DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY
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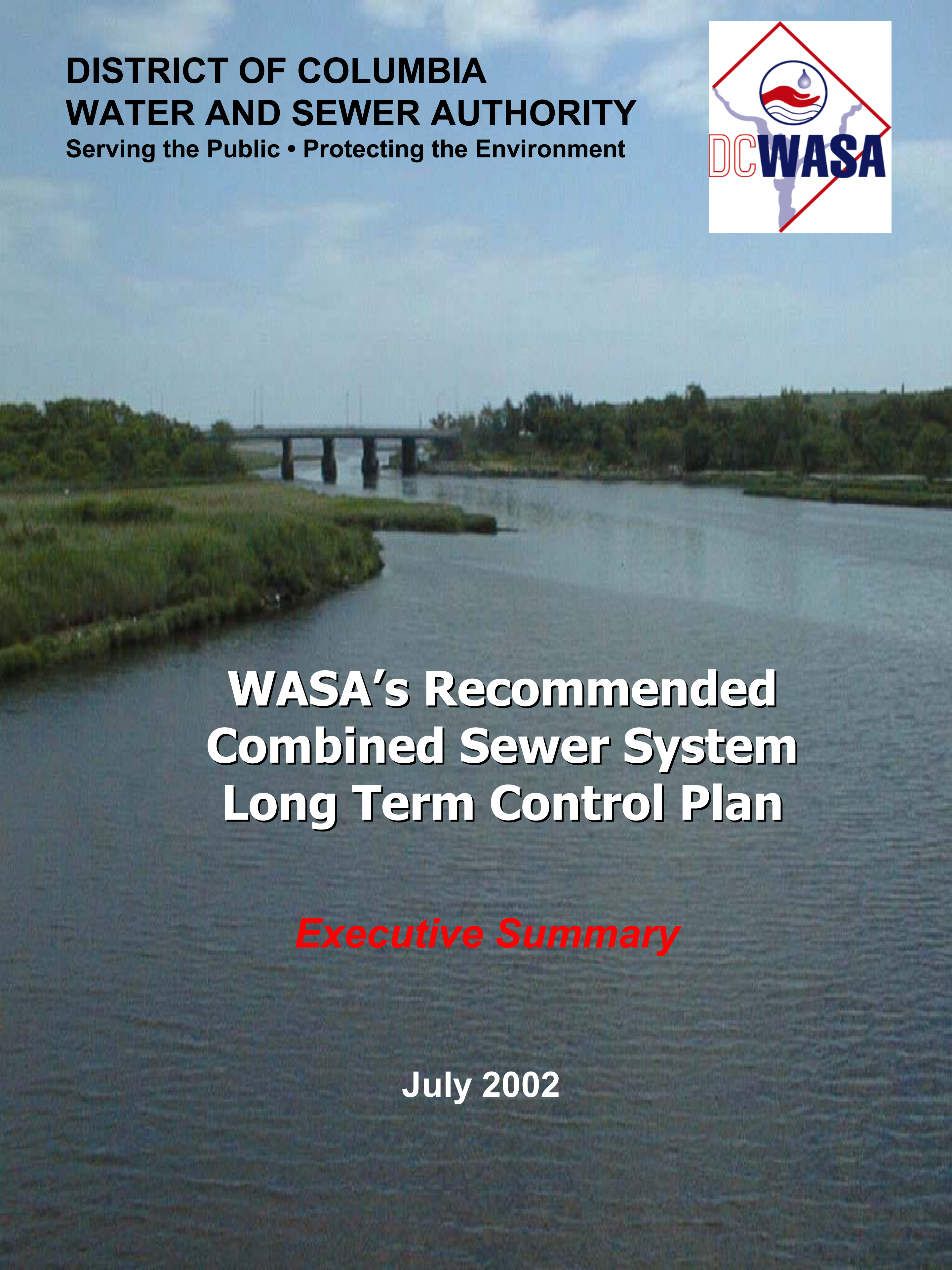


WASA's Recommended Combined Sewer System Long Term Control Plan

Executive Summary

July 2002

Executive Summary

1. PURPOSE

The District of Columbia Water and Sewer Authority (WASA or Authority) has prepared this report to describe the development and selection of the plan for controlling combined sewer overflows (CSOs) in the District of Columbia. The plan for controlling CSOs is called a Long Term Control Plan or LTCP.

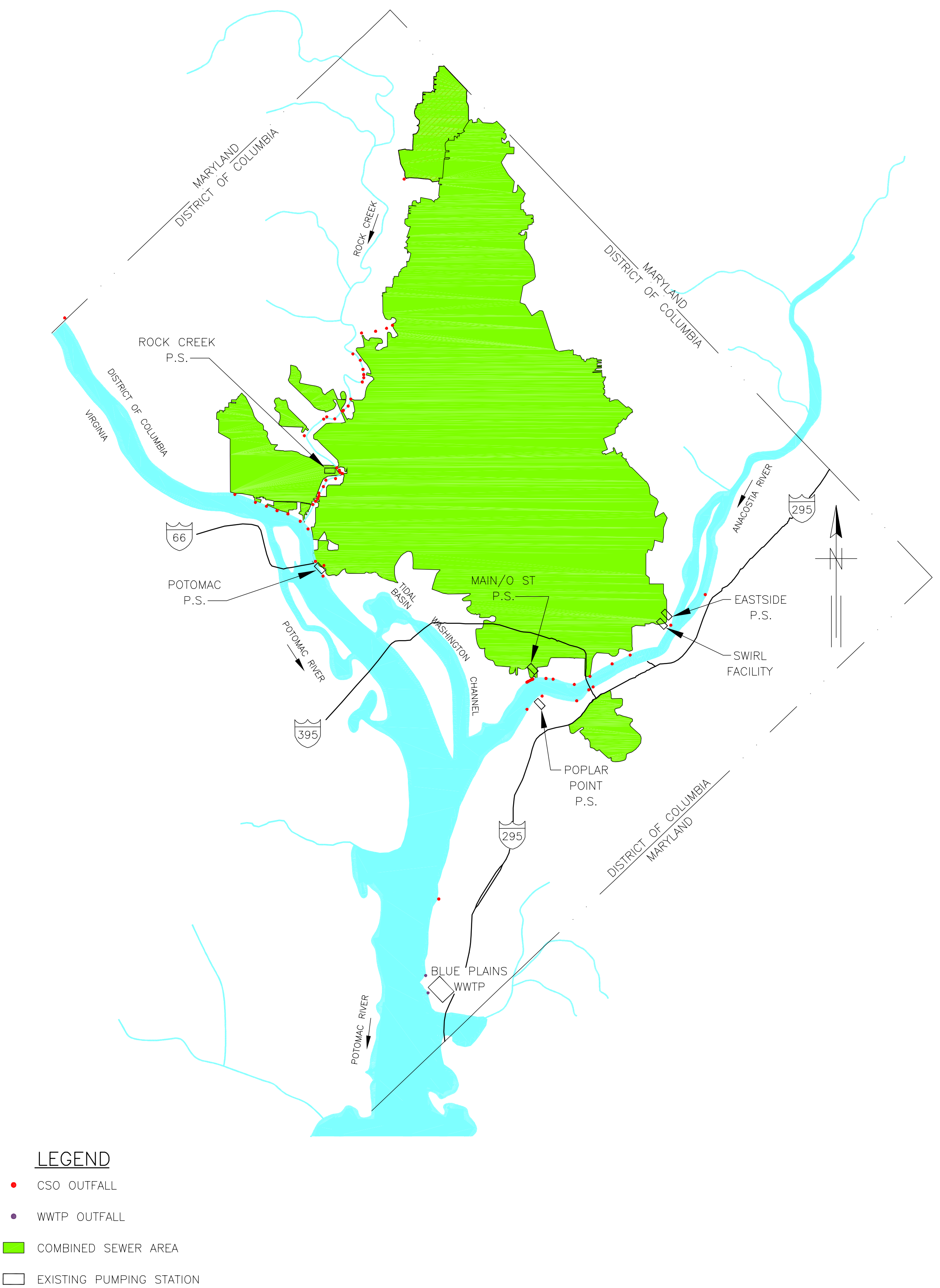
In June 2001, WASA submitted a Draft LTCP to regulatory agencies and the public for review and comment. An extensive public outreach and comment period followed in the summer and autumn of 2001. This report presents the proposed Final LTCP. It has been developed taking into consideration regulatory agency comments, public comments, and additional water quality standard and total maximum daily load (TMDL) requirements.

2. BACKGROUND

Like many older cities in the United States, the sewer system in the District is comprised of both combined sewers and separate sanitary sewers. A combined sewer carries both sewage and runoff from storms. Modern practice is to build separate sewers for sewage and storm water, and no new combined sewers have been built in the District since the early 1900's. Approximately one-third of the District (12,478 acres) is served by combined sewers. The majority of the area served by combined sewers is in the older developed sections of the District. The combined sewer area is shown on Figure ES-1.

In the combined sewer system, sewage from homes and businesses during dry weather conditions is conveyed to the District of Columbia Wastewater Treatment Plant at Blue Plains, which is located in the southwestern part of the District on the east bank of the Potomac River. There, the wastewater is treated to remove pollutants before being discharged to the Potomac River. When the capacity of a combined sewer is exceeded during storms, the excess flow, which is a mixture of sewage and storm water runoff, is discharged to the Anacostia and Potomac Rivers, Rock Creek and tributary waters. The excess flow is called Combined Sewer Overflow (CSO). There are a total of 60 CSO outfalls in the combined sewer system listed in the National Pollutant Discharge Elimination System (NPDES) Permit issued by the Environmental Protection Agency (EPA) to WASA.

Discharges of CSOs can adversely impact the quality of the receiving waters. The primary purpose of the LTCP is to control CSOs such that water quality standards are met. In the District of Columbia water quality standards, the designated use of the Anacostia River, Potomac River and Rock Creek is Class A or suitable for primary contact recreation. Because the water quality in the receiving waters currently does not meet these standards much of the time, the actual use of the water body is Class B or suitable for secondary contact recreation and aquatic enjoyment. In recognition of



COMBINED SEWER AREA

SCALE: 1"=10,000'

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FILE: J:\1160\DWGS\LTCP\FINAL-LTCP\EXFFES-1 1:1 07/01/02 10:04 GH-G this condition, District law prohibits primary contact recreation such as swimming in each of the receiving waters.

Information collected to develop the LTCP demonstrates that water quality is affected by many sources other than CSOs, including storm water, upstream sources outside of the District, and in the Anacostia River by the sediments in the bottom of the river. While the LTCP is only required to address CSOs, WASA has considered these other sources to identify the impact of CSOs as compared to other sources of pollution. This will assist in developing a watershed-based approach to improving water quality beyond the CSO control described in the LTCP.

3. EXISTING CONDITIONS

In order to assess the impact of CSO control on receiving water quality, computer models of the combined sewer system, separate storm water system and of Rock Creek were developed. In addition, existing computer models of the Anacostia River and the Potomac River were adapted for use in the study. The computer models were calibrated based on historical data and on 9 to 12 months of monitoring data collected in the receiving waters, the combined sewer system, CSOs and in the separate storm water system.

In accordance with EPA guidelines, CSO planning was based on "average year" conditions. The rainfall in the period 1988-1990 was selected as representative of average conditions based on review of 50 years of rainfall data at Ronald Reagan National Airport. The representative three-year period contains a relatively wet year, a dry year and an average year. Average year conditions are defined as the arithmetic average of the predictions for years 1988, 1989 and 1990. In the process of developing the Final LTCP, other rainfall conditions such as the 1-year and 5-year design storms were also investigated.

Using the combined sewer system model, CSO overflow volumes and frequencies were predicted for existing conditions in the average year. The predicted CSO overflow volumes for the average year conditions are shown on Table ES-1.

Table ES-1
Existing Conditions: Annual CSO Overflow Predictions for Average Year

Item	*Anacostia River*	*Potomac River*	*Rock Creek*	*Total System*
CSO Overflow Volume (million gallons/yr)				
No Phase I Controls (prior to 1991)	2,142	1,063	49	3,254
With Phase I Controls (after 1991)	1,485	953	52	2,490
Number of Overflows/yr				
No Phase I Controls (prior to 1991)	82	74	30	-
With Phase I Controls (after 1991)	75	74	30	-

The Phase I CSO controls consist of in-system storage devices called inflatable dams and a CSO treatment system called the Northeast Boundary Swirl Facility. These controls were completed in 1991. As of the writing of this report, certain inflatable dams are not functional and are in the process of being replaced.

Using the predicted pollutant loads from the combined sewer system, separate storm water system and the upstream boundary, the water quality in each receiving water was predicted for average year conditions. The following summarizes the characteristics of each receiving water:

Anacostia River - The Anacostia River is a relatively stagnant water body with a long residence time that is significantly affected by the tide. Both dissolved oxygen and bacteria concentrations are problems. Low dissolved oxygen levels typically occur in the summer months of June to August and typically follow a significant local or upstream wet weather event. The low dissolved oxygen is driven by the naturally low saturation level of oxygen in the water due to the high water temperature and the influx of pollutant loads from wet weather events. The sluggish nature of the river does not allow effective re-aeration, contributing to the low dissolved oxygen. In addition to direct loads of oxygen consuming pollutants from CSO, storm water, and the upstream boundary, the sediments in the Anacostia River are known to exert a substantial oxygen demand. Dissolved oxygen levels below 2.0 mg/L can occur several times per summer month, with each episode lasting 1 to 2 days. Fish kills have been observed in the past under these conditions. Bacteria concentrations (fecal coliform) are relatively high and are predicted to exceed the Class A monthly standard for the majority of the average year. In addition to CSO, bacterial pollution from storm water and the upstream boundary are significant.

Rock Creek - Rock Creek is a free-flowing stream that is unaffected by the tide for the majority of its length. The stream is naturally aerated by turbulence as it flows over the irregular bottom of the creek bed. There is no evidence of low dissolved oxygen problems in Rock Creek and bacteriological concentrations are the primary concern. Bacteria (fecal coliform) concentrations in Rock Creek are predicted to be above the Class A monthly standard every month in the average year under existing conditions. The majority of the load comes from storm water and upstream sources. The volume of water in Rock Creek in any particular reach is relatively small. As a result, it is not able to absorb significant wet weather loads without causing relatively high bacteria concentrations in the creek. The free-flowing nature of the creek causes relatively short residence time of wet weather pollution.

Potomac River - The water quality of the Potomac River is much better than that in the Anacostia River or Rock Creek. This is due both to the low pollutant loads and the size and assimilative capacity of the river. In the upstream reaches of the river from the Memorial Bridge to Georgetown, the Class A bacteria standard is only predicted to be exceeded one month out of the year by a relatively small amount. Downstream of the Memorial Bridge, no exceedances are predicted on a monthly basis. Low oxygen is not a significant problem in the Potomac River.

4. ALTERNATIVES EVALUATION

A wide range of technologies was considered to control CSOs. The technologies are grouped into the following general categories:

- Source Controls– such as public education, a higher level of street sweeping, additional construction site controls, more frequent catch basin cleaning, garbage disposal bans and combined sewer flushing;
- Inflow Controls – such as Low Impact Development-Retrofit, rooftop greening, storm water treatment, street storage of storm water, rain leader disconnections, extending storm sewers to receiving waters;
- Sewer System Optimization - such as real time control, storing combined sewage in existing sewers, revision to facility operations;
- Sewer Separation – such as partial or complete separation;
- Storage Technologies – such as retention basins and tunnels;
- Treatment Technologies - such as screening, sedimentation, high rate physical chemical treatment, swirl concentrators and disinfection;
- Receiving Water Improvement – such as aeration and flow augmentation

Each technology was evaluated for its ability to reduce CSO volume and the pollutants in CSO. After the initial screening, groups of technologies were assembled into control plans for each receiving water. The alternatives were evaluated against the following criteria:

- Regulatory Compliance – Ability to meet the EPA CSO Policy which is now part of the Clean Water Act, D.C. Water Quality Standards, WASA's National Pollutant Discharge Elimination System (NPDES) Permit and the total maximum daily load (TMDL) allocations for the Anacostia River for dissolved oxygen (biochemical oxygen demand or BOD) and water clarity (total suspended solids or TSS).
- Cost effectiveness – Ability to achieve the greatest benefit at the lowest reasonable cost.
- Northeast Boundary Flooding – Ability to relieve street flooding and basement sewer back-ups from the combined sewer system in the Northeast Boundary area.
- Non-monetary factors – Implementability, operational complexity, ability to upgrade and other non-monetary factors.
- Public Acceptance – Responsiveness to public comments.

In accordance with EPA guidelines, each alternative was configured and evaluated to reduce CSO overflows to between zero and 12 events per average year. Note that control plans which achieve zero overflows for all storms in the 1988-1990 analysis period would not eliminate overflows under all conditions. Rainfall conditions more severe than those represented in the three-year analysis period will occur and can cause CSO events. For that reason, complete sewer separation that would achieve zero CSO overflows under all conditions was also evaluated. In response to public comments, control plans were also developed for various return frequency design storms such as the 1-year, 2-year and 5-year storms. Costs, CSO overflow volume reductions, and benefits to receiving waters were evaluated for each level of CSO control.

5. PUBLIC PARTICIPATION

WASA conducted an extensive public participation program designed to educate the affected public and to obtain their input and consultation in selecting the long term CSO controls. The public participation process included public meetings, establishment of a Stakeholder Advisory Panel, and an elaborate public information process. Four public meetings have been held to educate the public and to obtain feedback about CSO issues. At the request of the public during the first public meeting, a Stakeholder Advisory Panel was formed. The panel consisted of representatives from government agencies, regulatory agencies, citizens' groups, and environmental advocacy groups that are concerned about water quality issues within the District. Twelve Panel meetings were held during development of the LTCP.

In addition, the public outreach program included educational mailers in water and sewer bills, establishment of a CSO website, creation of a CSO mailing list, informational CSO newsletters, and establishment of public information depositories.

After release of the Draft LTCP, nine neighborhood meeting were held throughout the District to explain the program and obtain public comments. The D.C. Council and WASA held public hearings on the plan. Informational mailers, WASA's website and presentations to interested groups were also used to obtain input on plan. The Draft LTCP was well publicized and members of the public provided thoughtful comments. Over 2,300 comments were received on the Draft LTCP.

6. RECOMMENDED PLAN

WASA is committed to improving the quality of the Anacostia River, Rock Creek, and the Potomac River. The recommended LTCP has been selected to provide a significant improvement in the quality of each receiving water while balancing the affordability to ratepayers. The recommended LTCP consists of many elements and program components. Table ES-2 lists the components by receiving water. Figure ES-2 shows the location of the principal elements.

Table ES-2

Recommended Control Program Elements and Estimated Costs

Component	*Capital Cost Opinion (Millions, ENR=6383)*	*Annual Operation and Maintenance (Millions, ENR=6383)*
System Wide		
Low Impact Development – Retrofit (LID-R)– Advocate implementation of LID-R throughout entire District. Provide technical and regulatory assistance to District Government. Implement LID-R projects on WASA facilities where feasible.	$3	$0.11
Anacostia River		
Rehabilitate Pumping Stations – Rehabilitate existing pumping stations as follows: • Interim improvements at Main and 'O' Street Pumping Stations necessary for reliable operation until rehabilitation of stations is performed. • Rehabilitate Main Pumping Station to 240 mgd firm sanitary capacity. Screening facilities for firm sanitary pumping capacity only. • Rehabilitate Eastside and 'O' Street Pumping stations to 45 mgd firm sanitary capacity • Interim improvements at existing Poplar Point Pumping Station necessary for reliable operation until replacement pumping station is constructed as part of storage tunnel	$115	$0[1]
Storage Tunnel from Poplar Point to Northeast Boundary Outfall – 49 million gallon storage tunnel between Poplar Point and Northeast Boundary. Tunnel will intercept CSOs 009 through 019 on the west side of the Anacostia. Project includes new tunnel dewatering pump station and low lift pumping station at Poplar Point.	$332	$7.98
Storage/Conveyance Tunnel Parallel to Northeast Boundary Sewer – 77 million gallon storage/conveyance tunnel parallel to the Northeast Boundary Sewer. Also includes side tunnels from main tunnel along West Virginia and Mt. Olivet Avenues, NE and Rhode Island and 4th St NE to relieve flooding. Abandon Northeast Boundary Swirl Facility upon completion of main tunnel.	$452	
Outfall Consolidation – Consolidate the following CSOs in the Anacostia Marina area: CSO 016, 017 and 018	$27	$0[1]
Separate CSO 006 – Separate this CSO in the Fort Stanton Drainage Area	$3	$0.01
Ft Stanton Interceptor – Pipeline from Fort Stanton to Poplar Point to convey CSO 005, 006 and 007 on the east side of the Anacostia to the storage tunnel.	$11	$0.04
Anacostia Subtotal	**$940**	**$8.03**
Rock Creek		
Separate Luzon Valley – Completed in 2002.	Completed	$0
Separation – Separate CSOs 031, 037, 053, and 058.	$5	$0.02
Monitoring at CSO 033, 036, 047 and 057 – Conduct monitoring to confirm prediction of overflows. If overflows confirmed, then perform the following: • Regulator Improvements: Improve regulators for CSO 033, 036, 047 and 057 • Connection to Potomac Storage Tunnel: Relieve Rock Creek Main Interceptor to proposed Potomac Storage Tunnel when it is constructed	$3	$0.01

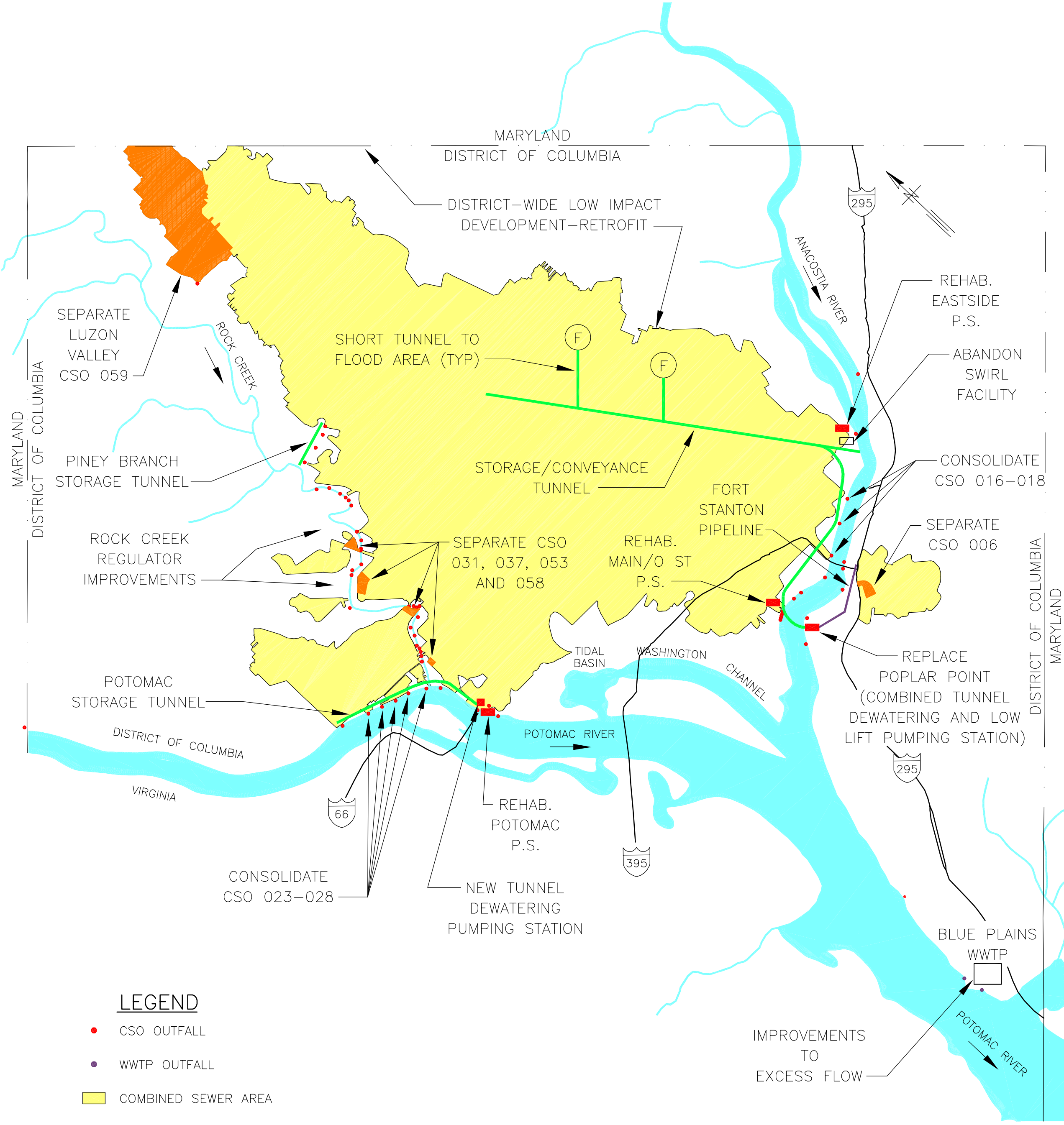
Component	*Capital Cost Opinion (Millions, ENR=6383)*	*Annual Operation and Maintenance (Millions, ENR=6383)*
Storage Tunnel for Piney Branch (CSO 049) – 9.5 million gallon storage tunnel	$42	$0.60
Rock Creek Subtotal	**$50**	**$0.63**
Potomac River		
Rehabilitate Potomac Pumping Station – Rehabilitate station to firm 460 mgd pumping capacity	$12	$0[1]
Outfall Consolidation – Consolidate CSOs 023 through 028 in the Georgetown Waterfront Area.	$20	$0[1]
Potomac Storage Tunnel – 58 million gallon storage tunnel from Georgetown to Potomac Pumping Station. Includes tunnel dewatering pumping station.	$218	$2.78
Potomac River Subtotal	**$250**	**$2.78**
Blue Plains Wastewater Treatment Plant		
Excess Flow Treatment Improvements – Four new primary clarifiers, improvements to excess flow treatment control and operations	$22	$1.81
Grand Total	**$1,265**	**$13.36**

Notes:
1. No significant change from existing.

The principal components of the control program are described below, while detailed recommendations are included in Section 13 of this report.

System Wide Controls - WASA recommends the implementation of Low Impact Development Retrofit (LID-R) in the District. In addition to reducing CSOs, LID-R also has ancillary benefits such as reducing storm water volume and pollutant concentrations, reducing cooling costs and increasing aesthetic value. Reduction of storm water pollution is a part of the District's storm water management efforts as part of its Municipal Separate Storm Sewer (MS4) Permit. Since WASA does not control development or redevelopment in the District, WASA cannot mandate application of LID-R. WASA will, however, incorporate LID-R techniques into new construction or reconstruction on WASA facilities where applicable, and will act as an advocate for LID-R in the District. In addition, WASA recommends that the District Government develop and adopt the necessary laws and regulations to enable implementation of LID-R. Detailed recommendations are included in Section 13 of this report.

In addition to these, WASA looks forward to participating in a partnership with others to investigate the feasibility of apply LID-R in an urban setting. Possible goals of the partnership would be to demonstrate and evaluate LID-R effectiveness on a sewershed basis, establish design, construction and performance standards, assess costs, and determine practicality. Given the Federal Government's role in the District and its interest is identifying techniques that could be applied elsewhere, a significant Federal participation in such a partnership would be appropriate.



LEGEND

- CSO OUTFALL
- WWTP OUTFALL
- COMBINED SEWER AREA
- COMBINED SEWER AREA TO BE SEPARATED
- EXISTING PUMPING STATION
- NEW PUMPING STATION OR MODIFIED EXISTING PUMPING STATION
- NEW TUNNEL
- NEW PIPELINE
- F FLOOD AREA

RECOMMENDED CONTROL PROGRAM

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WASA would also be willing to participate in a watershed forum or planning group, with a Federal presence, to address pollution in the watershed. The LTCP has identified that storm water is one of the major pollution sources for all of the urban watersheds. Storm water pollution is a common concern of the District, Virginia and Maryland. This could serve as a catalyst to create the forum and to strive for solutions.

Anacostia River Components - The control measures selected for the Anacostia River are predicted to limit overflows to two events per average year. During the three year analysis period (1988-1990), the frequency of overflow ranged from one per year to three per year for dry and wet years, respectively. The controls were selected to make maximum use of existing facilities and to provide supplemental storage via a tunnel to control overflows. Major elements of the controls include the rehabilitation of Main, 'O' Street, and Eastside pumping stations, separation of a CSO on the east side of the Anacostia River, construction of a storage/conveyance tunnel from Poplar Point to Northeast Boundary and construction of a pipeline from Fort Stanton to Poplar Point to address the remaining CSOs on the east side of the Anacostia. An additional leg of the tunnel will be constructed parallel to the Northeast Boundary Sewer and to several low lying areas to provide additional storage for CSO and to relieve street and basement flooding in the Northeast Boundary area. The existing Poplar Point Pumping Station will be replaced by a new facility located at the end of the tunnel that both dewaters the tunnel and replaces the function of the existing pumping station. In addition three CSOs on the west side of the River near the marinas will be consolidated to eliminate their impacts to this area of the River. One CSO on the east side of the river will be eliminated by separation. Once the tunnel is operational, the Northeast Boundary Swirl Facility will be abandoned.

Rock Creek Components - The control measures selected for Rock Creek are predicted to limit Piney Branch overflows to one per average year. At Piney Branch, the frequency of overflow ranged from zero per year to two per year for dry and wet years, respectively, during the three-year analysis period. The remaining overflows in Rock Creek will be controlled to 4 events per average year. For these overflows, the frequency of overflow ranged from one per year to six per year for dry and wet years, respectively, during the three year analysis period. The principal control measures include separation of four CSOs, construction of a storage tunnel at Piney Branch, and monitoring and regulator improvements to four CSOs south of Piney Branch.

Potomac River Components - The control measures selected for the Potomac River are predicted to limit overflows to four events per average year. During the three year analysis period, the frequency of overflow ranged from zero per year to five per year for dry and wet years, respectively. The principal control measures include rehabilitation of the Potomac Pumping Station and construction of a storage tunnel from west of the Key Bridge, along the Potomac River waterfront parallel to Georgetown, and terminating at Potomac Pumping Station. The tunnel will intercept the Georgetown CSOs and the large CSOs downstream of Rock Creek. A new pumping station would be constructed at Potomac Pump Station to dewater the tunnel. In addition, the LTCP will consolidate and close all CSOs between the Key Bridge and Rock Creek to remove the impact of these CSOs from the Georgetown waterfront area.

Blue Plains Wastewater Treatment Plant (BPWWTP) Components – BPWWTP has an existing excess flow treatment system designed to provide screening, grit removal, primary treatment, and disinfection to storm flows up to 336 mgd. Improvements to the excess flow treatment train are recommended to improve performance and reliability. These improvements consist of the addition of four new clarifiers and appurtenant weir and control system improvements. In addition, the BPWWTP conducts voluntary denitrification in accordance with the Chesapeake Bay Agreement. The plant uses the existing nitrification reactors to conduct both nitrification and denitrification. Nitrification capacity was reduced to the first four stages of the reactor, to accommodate denitrification in the last stage. This approach to denitrification utilizes one facility for two processes. There are difficulties in conducting denitrification under all conditions of flow, load and temperature. This was shown to be the case when implementation of nitrogen removal was negotiated with regulatory agencies. Experience with the full scale facility has shown that the denitrification process produces poorly settling solids which contribute to solids washouts and blinding of the effluent filters at high flow rates. This is due to attempting to treat high flows during storm events simultaneously with nitrification-denitrification using the same tankage, particularly during cold weather. Based on this experience, it appears that BPWWTP will not be able to reliably denitrify under high flow conditions. Because the Chesapeake Bay Program is considering revised nitrogen limits for the Bay, future NPDES permits may require nitrogen removal at Blue Plains to an effluent concentration as low as 3 mg/L. Chesapeake Bay Program Goals may thus dictate nitrogen removal requirements at the plant, and further measures should be based on the final outcome of the Bay Program. No costs for additional nitrogen removal are included in the LTCP.

The selected CSO control program is expected to greatly reduce the frequency and volume of CSO overflows. Table ES-3 illustrates the reduction in overflows.

Table ES-3
CSO Overflow Reduction of Recommended CSO Plan (Average Year)

Item	*Anacostia River*	*Potomac River*	*Rock Creek*	*Total System*	*% Capture of Combined Sewage per CSO Policy*
CSO Overflow Volume (mg/yr)					
No Phase I Controls	2,142	1,063	49	3,254	76%
With Phase I Controls	1,485	953	52	2,490	82%
Recommended Plan	*54*	*79*	*5*	*138*	*99%*
% Reduction from No Phase I Controls	97.5%	92.5%	89.8%	95.8%	-
Number of Overflows/yr					
No Phase I Controls	82	74	30	-	-
With Phase I Controls	75	74	30	-	-
Recommended Plan	*2*	*4*	*1 / 4*[1]	-	-

Notes: 1. One at Piney Branch, four at the other Rock Creek CSOs.

In addition to demonstrating reductions in overflows from current levels, EPA's CSO Policy calls for calculating the percentage of combined sewage that is captured for treatment in the combined sewer system. The percentage of capture without the Phase I CSO controls is already very high at 76%, primarily due to the ability of BPWWTP to treat high flows during wet weather events. With implementation of the recommended LTCP, the CSO capture rate is predicted to be 99% on a system wide, annual average basis. This is extremely high when compared to EPA's guideline of 85% capture under the presumptive approach as described in Section 2 of this report.

The following are findings regarding the impact of the recommended LTCP on water quality:

- Bacteria conditions are a problem in all three receiving waters. CSO control will significantly reduce the concentrations of bacteria, but will not result in conditions in the river that meet water quality standards all the time because of pollution from storm water and upstream sources. Control of other sources coupled with CSO control is required to meet current water quality standards

- Elimination (by separation) of combined sewer discharges to the receiving waters is not economically feasible for the District and has numerous drawbacks, including the disruption associated with constructing essentially a new sewer system for one-third of the District. The recommended plan is predicted to provide better water quality than separation. This is due to the large amount of storm water that is collected in the combined sewer system and treated prior to discharge. Note that CSO control alternatives which allow zero overflows in the three year analysis period (1988-1990) were also analyzed. These alternatives still allow overflows under more extreme climate conditions not represented in the three year analysis period. These items are discussed in more detail in Sections 8 and 9.

- Significant sources of bacteria are found in storm water runoff and in water entering the District from upstream sources. Cost-effective and reliable technical programs to reduce these pollution sources to the degree required to meet current water quality standards may not be available for the foreseeable future.

- The recommended plan for CSO control will meet the geometric mean bacteria standard in all receiving waters. Initial discussions with the D.C. Department of Health indicate it will also meet the fecal coliform TMDL which is expected to be promulgated for all receiving waters.

- CSO control will improve the dissolved oxygen levels in the Anacostia River. However, CSO control alone will not allow the dissolved oxygen standard to be met and will not prevent the dissolved oxygen from dropping below the level where fish kills are possible. Control of storm water and upstream sources are required to achieve this standard.

- The recommended control plan will virtually eliminate solids and floatables from the combined sewer system because the majority of CSOs will be captured and treated. For storms which are beyond the capacity of the proposed control system, the first flush of CSO which contains the vast majority of solids and floatables will be captured and treated. Overflows from the proposed control system will typically occur near the end of extreme storm events after most of the solids and floatables have been washed from the streets and captured by the control facilities. After implementation of the recommended plan, a large amount of trash may still be present due to sources other than CSO. Control of these other sources in a watershed-based approach is recommended.

7. COMPARISON OF FINAL LTCP TO DRAFT LTCP

The Final LTCP described in this report represents a major increase in CSO control over the Draft LTCP that was released in June 2001. In developing the Final LTCP, consideration was given to public and regulatory agency comments, the CSO Policy, the need to meet D.C. water quality standards, and existing and prospective TMDLs for the receiving waters. Particular attention was paid to separation, outfall elimination, low impact development and increasing the level of CSO control. Major advances in each of these categories have been made. The Final LTCP is compared to the Draft in Table ES-4.

Table ES-4
Comparison of Final and Draft LTCPs

Item	*Draft LTCP*	*Final LTCP*
No. CSO Overflows/Avg. Year		
Anacostia	4	2
Potomac	12	4
Rock Creek at Piney Branch	4	1
Rock Creek – other outfalls	4	4
CSO Overflow Volume (mg/avg yr)		
Anacostia	93	54
Potomac	153	79
Rock Creek	13	5
Total	259	138
% Reduction From Existing	92%	96%
% Reduction on Anacostia	96%	98%
System Characteristics		
CSO Storage Volume (mg)	147	193
No of CSO Outfalls	60	46
Water Quality Criteria		
Meets Oxygen and Bacteria Water Quality Standard for Design Condition?	Yes	Yes
Meets Anacostia BOD and TSS TMDLs?	BOD - Yes TSS - Yes	Yes
Cost		
Capital Cost (Year 2001)	$1.05 Billion	$1.265 Billion
Cost Increase over Draft LTCP	-	20%

8. FINANCIAL IMPACTS

Financing CSO programs in an equitable manner without placing an unreasonable burden on ratepayers is one of the most challenging aspects facing CSO communities. WASA has used the following two methods to document the burden on the District of the proposed LTCP:

- Long-term rate impact analyses using the Authority's financial planning and rates model, and
- Affordability analysis using procedures developed by EPA.

A key indicator of the affordability of the proposed LTCP is the impact on the annual household budgets for District ratepayers as measured by the timing and extent of the required annual rate increases. To document the actual impact on household budgets and to supplement the EPA approach, WASA conducted an analysis of the impacts of the CSO program on wastewater rates.

To finance its current $1.6 billion capital program, annual increases in retail rates of approximately 6.5% to 7.0% through FY 2008 followed by 6% annual increases from FY 2009 through FY 2012 will be required. Over the long-term, WASA is projecting that future necessary infrastructure re-investment will continue to require steady rate increases of about 5% per year. This longer-term outlook is consistent with national infrastructure studies that document the need for doubling of rates over 20 years for infrastructure investment. Under this "baseline" scenario, the annual cost for water and wastewater for a typical residential customer with metered consumption of 100 CCF per year will increase 113% (from $290 to $617) in fifteen years.

Implementation of the LTCP will result in additional rate increases and higher costs to the Authority's customers over and above the increases needed to fund the baseline capital program. Through analysis of a range of LTCP implementation schedules WASA has determined that the only rates impacts that are feasible are those associated with the longest implementation schedules. Table ES-5 displays the impacts for a 100 CCF customer over 15 years for the baseline and for several LTCP implementation schedules.

Table ES -5
Rate Impacts of the CSO LTCP on 100 CCF Residential Customer

	FY 2003 Annual Bill	*Annual Bill in 15 Years*	*Annual Rate Increases Over 15 Years*
Baseline – No LTCP	$290	$617	6.0%
Baseline Plus LTCP – 40 Years	$290	$722	7.2%
Baseline Plus LTCP – 30 Years	$290	$795	8.0%
Baseline Plus LTCP – 20 Years	$290	$942	9.4%
Baseline Plus LTCP – 15 Years	$290	$1,002	9.9%

If WASA implemented the proposed LTCP over a 40-year period, a typical residential customer with annual metered water consumption of 100 CCF will see their annual wastewater costs rise from $290 to $722 in 15-years; a 150% increase.

Shorter LTCP implementation schedules create too high a burden on the Authority's rate payers in terms of rapid escalation of the cost of wastewater services. The 15 and 20-year LTCP implementation schedules would require a large number of consecutive "double-digit" rate increases when the costs of those programs are added to the demands imposed by the baseline investment in water and wastewater infrastructure. As shown in Figure ES-3, the 15-year program is projected to require 8 consecutive increases over 10% per year. Such rate increases would outpace expected growth in household incomes by two to three times, thereby eroding household resources for other items. As shown in Figure ES-4, longer implementation schedules require lower peak rate increases and reduce the number of increases over 10% from 8 consecutive increases to fund the 15-year schedule to a single increase exceeding 10% in the case of the 40-year schedule.

Figure ES -3
Annual Rate Increases Required for 15 and 20-year LTCP Plans

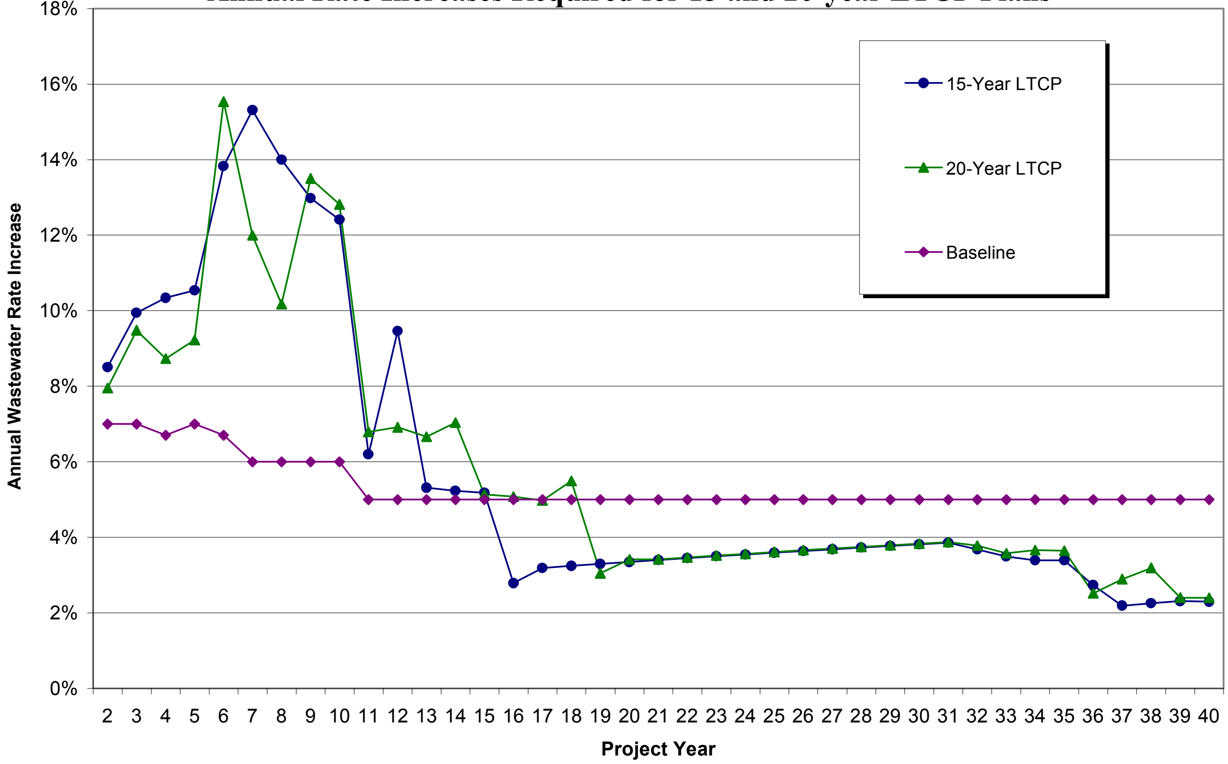
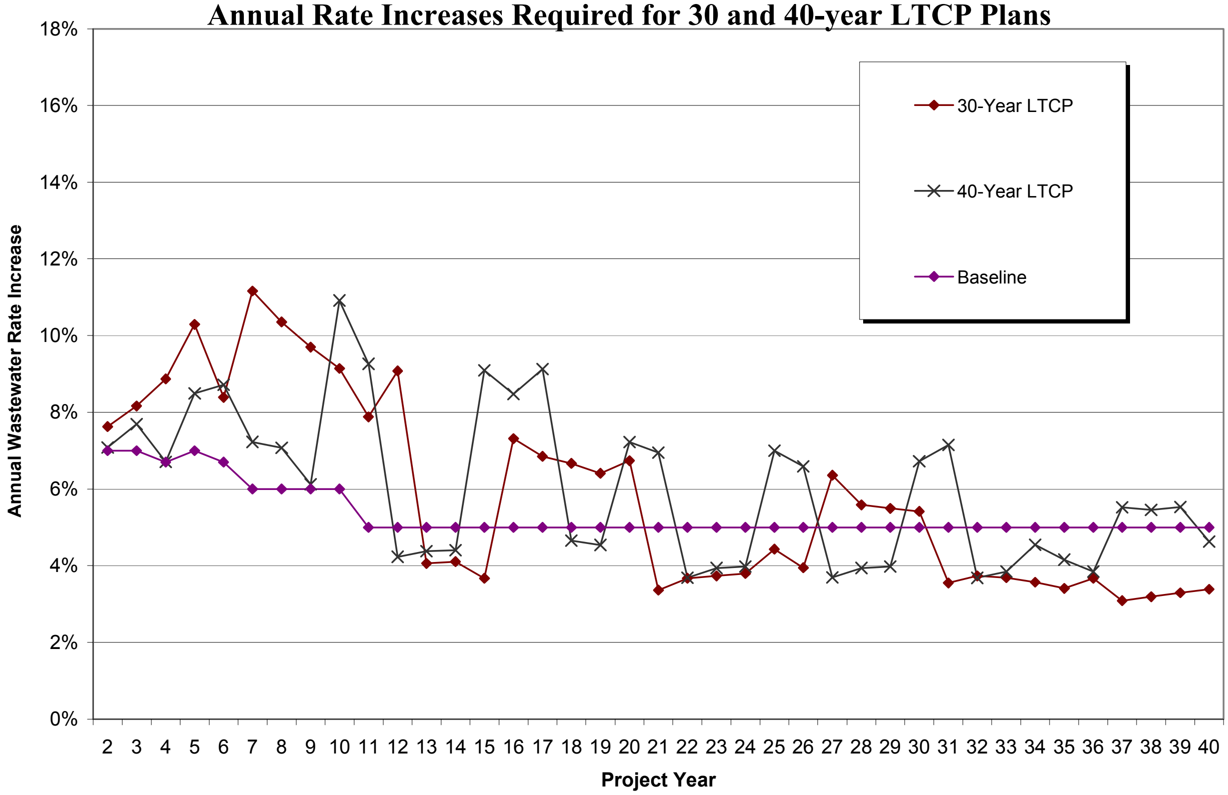


Figure ES- 4
Annual Rate Increases Required for 30 and 40-year LTCP Plans



There are two ways to reduce the rate impacts of a shorter LTCP implementation schedule, external funding assistance and deferral of other water and wastewater capital expenditures. External assistance targeted at limiting peak rate increases can reduce the severe impacts of high annual rate increases associated with the shorter programs. External assistance of approximately 62% of the capital cost of the program can keep rate increases to 8% per year as shown in the following chart. Total external capital assistance under this scenario would be $960 million. It is important for any external assistance to reflect year-of-expenditure values or the actual "cost to complete" the project. If external assistance is determined on current dollars or on an amount per year, the cost to complete and inflation risks are shifted to ratepayers.

The EPA's approach involves calculating the cost per household (CPH) for residential customers for current and proposed wastewater treatment and CSO control costs. The CPH is used in conjunction with the median household income (MHI), estimated at $39,760 per year in 2001, to estimate residential impacts. Residential impacts are considered by EPA to be 'low' if the CPH is less than 1% of the MHI, 'medium' if the CPH is between 1% and 2% of the MHI, and 'high' if the CPH is greater than 2% of the MHI. The CPH is combined with other factors such as unemployment rate, property tax collection rates and other factors to develop an overall assessment of financial burden.

In the District, there is a distinct clustering of household incomes at the lower and upper extremes of the income spectrum. Because of the disproportionate number of low-income households in the District, the impact of wastewater treatment and CSO control costs on the lowest 20% of income distribution in the District was calculated. The analysis was performed for the maximum income in this category, which is $18,000 per year.

Table ES-6 summarizes the results of the analysis. For median incomes, wastewater treatment costs including the proposed CSO controls are projected to impose a medium burden according to EPA guidelines. Current wastewater treatment costs alone impose a medium burden on lower income households. Addition of CSO controls to low income households increases the burden level to EPA's highest level, reaching nearly 3.5% of household income alone for wastewater costs. Various levels of Federal assistance are also listed showing the degree to which they reduce the CPH as a percent of median income.

Table ES-6

Cost Impacts on Residential Customers (Year 2001 Dollars)

Scenario	*Cost Per Household for Wastewater Treatment ($/yr)*	*Cost Per Household as % of Income*	
		Median Incomes	*Upper end of Lower 24% of Incomes ($18,000/yr Income)*
Current Residential Bill (April 2001)	$271	0.8%	1.5 %
After Completion of Current Capital Improvement Program, but no additional CSO controls[1]	$329	0.83%	1.83%
Current Capital Improvement Program Plus Additional Recommended CSO Controls:			
0% Assistance	$602	1.51%	3.35%
25% Assistance	$539	1.36%	3.00%
75% Assistance	$413	1.04%	2.30%

Notes: 1. Includes cost of rehabilitation of Main, 'O' Street, Eastside and Poplar Point Pumping Stations.

9. SCHEDULE

In accordance with public comments, the schedule for implementing the recommended control plan was developed by giving priority to projects that benefit the Anacostia River. The projects in the LTCP can be divided into two categories: those in the existing Capital Improvement Program (CIP) and those not currently in the CIP. Projects in the CIP have been budgeted and scheduled and these projects will move forward without approval of the LTCP. For projects not currently in the CIP, an implementation schedule has been developed based on years after approval of the LTCP. Based on the financial capability assessment and in order to mitigate the annual rate increases that would be required to fund the full LTCP, a 40-year implementation time is proposed for the entire recommended plan if no outside financial assistance is received. If significant outside financial assistance is obtained, it is technically feasible to accelerate the schedule to a 15-year implementation time frame. Significant outside assistance on the order of 62% would be required to achieve this schedule.

10. WATER QUALITY STANDARDS REVIEW

The current water quality standards for the District of Columbia do not address the transient nature of wet weather events. The standards also include a narrative component, which, among other items, require that discharges be free of untreated sewage. Given the current standards, no alternative short of complete separation can completely eliminate overflows (and thereby comply with current standards) during all conditions. The analyses conducted as part of the LTCP have shown that complete separation is not economically feasible, has numerous technical drawbacks, and is less beneficial in terms of water quality than the recommended control program. As a result, WASA has selected a LTCP that offers an effective combination of costs, benefits and environmental protection. However, although greatly reduced, CSO discharges will continue to occur under the LTCP and water quality provisions will need to be adopted that address wet weather discharges from the combined sewer system.

Studies conducted as part of the LTCP have demonstrated that pollution sources other than CSOs (storm water, upstream sources, non point sources) cause substantial impairment to the receiving waters. These sources will have to be significantly reduced to reach the equivalent degree of protection that can be achieved by the LTCP. Cost-effective and reliable technical programs to effectively reduce the impact of the other pollution sources may not be available for the foreseeable future. Besides the technical uncertainties of reduction of the other pollution sources, a significant component of these sources originate in political jurisdictions outside the District. Given the history and experience of dealing with diverse pollution sources and other political jurisdictions, the results of future efforts to control these sources cannot be predicted with any degree of certainty. The CSO studies have shown that the benefits of the LTCP are reliable and implementable. As WASA and the District develop provisions to implement the LTCP, consideration should be given to formation of a watershed based forum to reduce the other pollution sources.

In view of the complex and technically difficult situation regarding control of diverse and undocumented pollution sources, consistent "fishable and swimmable" water quality conditions for District waters receiving CSO discharges may not be achievable, particularly during wet weather. In any case, the recommended LTCP would provide the foundation to work towards "fishable-swimmable" conditions. To such an end, the recommended LTCP would accomplish the following:

- A situation whereby the remaining CSO discharges would not negatively affect achieving the "fishable" component of the "fishable-swimmable" use designation. In this regard, fishing could be practiced whether or not a CSO discharge was occurring.
- A situation wherein the remaining CSO discharges would preclude achieving full body contact a small percentage of the time. However, there would be few occurrences throughout the warm weather recreational period when the public might occasionally be precluded from full body contact by CSO discharges.

Given the magnitude of the investment proposed for CSO control, WASA has a responsibility to protect the investment in the LTCP and to seek wet weather discharge provisions in the water quality standards prior to implementation. Implementing the LTCP without such provisions would expose rate payers to significant economic risk since the control plan would not technically meet water quality standards and would be subject to challenge. A framework for such provisions in the standards could be as follows:

- Provide for the limited discharges as included in the LTCP to continue. The designated use would be restricted during times of discharge and for a limited time thereafter.

- Develop compliance requirements based on the physical elements of the control plan (e.g. capacity to store a set volume or to convey CSO at a set rate).
- Exclude those wet weather events over and above the capacity of those facilities included in the plan.
- Provide for public notification when discharges are occurring and for established times after discharges cease.
- Provide for a post construction-monitoring program to measure instream conditions.

Additional information is presented in Section 14 of this report.

11. POST CONSTRUCTION MONITORING

A program will be required to monitor performance of the final LTCP. This program would commence as usable components of the final LTCP are placed in operation. The monitoring program would comprise elements as follows:

- Flow monitoring and sampling at representative CSO outfalls on each receiving water system.
- Flow monitoring on representative facilities that transfer flow from CSO outfalls to storage and a system to measure the degree to which storage facilities are filled.
- A visual notification system placed at three or four locations on each receiving water at public access locations. This system would serve to notify the public of the occurrence of overflows based on the flow monitoring at the representative CSO outfalls. The system would comprise a series of colored lights, flags or pendents.
- An instream monitoring program would be developed to periodically obtain information on water quality. This program could be structured similar to that employed to obtain information for the LTCP.