The cost of the Lincoln Creek project increased 63.9 percent from original estimates.

Lincoln Creek project costs were projected at $70.4 million when construction began in 1999. As shown in Table 21, however, the most recent projected cost estimate was $115.4 million, an increase of 63.9 percent. Design, construction, and other costs, which include real estate acquisition, insurance, and legal and other professional services costs, all increased by more than 50 percent.

Table 21

Lincoln Creek Flood Control Project

Budget Item	Original Cost Projection	Current Estimate (March 2002)	Difference	Percentage Increase
Design	$ 4,070,000	$ 7,693,729	$ 3,623,729	89.0%
Construction	61,100,000	94,689,380	33,589,380	55.0
Other	5,230,000	13,013,380	7,783,380	148.8
Total	$70,400,000	$115,396,489	$44,996,489	63.9

The $33.6 million increase in estimated construction costs occurred because construction bids exceeded the District's projection by $12.9 million, because the District chose to accelerate completion of the project by two years after the floods in 1997 and 1998, and because the District made numerous changes to its original project plans and underestimated the amount of erosion control work that would be required by DNR before the start of construction.

District officials give several reasons for the increased cost of the watercourse improvement projects. For example, they believe project bids exceeded the District's original projections because a number of contractors had already reached the maximum amount of work they were able to be bonded for and, therefore, fewer contractors bid on the work. District officials also indicated that the amount of work required to relocate utilities and construct additional bridges was greater than had been anticipated and that substantial additional costs were incurred because the District was unable to ascertain the extent of soil contamination from incinerator ash and other toxic pollutants on a number of sites related to the project. Although environmental concerns had been noted during preliminary engineering investigations, the extent of the contamination could not be determined, in part, because property owners would not allow environmental consultants hired by the District on their property before the District negotiated for ownership or easement access. We found that the District spent an additional $6.1 million to remove and dispose of 256,774 cubic yards of contaminated soil in a permitted landfill.

Finally, the District contends that new DNR regulations also caused costs to increase. In 2001, construction contractors on the Lincoln Creek project billed the District for $1.0 million above projected amounts for additional erosion control measures required by DNR. Officials indicated that as the extent of DNR's erosion control requirements became clearer, the District incorporated them into subsequent construction contracts.

Menomonee River watershed project costs are currently $108.9 million higher than originally projected.

Similarly, the District's cost projection for the Menomonee River watershed has more than doubled since 2000, and most of the work associated with the project has yet to be completed. The Menomonee River watershed is larger than Lincoln Creek, draining 137 square miles in portions of 18 communities. The District's initial plan of August 2000 called for completion of $83.1 million in projects to protect 425 properties and 315 structures from a 100-year flood. However, the District's most recent estimate of total project costs is $192.0 million, which is $108.9 million (131.0 percent) more than originally projected. District officials note that the initial cost projection was made early in project planning, and it is not unusual or unexpected for costs to increase as additional information about the properties and structures within the project area become available.

The District attributes projected increases for the Menomonee River watershed plan to higher-than-expected costs for acquiring and relocating businesses and homes, the identification of additional structures requiring protection, the need for additional environmental clean-up work, the modification of initial projects because of site constraints, and the addition of projects not included in the original plan. For example, the District initially projected that constructing floodwater detention basins on the Milwaukee County Grounds would cost $36.4 million. During later stages of project planning, the District discovered that design constraints on the site would require the addition of a 3,000-foot stormwater tunnel at an additional cost of $22.8 million. The tunnel and other modifications resulted in a revised cost estimate of $69.3 million for the project.

One completed Menomonee River watershed project that experienced cost overruns was the removal of a dam and a concrete lining in the channel of a portion of the lower Menomonee River, which was initially projected to cost $2.3 million. The District subsequently added $811,000 to the project's budget to address sediment contamination that had not been previously identified, along with additional costs related to staffing, design work, environmental investigations, and the demolition of a structure in the floodplain. As a result, the final project costs totaled $4.7 million, or 104.3 percent more than the District's initial projection.

Similarly, the District initially projected construction costs at $14.0 million, with an additional $11.0 million for property acquisition of 34 structures along the Menomonee River in Wauwatosa. District officials now believe that 56 structures are in the floodplain and that property acquisition costs will total $21.0 million. To date, the District has spent $8.5 million on property acquisition for this project.

Finally, the District's 2002 capital budget includes approximately $25.1 million for the construction of a levee, removal of contaminated soils, and acquisition of properties in western Milwaukee. These costs were not included in the initial August 2000 Menomonee River watershed plan approved by the District.

Substantial cost increases raise concerns about project selection and the District's ability to predict total watercourse project costs.

Substantial actual and projected cost increases for watershed improvement projects raise concerns regarding not only the District's ability to accurately predict and limit total project costs, but also its criteria for selecting projects. District officials have indicated they use what is known as a "cost-effective approach" in selecting certain projects from among a range of possible alternatives that meet the objectives and expectations of interested parties. However, they do not use cost-benefit analyses to evaluate proposed projects.

District officials believe a cost-benefit approach is inappropriate for watercourse management projects because they believe this type of approach does not necessarily lead to the most acceptable solution to flooding problems. They have also indicated that it is difficult to assign dollar values to secondary benefits that are required in cost-benefit analyses, such as improved water quality, fish and wildlife habitat, public health, recreational opportunities, and aesthetic improvements.

Watershed improvement costs greatly exceed potential property damage costs from flooding.

Regardless of whether a cost-benefit approach is used, we believe more could be done to enhance the District's current approach. For example, the District does not currently consider less-costly alternatives that would protect some or most—but not all—structures within the 100-year floodplains. Further, its current approach does not appear to balance the cost of a watercourse improvement project with anticipated savings from flood damage: the District estimates that through 2020, a 100-year flood in the Menomonee River watershed would result in $13.2 million in damages to structures, but it has proposed a $192.0 million dollar watershed management plan to address this concern. Total costs associated with property damage from a series of smaller floods would also be substantially less than the amount the District will spend on watercourse improvements.

The extent and frequency with which projects exceeded their projected costs may warrant closer attention.

Although it is not unusual for construction projects to exceed their budgets, the extent and frequency with which the District's watercourse improvement projects have exceeded projected costs warrants closer attention and consideration, including justification for cost increases. We believe a clearer understanding of costs and benefits is needed for the District to make informed decisions on these projects. While the District does not have control over all factors contributing to cost increases, it does have control over a number of them, including the scope of the projects it chooses to undertake. However, cost-control efforts are made more difficult because of the District's budgeting practices. Commissioners are currently provided with only annual budgets for all of the capital projects the District is proposing, including watercourse improvement projects. The annual budgets include estimates for future years, but experience has shown that the information provided to the Commission does not provide for an accurate determination of total project costs.

Stormwater Rules

Since 2001, the District has required municipalities to include a runoff management system in all development plans.

To limit additional stormwater runoff that contributes to flooding and the inflow of stormwater into sanitary sewer systems, the District adopted rules in 2001 requiring municipalities to include a runoff management system as part of any development plan. The stormwater management requirements will apply to any new development that results in the construction of impervious surfaces of one-half acre or more, such as parking lots. It excludes impervious surfaces already in existence and exempts any project approved before January 1, 2002.

By January 1, 2003, local communities are required to adopt their own stormwater management rules to:

- preserve natural features having stormwater storage and drainage characteristics;
- minimize the construction of surfaces that create runoff; and
- limit runoff with stormwater detention structures.

Municipalities must submit their stormwater management plans to the District for approval before beginning any new development. The District may withhold approval of stormwater management plans if a municipality has not complied with its stormwater management rules or rules related to the construction of sewers and inflow and infiltration control.

In-Plant Diversions

In-plant diversions increase the volume of wastewater that receives some treatment during wet weather.

An in-plant diversion is another strategy for reducing the volume of overflows by maximizing the flow of wastewater through a treatment plant. Under extreme wet-weather conditions, DNR regulations allow wastewater treatment facilities to divert and partially treat a portion of the wastewater they process in order to protect the biological treatment components of a treatment plant from excessive flows and to prevent damage to private property caused by sewer backups. During an in-plant diversion, wastewater that is diverted receives partial treatment before being combined with fully treated wastewater and discharged. Such discharges must still meet limits on contaminants specified by the facility's wastewater discharge permit; therefore, DNR and the District indicate that the use of in-plant diversions is preferable to allowing untreated wastewater to be discharged through sewer overflows. Nevertheless, the District does not fully use its in-plant diversion capabilities.

The Jones Island treatment plant was designed to use in-plant diversions during peak flows. According to the District's standard operating procedures for the plant, if flows reach the plant's stated peak capacity (330 million gallons per day), up to an additional 60 million gallons per day may be diverted to a later stage of the treatment process. Total flow will then equal 390 million gallons per day, which is the maximum that can be disinfected through a treatment process that includes application of chlorine to kill harmful organisms.

The District did not employ in-plant diversions on at least six occasions that resulted in overflows.

We found that the District did not employ in-plant diversions on at least six occasions that resulted in overflows. Moreover, during ten overflows when in-plant diversions were used, the District did not fully use its ability to perform in-plant diversions. For example, during a storm that occurred in July 2000, the District partially treated only 7.0 million gallons of wastewater but discharged 796.4 million gallons of untreated wastewater into local waterways.

District officials indicated that they consider a number of factors before initiating an in-plant diversion, including whether the plant can continue to meet effluent limits during higher than normal flows and whether additional flows would compromise the plant's long-term treatment capability. In addition, they stated that the use of this practice has been limited in the past to avoid criticism by the media and legislators and to avoid possible enforcement actions by the EPA. It should be noted that while this practice is accepted by DNR, the EPA has not issued clear guidance regarding the use of in-plant diversions as a means to limit the volume of sewer overflows.

Two other factors may also provide incentives for both United Water Services and the District to limit in-plant diversions. First, the District pays a fee to DNR based on the level of contaminants in its effluent, and the fee would likely increase if greater amounts of pollutants were contained in its effluent as a result of only partially treating wastewater during in-plant diversions. Second, the District's contract with United Water Services provides financial incentives to the contractor if effluent standards specified in the contract are achieved. Neither DNR's measure of the District's effluent quality nor United Water Services' bonus is affected when an overflow—rather than an in-plant diversion—occurs. Furthermore, the District's wastewater discharge permit limits only the number of overflows each year, not their volume.

The District's use of in-plant diversions is likely to be clarified in its next permit.

The limited use of in-plant diversions during periods of heavy flow may be less harmful to human health and the environment than discharging untreated sewage into local waterways. DNR and EPA officials indicate that the District's use of in-plant diversions is likely to be clarified in its next wastewater discharge permit, to be issued later this year.

Future Considerations

The District expects its comprehensive 2020 Facility Plan to be completed in 2007, and all work included in the plan to be completed by the end of 2020. To accomplish its stated goals of protecting public health and the environment, preventing pollution, and enhancing the quality of area waterways, the District will need to establish clear priorities and to consider a number of cost-effective alternatives before determining how it will proceed.

Establishing District Priorities

Statutes provide the District with broad authority.

The duties and powers of all metropolitan sewerage districts are established by ch. 200, Wis. Stats., which authorizes the District to:

- plan, design, construct, maintain, and operate a system for the collection, transmission, treatment, and disposal of all sewage;
- collect, transmit, and dispose of stormwater and groundwater;
- excavate in or alter any state, county, or municipal street, road, alley, or public highway in the District for the purpose of constructing, maintaining, and operating its sewer system;
- improve any river or stream within the District by widening, deepening, or otherwise changing it in order to carry surface or drainage water;

- make improvements outside of the District to any river or stream that flows from within the District to a point outside of the District;

- divert stormwater, groundwater, and water from lakes, rivers, or streams into drains, conduits, or storm sewers;

- adopt rules, issue special orders, and award permits related to carrying out its responsibilities;

- levy a tax on property and assess user charges for sewer operation; and

- issue bonds, notes, or certificates to fund capital expenditures.

Statues do not, however, establish priorities for the District's use of these powers in accomplishing its objectives. That is the responsibility of the 11-member Commission, which will need to establish priorities for allocating the funds the District expects to have available for its 2020 Facility Plan. To fund capital projects, the District expects to continue to levy a tax of $1.70 per $1,000 of assessed property value through at least 2007.

The District will need to evaluate its tax rate and capital spending levels.

In planning for future capital projects, a number of issues will need to be considered:

- First, the District will need to assess the level of capital spending it expects to fund with taxes. For example, it could restrict capital spending to levels that could be funded at its current tax rate, increase taxes to fund additional projects that will present significant benefits, or reduce the tax rate and undertake only those projects needed to maintain its current system and meet its legal obligations under terms of an agreement with DNR.

- Second, the District will need to assess the level of resources it can devote to various goals. For example, while the collection, treatment, and disposal of sewage is a critical responsibility, some question funds spent for restoring animal and plant habitat, which is not expressly part of its statutory mission. In addition, while the District's watercourse improvement projects have both protected a number of structures located in floodplains and enhanced the environment, they have less-directly affected sewer overflows. The District will therefore need to determine whether its goals are better served by directing resources toward these projects or others, such as those that would reduce the number and volume of future overflows by, for example, constructing additional wastewater storage.

- Third, the District will need to define and evaluate the potential effects of planned capital projects on future operating costs. For example, planning, construction, and eventual maintenance work associated with the District's comprehensive 2020 Facility Plan may affect the District's staffing needs.

- Finally, the District will need to continue reviewing staffing levels to ensure that the savings it achieved through significant staff reductions during the past several years continue to limit its costs.

Separation of Combined Sewers

Separating Milwaukee's combined sewers may be costly.

One longstanding proposal for limiting future overflows has been to separate combined sewers in the City of Milwaukee and the Village of Shorewood into sanitary and stormwater sewers, so that only sanitary sewage would be treated. Officials from the District, DNR, and the EPA have periodically evaluated this option and believe that it would be prohibitively costly, disruptive to residents and businesses because work would be required on most streets, and potentially degrade water quality because additional untreated stormwater would enter local waterways. Currently, stormwater—potentially containing road salt, heavy metals, oil, bacteria, viruses, and nutrients—is captured by the combined sewers and treated at the Jones Island treatment plant.

The cost of sewer separation compared to other overflow abatement measures is an important consideration. Section 200.33 (2)(b), Wis. Stats., directs sewerage districts to choose the most cost-effective method of combined sewer overflow abatement. If two or more methods are equally cost-effective, the method that separates the fewest feet of combined sewers must be chosen. When the District evaluated the cost of separating the combined sewer systems in the late 1970s, while developing its Water Pollution Abatement Program, it determined that the cost would be approximately $469.0 million more than building a tunnel to capture and store stormwater and sanitary sewage.

More recently, a consultant hired by the District estimated it would cost $2.1 billion to completely separate the combined sewers in Milwaukee and Shorewood. The District has no plans to separate the combined sewers at this time, although it plans to revisit this issue as it completes its 2020 Facility Plan.

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Several water quality indicators suggest that the District's Water Pollution Abatement Program has decreased the amount of pollutants entering Milwaukee-area waterways by reducing the number and volume of sewer overflows. Our review of water quality monitoring data suggests that water quality has improved within the combined sewer area since the Deep Tunnel began operation, but that water quality outside of the combined sewer area has not substantially improved since 1994. Furthermore, despite improvements within the combined sewer area, a 1998 report by DNR indicates that neither Lake Michigan nor Milwaukee-area rivers currently meet designated water quality standards specified in federal and state law. Other sources of pollution, including nonpoint sources, continue to adversely affect water quality in the District's service area. In addition, the best available data indicate the Deep Tunnel has adversely affected groundwater quality in limited areas.

Effects of Sewer Overflows on Water Quality

Water quality within and outside the combined sewer area is degraded by sewer overflows from the District and surrounding communities, as well as by other urban and rural point and nonpoint sources. Point sources are fixed and identifiable. They include industrial waste discharge points and farm animal feeding operations. Nonpoint sources are more diffuse and numerous and include both urban and rural runoff and airborne pollutants. Appendix 4 describes various pollutants and defines a number of water quality indicators.

The primary human health concern of all sewer overflows is exposure to disease-causing organisms.

The primary human health concern of both combined and sanitary sewer overflows is exposure to disease-causing bacteria and viruses, including cryptosporidium, which cause gastrointestinal illnesses. In addition to human health problems, sewer overflows degrade the aesthetic aspects of rivers and lakes and can release excessive nutrients and toxic chemicals that may harm or kill aquatic plants and wildlife. There is also growing evidence that urban stormwater runoff is a major source of bacteria and other microorganisms generated by domestic pets and urban wildlife.

In downtown Milwaukee, some of the negative effects of urban runoff are mitigated by the combined sewer system and the Deep Tunnel. However, upstream sources of nonpoint source pollution, including stormwater runoff outside of the District's combined sewer area and rural nonpoint pollution, adversely affect water quality throughout the watershed, including within the combined sewer area.

Sanitary sewer overflows contain higher concentrations of raw sewage than combined sewer overflows.

The amount of pollutants found in point and nonpoint sources of pollution can vary widely depending on their source. For example, combined sewer overflows contain untreated sewage that is substantially diluted by stormwater, but stormwater can contain pollutants such as road salt, sand, gravel, heavy metals, bacteria, viruses, oil, and grease washed from city streets and parking lots. Sanitary sewer overflows typically contain higher concentrations of raw sewage but less of these other types of pollutants. Sanitary sewer overflows are also a significant source of phosphorous, a nutrient that can degrade water quality at excessive levels. The major pollutants in rural nonpoint source pollution are nutrients from fertilizers, bacteria from animal waste, and suspended solids from sediment and soil erosion. These contaminants are also present in urban nonpoint source pollution, but urban runoff may also contain more chloride from road salt and toxic pollutants such as gasoline, oil, lead, zinc, and particles from vehicle exhaust.

As shown in Table 22, DNR estimates that rural runoff contains more than twice the level of suspended solids as sanitary or combined sewer overflows. On the other hand, sanitary sewer overflows typically contain significantly higher concentrations of pollutants such as phosphorus and bacteria. Nevertheless, combined sewer overflows have been the primary focus of concern in the Milwaukee area. The more limited attention focused on sanitary sewer overflows may stem from the fact that combined sewer overflows are typically much larger and may contribute more pollution due to their larger volume.

Table 22

Estimated Pollution in One Million Gallons of Wastewater
(in pounds)

Source of Pollution	Biochemical Oxygen Demand	Phosphorus	Suspended Solids	Fecal Coliform Bacteria*
Sanitary sewer overflow	833	16.7	1,000	19 million
Combined sewer overflow	333	5.8	667	9 million
Urban stormwater	250	2.5	1,000	4 million
Rural runoff	125	6.7	2,500	no data

* Fecal coliform bacteria values show the number of bacteria in one gallon of water and provide an indicator of more harmful bacteria that may be present but are more difficult to identify and measure.

Source: Department of Natural Resources

The Deep Tunnel has reduced the amount of phosphorous entering the Milwaukee River.

DNR estimates that as a result of the Deep Tunnel, the amount of phosphorus entering the Milwaukee River from all sources within the District's service area has been reduced by approximately 59 percent, from 170 tons per year before 1994 to approximately 70 tons afterwards. As shown in Table 23, following construction of the Deep Tunnel, overflows from combined and sanitary sewers dropped from first to last as a source of phosphorus in the Milwaukee River. Currently DNR estimates that stormwater runoff and upstream point sources are the most significant sources of phosphorous in the river.

Table 23

Phosphorus Entering the Milwaukee River
(pre-tunnel and post-tunnel percentages)

	Percentage of Total	
Source of Phosphorus	Pre-Tunnel	Post-Tunnel
Sewer overflows	56%	6%
Stormwater runoff	25	54
Upstream point sources	14	27
Other sources	5	13
Total	100%	100%

Source: Department of Natural Resources

Beach Closures

There were 105 beach closures in Milwaukee County in 2000.

Concerns over the frequency of beach closures in the Milwaukee area have drawn attention to sewer overflows as a potential source of bacteria. The City of Milwaukee Health Department regularly monitors Milwaukee-area beaches and issues advisories to responsible local officials when bacteria counts are high. Many Milwaukee-area beaches are also closed as a precautionary measure after significant rainfall, in response to concerns over bacteria in urban stormwater. There were 105 beach closures in Milwaukee County in 2000, including 79 at Milwaukee's South Shore, the most frequently closed beach. South Shore was also closed for a total of 43 days in 1999 and 28 days in 2001.

The number of beach closures cannot be explained solely by bacteria from sewer overflows.

DNR, the United States Geological Survey, the University of Wisconsin-Milwaukee Great Lakes Water Institute, and others, working together as the Southeast Wisconsin Beach Task Force, are studying the relationship between sewer overflows and beach closures. To date, their research has concluded that beach closures in Milwaukee occur more frequently than sewer overflows, and that while sewer overflows are one source of harmful microorganisms, the number of beach closures cannot be explained solely by bacteria from sewer overflows. Researchers believe that nonpoint source pollution also contributes significant levels of bacteria to waters near area beaches, and that bacteria levels are affected by water temperature, wind direction, lake currents, and rainfall. Preliminary research suggests that closures at South Shore Beach are the result of multiple local sources of bacteria, including waterfowl, poor water circulation because of the configuration of the breakwater, and stormwater runoff from a nearby parking lot. Researchers indicate that these beach closures at South Shore do not appear to be directly related to bacteria levels in the Milwaukee River caused by sewer overflows.

In addition, Milwaukee Health Department officials suggested that one reason for the increase in beach closures in recent years may be that more effort has been placed on monitoring beach water quality. Researchers continue to study the factors leading to high bacterial counts at Milwaukee-area beaches, and a final report is expected in fall of 2002.

Assessing Changes in Surface Water Quality

The District conducts extensive monitoring of surface water in the Milwaukee area.

As noted, the Deep Tunnel was designed to capture nearly all sanitary sewer overflows, which contain high levels of fecal coliform bacteria and other pollutants and are a source of phosphorus and other excessive nutrients. The District conducts extensive monitoring of surface water in the Milwaukee-area and maintains a database of water quality tests dating back to 1975. The monitoring sites include more than 70 locations on Lake Michigan and Milwaukee-area rivers, including sites outside of the District's service area.

In order to assess the effect of the Deep Tunnel on water quality, we analyzed the District's surface water monitoring data using two methods. First, we analyzed significant changes in average concentrations of 13 water quality indicators at 10 monitoring sites on the Menomonee, Milwaukee, and Kinnickinnic rivers. Second, we analyzed data from 29 monitoring sites on the 3 rivers and Lincoln Creek that were located both within the combined sewer area and outside the combined sewer area, to determine whether established standards for water quality have been met. We combined the findings from both analyses to make an overall determination of water quality changes since completion of the Deep Tunnel.

Water quality is a relative description of the condition of a river or lake with respect to its physical, chemical, and biological components and cannot be measured by a single test. Moreover, water quality fluctuates on a day-to-day basis as a result of varying environmental conditions and changing sources of pollution. Because it is difficult to summarize water quality in absolute terms, we selected 13 water quality indicators that are influenced by sewer overflows.

Changes in Concentration of Indicators

One way to measure water quality is to examine the extent to which average concentrations of the 13 water quality indicators changed over time. We calculated multiple year averages at ten representative sampling sites over two time periods, 1987 through 1993 (pre-tunnel), and 1994 through 2000 (post-tunnel). Five of the sites are within the combined sewer area, and five are in areas of the watershed not affected by combined sewer overflows. We used statistical procedures to assess whether the changes in average concentrations were significant for each of the water quality indicators. If no significant changes indicating either improvement or degradation in water quality were found at a particular site, that site was considered to have no change in the average concentration of a pollutant or water quality indicator.

Changes in average concentrations of water quality indicators suggest general improvement within the combined sewer area.

As shown in Table 24, within the combined sewer area, changes in the average concentrations of seven water quality indictors suggest improvement in water quality since the Deep Tunnel began to operate. However, changes in the average concentrations of four indicators suggest degradation in water quality within the same area. The average concentrations of two water quality indicators showed no change.

Table 24

Changes in Average Concentrations Within the Combined Sewer Area
(sites showing significant change from pre-tunnel levels)

Water Quality Indicator	Number of Sites: Increase	Decrease	No Change
Improvement			
Ammonia	1	3	1
Biochemical oxygen demand	0	3	2
Chlorophyll	0	3	2
Dissolved oxygen*	2	0	3
Fecal coliform bacteria	0	3	2
Lead	0	2	3
Nitrogen	1	3	1
Deterioration			
Chloride	5	0	0
Phosphorus	2	0	3
Suspended solids	4	0	1
Turbidity	4	0	1
No Change			
Copper	0	0	5
Zinc	0	0	5

* Increased concentrations of dissolved oxygen represent an improvement in water quality.

Changes in average concentrations of water quality indicators suggest water quality has not improved outside the combined sewer area.

As shown in Table 25, outside the combined sewer area, changes in the average concentrations of only two indicators suggest improvements in water quality since the Deep Tunnel began to operate. In contrast, changes in the average concentrations of six other indicators suggest that water quality has deteriorated outside the combined sewer area. The average concentrations of five indicators showed no significant changes outside of the combined sewer area after the Deep Tunnel began to operate.

Table 25

Changes in Average Concentrations Outside the Combined Sewer Area
(sites showing significant change from pre-tunnel levels)

Water Quality Indicator	Number of Sites		
	Increase	Decrease	No Change
Improvement			
Biochemical oxygen demand	0	3	2
Lead	0	2	3
Deterioration			
Ammonia	2	0	3
Chloride	4	0	1
Nitrogen	2	0	3
Phosphorus	2	0	3
Suspended solids	3	0	2
Turbidity	3	0	2
No Change			
Chlorophyll	0	0	5
Copper	0	0	5
Dissolved oxygen	0	0	5
Fecal coliform bacteria	0	0	5
Zinc	0	0	5

Meeting Water Quality Standards

Although average concentrations are useful for measuring changes in water quality, water quality standards provide another measure. Under the Clean Water Act, DNR establishes water quality standards for Wisconsin waters according to the highest potential uses each water body in the state is capable of supporting. These uses include supporting fish and other aquatic life, supporting wildlife, use for human recreation, and use for drinking water. The water quality standards set maximum limits for pollutants, including nutrients, bacteria, and toxic chemicals, and establish acceptable ranges for water quality indicators such as temperature and dissolved oxygen, which are important in sustaining the beneficial uses of a water body.

Evaluating changes in the percentage of samples meeting water quality standards before and after the Deep Tunnel provides a useful way to summarize the monitoring data collected by the District and to evaluate progress in meeting water quality goals. We calculated the percentage of sample results that met recommended or established water quality standards for 11 water quality indicators over two time periods: 1987 through 1993 (pre-tunnel), and 1994 through 2000 (post-tunnel). Our analysis included 29 monitoring sites on the Menomonee, Kinnickinnic, and Milwaukee rivers and Lincoln Creek, including 15 sites within the combined sewer area and 14 sites outside of the combined sewer area. In performing this analysis, we used DNR's established water quality standards for "warm water sport fish and aquatic life" to evaluate chloride, copper, dissolved oxygen, lead, and zinc, and the "full human contact recreational use" standard for fecal coliform bacteria. In addition, we used EPA-recommended reference values to evaluate ammonia, chlorophyll, nitrogen, phosphorus, and turbidity, because neither the EPA nor DNR has promulgated water quality standards for these indicators. Because no standards or reference values have been established for biochemical oxygen demand and suspended solids, we did not include them in this analysis.

As measured by water quality standards, water within the combined sewer area showed both improvement and deterioration.

In this analysis, an increase in the percentage of samples meeting the water quality standard indicates improvement in water quality, while a decrease in the percentage of samples meeting the standard suggests deterioration in water quality. As shown in Table 26, within the combined sewer area, four water quality indicators improved, five indicators deteriorated, and two did not change.

Table 26

Percentage of Samples Within the Combined Sewer Area Meeting Water Quality Standards

Indicator	Pre-Tunnel	Post-Tunnel	Percentage Point Difference
Improvement			
Chlorophyll	19.3%	32.9%	13.6%
Dissolved oxygen	75.2	79.2	4.0
Fecal coliform	18.4	41.5	23.1
Lead	98.1	98.2	0.1
Deterioration			
Chloride	100.0	99.7	(0.3)
Copper	89.7	87.9	(1.8)
Nitrogen	14.7	11.7	(3.0)
Phosphorus	6.2	4.2	(2.0)
Zinc	99.7	99.5	(0.2)
No Change			
Ammonia	99.6	99.6	0.0
Turbidity	0.6	0.6	0.0

As measured by water quality standards, water outside the combined sewer area has deteriorated.

As shown in Table 27, outside of the combined sewer area, the percentage of samples meeting the water quality standards decreased for all 11 water quality indicators.

Table 27

Percentage of Samples Outside the Combined Sewer Area Meeting Water Quality Standards

Indicator	Pre-Tunnel	Post-Tunnel	Percentage Point Difference
Improvement			
None	–	–	–
Deterioration			
Ammonia	98.9%	98.7%	(0.2)%
Chloride	100.0	98.1	(1.9)
Chlorophyll	24.1	21.6	(2.5)
Copper	92.9	92.1	(0.8)
Dissolved oxygen	97.6	96.9	(0.7)
Fecal coliform	29.3	24.9	(4.4)
Lead	99.4	99.2	(0.2)
Nitrogen	17.6	14.6	(3.0)
Phosphorus	10.8	5.4	(5.4)
Turbidity	3.0	2.4	(0.6)
Zinc	100.0	99.7	(0.3)
No Change			
None	–	–	–

It should also be noted that the degree to which the various water quality standards were met ranged from less than 1 percent to 100 percent. For example, both within and outside the combined sewer area, over 98 percent of all samples met water quality standards for ammonia and chloride, while nearly every sample measured for turbidity and phosphorus failed to meet the standards.

Overall Changes in Surface Water Quality

We combined data from both measures of water quality to produce a single measure.

In order to create a single measure of change in water quality, we combined the findings from our previous two analyses to assess overall changes in various water quality indicators both within and outside of the combined sewer area. In general, for an indicator to be considered "improved," average concentrations had to show improvement and the percentage of samples meeting water quality standards had to increase or remain unchanged. Conversely, for an indicator to be considered "deteriorated," average concentrations had to show deterioration and the percentage of samples meeting water quality standards had to decrease or remain unchanged. Because there were no water quality standards for biochemical oxygen demand and suspended solids, our assessment is based solely on changes in their concentrations.

Overall, water quality within the combined sewer area has improved for more indicators.

As shown in Table 28, overall water quality within the combined sewer area has improved with respect to five indicators (ammonia, biochemical oxygen demand, chlorophyll, dissolved oxygen, and fecal coliform) and deteriorated with respect to five indicators (chloride, nitrogen, phosphorus, suspended solids, and turbidity). In contrast, overall water quality outside of the combined sewer area improved for only one indicator (biochemical oxygen demand), while it deteriorated for six indicators (ammonia, chloride, nitrogen, phosphorus, suspended solids, and turbidity). In no instances did a water quality indicator improve outside of the combined sewer area but deteriorate inside of the combined sewer area.

Table 28

Summary of Water Quality Changes After Construction of the Deep Tunnel

Indicator	Within Combined Sewer Area	Outside Combined Sewer Area
Ammonia	Improved	Deteriorated
Biochemical oxygen demand	Improved	Improved
Chloride	Deteriorated	Deteriorated
Chlorophyll	Improved	No change
Copper	No change	No change
Dissolved oxygen	Improved	No change
Fecal coliform	Improved	No change
Lead	No change	No change
Nitrogen	Deteriorated*	Deteriorated
Phosphorus	Deteriorated	Deteriorated
Suspended solids	Deteriorated	Deteriorated
Turbidity	Deteriorated	Deteriorated
Zinc	No change	No change

* Although nitrogen concentrations within the combined sewer area decreased at three of the five monitoring sites, the percentage of samples meeting water quality standards decreased by such a large extent that a general decline in water quality is indicated.

The changes in water quality noted within the combined sewer area suggest that the Deep Tunnel has played a role in reducing the amount of pollution entering the waterways as the result of combined sewer overflows. However, because of the diversity of pollution sources that affect Milwaukee-area waterways, changes in water quality cannot be attributed to a single factor.

In addition, monitoring sites outside of the combined sewer area are not affected by combined sewer overflows, and the Deep Tunnel would be expected to have a smaller effect on water quality at these sites. Our findings suggest that while some water quality indicators improved within the combined sewer area after construction of the Deep Tunnel, upstream pollution sources—including nonpoint source pollution and sanitary sewer overflows—continue to impair water quality within and outside of the combined sewer area. These conclusions are generally consistent with a number of water quality assessments we reviewed that were completed by the District, the Southeast Wisconsin Regional Planning Commission, DNR, and others. Differences among the studies' conclusions are the result of slightly differing methodologies, including whether data are reported separately for each monitoring site or aggregated to provide a broader picture of overall changes in water quality. For example, some studies have reported slight improvements in water quality when selected monitoring sites outside of the combined sewer area are analyzed individually.

Effects of the Deep Tunnel on Groundwater

17.2 percent of samples taken near the Deep Tunnel exceeded the groundwater standard for coliform bacteria.

Concerns have also been raised about the effects the Deep Tunnel may have on groundwater quality in the Milwaukee area. DNR requires the District to monitor 32 groundwater wells located near the Deep Tunnel for nutrients, toxic chemicals, and bacteria to ensure that wastewater is not escaping from the Deep Tunnel and that groundwater meets established standards. Between 1995 and 2001, the District reported that 17.2 percent of the groundwater samples taken at the wells exceeded the groundwater standard for total coliform bacteria, which includes both fecal coliform and other species of coliform bacteria. While coliform bacteria have never been detected in 3 wells, the remaining 29 wells demonstrate a range of coliform contamination. As shown in Table 29, the percentage of samples from all wells that failed to meet the groundwater standard for total coliform bacteria ranged from 11.1 to 21.1 percent annually.

Table 29

Number of Samples Exceeding Groundwater Standards for Total Coliform

Year	Number of Samples	Number of Exceedances	Percentage
1995	319	53	16.6%
1996	596	120	20.1
1997	744	157	21.1
1998	631	90	14.3
1999	709	132	18.6
2000	482	74	15.4
2001	469	52	11.1
Total	3,950	678	17.2

In order to address concerns regarding potential long-term groundwater contamination, DNR included a groundwater monitoring compliance schedule requirement in the District's 1997 wastewater discharge permit. As a result of the compliance schedule, the District hired an outside consultant to evaluate the potential long-term effects of the Deep Tunnel on groundwater. After reviewing the groundwater monitoring data, the consultant confirmed elevated levels of certain wastewater pollutants, including fecal coliform bacteria, in some wells after the Deep Tunnel was filled. The consultant also found that coliform bacteria were more likely to be present in the wells when the Deep Tunnel was filled to a level higher than the maximum operating level established by DNR in the District's permit. The District has filled the Deep Tunnel above that level on five occasions but has not done so since 1999.

The consultant concluded that although wastewater escaping from the Deep Tunnel has the potential to pollute groundwater, the effects are localized and short in duration. The consultant also concluded that some wells were more likely to be contaminated than others, because of both their proximity to the Deep Tunnel and localized geologic conditions such as fractures in the rock and groundwater flow patterns. The consultant estimated that the maximum distance of travel for wastewater escaping from the Deep Tunnel is between 150 and 400 feet, assuming that the Deep Tunnel is not filled above the maximum operating level established in the permit. Overall, the District and its consultant believe that the majority of pollutants are flushed back into the Deep Tunnel within days after the Deep Tunnel has been pumped out to a treatment plant and normal inward groundwater flow is reestablished.

The District maintains that because of the short duration of wastewater surges out of the Deep Tunnel and the limited distance wastewater travels in groundwater, and because few industries or residences within the District's service area obtain their water supply from wells, wastewater escaping from the Deep Tunnel is unlikely to affect other groundwater users. Nearly all residential and industrial users within the District's service area receive their water supply from Lake Michigan, and DNR estimates there are fewer than 25 active high-capacity wells in the entire Milwaukee River Basin. Both DNR and the District's consultant believe that most of these wells are located far enough away from the Deep Tunnel to be unaffected by wastewater escaping from the Deep Tunnel.

DNR and the District both agree that filling the Deep Tunnel to a level greater than the maximum operating level allowed in the permit increases the chance of wastewater contaminating the groundwater. Therefore, the District has agreed to abide by this operating restriction. The District and DNR continue to monitor groundwater quality around the tunnel, and DNR has indicated that additional groundwater monitoring and reporting requirements may be included in future permits.

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The District generally complies with the requirements of its wastewater discharge permit, but it appears to have failed to meet certain conditions related to groundwater standards, sanitary sewer overflows, and the Deep Tunnel's operating requirements. Since 1994, DNR has taken two enforcement actions against the District for alleged permit violations related to sewer overflows, including a civil complaint filed with the Milwaukee County Circuit Court in March 2002. The complaint has been resolved with a stipulated agreement between DNR and the District issued in May 2002.

Wastewater Discharge Permit Compliance

DNR issues wastewater discharge permits that regulate the District's operations.

Wastewater discharge permits are the primary mechanism used to implement the point source pollution control requirements of the Clean Water Act and ch. 283, Wis. Stats. The EPA retains an oversight role in Wisconsin's permitting program, but DNR issues the wastewater discharge permit that regulates many aspects of the District's operations. Although the District's most recent five-year permit expired on March 31, 2002, its provisions will remain in effect until DNR issues a new permit, which is expected to occur later in 2002. They include:

- effluent limits that restrict the amount of pollutants that may be legally discharged from the two wastewater treatment plants;
- restrictions on combined and sanitary sewer overflows; and
- other compliance requirements, such as requirements for sludge disposal and Milorganite production, guidelines for operating the Deep Tunnel, and provisions for surface and groundwater monitoring.

Permit violations may be self-reported or identified by DNR.

Like other regulated facilities, the District is required to self-report any violations of permit terms and conditions. DNR may also identify permit noncompliance during on-site inspections or through reviews of the monthly discharge monitoring reports that regulated facilities must submit. These reports contain the results of effluent water testing and are used to verify compliance with permitted limits.

The range of potential violations depends on the specific requirements included in a facility's permit, but it may include sewer overflows, failure to meet effluent limits, failure to submit required monitoring information, or failure to adhere to permit-required deadlines. All violations of permit conditions are subject to enforcement, although isolated violations do not automatically result in formal enforcement actions. DNR officials indicate that the appropriate enforcement response is based on the type, severity, and frequency of the violation, as well as the compliance history of a particular facility and the potential harm to public health and the environment.

DNR follows a stepped enforcement process, which begins with less-formal enforcement actions, such as meeting with the permittee to discuss corrective actions or issuing warning letters known as notices of noncompliance. If the conditions leading to the violation cannot be resolved in this manner, DNR can issue a more formal notice of violation; schedule an enforcement conference with the permittee; establish a compliance schedule in future permits; or in the case of sewer overflows and effluent limit violations, enact a moratorium on new sewer system extensions in the community. If the permittee still fails to undertake the appropriate corrective actions, DNR may request that the Department of Justice initiate a formal action leading to court-ordered fines, judgements, stipulations, or consent orders.

Effluent Limit Compliance

The District has consistently met effluent limitations established in its permit.

To determine the District's compliance with effluent limits, we reviewed the monthly discharge monitoring reports it submitted to DNR from 1998 through 2001. We found that the District has consistently met effluent limitations established in its permit at both the Jones Island and South Shore treatment plants. In only one instance—during the Hoan Bridge failure of December 2000, which forced the closure of a large portion of the Jones Island plant—did the District fail to meet its weekly limit for biochemical oxygen demand. DNR and the EPA agreed not to pursue enforcement actions for this effluent violation because the cause of the disruption was beyond the District's control.

Sewer Overflow Compliance

Since completion of the Deep Tunnel, the District has never violated combined sewer overflow requirements.

Since the completion of the Deep Tunnel, the District has never violated the terms of its permit as a result of combined sewer overflows. The permit, issued in June 1997, allows either up to six combined sewer overflows per year or the capture and treatment of at least 85 percent of the total annual wet-weather wastewater collected in the combined sewer area. The District has had six or fewer combined sewer overflows each year since 1994.

Eight sanitary sewer overflows resulted in the discharge of 471 million gallons of untreated sewage.

However, the District has had 39 sanitary sewer overflows since 1994. DNR officials allege that at least eight of these sanitary sewer overflows, which resulted in 471 million gallons of untreated sanitary sewage being discharged to Milwaukee-area waterways, violated the permit. With the Wisconsin Department of Justice, DNR filed a complaint in Milwaukee County Circuit Court against the District in March 2002. DNR officials also identified an additional nine sanitary sewer overflows between 1994 and 2000 that they believe may have been violations of the District's permit.

The District maintains that all of these overflows were unavoidable and, therefore, allowed under the terms of its permit, which include exemptions for overflows that result from equipment damage or temporary power interruption, are unavoidable and necessary to prevent loss of life or severe property damage, or are the result of excessive storm runoff. DNR and the District entered into a stipulated settlement in May 2002 under which the District has agreed to:

- complete all projects identified in the District's 2010 Facility Plan by December 31, 2010;
- enlarge planned sewer upgrade projects to add an additional 116.0 million gallons of storage;
- develop a 2020 Facility Plan that will identify future wastewater treatment, storage, and conveyance needs;
- undertake inflow and infiltration reduction efforts with the assistance of the municipalities served by the District, with a goal of a 5 percent reduction in inflow and infiltration system-wide;
- implement operational measures to minimize wet-weather combined and sanitary sewer overflows, including maximizing wastewater flow to the treatment plants during wet weather and maximizing plant capacity through the use of in-plant diversions;
- install additional rain gauges and flow meters in the conveyance system to improve decision-making on Deep Tunnel filling rates and on how much capacity to reserve in the tunnel for wastewater from outside the combined sewer area;
- develop and implement a capacity, management, and operations and maintenance plan to meet the goal of eliminating all non-permitted sewer overflows; and

- prepare a long-term combined sewer overflow control plan as required under federal law as part of its 2020 Facility Plan.

The District has agreed to develop a long-term control plan for combined sewer overflows no later than December 31, 2007.

Under the stipulated agreement with DNR, the District has also agreed to develop a long-term sewer overflow control plan no later than December 31, 2007. Changes to federal law enacted in 2001 require the development of such plans as soon as practicable, and generally within two years. Officials of the EPA acknowledged that the District had already completed many elements of the plan as a result of the efforts leading to construction of the Deep Tunnel; however, they stated that several additional areas need to be addressed, including identification of the effects of sewer overflows on sensitive areas such as beaches, an assessment of combined sewer overflows' effect on water quality, and development and evaluation of combined sewer overflow alternatives.

It should be noted that in July 2001, before the DNR lawsuit was filed, two environmental organizations notified DNR and the District that they intended to file a lawsuit for alleged permit violations related to sewer overflows. District and DNR officials stated that they were unable to reach agreement with these groups, and the groups subsequently filed a separate lawsuit in federal District Court in March 2002. The environmental groups' complaint alleges that at least 28 of the 39 sanitary sewer overflows since 1994 violated the District's permit, and it seeks abatement of future sewer overflows, penalties for past overflows of up to $25,000 per violation per day, and reimbursement for court costs and attorney's fees. This case is currently pending.

Other Compliance Issues

In October 2001, DNR issued a notice of noncompliance to the District for failure to report two dry-weather sanitary sewer overflows within 24 hours, as required by the District's permit. These overflows, which occurred on September 18 and September 24, 2001, during days with no precipitation, resulted from malfunctioning overflow control gates. Each lasted approximately 20 minutes; together, they released a combined total of approximately 10,000 gallons of untreated wastewater to the Menomonee River. The District issued a notice of contract noncompliance to United Water Services for its failure to properly maintain this overflow point and related equipment. In addition, DNR and the District resolved the notice of noncompliance by agreeing to permanently abandon these overflow gates so that sewage could not be inadvertently released in the future.

In four instances, the District appears not to have submitted a sewer overflow report by the required time.

We reviewed quarterly overflow reports submitted to DNR by the District and identified four other instances between 1994 and 2001 in which it appears that the District failed to report sanitary sewer overflows within the required 24 hours. The overflows occurred at different locations and released a total of approximately 90,000 gallons of untreated wastewater. The District ultimately reported these overflows in a quarterly report to DNR, but DNR did not issue a notice of noncompliance for failing to report these events within the requisite time frame. District officials note that these overflows required field verification and contend that they could not, therefore, be reported within 24 hours as required. These overflows were all attributed to precipitation, and they included:

- a July 23, 2001 overflow lasting 20 minutes that released 50,000 gallons of untreated wastewater;
- a June 1, 2000 overflow lasting approximately one hour that released 29,000 gallons of wastewater;
- an overflow occurring between July 21 and 22, 1999, during which an unknown volume of wastewater was discharged for an unknown duration from two manholes that are not monitored by the District; and
- a November 10, 1998 overflow lasting less than 5 minutes that released 10,000 gallons.

Based on our review of available information, it also appears that the District failed to meet certain conditions of its permit on several other occasions. As noted previously, the District has reported that levels of coliform bacteria exceeded the groundwater standard in at least 29 wells since 1995. According to the terms of the District's permit and Wisconsin Administrative Code, the District is required to meet all groundwater standards in the aquifer surrounding the Deep Tunnel. Moreover, the District filled the Deep Tunnel to a level higher than the maximum allowable level established in the permit five times since 1994. When the Deep Tunnel was initially constructed, neither DNR nor the District anticipated that wastewater would escape from the tunnel if the District adhered to the maximum allowable fill level established in the permit. The District's experience in operating the tunnel between 1994 and 1997 showed that wastewater could escape from the tunnel even if the tunnel was filled to a level lower than the maximum limit provided by the permit. The District contested this provision of its permit in 1997, pending the outcome of additional groundwater studies required by DNR through a compliance schedule included in the 1997 permit. As noted, based on the results of these studies, the District agreed to abide by the maximum fill level to minimize the risk of wastewater escaping from the tunnel, and the tunnel has not been over-filled since 1999.

Statewide Wastewater Permit-Related Enforcement Actions

Historically, DNR has rarely initiated enforcement actions against communities for sewer overflows.

Historically, DNR has rarely initiated enforcement actions against communities for sewer overflows, but has instead relied on informal administrative enforcement procedures, permit compliance schedules, and its authority to deny requested sewer extensions to achieve compliance with permit conditions. However, between January 1, 1995 and December 31, 2001, DNR initiated a total of 350 formal enforcement actions against municipal, industrial, and agricultural facilities statewide for wastewater permit or other wastewater-related violations. These actions included 286 notices of violation and 64 cases that were referred to the Department of Justice, including the previously noted case involving the District.

Table 30 summarizes the types of violations cited in 286 notices of violation issued from 1995 through 2001. In total, 752 instances of noncompliance were cited in the notices, most of which covered more than a single violation. As shown in the table, effluent limit exceedances and failure to submit discharge monitoring reports were the two most common reasons for notifications and together accounted for 30.3 percent of the instances of noncompliance cited.

Sewer overflows accounted for only 1.1 percent of the incidents in which noncompliance was cited. As was shown in Table 16, 288 municipalities—excluding the District—reported a total of 988 sewer overflows from 1996 through 2001 that discharged 564.1 million gallons of untreated wastewater to Wisconsin waters. Many of these communities are regulated under a single general permit for wastewater discharges that, like the District's, prohibits sanitary sewer overflows except in limited circumstances. DNR allows facilities or industries with similar types of wastewater discharges to be regulated under a general, statewide permit, including communities that own or maintain a sanitary sewer collection system but do not operate their own treatment facility.

Table 30

Instances of Noncompliance with Wastewater Rules and Regulations
(notices of violation from 1995 through 2001)

Description	Number	Percentage
Effluent limit exceedance	117	15.5%
Failure to submit discharge monitoring report	111	14.8
Miscellaneous*	90	12.0
Discharging in violation of permit	83	11.0
Sludge and landspreading related	70	9.3
Discharging without permit	63	8.4
Reporting-related	53	7.0
Laboratory and sampling related	48	6.4
Inadequate/improper equipment maintenance	38	5.0
Operator improperly certified	27	3.6
Industrial pretreatment related	27	3.6
Agriculture and animal waste related	9	1.2
Overflow violations	8	1.1
Stormwater-related	8	1.1
Total	752	100.0%

* Miscellaneous violations include failure to submit plans, failure to meet compliance schedules or other permit deadlines, nonpoint source pollution violations, construction without approval, air emissions violations, and improper operator training, among others.

The difference between the number of overflow-related enforcement actions shown in Table 30 and the number of actual overflows indicates that while sewer overflows continue to occur throughout the state, few communities are subject to formal enforcement action by DNR for these overflows. Instead, DNR officials indicate they address sewer overflow problems by working with communities to reduce inflow and infiltration into the sewer system and to ensure plant capacities are adequate. In some circumstances, DNR has enacted sewer extension moratoriums. Since 1995, it has issued sewer extension bans for 35 municipalities, including 1 within the District's service area (Whitefish Bay). As of April 2002, five sewer extension bans were in effect, but none were within the District's service area.

Informal enforcement actions and notices of noncompliance may occur more frequently than formal enforcement actions. It is difficult to determine how many informal actions DNR has taken against regulated facilities because records of such actions are kept in DNR regional offices. DNR's Southeast Region, which includes the area served by the District, reported issuing seven notices of noncompliance to municipalities for permit violations in 2001, including the previously noted notice of noncompliance issued to the District. These actions resulted from a variety of permit violations, including laboratory certification violations, failure to report sewer overflows, exceedance of effluent limits, noncompliance with pretreatment program requirements, and incomplete or late submittal of discharge monitoring reports.

Future Considerations

EPA has agreed with the stipulated agreement between DNR and the District and acknowledges that the District has made progress toward reducing the number and volume of combined sewer overflows with the completion of the Deep Tunnel. However, as noted, recent amendments to the Clean Water Act mandate that all new wastewater permits issued to facilities with combined sewers require each facility to develop a long-term plan to limit combined sewer overflows. As part of the May 2002 settlement, the EPA has required the District to immediately begin developing critical elements of its plan to meet federal combined sewer overflow requirements. In addition, the EPA has announced its intention to develop a national strategy for addressing sanitary sewer overflows, which may include provisions that would require additional efforts by the District in the future.

Because of the large number of communities in Wisconsin with sanitary sewer overflows, DNR recognized a need for increased statewide efforts to control sanitary sewer overflows in a report to the Natural Resources Board in March 2001. DNR's strategy for bringing these facilities into compliance with federal and state requirements regarding sanitary sewer overflows includes:

- identifying and mapping every sewer overflow location in the state;
- working with communities to improve reporting of overflows; and
- addressing the problem of clean water inflow and infiltration into sanitary sewer systems.

DNR recently revised permit language to specify when sewer overflows are allowed.

In response to EPA concerns that Wisconsin permits were less stringent than federal requirements pertaining to sanitary sewer overflows, DNR recently submitted revised permit language defining the conditions under which sanitary sewer overflows would be allowed. The EPA concluded that this revised language is sufficient to meet existing federal requirements prohibiting sanitary sewer overflows. DNR also intends to work with communities covered by the general permit that experience chronic sanitary sewer overflows, and in some cases it may issue individual permits that establish compliance schedules for correcting the problems leading to overflows. Wisconsin is one of only a few states that issue a general permit to communities that do not operate their own treatment plants. While the general permit requires communities to report sanitary sewer overflows, it does not provide a mechanism for requiring communities to address the underlying causes of the overflows. Currently, more than 220 sewer systems that operate a wastewater conveyance system without a treatment plant are regulated by the general wastewater permit, including all 28 communities served by the District.

DNR officials indicate they are considering developing a set of factors for determining which communities will be targeted for individual permits. These factors are likely to include the number and volume of sewer overflows, the number of locations at which overflows occur, and the local water quality standards. Because some communities served by the District have had sanitary sewer overflow problems, they may be subject to these new permit requirements in the future.

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Appendix 1

Sewer User Charges to Municipalities

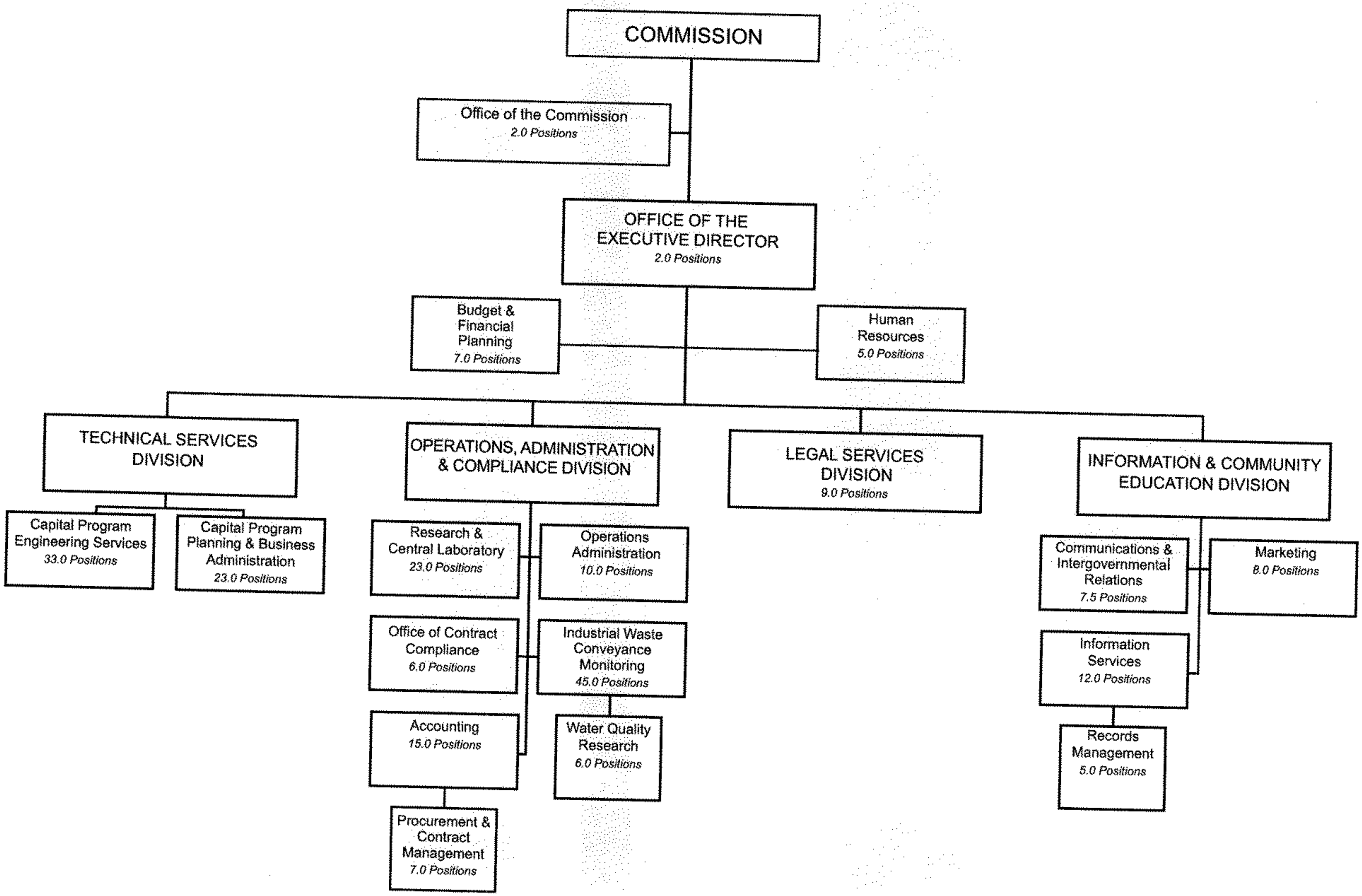
Municipality	1997	2001	Percentage Change
Bayside	$ 165,750	$ 145,147	(12.4)%
Brookfield	631,330	537,128	(14.9)
Brown Deer	549,176	448,277	(18.4)
Butler	145,770	109,815	(24.7)
Caddy Vista Sanitary District	24,370	20,747	(14.9)
Cudahy	1,215,986	1,042,008	(14.3)
Elm Grove	208,237	194,612	(6.5)
Fox Point	251,500	218,593	(13.1)
Franklin	859,868	893,759	3.9
Germantown	686,708	584,571	(14.9)
Glendale	681,639	591,838	(13.2)
Greendale	519,832	434,347	(16.4)
Greenfield	1,258,364	1,174,868	(6.6)
Hales Corners	297,669	262,380	(11.9)
Menomonee Falls	1,136,164	991,901	(12.7)
Mequon	648,351	582,216	(10.2)
Milwaukee	33,028,525	26,357,142	(20.2)
Muskego	600,690	537,029	(10.6)
New Berlin	1,157,831	1,064,800	(8.0)
Oak Creek	1,122,180	1,029,039	(8.3)
River Hills	59,135	55,842	(5.6)
Shorewood	464,217	413,552	(10.9)
South Milwaukee*	11,106	18,842	69.7
St. Francis	347,124	324,910	(6.4)
Thiensville	112,630	96,147	(14.6)
Wauwatosa	2,369,281	1,995,544	(15.8)
West Allis	2,622,885	2,197,358	(16.2)
West Milwaukee	2,225,077	624,949	(71.9)
Whitefish Bay	479,468	422,774	(11.8)
Total	$53,880,863	$43,370,135	(19.5)

* South Milwaukee receives hazardous waste disposal services only, because it operates its own wastewater treatment plant.

Appendix 2

Milwaukee Metropolitan Sewerage District 2002 Organization Chart

Including FTE positions in each area



Appendix 3

District Funding of Municipal Sewer System Evaluations

Municipality	Budget	Expenses through 2001
Bayside	$ 81,445	$ 53,671
Brookfield	287,263	153,312
Brown Deer	157,240	0
Butler	49,932	0
Caddy Vista	10,013	9,519
Cudahy	190,552	38,170
Elm Grove	128,325	96,218
Fox Point	109,205	111,287
Franklin	377,828	373,776
Germantown	191,205	27,885
Glendale	209,208	74,800
Greendale	229,718	113,891
Greenfield	430,405	168,080
Hales Corners	115,010	114,932
Menomonee Falls	488,278	379,632
Mequon	352,128	295,963
Milwaukee	2,535,026	2,069,807
Muskego	203,339	247,428
New Berlin	497,426	322,450
Oak Creek	428,096	203,910
River Hills	76,582	64,130
St. Francis	97,584	76,493
Shorewood	47,100	46,923
Thiensville	45,513	38,169
Wauwatosa	510,423	213,290
West Allis	528,851	300,784
West Milwaukee	68,819	25,583
Whitefish Bay	121,289	120,443
Total	$8,567,803	$5,740,546

Appendix 4

Water Quality Pollutants and Indicators

Ammonia – Ammonia is a component of nitrogen fertilizers, domestic and industrial wastewater, and animal waste. High concentrations of ammonia are toxic to fish and other aquatic life. The toxicity of ammonia depends on water temperature and pH, and it becomes more toxic to fish and aquatic life during the warm summer months.

Biochemical Oxygen Demand – Biochemical oxygen demand is a measurement of the amount of dissolved oxygen consumed through the decomposition of organic material over a specified time period (usually 5 days) in a water sample. Although biochemical oxygen demand is not a specific pollutant, it is used as a measure of the readily decomposable organic content of water and wastewater.

Chloride – Chloride is present naturally in the environment, but high concentrations of chloride in waterways are caused primarily by road salt runoff, sewage from overflows, faulty septic systems, agricultural irrigation, and municipal and industrial discharges. High concentrations of chloride are toxic to freshwater fish and other aquatic life.

Chlorophyll – Chlorophyll is not a pollutant, but rather is a measure of aquatic plant and algae growth in rivers and lakes. As aquatic plants and algae die, they release chlorophyll—the substance used to convert sunlight, water, and air into food for plants—into the water. High levels of chlorophyll usually indicate the presence of noxious weeds and algae caused by excessive amounts of nutrients in the waterway. These weeds and algae cause aesthetic impairments, reduce the recreational value of the river or lake, and can displace more desirable native plants.

Copper, Lead, and Zinc – Trace levels of naturally occurring metals such as copper, lead, and zinc are found naturally in the environment. Many of these elements are necessary for aquatic life in minute amounts but are toxic to fish, aquatic life, and humans at higher doses. Toxic heavy metals are found as pollutants in many water bodies as a result of urban runoff that contains paint chips, residue from automobile tires and brakes, and corroded metal parts. Other sources of trace metals include municipal and industrial wastewater discharges and contaminated sediments from past industrial activity.

Dissolved Oxygen – Dissolved oxygen is not a pollutant, but instead is an important indicator of water quality. Without sufficient dissolved oxygen, fish and other aquatic life suffocate and toxic chemicals such as mercury may be released from bottom sediments. Dissolved oxygen is affected by temperature and the presence of oxygen-consuming material in the water, such as sewage, decaying plant matter, and other biochemical processes that consume oxygen.

Fecal Coliform Bacteria – Fecal coliform bacteria are naturally present in the environment in excrement from all warm-blooded organisms, including humans. Although fecal coliform bacteria do not pose a health threat to humans, they are relatively easy to measure and are indicative of conditions in which fecal contamination containing more serious pathogens is likely to be present.

Phosphorus and Nitrogen – Nutrients such as phosphorus and nitrogen are essential in limited quantities for aquatic plant growth, but excessive nutrients lead to degradation of water quality through excessive weed and algae growth, increased turbidity, and low dissolved oxygen as plant matter decays. Common sources of nutrients include municipal and industrial discharges, failing septic systems, sewer overflows, fertilizer, livestock, domestic pet waste, wildlife, and airborne sources.

Suspended Solids – Suspended solids are the particulate matter present in water or wastewater and include sand, gravel, soil, and other solid materials. High levels of suspended solids harm fish and aquatic life by clogging gills, reducing the amount of light that can penetrate the water, and causing silt and sand to cover spawning areas. Suspended solids typically enter waterways as the result of runoff from fields, roads, and construction sites or from eroding stream banks.

Turbidity – Turbidity is a measure of the amount of light transmitted through a water sample and is closely related to suspended solids, but measures both particulate and dissolved pollutants in the water. High levels of turbidity usually indicate polluted waters and affect the amount of light available for desirable plant growth.

MMSD
Preserving The Environment • Improving Water Quality
Kevin L. Shafer, P.E.
Executive Director

July 24, 2002

Ms. Janice Mueller
State Auditor
State of Wisconsin
Legislative Audit Bureau
22 E. Mifflin St., Suite 500
Madison, WI 53703

Dear Ms. Mueller:

I am pleased to provide a written response to the Legislative Audit Bureau's (LAB) evaluation of the Milwaukee Metropolitan Sewerage District's successful effort to reduce the number of sewer overflows into Milwaukee-area waterways.

First, I would like to thank you and your staff for your review over the past 10 months. Your efforts have resulted in a report that highlights the many positive results for the Milwaukee area as a result of the Deep Tunnel System, including the fact that the Deep Tunnel has substantially reduced the amount of pollutants entering Milwaukee-area waterways, and water quality has improved within the combined sewer area of the District, which was the main goal of the Water Pollution Abatement Program. Your report also notes that other pollution sources, including polluted runoff and sanitary sewer overflows, continue to impair water quality within and outside of the combined sewer area.

We are proud to say that in all of the instances where the Audit Bureau has raised issues, MMSD already had projects started to improve those specific operations prior to the initiation of the audit.

We are proud to say that in all of the instances where the LAB has raised issues, MMSD already had projects started to improve those specific operations prior to the initiation of the audit. For example, the District began in 2001 the $96.5 million design and reconstruction of two siphons in downtown Milwaukee that transport wastewater under the Milwaukee River to the Jones Island Wastewater Treatment Plant to improve their efficiency and increase their capacity. The Audit Bureau has confirmed the issues that the District is already working to improve and found no new issues.

In addition to my comments on the specifics of your report, it is necessary to highlight several important items included in your evaluation:

•The Deep Tunnel System has substantially reduced the frequency and volume of both combined sewer overflows (CSOs) and sanitary sewer overflows (SSOs). The number of annual overflows has been reduced from 50 a year to about 2.6 a year. In addition, after completion of the Deep Tunnel System, the average annual volume of SSOs was reduced by 1.7 billion gallons per year, or 93.4 percent, while the average annual volume of CSOs was reduced by 5.5 billion gallons per year, or 78.3 percent.

The District has never violated its Wisconsin Department of Natural Resources- and Federal Environmental Protection Agency-approved combined sewer overflow permit.

•Polluted runoff, or nonpoint pollution, is now the major source of pollutant loadings to Milwaukee-area waterways. According to a recent report, polluted runoff accounts for more than 88 percent of the biochemical oxygen demand entering Milwaukee-area waterways.

The Deep Tunnel System has substantially reduced the frequency and volume of both combined sewer overflows and sanitary sewer overflows.

•The District has never violated its Wisconsin Department of Natural Resources- (DNR) and Federal Environmental Protection Agency-approved (EPA) combined sewer overflow permit.

•A major contributing factor to sewer overflows in recent years is the increase in the number of large storms that produced wastewater flows that exceeded the capacity of the Deep Tunnel System.

•The single most important cause of the overflows is the amount of rainwater leaking into private laterals and local sewers. This flow has increased by 17.4 percent since 1980 rather than being reduced by 12 percent as had been planned as part of the Water Pollution Abatement Program in the 1980s. The DNR agrees that rainwater leaking into local sewers is the major cause of recent sewer overflows. When these excessive flows overwhelm the District's system, overflows are necessary rather than letting untreated wastewater backup into homes and businesses.

•The District has saved $36.5 million over the first three years of its 10-year contract, started in March 1998. The savings are about $1.4 million more than projected after three years. In all, the District expects to save more than $140 million over the term of the contract with United Water Services to operate its treatment plants and conveyance system.

•As the report accurately reflects, the District plans to spend about $1 billion over the next several years to rehabilitate, replace and build new interceptor sewers, which will provide additional capacity and further reduce the risk of overflows. The plan, which has been approved by a Milwaukee County Circuit Court judge, is the result of an agreement with DNR and is intended to assure that MMSD will meet its discharge permit requirements for SSOs. The federal EPA is fully supportive of this stipulation.

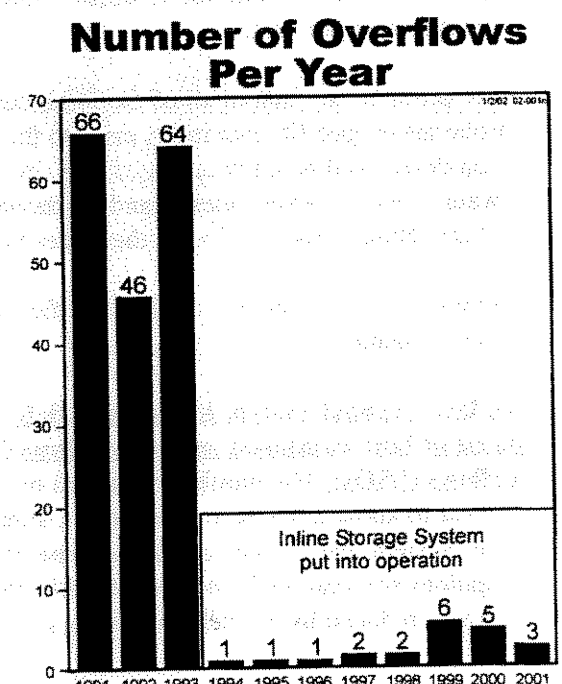
There are a few significant areas in the report where we have differing viewpoints or there is a need for further elaboration. They are:

Frequency of overflows should be evaluated by specific cause

The report overstates the average number of combined and sanitary sewer overflows that have occurred as a result of the Deep Tunnel System. Rather than counting sewer overflows that were Deep Tunnel related, the report cites all overflows, even if they were caused by a mechanical failure or an unrelated problem in the conveyance system, resulting in an inflated annual average. Those overflows were unrelated to the Deep Tunnel and, in fact, these type of events occur in all communities throughout Wisconsin and the United States.

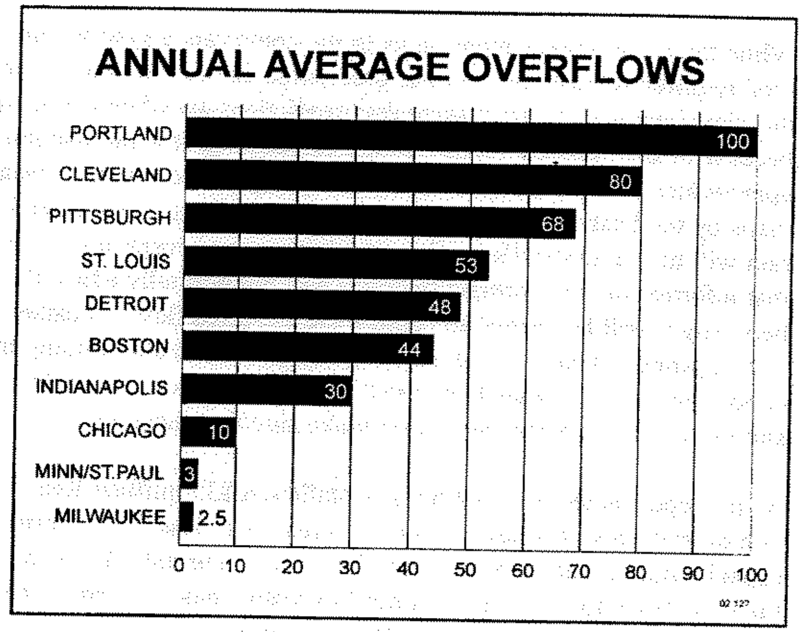
In the first eight years of operation of the Deep Tunnel, there have been 21 CSOs, or an annual average of 2.6, and 18 SSOs, or an annual average of 2.3, that occurred as a result of the closing of the Deep Tunnel gates.

The report cites the planning goal average number of overflows that was expected at 1.4 per year during the design and planning for the Deep Tunnel System in the early 1980s. But the report fails to state that the figure was an estimate over a 40-year weather record. It is unfair to state that after just eight years, the tunnel has not achieved the results it was designed for. It is too early to make that conclusion. If the LAB had looked at the number of overflows from the Deep Tunnel after three years, it would have only been an average of 1.0 CSO a year. The point is that due to fluctuations in weather patterns, one needs to look at a longer period of time to judge the results.



MMSD is recognized as the national leader in reducing sewer overflows

We are concerned that the report does not include information on the level and volume of overflows for comparable cities across the United States. The information would have shown that Milwaukee is significantly ahead of any major city in the United States in reducing the number and volume of CSOs and SSOs.



In some cities, there are still sewer overflows any time it rains more than .25 inches. For example, in 2001, the City of St. Louis, which serves a population of 1.4 million, had about 53 sewer overflows, discharging about 26 billion gallons of untreated wastewater to the Mississippi River. The Allegheny County Sanitary Authority, which serves 850,000 residents including the City of Pittsburgh, had about 68 sewer overflows in 2001, discharging 12 billion gallons of untreated wastewater.

Other cities that have wastewater storage systems similar to Milwaukee, such as Chicago, still experience sewer overflows. In fact, in August 2002, after a very large rainstorm hit downtown Chicago, the sewerage agency was forced to overflow about 2 billion gallons of untreated wastewater into the Chicago River and 1 billion gallons into Lake Michigan as reported by The Chicago Tribune.

Sewer overflows are a national issue that many communities across the country are just starting to address. Cities such as Pittsburgh and Atlanta are facing potential huge fines from the EPA if they don't implement plans to significantly reduce sewer overflows to levels that Milwaukee is already achieving. Many cities, such as Atlanta, Cincinnati, Portland and Washington, D.C. are just now embarking on building wastewater storage systems similar to the Deep Tunnel. Officials from some of these cities have visited Milwaukee to look at our successful approach to this problem.

Cities such as Pittsburgh and Atlanta are facing potential huge fines from EPA if they don't implement plans to significantly reduce sewer overflows to levels that Milwaukee is already achieving.

Indianapolis plans to spend more than $1 billion over the next 20 years in an effort to reduce its sewer overflows about 80 percent, to an average of four a year, by expanding its sewer plants and likely building huge underground storage tanks to capture most of its overflows for later treatment. The average sewer rate for the city's 870,000 taxpayers is expected to climb 40 percent by 2020 to help pay for it.

The establishment of the 200-million-gallon reserve policy for separate sewer flows optimizes the District's chances of achieving all of the objectives of the Deep Tunnel System

The original purpose of the Deep Tunnel System was the elimination of SSOs, the control of CSOs and improvement in water quality. The reserve policy also helps reduce the risk of overfill of the storage system, which could cause exfiltration from the Deep Tunnel. Since this reserve policy has been established, there have been no tunnel overfills.

Since the policy was put in place three years ago, about 190 million gallons of untreated sanitary sewage has been overflowed as a result of the Deep Tunnel gates being closed, or an average of 63 million gallons a year, compared to about 733 million gallons in the five years prior to that policy, or an average of 147 million gallons a year. This is a 57 percent reduction.

The reserve policy is flexible, allowing our contract operators to adjust it as they monitor approaching rain, to ensure the capture of the maximum amount of untreated wastewater

As the LAB report points out, the reserve policy is flexible, allowing our contract operators to adjust it as they monitor approaching rain, to ensure the capture of the maximum amount of untreated wastewater. For example, in early June 2002, the Milwaukee area was hit with up to 4.5 inches of rain over two days. The Deep Tunnel was able to capture more than 300 million gallons of untreated wastewater as operators adjusted the reserve that prior to its operation would have been discharged into area rivers and Lake Michigan. There were no separate or combined sewer overflows or bypasses from the Deep Tunnel during this event.

Weather patterns often change radically, either shifting north or south and missing the service area. These unpredictable weather conditions have necessarily resulted in unused capacity in the Deep Tunnel.

While the report makes mention as to the conveyance system's and operators' required reliance on weather predictions in order to make complex decisions, we wish to emphasize that predictions are often not accurate because of the imprecision of weather forecasting. It is not uncommon for approaching storms that are monitored on digitalized real-time weather maps by the District's contract operator to show that one to three inches of rain will hit the District's service area in the next several hours. Based on that information, the contract operator will not normally adjust the reserve believing it will be needed to capture the expected flows. Weather patterns often change radically, either shifting north or south and missing the service area. These unpredictable weather conditions have necessarily resulted in unused capacity in the Deep Tunnel. The DNR permit requires that the District and its contract operator must first make sure that there are no SSOs and that the Deep Tunnel does not overfill.

As the report noted, the District is installing a $3.3 million Real Time Control System that will provide updated information on system performance every 15 minutes or less. The information will help the District maximize existing system capacity during heavy rainstorms. The District currently has extensive monitoring devices in its conveyance system, but the new technology will give control operators more information faster and allow them to adjust system operations to changes in weather throughout MMSD's service area.

Blending

As stated in the report, blending, or inplant diversion, is an EPA- and DNR-approved standard operating procedure for a wastewater treatment plant trying to maximize the amount of wastewater treated. The total flow receives extensive treatment, including disinfection and dechlorination, and meets all permit requirements. In fact, a court-ordered agreement between DNR and MMSD requires that the District begin blending during rainstorms as soon as the treatment plants reach full capacity to ensure the treatment of as much wastewater as possible.

Blending is an EPA- and DNR-approved standard operating procedure for a wastewater treatment plant trying to maximize the amount of wastewater treated. The total flow receives extensive treatment and meets all permit requirements.

The District's contract operator uses this procedure when it is warranted, but the comments in the report do not take into account the fact that weather events can be intense, but brief, and may not warrant blending for a full 24 hours. The blending capacity at Jones Island cannot be met if the storm flow intensity is for only a portion of the day.

The District has objected to United Water Services' policy of turning off pumps to switch power sources during storm events

The District agrees that this practice should not occur, and, in fact, issued a notice of noncompliance to United Water Services in September 1999 after it was done during July 1999. The notice states that United Water Services "breached the terms of the agreement" when it failed to maximize pumpout capacity on July 21 and 22, 1999. It should be noted that the District's contract with United Water Services allows for an "event of default" if the company receives notices of "persistent and repeated failures."

The District agrees that this practice should not occur, and in fact, issued a notice of noncompliance to United Water Services in September 1999 after it was done during July 1999.

United Water Services disputed the notice of noncompliance and also disputes some of the LAB's findings. None of United Water Services' actions prompted either a combined or separated sewer overflow. Their actions may have slightly increased the volume of the overflows. The District has ordered the company to continuously run the pumps during tunnel events. MMSD also began a project in 2001 that will allow the power switchover without having to turn off the pumps. It is expected to be completed in 2003.

Siphon capacity project already underway

Because construction of the downtown siphons, which transport wastewater under the Milwaukee River to the Jones Island plant, was started before other elements of the Water Pollution Abatement Program were finalized, their design was based on factors that later changed. However, as documents provided to the LAB showed, the plan all along was that any shortfall in hydraulic delivery through the siphons to Jones Island would be accommodated by diverting flow to the Inline Storage System and then pumped out to the Jones Island or South Shore plant for treatment.

As stated earlier in this response, the District began a project in 2001 to redesign and reconstruct the siphons as part of the Central Metropolitan Interceptor Sewer improvement project that will increase their efficiency and capacity. We expect this project will be completed in 2007.

Concerns raised about watercourse project cost increases do not consider the cost changes inherent in watercourse project planning

The report's analysis of a small number of watercourse projects illustrates the well-understood principle that there will usually be a reasonable difference between preliminary cost estimates and final construction costs. This is because preliminary estimates are developed without the benefit of public participation, site location, geotechnical investigations or even preliminary design. This principle is reflected in the Association for the Advancement of Cost Engineering's guideline that preliminary costs generally vary between -30 percent and +50 percent of final construction costs.

The report's analysis of a small number of watercourse projects illustrates the well-understood principle that there will usually be a reasonable difference between preliminary cost estimates and final construction costs.

Despite those facts, the report uses a preliminary and outdated cost estimate for the Lincoln Creek Environmental Restoration and Flood Control Project to make its assertion that the projects exceeded budgeted amounts. In fact, the $70.4 million figure used in the report was a preliminary estimate that was not necessary to update after final design was completed because the project was on a fast-track schedule to be completed because of heavy flooding along the creek corridor in 1997 and 1998.

It was completed two years ahead of schedule, bringing flood relief to more than 2,000 homes and businesses, which had been ravaged by flooding for decades. In fact, between 1960 and 1997, more than 4,000 separate flooding problems were reported along Lincoln Creek.

The main reasons for the increase in the Lincoln Creek cost preliminary estimate were:

- DNR permit requirements that exceeded expectations based on past practices of the state agency and the fact that the District had to receive a Chapter 30 permit from the DNR for each of the 10 reaches of the creek, rather than one permit for the entire project.
- $12.8 million in design costs were not included in the preliminary estimate as it was only a construction estimate for the project.
- Contaminated soils encountered were not identified during initial investigations because they were on private property where owners did not allow access for soil borings. This cost the District about $6.1 million.
- The preliminary estimate was developed in 1996 and inflation added about $13.7 million to the project.
- An endangered snake habitat that DNR was not aware of, along with other real estate, insurance and professional services that added $7.8 million.
- Bypass culvert projects that were not included in the original estimate that added $7.2 million to the cost of the project.

The $70.4 million figure used in the report was a preliminary estimate that was not necessary to update after final design was completed because the project was on a fast-track schedule to be completed because of heavy flooding along the Lincoln Creek corridor in 1997 and 1998.

Substantial changes were made along Lincoln Creek as concrete was removed and detention ponds added. It is now more of a meandering waterway, aimed at keeping the water within its banks during heavy rainstorms. Over two miles of concrete were removed as part of the project and the floodplain was shrunk, thereby removing the need for the residents to carry expensive flood insurance. The project is being viewed nationally as a model of how to implement a flood control project in an urban area.

Lastly, the number of contracts sampled was too few from which to draw any conclusion. For example, a review of the Water Pollution Abatement Program projects would have provided a representative number of contracts. It would have been relevant because most of the inspectors, project managers and senior staff now employed by the District were present during the original program from the mid 1980s to the present time. Such a study would have shown minimal cost increases generally in the area of 7 percent, which were extraordinarily low for a $2.3 billion program.

A strict cost-benefit approach to flood management work does not yield the most acceptable solution to urban flooding problems

The District's current approach on flood management projects, to implement an alternative that is preferred by a consensus of watershed stakeholders, was a decision by the MMSD Commission, based on the recommendations of a special policy group that included the executive director of Southeastern Wisconsin Regional Planning Commission, along with five locally elected officials.

Taxpayers have found the alternative of allowing homes to flood with sewage after extensive overland flooding to be unacceptable. This alternative is potentially dangerous, can cause significant property damage and is a risk to public health and safety.

Taxpayers have found the alternative of allowing homes to flood with sewage after extensive overland flooding to be unacceptable. This alternative is potentially dangerous, can cause significant property damage and is a risk to public health and safety.

The report also states that the District should consider whether to do a project based on the amount of flood damages. This is a flawed approach. The costs from a single 100-year event cannot be used as a comparison to project costs because in all of the areas MMSD is undertaking flood management work, the flooding has occurred numerous times. For example, the area of downtown Wauwatosa near the Menomonee River was extensively flooded in both June 1997 and August 1998. In the Congress Street area near Lincoln Creek, it has been reported that flooding occurred on a yearly basis prior to the implementation of the flood management project.

The report's comments on the benefits and costs of watercourse projects ignore three important considerations:

- The tangible benefits from these projects are not limited to preventing damages to homes and businesses. Several watercourse projects are multi-purpose in nature and provide water quality treatment, recreational opportunities and natural resources protection.

- The District made an explicit commitment to minimize the use of conveyance-oriented solutions because they were destructive to the environment and would not receive approval from the DNR. The District's and stakeholders' choice of other solutions have added to total project costs, but will preserve and enhance the resource value of area waterways and neighborhoods for future generations.

- Flood management plays an important role in the protection and efficient operation of the local and regional sewer systems during heavy storms. This function is not captured in the cost-benefit analysis of the monetary property damages avoided as a result of District flood management projects.

The report's suggestion that the District look at implementing projects that would provide protection for some, but not all residents impacted by flooding in a watershed is ill-advised and would not be supported by elected officials in communities served by MMSD or their residents.

Moreover, the report's suggestion that the District look at implementing projects that would provide protection for some, but not all residents impacted by flooding in a watershed is ill-advised and would not be supported by elected officials in communities served by MMSD or their residents. We should not be expected to go to West Allis, for example, and say the District will implement a project that will reduce the risk of flooding to residents who live near the Root River north of Oklahoma Avenue but not to others who just happen to live south of Oklahoma Avenue. That is unfair treatment to residents who are District taxpayers and who have made a commitment to their neighborhoods.

Increase in lobbying expenses does not include millions of dollars captured by the District as a result of lobbying efforts

This has resulted in a net savings of over $17.2 million to taxpayers because of the additional interest costs if the District had to borrow that amount.

As a result of this increased effort to secure federal funds, the District has received $11 million from Congress since 1998 for the Central Metropolitan Interceptor Sewer System Improvement Project. This has resulted in a net savings of over $17.2 million to taxpayers because of the additional interest costs if the District had to borrow that amount. A request for an additional $12 million has been made by the Milwaukee Congressional delegation in 2002. The District also received $2 million from Congress in 1997 for the District's Lincoln Creek Environmental Restoration and Flood Control Project.

On the state level, MMSD helped establish the statewide flood control grant program as part of the 1999 state budget. This fund, originally budgeted at $17 million, provides grants to communities statewide working on flood control projects. The District has already received $185,000 for the home acquisitions as part of the Hart Park flood management project and $600,000 for the Root River flood management project. In addition, several communities served by the District have received flood control grants, including Brookfield, Elm Grove, Mequon and Fox Point.

In closing, I would like to express once again our appreciation for your analysis. We look forward to reviewing the analysis in more detail to determine if there are changes that can be made to improve the quality and cost effectiveness of the District's service to its customers and to continue to improve the Milwaukee-area environment. I also hope your report prompts discussions among the policy-makers at the state level as to what can be done to reduce the amount of polluted runoff entering Milwaukee-area waterways, which the LAB identified as the major priority in the efforts to continue to improve water quality.

Sincerely,

Kevin L. Shafer

Kevin L. Shafer, P. E.
Executive Director