lower than CBO's high-end estimate of an $11.1 billion increase ($20.9 billion minus $9.8 billion). Over the 20-year period, EPA's estimate is $28 billion below CBO's.

EPA's and CBO's baseline estimates—the former's reflecting costs as financed in 1996 and the latter's reflecting costs as financed in 1999—differ primarily because EPA assumes that wastewater systems used much more debt financing in the years preceding 1996.[17] EPA assumes that 90 percent of nongrant expenditures from 1977 to 1996 were financed through debt. CBO assumes that 50 percent of nongrant expenditures in 1980 were debt financed, and it increases that figure by 1 percent each year so that debt financing

16. EPA's adjustment for underreporting increases by 30 percent the 20-year estimate of nonpipe costs and costs of recently promulgated and proposed regulations reported in the needs survey. Applying a 30 percent increase to CBO's $78.1 billion estimate of those costs and allowing for 5 percent efficiency savings yields an estimate of $96.5 billion (an $18.4 billion increase in CBO's high-end estimate of investment in drinking water infrastructure from 2000 to 2019, or an average annual increase of $0.9 billion).

17. The available data do not measure spending in terms of costs as financed. CBO uses data through 1999 from the Census Bureau's annual survey of state and local government finances; EPA uses data through 1996, noting that capital spending for wastewater infrastructure is relatively flat between 1973 and 1996 when measured in 2001 dollars.

accounts for 69 percent of nongrant expenditures in 1999.[18] Consequently, EPA's estimate of baseline expenditures reflects a much higher level of debt service associated with the investments undertaken in prior years. EPA asserts that wastewater systems have historically used debt to finance 90 percent of their capital stock. CBO's debt-financing assumptions are common to both its drinking water and wastewater analyses and build on two small surveys of water systems.[19] Given the dearth of data, it is difficult to determine the relative accuracy of the two approaches.

For its high-end projections, EPA's higher estimate of investment costs as financed is also driven by financing assumptions. Measured in terms of average annual investment resource costs rather than costs as financed, EPA's estimate ($22.5 billion) essentially matches CBO's ($22.3 billion).[20] When estimating costs as financed, however, EPA assumes higher debt service associated with pre-2000 investments (more than $6 billion annually from 2000 to 2019 compared with CBO's $4.3 billion) and a shorter repayment period (20 years compared with CBO's 25 years).[21]

On the low end, differences in financing assumptions are not as important in explaining EPA's higher estimate of investment costs as financed, for two reasons. First, both agencies assume repayment periods of 30 years. Second, the effect of EPA's higher debt-service payments associated with pre-2000 investments is countered by its lower pay-as-you-go costs associated with investments from 2000 to 2019. Instead, the primary reason that EPA's estimate is higher than CBO's is that it does not allow for savings from

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18. CBO's assumption that debt financing has risen over time is broadly consistent with industry experts' reports that systems undertaking large amounts of investment place more emphasis on debt financing.

19. Two surveys, both conducted in 1999, provide information on the level of debt financing used by drinking water and wastewater systems, respectively. As described in an earlier footnote, data reported by privately owned drinking water systems suggest a 1999 level of debt financing of 62 percent. A survey of medium-sized and large wastewater systems conducted by the Association of Metropolitan Sewerage Agencies reports data consistent with a 1999 level of debt financing of 46 percent to 53 percent. See Association of Metropolitan Sewerage Agencies, *The AMSA Financial Survey, 1999: A National Survey of Municipal Wastewater Management Financing and Trends* (Washington, D.C.: AMSA, 1999); and Congressional Budget Office, *Future Investment in Drinking Water and Wastewater Infrastructure*, p. 48, footnote 7.

20. Resource costs reflect the capital costs of all investments, whether financed by borrowing or paid from funds on hand, omitting interest payments on bonds and loans (which represent transfers of funds rather than real economic resources associated with the investments).

21. See Environmental Protection Agency, *The Clean Water and Drinking Water Infrastructure Gap Analysis*, p. 23.

increased efficiency in investment. CBO's estimate reflects efficiency savings of 15 percent.[22]

Ultimately, EPA's estimates of the increase in investment costs for wastewater infrastructure from 2000 to 2019 are neither better nor worse than CBO's. EPA's estimates of baseline investment and the associated future cost of debt service on pre-2000 investments cannot be deemed more or less credible than CBO's on the basis of information currently available. If CBO adopted EPA's assumptions for those factors, its high-end estimate of the increase would fall to a level similar to EPA's and its low-end estimate of the increase would fall below the current estimates because of the effect of efficiency savings.[23]

Operations and Maintenance Costs from 2000 to 2019

EPA's and CBO's high-end projections of total O&M costs differ dramatically (*see Figure 3*).[24] EPA's $36.2 billion estimate ($82 billion minus $45.8 billion) of the increase in costs doubles CBO's $18.1 billion estimate ($57 billion minus $38.9 billion), resulting

22. The two estimates (both of which calculate the costs of replacing existing wastewater infrastructure using annual data on the net capital stock and an assumed depreciation rate) also differ in that EPA assumes a higher annual depreciation rate (2.9 percent compared with CBO's 2.7 percent), yielding higher costs for replacement needs. That effect is neutralized, however, by differences in the adjustments that EPA and CBO make to avoid double-counting replacement investments captured in the *Clean Water Needs Survey* (Environmental Protection Agency, Office of Water, *1996 Clean Water Needs Survey: Report to Congress*, EPA 832-R-97-003, September 1997). EPA assumes that the share of investments reported in the needs survey that represents replacement of existing capital (and thus is already reflected in the depreciation calculation) is 31 percent; CBO assumes a share of only 25 percent. For the high-end estimates, EPA also omits efficiency savings (CBO assumes 5 percent savings) and assumes a higher depreciation rate (4.0 percent compared with CBO's 3.3 percent), but both of those influences are essentially balanced by EPA's assumption that 10 percent of investments reported in the needs survey have otherwise been accounted for (compared with CBO's 15 percent) and that average annual costs of controlling combined sewer overflows are $2.5 billion (compared with CBO's $5.4 billion).

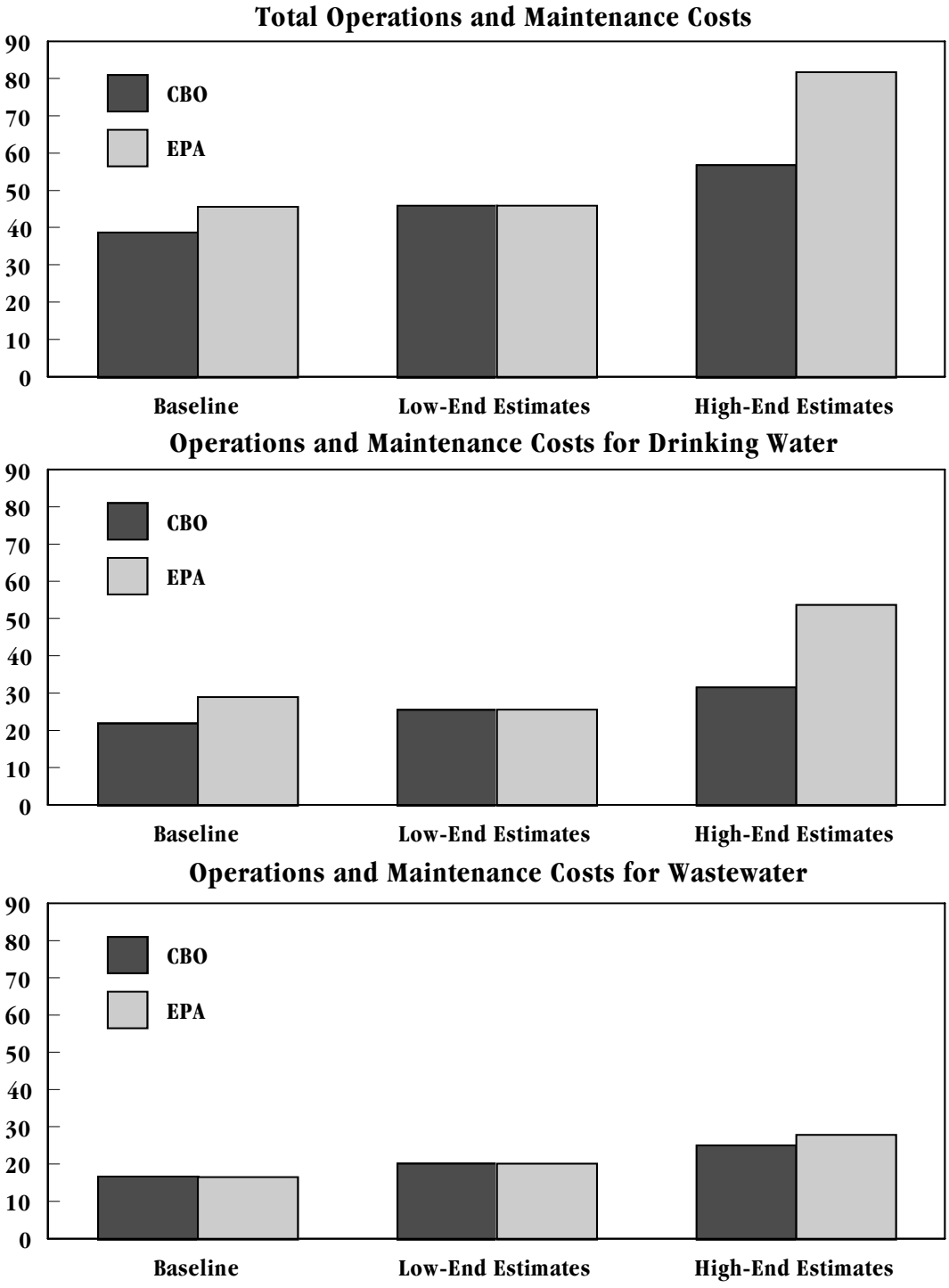
23. Conversely, if EPA adopted CBO's assumptions, its high-end estimate of the increase would rise to a level similar to CBO's and its low-end estimate would climb above the current estimates, given EPA's pessimistic assumption that systems cannot expect to realize any savings from increased efficiency in investment.

24. At the low end, EPA's estimate of O&M costs from 2000 to 2019 matches CBO's. Different estimates of baseline expenditures result in low-end projections of the increase in O&M equal to $0.3 billion ($46.1 billion minus $45.8 billion) for EPA and $7.1 billion ($46.1 billion minus $38.9 billion) for CBO.

Figure 3.

Operations and Maintenance Costs for Drinking Water and Wastewater

(Average annual costs in billions of 2001 dollars)



Source: Congressional Budget Office.

in a $362 billion difference over the 20-year period. Almost all of that difference—88 percent—is found on the drinking water side.

CBO's and EPA's baseline drinking water estimates vary because the two agencies make different adjustments to compensate for the fact that the underlying data do not reflect spending by private drinking water systems. EPA scales the underlying data up by 33.3 percent, reflecting information from the November 1998 "Regulatory Impacts Analysis of the Stage 1 Disinfection By-Products Rulemaking," a peer-reviewed document. CBO uses a figure of 15 percent, in keeping with conventional wisdom and data from the responses recorded in EPA's *Community Water System Survey*.[25]

The dramatic gap between the agencies' high-end projections of drinking water O&M is attributable to EPA's assumption in this scenario that the investment profile from 2000 to 2019 is front-loaded (rather than distributed more evenly over the 20-year period). Using the distinction between current and future needs identified in the *1999 Drinking Water Infrastructure Needs Survey*, EPA chose to assign 25 percent of current pipe and nonpipe needs to each year in the 2000-2003 period, 20 percent of the costs of complying with recently promulgated or proposed regulations to each year in the 2000-2004 period, and 6.25 percent of future pipe and nonpipe needs to each year in the 2004-2019 period. Thus, most of the new investment in drinking water occurs from 2000 to 2004 under that scenario. Together with EPA's use of the historical relationship between O&M spending and the capital stock as the basis for projecting future costs, the agency forecasts high O&M costs throughout the period as a by-product of the early increase in the capital stock. Although it is plausible that the amount of O&M is related to the size of the capital stock, EPA's use of the historical relationship between the two, in combination with a large amount of early investment, sharply increases its O&M estimate. CBO's approach

25. Environmental Protection Agency, Office of Water, *Community Water System Survey*, vol. 1, EPA 815-R-97-001a (January 1997). EPA and CBO made the same adjustments in their analyses of baseline investment in drinking water infrastructure. In the case of investment costs, however, EPA also scaled down the underlying data by 20 percent to compensate for spending that was ineligible for support from the drinking water state revolving fund (SRF). Netting out spending to serve future growth is appropriate in the capital investment analysis but not the O&M analysis. EPA's net increase in the underlying data (13.3 percent) resulted in an adjustment similar to CBO's 15 percent increase. Although CBO agrees, in principle, that the data should be adjusted downward to omit investments that serve future growth, it did not make such an adjustment because there was no reliable way to determine an appropriate value. EPA admits it has little confidence in its value of 20 percent, which was based on a review of only 20 capital improvement plans; further, in those plans, systems may have creatively labeled investment needs to encourage boards to approve them—making them appear ineligible for SRF assistance when, in fact, they were eligible.

(a simple linear extrapolation of estimated real O&M spending from 1980 to 1998, which explains 99 percent of the variation from the means) might understate the uncertainty surrounding O&M costs by failing to capture some ways in which the future could differ from the past (tighter effluent standards could raise O&M costs more quickly, for example). Nevertheless, EPA's high-end estimate is probably too high.