
Task F: Financial Plan

**Comprehensive Water Master Plan
DWSD Contract No. CS-1278**

Final Report

For Submittal to
**Detroit Water and Sewerage
Department**

June 2004



IN ASSOCIATION WITH CDM

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Acronyms and Abbreviations

AWWA	American Water Works Association
CIP	capital improvement program
CWMP	Comprehensive Water Master Plan
DB	design build
DBB	design, bid, build
DWRF	Drinking Water Resolving Fund
DWSD	Detroit Water and Sewerage Department
FY	fiscal year
M	million
MG	million gallons
MGD	million gallons per day
NAS	Needs Assessments Studies
O&M	operation and maintenance
PM	program management

SECTION 1

Introduction

The Detroit Water and Sewerage Department (“DWSD” or the “Department”) has engaged in a long-term master-planning program for its water system. The purpose of the master plan is to identify the Department’s infrastructure needs over the next 50 years and to prepare a CIP and financial plan to support the infrastructure needs. The focus of the master plan is the capacity and condition of the water transmission system and the water treatment facilities. It builds on and includes costs from other DWSD long-term planning efforts evaluating system improvements and treatment plant upgrades such as those identified in the “Needs Assessments” reports prepared for the three older water treatment plants including Northeast, Springwells, and Southwest. The master plan incorporates infrastructure needs associated with:

- Growing water demands of both existing customers and potential future customers,
- System security in terms of facility redundancy, looping of mains to provide additional and more secure feeds to customer communities, and finally
- Renewal and Replacement of critical infrastructure on an ongoing basis depending on the life expectancy of the various infrastructure classes, including the distribution system within the city of Detroit.

The purpose of this report is to document the financial analysis conducted as part of the master planning process. The master plan projects that the Department will be required to make significant capital improvements over the next 50 years. The Department has recently begun an aggressive program of capital improvements focused on improving the overall condition of the system and ensuring its long-term reliability and integrity.

The Master Plan continues that effort and projects that a capital improvement program (CIP) of approximately \$8.9 billion (in Year 2003 \$) will be required over the next fifty year time frame and more than half of that amount or approximately \$4.6 billion is projected by the year 2020. In addition to this, an estimate of ongoing operation and maintenance (O&M) costs has been made and these have been projected forward based on the projected growth of the system and the increase in water demands over the planning time frame. The O&M budget over the planning period is estimated to be approximately \$ 8.9 billion (Year 2003 \$). It is the total of the CIP and the O&M projections that determine the revenue requirements for the department and form the basis for the rate structure.

All of this is summarized by decade in Table 1 (in \$1,000 and in 2003 \$):

TABLE 1
Summary of the CWMP Recommended CIP and O&M Costs (in \$1,000) for DWSD Water Supply System (FY 2004 - 2050) by Decade *

Description	Years 2004 ~ 2010	Years 2011~2020	Years 2021~2030	Years 2031~2040	Years 2041~2050	Sum by Row
CIP						
1. New Infrastructure	\$507,000	\$866,000	\$386,000	\$330,000	\$209,000	\$2,297,000
2. Rehabilitation, and Replacement	\$1,118,000	\$1,890,000	\$1,133,000	\$1,065,000	\$1,077,000	\$6,283,000
3. Technology (computer systems)	\$147,000	\$47,000	\$47,000	\$47,000	\$47,000	\$335,000
Total Capital Costs	\$1,772,000	\$2,803,000	\$1,566,000	\$1,442,000	\$1,333,000	\$8,916,000
O & M Costs	\$1,138,000	\$1,796,000	\$1,903,000	\$1,976,000	\$2,067,000	\$8,880,000
CIP + O & M Costs	\$2,909,000	\$4,599,000	\$3,469,000	\$3,418,000	\$3,401,000	\$17,796,000

* All costs are in 2003 \$ and all numbers are rounded to millions.

To assess the financial impacts, it is necessary to analyze the combined impact of the CIP and O&M costs on the Department's annual revenue requirements. The revenue requirements are equal to the annual financial needs, or the amounts of money that need to be obtained from water rate revenue to fund the anticipated expenses and ensure compliance with the Department's General Bond Resolution.

DWSD provides wholesale water service to 126 suburban communities in the Greater Detroit metropolitan area as well as retail service to the City of Detroit itself. The total costs of operating the water utility are allocated to the customers of DWSD. For the purposes of this report, the overall impact on DWSD's revenue requirement has been assessed without considering the different customer groups. The analysis does not include detailed rate projections; rather a projection of overall rate increases, both on an average annual and a cumulative percentage basis, to meet projected revenue requirements has been made. For planning purposes, it has been assumed that the rate increases projected will be approximately uniform for all classes of customers. The impact of additional revenues from new or expanding customers to fund new capital works in accordance with the "Growth pays for Growth" policy has not been considered. Application of the principles of this policy would actually have an effect of reducing somewhat the projected rate increases for existing customers, as the rate projections assume that all future capital costs will be paid for through the rate structure.

Rate projections have been made utilizing the existing DWSD rate model so that current borrowing commitments and revenue bond conditions and covenants have been incorporated.

It is important to express some caution about the level of accuracy inherent in these projections. The timeframe of the analysis is 50 years. This is a very long period during which the accuracy of the financial projections can vary significantly. Assumptions on borrowing rates, inflation, assumed operating efficiency and growth directly affect the

actual revenue requirements. Although projections for capital needs for the next twenty years may be considered reasonable and realistic, projections beyond that time frame become much less predictable. Changes in technology, changing regulations, and changes in growth patterns all could impact longer-term needs.

However, this long-term financial plan is a useful tool that enables the Department to assess and visualize the impact of the master plan and other spending requirements facing the Department. Thus, the financial projections are only a guide to the impact that the master plan and its projected capital expenditures will have on the revenue requirements. To ensure the long-term usefulness of this analysis, the Department should on a continuing basis, such as during the annual budget process, update these projections and evaluate the projected requirements.

This report first presents the data sources that have been used in completing the assumptions. It then comments on the assumptions and methodologies used, summarizes the Capital Improvement Program, and describes the O&M projections and the resulting revenue requirements.

Master Planning of the water system should be an ongoing continuous process. However the formal process of documentation should be revisited at least on a ten year cycle, preferably one or two years after each decade census information is available. This will allow a comparison of previous growth projections with actual experience and allow for any needed adjustments to be made. Unforeseen events or circumstances may dictate a shorter review time frame.

SECTION 2

Data Sources

A large amount of data has been used to acquire knowledge of the Department's operating functions, its financial operations and policies and practices dealing with the funding of capital expenses and allocation of costs. Among the documents that have been used in the financial analysis are:

- Official Statements for Water Bond Issues 2001 Series A.
- Water Rate Documentation, "Water Rates 2002-2003," Black & Veatch.
- Audited Financial Statements, FY2002, KPMG.
- DWSD Annual Operating Budget FY2003.
- Capital Improvement Program, FY2004-FY2050; developed under the master plan.
- Projections of customer growth within the wholesale customers and the City of Detroit, based primarily on SEMCOG projections and developed as part of the master plan.
- City of Detroit Water and Sewerage Department Board of Water Commissioners Public Hearings for Fiscal Years 2002-2003, 2003-2004, and 2004-2005 Proposed Water and Sewerage System Budgets and Rates.
- Water Supply System Capital Improvement Program, Fiscal Years 1999-2008.
- City of Detroit Water Fund Financial Statements For the Years Ended June 30, 1999 and 1998.

Additional information has been obtained through interviews and discussions with DWSD staff. The Master Plan has been an ongoing project for the past four years with the financial analysis being completed as a final component of the project.

SECTION 3

Assumptions & Methodologies

The methodology used in the completion of the financial projections is directly based on the annual rate projection model and documentation by Black & Veatch, DWSD's rate consultant. For the purposes of this analysis, actual unit costs are not presented, but rather the annual revenue requirement for the Department overall is summarized. Primarily, the revenue requirement consists of operating expenses, annual rate financed capital improvements and debt service resulting from the issue of long-term debt. In the development of the annual revenue requirements, the following assumptions have been used:

- The Department is not expected to receive any state or federal grants in support of its capital improvement program.
- The Department is assumed to be eligible to finance a small portion of its capital needs through Drinking Water Revolving Fund loans. These loans are assumed to carry an interest rate of 2.5% over a term of 20 years.
- It is assumed that the Department will use both pay as you go capital and debt financed revenue bonds for the balance of the CIP. Pay as you go capital is essentially raised through the Department's debt service coverage amounts described below. It is assumed that all other capital expenditures will be financed through the issuance of long-term debt. The bond issues are assumed to have a term of 30 years with an interest rate of 6 percent starting in FY 2007. Debt issued in prior years carries an interest rate of 5.5 percent.
- The Department is assumed to follow a debt service coverage requirement of 40 percent for all of its issued long-term bonds. While the Department has a legal coverage requirement of 25 percent, for planning purposes the Department has set a target of 40 which is consistent with the Department's short term planning for the recent past.
- In the presentation of revenue requirements and rates, both Capital and Operating and Maintenance costs are projected to inflate at a 3.0 percent average annual rate beginning in 2009 and continuing over the study period. The DWSD's current five-year (FY 2004-2008) O&M and Capital projections have inflation built into them.

SECTION 4

Capital Improvement Program

The Capital Improvement Program has been developed after a thorough review of the Department's current system. It should be noted that the master plan recommendations incorporate the Department's approved FY 2004-2008 Capital Improvement Program. In addition, the financial analysis accounts for the carry-over CIP, that is the amount identified in the current DWSD CIP but which is projected to be expended in FY 2008 and beyond. The financial modeling assumes that most of the expenditures associated with carry-over projects take place between FY 2008 and FY 2010.

The CIP totals approximately \$8.9 billion in Year 2003 dollars over the fifty year planning period, of which approximately \$4.6 billion is projected needed by the year 2020. Of the total amount, approximately 26% is assigned for new or expansion of water infrastructure, 70% for renewal and replacement of infrastructure and 4% for technology. Of the total renewal and replacement amount, approximately 33% is allocated to the water transmission and distribution mains, 51% to the plants, pumping stations and reservoirs, and 16% for unidentified capitalized maintenance.

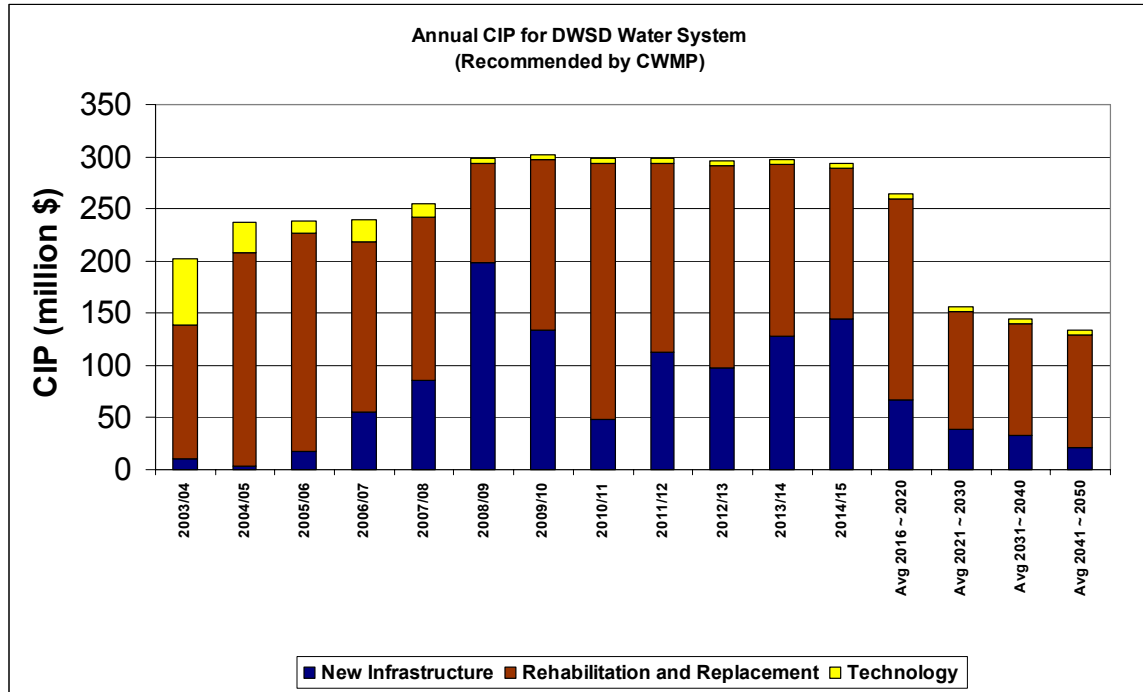
The CIP varies from approximately \$200M per year to \$250M per year for the period 2003/2004 through 2007/2008, and this is in accordance with the current DWSD published "Water Supply System Capital Improvement Program". From 2009 through 2020, the master plan projects an annual capital budget increasing to approximately \$300M per year. From 2020 through 2050, the master plan projects that the capital budget will decrease to about \$150M per year, approximately 70% to 80% of which is attributed to renewal and replacement of infrastructure. It must be recognized however that projections of need beyond 2020 can not be determined with the same level of confidence as those for the shorter term up to 2020, and it is very likely that additional needs will be identified as this time frame approaches.

The EPA in its 2002 report "*The Clean Water and Drinking Water Infrastructure Gap Analysis*"¹ reported that the 1999 EPA Needs Assessment survey identified a nation wide renewal and rehabilitation need for water systems of approximately \$218 billion in 1999 dollars. For the DWSD system, the total renewal and rehabilitation costs for the fifty-year planning period are projected to be approximately \$6.3 billion. Renewal and replacement will be a major component of all utilities' CIP needs over the next number of years.

The CIP as projected for the fifty-year planning period is shown graphically in Figure 1.

¹ "The Clean Water and Drinking Water Infrastructure Gap Analysis", September 2002, USEPA

FIGURE 1
Recommended Annual CIP for DWSD Water Supply System (FY 2004 – 2050)



* in 2003 dollars

The CIP is summarized by year to the year 2015 and then by decade to the year 2050 in Table 2. The table also contains a projection of the annual operation and maintenance costs, and the details relating to the projection of these costs are described in the next section.

TABLE 2

Summary of the CWMP Recommended CIP and O&M Costs (in \$1,000) for DWSD Water Supply System (FY 2004 - 2050)

Description	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	Years 2016-2020	Years 2021-2030	Years 2031-2040	Years 2041-2050	Subtotal by rows
CIP																	
1. New Infrastructure																	
Pipes	\$9,119	\$3,783	\$11,531	\$33,219	\$78,359	\$158,933	\$71,533	\$5,000	\$83,000	\$86,000	\$110,100	\$106,620	\$173,280	\$183,600	\$210,100	\$157,500	\$1,481,677
Meter Installations								\$1,000	\$1,000								\$2,000
Water Storage																	
Ground Reservoirs (@Pump Station) - Equalization																	\$0
High Ground Reservoirs - Equalization	\$0	\$0	\$1,600	\$4,300	\$0	\$0	\$0	\$15,100	\$15,100	\$0	\$0	\$0	\$0			\$4,000	\$40,100
Emergency Storage								\$0	\$0	\$10,650	\$10,650	\$0	\$0	\$12,200	\$28,200	\$9,100	\$70,800
Pump Stations	\$1,220	\$0	\$1,619	\$14,281	\$4,250	\$24,500	\$18,200	\$0	\$0	\$0	\$0	\$0	\$7,800	\$25,500	\$90,300	\$36,900	\$224,570
WTPs																	
Plant Expansion (Lake Huron WTP)	\$0	\$0	\$0	\$0	\$0	\$0	\$23,450	\$11,725	\$11,725	\$0	\$0	\$0	\$0	\$163,000	\$0	\$0	\$209,900
Plant Water Quality Improvements	\$0	\$0	\$3,281	\$3,869	\$3,366	\$15,256	\$20,850	\$14,850	\$1,750	\$1,150	\$7,350	\$38,250	\$153,550	\$1,500	\$1,500	\$1,500	\$268,022
Subtotal	\$10,339	\$3,783	\$18,031	\$55,669	\$85,975	\$198,689	\$134,033	\$47,675	\$112,575	\$97,800	\$128,100	\$144,870	\$334,630	\$385,800	\$330,100	\$209,000	\$2,297,069
2. Rehabilitation and Replacement																	
Asset Management Program Cost				\$500	\$500	\$667	\$667	\$667	\$1,000	\$1,000	\$1,000						\$6,000
Water Mains																	
Transmission Mains																	
Age Related							\$38,960	\$36,774	\$36,835	\$25,365	\$33,652	\$31,301	\$263,308	\$147,635	\$100,872	\$115,453	\$830,155
Capacity (Level of Service) Related							\$12,567	\$12,567	\$25,133	\$12,567	\$12,567	\$12,567	\$988	\$9,212	\$10,745	\$17,761	\$126,672
Distribution Mains																	
Urban Systems (Distribution)	\$30,928	\$46,855	\$36,972	\$25,000	\$26,000	\$5,000	\$21,000	\$97,000	\$31,000	\$47,094	\$10,000	\$10,000	\$309,658	\$172,589	\$124,580	\$99,410	\$1,093,086
WTPs																	
General Plant	\$16,897	\$38,437	\$24,499	\$9,180	\$12,750	\$2,688	\$2,688	\$2,688	\$2,688	\$2,688	\$2,688	\$2,688	\$13,438	\$26,875	\$26,875	\$26,875	\$214,638
Needs Assessment and Others in DWSD CIP																	
Northeast WTP	\$0	\$13,039	\$23,630	\$27,980	\$21,600	\$32,581	\$32,581										\$151,410
Springwells WTP	\$700	\$6,360	\$38,800	\$53,900	\$61,000	\$26,533	\$26,533	\$21,333	\$10,000	\$30,000	\$30,000	\$12,800					\$317,960
Southwest WTP	\$0	\$1,982	\$19,500	\$22,340	\$16,400	\$525	\$525										\$61,272
Water Treatment Plants Replacement/Renovation	\$57,308	\$71,294	\$30,902	\$3,279	\$0	\$208	\$208	\$39,005	\$39,005	\$39,005	\$39,005	\$39,005	\$195,027	\$413,828	\$424,017	\$424,017	\$1,815,114
Pump Stations and Reservoirs	\$19,884	\$15,853	\$11,674	\$6,106	\$1,350	\$0	\$0	\$10,696	\$10,696	\$10,696	\$10,696	\$10,696	\$53,481	\$112,967	\$127,762	\$143,932	\$546,490
Capitalized Maintenance	\$3,060	\$10,000	\$22,500	\$14,250	\$16,250	\$27,318	\$27,318										\$120,695
Future Unidentified Capitalized Maintenance & Repair								\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$125,000	\$250,000	\$250,000	\$250,000	\$1,000,000
Subtotal	\$128,777	\$203,820	\$208,477	\$162,535	\$155,850	\$95,519	\$163,045	\$245,730	\$181,358	\$193,414	\$164,608	\$144,057	\$960,900	\$1,133,106	\$1,064,851	\$1,077,447	\$6,283,492
3. Technology (Computer Systems)																	
Computer Systems	\$63,430	\$29,400	\$11,496	\$20,828	\$12,786	\$4,695	\$4,695	\$4,695	\$4,695	\$4,695	\$4,695	\$4,695	\$23,473	\$46,945	\$46,945	\$46,945	\$335,109
Subtotal	\$63,430	\$29,400	\$11,496	\$20,828	\$12,786	\$4,695	\$4,695	\$4,695	\$4,695	\$4,695	\$4,695	\$4,695	\$23,473	\$46,945	\$46,945	\$46,945	\$335,109
Total Capital Costs	\$202,546	\$237,003	\$238,004	\$239,032	\$254,611	\$298,902	\$301,773	\$298,100	\$298,627	\$295,909	\$297,402	\$293,621	\$1,319,002	\$1,565,851	\$1,441,896	\$1,333,392	\$8,915,671
O & M Cost																	
Total O & M Costs	\$150,403	\$155,300	\$158,405	\$163,157	\$168,052	\$170,110	\$172,194	\$173,510	\$174,836	\$176,171	\$177,517	\$178,873	\$915,076	\$1,902,728	\$1,976,426	\$2,067,409	\$8,880,167
GRAND TOTAL	\$352,949	\$392,303	\$396,409	\$402,189	\$422,663	\$469,013	\$473,967	\$471,610	\$473,463	\$472,080	\$474,920	\$472,495	\$2,234,078	\$3,468,579	\$3,418,322	\$3,400,800	\$17,795,837

Notes:

- 1 The Green highlights indicate that the costs are from DWSD FY 2004-2008 Water Supply System CIP (2003).
- 2 The costs for Pump Stations category from FY2004 to 2010 include the costs for at station Water Storage for Equalization and Emergency.
- 3 All costs in this Table are in 2003 Dollars.

The CIP as outlined in Table 2 is a summary of the following:

1. The DWSD Water Supply System Capital Improvement Program – Fiscal Years 2004 through 2008.
2. The recommendations from the Water Master Plan – as summarized in the various Task “C” and Task “D” reports dealing with:
 - a. Water Transmission pipelines, pumping stations and storage reservoirs.
 - b. Water Treatment Plant Improvements and Expansions.
 - c. Source Water Protection.
 - d. Infrastructure Renewal and Replacement.
3. The capital renewal program for three water treatment plants as outlined in the various “Needs Assessment” reports for the Northeast, Springwells and Southwest plants.

The master plan reports have recommended schedules for construction of the various components of the system based on a projected need that is generally driven by growth, and or renewal needs. However, the scheduling of some of this work has been delayed or modified as part of the financial planning in order to maintain capital spending within the limits that have already been defined in the current DWSD CIP and a ceiling of \$300 million per year from 2009 and beyond. This ceiling has been set using past DWSD experience in combination with engineering judgement, and is based on the maximum amount of construction that is considered reasonable to undertake in any one year in combination with the cumulative impact on the water rates structure.

Appendix A provides the details of the CIP, by year to 2015 and by decade thereafter and the changes in the schedules for various of the projects are highlighted. Appendix A provides details for the CIP in the following categories:

1. New Infrastructure.
2. Rehabilitation and Replacement.
3. Needs Assessments for the three Water Treatment Plants (Northeast, Springwells, and Southeast).

SECTION 5

Operations and Maintenance Costs

Operations and Maintenance (O&M) costs are those costs associated with the ongoing day to day water operations, including such as labor, power, chemicals, materials, etc. They include minor repairs to facilities and infrastructure but do not include major infrastructure rehabilitation or replacement costs as these are accounted for in the CIP.

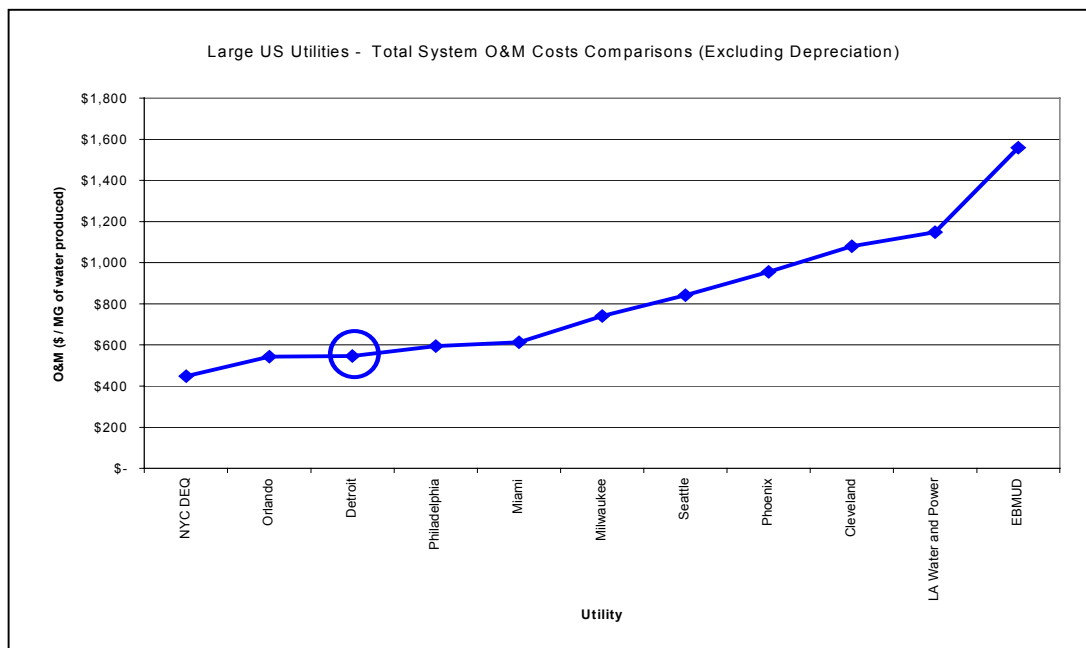
O&M costs can be categorized so that comparisons or some basic “benchmarking” can be made with peer utilities to assess the validity of projecting these costs forward to future years for planning purposes.

Currently, the total O&M budget for the water department is about \$150M. For comparison purposes, this has been categorized into three primary areas as follows:

- Production, including Source of Supply and Treatment
- Transmission and Distribution
- Administration

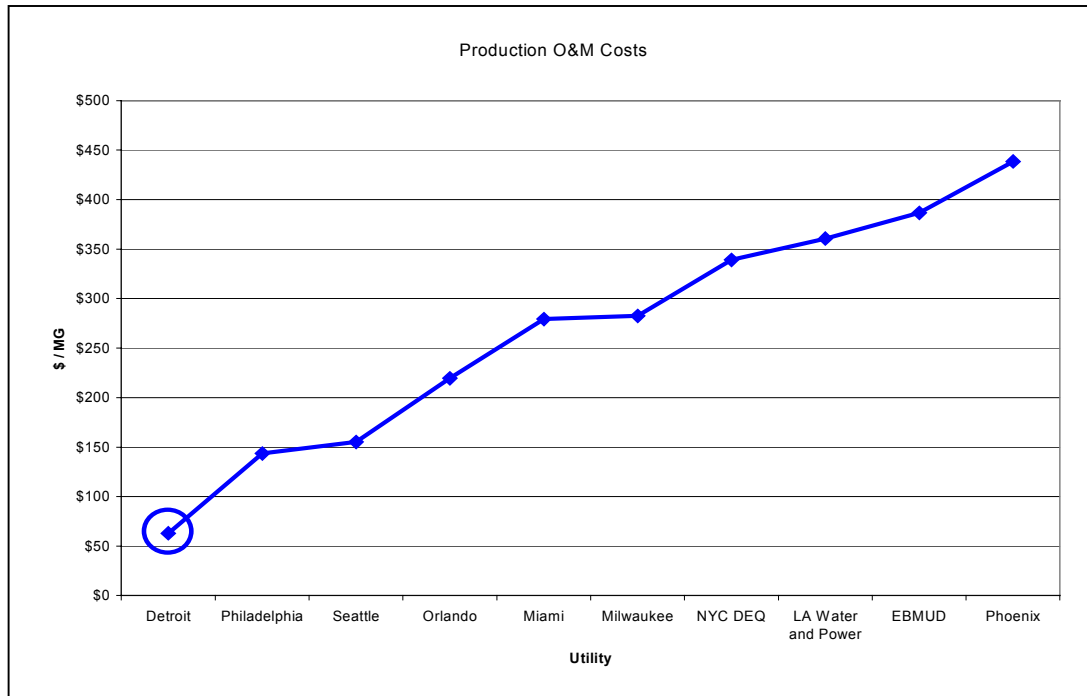
This categorization allowed comparison of DWSD O&M costs with a number of other large U.S. utilities using the AWWA Operating statistics for 1999, the latest year for which the data has been published. These data were compared with the DWSD data for the same year and Figures 2 through 6 provide a simple evaluation of how the DWSD operation compares with other large utilities.

FIGURE 2.
Large US Utilities – Total System O&M Costs Comparison



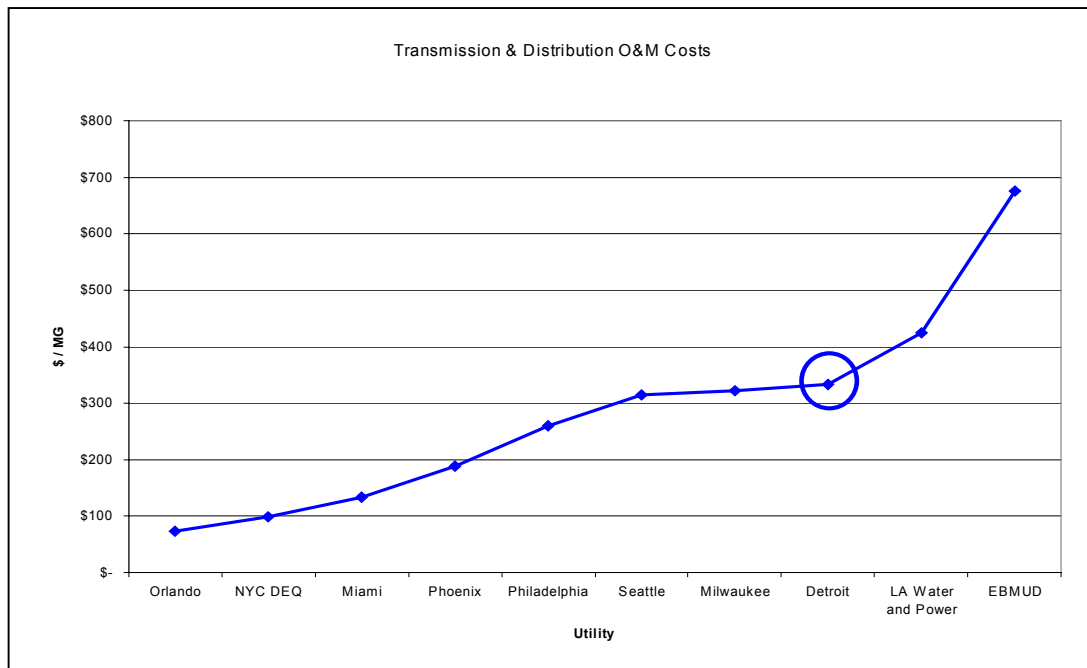
* from AWWA 1999 Operating Statistics

FIGURE 3
Large U.S. Utilities - Production O&M Costs



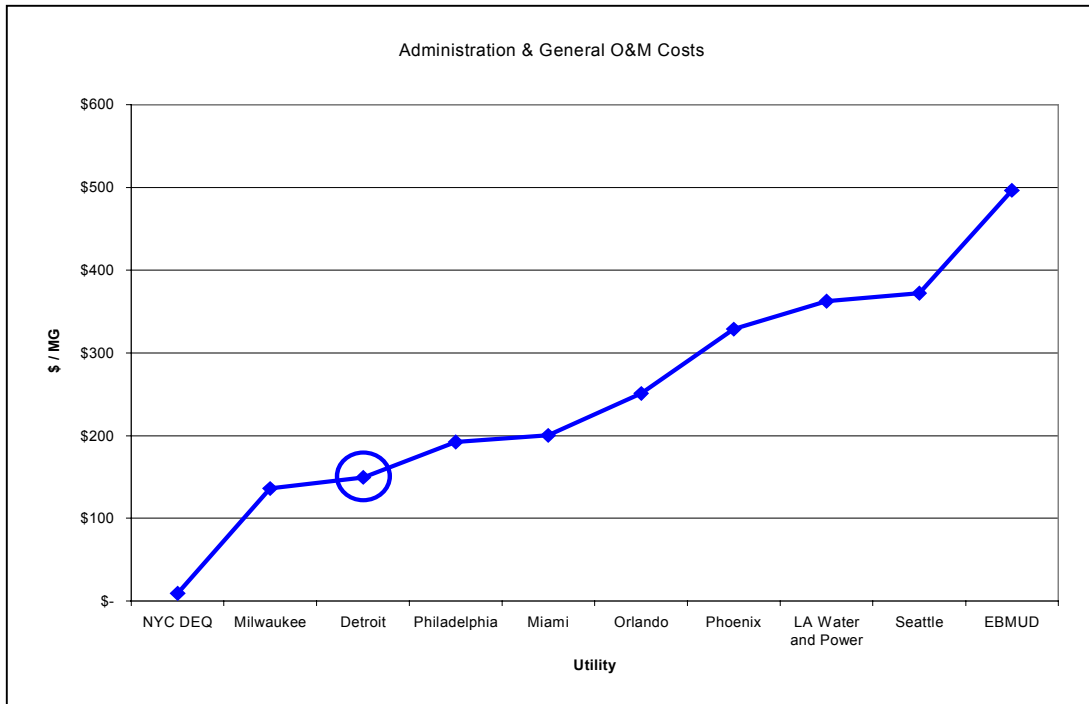
* from AWWA 1999 Operating Statistics

FIGURE 4
Large U.S. Utilities - Transmission and Distribution O&M Costs



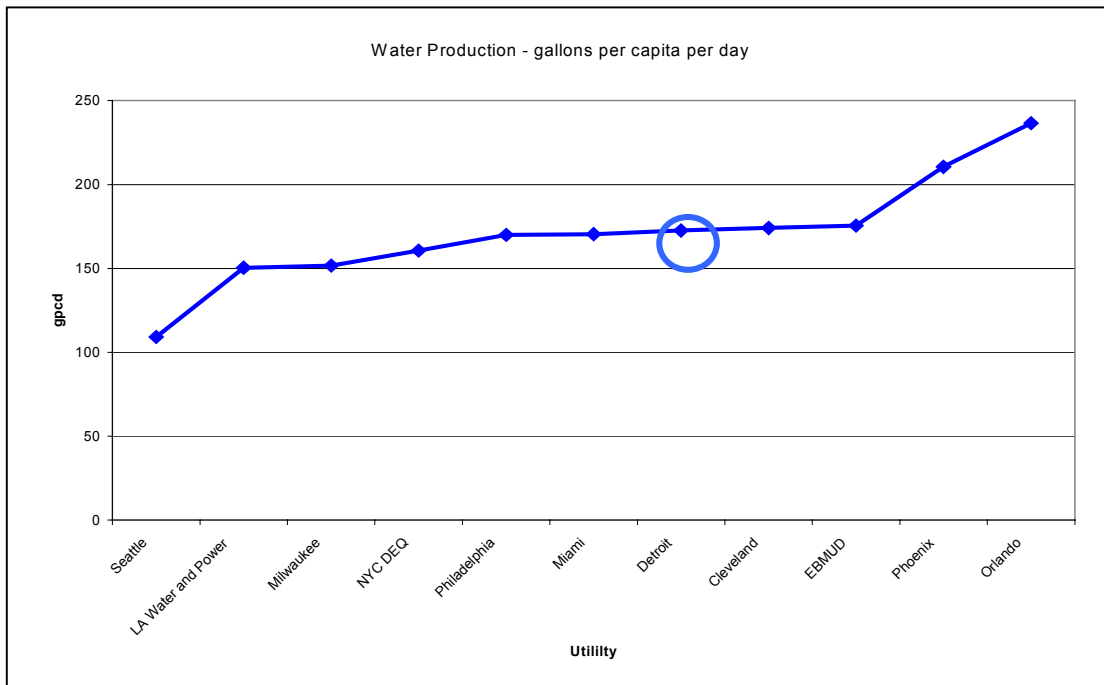
* from AWWA 1999 Operating Statistics

FIGURE 5
Large U.S. Utilities - Administration & General O&M Costs



* from AWWA 1999 Operating Statistics

FIGURE 6
Large U.S. Utilities - Water Production (gallons per capita per day)



* from AWWA 1999 Operating Statistics

A review of these graphs shows that, on an overall basis, the DWSD O&M costs for the water system operations compare favorably with other large utilities across the United States.

In terms of overall system O&M costs, only two of the ten utilities surveyed were lower in overall system O&M costs than DWSD. The lowest cost utility was New York City at \$448/MG. However, it must be recognized that New York City does not have the same level of treatment costs that the other utilities surveyed experience. Orlando (\$544/MG) was marginally lower than Detroit at \$617/MG. The highest O&M cost utility was East Bay MUD at \$1,559/MG.

DWSD production costs are the lowest of all of the utilities surveyed, and overall administration costs are third lowest, after New York City and Milwaukee. The O&M costs for transmission and distribution are third highest at \$367/MG. However a contributing factor in this regard may be attributed, at least in part, to the expanse of the service area and the long lengths of transmission mains and associated pumping costs that are included in the system operation.

The master plan has recommended a modified method of transmission system operation as the system expands, utilizing high ground storage to supply peak demands thereby reducing pumping and associated power costs. Savings in this regard will come about as the system expands and this “balancing” storage is integrated into the system. Other advances in technology and improvements in operational efficiencies could also lead to O&M costs savings. However, it is also possible that other O&M costs, such as water production, could increase as a result of such things as additional regulatory requirements with their associated increased treatment costs. Also unit energy cost could rise, so new customers added at high elevations could lead to more energy consumption for pumping, thereby offsetting other potential O&M savings.

For planning purposes, for the period up to 2008, O&M projections were those currently provided by DWSD in the current rate projections. From 2009 on, it was decided to project total O&M costs forward using the same unit costs per MGD as DWSD experience today, accounting only for the impacts of inflation. Therefore, as the water demand is projected to increase, the O&M costs have been projected to increase proportionally, using constant dollars per MGD of water produced.

SECTION 6

Revenue Requirement

The annual revenue requirements have been determined by adding the projected expenses for operating and maintenance activities to debt service resulting from the master plan and the amount required to comply with the Department's debt service coverage requirements (using the Department's current policy for 40% debt service coverage.) As noted earlier in this report, the revenue requirement also incorporates current borrowing commitments and revenue bond conditions and covenants. The rate of increase in revenue requirements is therefore dependent on the capital financing assumptions, the rate of increase in existing expenditures and the annual volume of capital improvements. The result will be a range of annual financial requirements that can be used by the Department for planning purposes. However, considering the long time frame of the analysis, it is recommended that the department continue to undertake a regular annual re-evaluation of the financial projections as occurs now during the rate setting process. This review should incorporate more detailed CIP planning schedules, updated cost estimates and more current customer allocation information. Updated projections should also reflect changes in the Department's cost allocation methodology, if any are approved and implemented.

Changes in the revenue requirements have been summarized and a snapshot of the detailed financial projections is provided here. Again, it is important to view these projections as the results of a planning effort. As events unfold, the projections contained herein will be subject to significant modification. The Department and its customers will need to be cognizant of this over time and make adjustments as appropriate.

The projections described below assume that the Department continues to set rates to generate a debt service coverage ratio of 40 percent consistent with current fiscal planning, which is over and above the legal covenant of 25 percent. However, the Department is evaluating a reduction in the target coverage amount. Such a reduction would reduce the Department's revenue requirements over the short term. If the Department reduces targeted coverage, its amount of cash funded capital falls, but the amount of debt it must issue for a given capital improvement program must increase. In the short term, the resulting revenue reduction could be significant, but the benefit of the lowered target coverage declines with time as debt service increases.

The revenue requirement projections as shown in Table 3 use the CIP costs as presented in Table 2. In FY2004, the revenue requirement is projected to be equal to approximately \$283 million. In FY2004, the Master Plan does not yet have an impact on the financial revenue requirement of the department.

The composition of the revenue requirement changes over the 50-year timeframe. Overall, the revenue requirement, including an allowance for inflation, is projected to increase to approximately \$1.3 billion by 2050, from the FY 2004 level of \$283 million.

TABLE 3
DWSD Revenue Requirement Projections
*In Thousand Dollars **

FY	2004	2010	2020	2030	2040	2050
O&M	\$150,400	\$182,200	\$261,000	\$364,300	\$508,600	\$715,700
Debt Service	\$ 92,400	\$179,400	\$376,600	\$466,500	\$395,700	\$413,800
Capital from current revenue	\$ 40,600	\$ 71,800	\$150,600	\$186,600	\$158,300	\$165,500
Allowance for other needs					\$ 62,400	
Totals	\$283,400	\$433,400	\$788,200	\$1,017,400	\$1,125,000	\$1,295,000

* Revenue Requirements are inflated at 3% per year.

In accordance with current financing, certain existing revenue bonds are due to be paid off in 2034. This theoretically reduces the total revenue requirements and although the calculated revenue requirements show a slight decline in the time period 2034 – 2040, it has been assumed for rate projection purposes, that the revenue requirements will remain level during these time frames. It is assumed that refinancing or other revenue needs will make up the difference.

The Department uses a “cost of service” rate system, driven by elevation, distance and capacity factors in order to recover costs and charge its customers. Although this report does not attempt to duplicate the rate schedules for individual customers, average rates of change in revenue requirements that will be roughly equivalent to the anticipated changes in rates (assuming no material change in the Department’s approved rate methodology) have been determined.

A key aspect of this analysis is that the projected revenue requirement increases are front-loaded, that is the rate increases are much greater in the shorter time frame than in the longer term. This reflects the need for the Department to catch up with its system rehabilitation and then the system’s costs will stabilize as repair and replacement expenditures stabilize in latter years. The timing of the Department’s existing debt payments enhances the projected rate pattern. Eliminating this debt reduces the Department’s revenue requirements by a significant amount and provides room within the revenue requirement to support significant new debt without increasing rates.

Table 4 shows the average annual rate increases for customers in each of the 10-year intervals. As described in the preceding paragraph, whereas initial rates are projected to increase by 7.4 percent per year, these average annual rates of change fall significantly once the end of the analysis timeframe is reached.

TABLE 4
Projected Average Annual Rate Increase by Decade

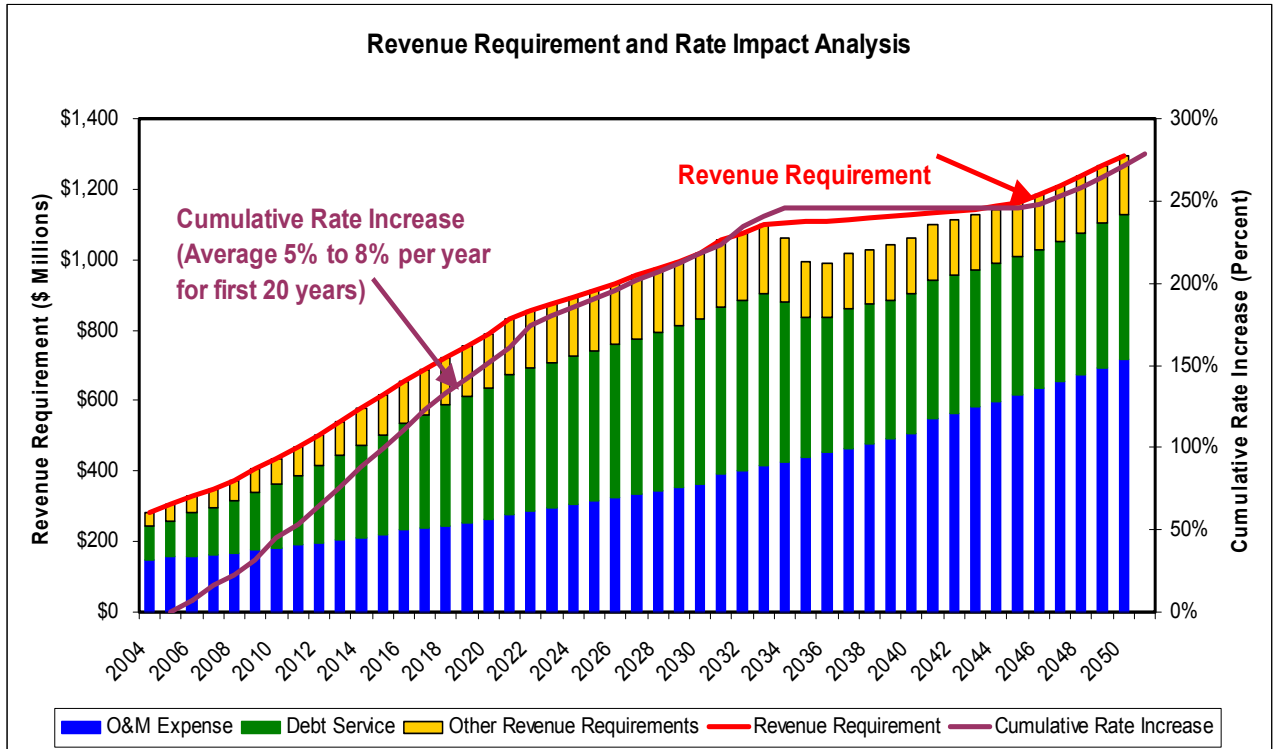
	2004-2010	2011-2020	2021-2030	2031-2040	2041-2050
Rate Increase	7.4%	5.4%	2.2%	0.7%	0.9%

* Inflation at 3% per year for both Capital and O&M costs is included in the rate calculations.

Over the fifty-year planning period, rates are projected to increase for all customers at an average annual rate of approximately 3.4 percent. However, as noted earlier, projections are considered to be more reliable for the first twenty-year period and the rate increases are projected to increase at an average annual rate of between 5% and 8% during this time frame.

Figure 7 illustrates the financial projections graphically.

FIGURE 7
Revenue Requirement and Rate Impact Analysis



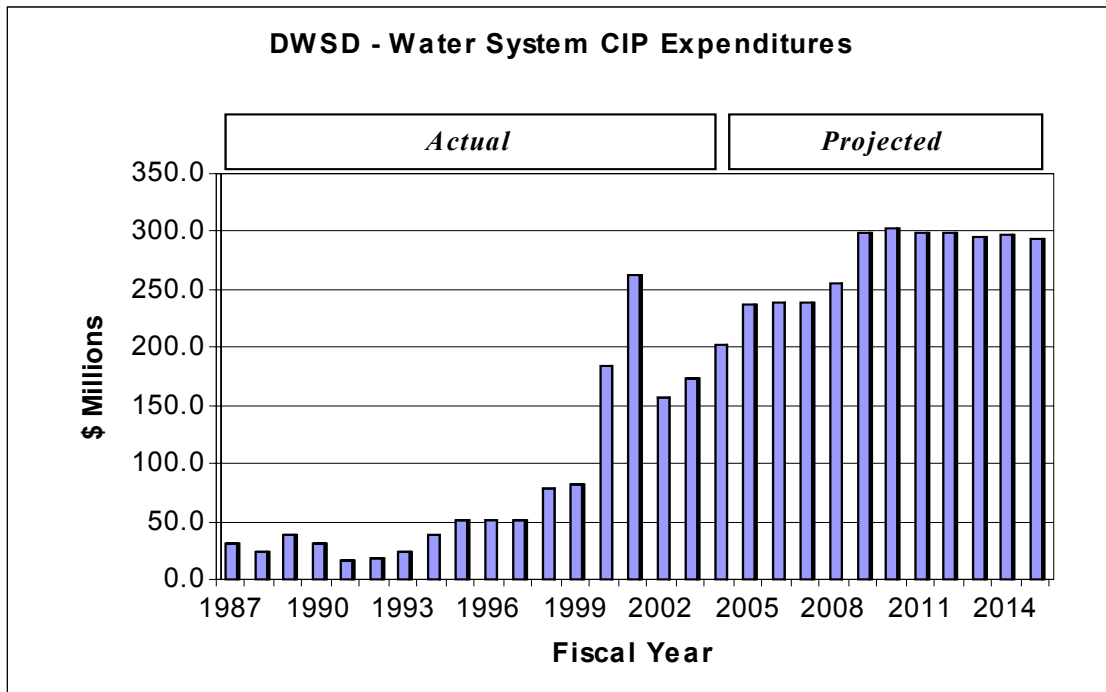
* Inflation at 3% is included in Revenue Projections.

SECTION 7

Program Delivery

The CIP as proposed is aggressive both in terms of the number of projects and the size of the annual budgets projected, particularly over the next twenty years. The annual capital budget for the DWSD water system has grown substantially over the period of the past ten years. As demonstrated in Figure 8, the CIP has grown from an annual budget of approximately \$25 M to \$75 M per year during the late 1980s and through the 1990s to the current \$200 M. This is planned to grow to more than \$250 M by the year 2008, and then to approximately \$300 M per year from 2009 through 2015.

FIGURE 8
DWSD – Water System CIP Expenditures



A major component of the CIP relates to the rehabilitation and replacement program for pipelines and plant infrastructure. This component of the CIP is somewhat the result of a “catch up” process as many components of the DWSD system are aging and the rehabilitation and replacement process has typically been under-funded in past years.

There are two individual components of the rehabilitation and replacement program that can be identified as separate programs. The first is the rehabilitation program identified for the three water treatment plants including Northeast, Springwells, and Southwest. The work recommended for these three plants totals approximately \$530M and is scheduled to be completed over a period of about ten years. This work is needed both to bring these three plants up to current day standards for treatment, and to provide the capacity for which they were initially rated. The Needs Assessments Studies (NAS) and CWMP also recommended

the addition of Ozone and UV for disinfection at these three plants. The estimated cost of this work is about \$182 M, and this is included in the New Infrastructure category.

The Water Works Park treatment plant has recently been replaced with a new state of the art facility, so no short-term rehabilitation work is identified for this plant. There is some work that has been identified in the current CIP for rehabilitation work at the Lake Huron water treatment plant, but it does not involve a major program. The long-term (FY 2010-2050) annual rehabilitation and replacement costs for all the five water treatment plants including the Lake Huron and Water Works Park plants were estimated based on the asset value as detailed in the CWMP report.

The second major program relates to the rehabilitation and replacement of pipelines. The CIP identifies the distribution system and the transmission system as two separate areas of pipeline rehabilitation. However, they could be viewed as one program for purposes of implementation. This program is scheduled to continue over the entire fifty-year planning period and represents a significant component of the CIP, amounting to approximately \$2.0 billion in 2003 dollars.

DWSD has recently employed three different models for project delivery. The traditional design, bid, build (DBB) model has been and still is employed for the majority of the DWSD projects. Some of the larger projects have employed the design build (DB) model and examples of this model include the new Water Works Park water treatment plant, the Lake Huron Residuals Management system and the Haggerty Road pumping station and reservoir, as well as others. In addition, the program management (PM) model has been employed for the very major (\$550M) and long term program at the wastewater treatment plant, PC-744. There is no one model that is appropriate or “the best” to apply to all projects.

The long term CIP contains numerous projects that will be appropriate for application of all three of these delivery models. Many of the smaller projects will continue to utilize the DBB model. The DB model may be the best delivery model for some of the larger and stand alone projects such as new reservoirs, new pumping stations, and perhaps some of the new transmission mains.

There are two programs that stand out as major programs that should be viewed as such for delivery through a PM model. The first is the program identified in the three water treatment plant “Needs Assessments.” This program contains a multitude of individual projects at three separate plants that are very closely interrelated and scheduling of the work will be critical and dependent on a number of issues including such as seasonal variation in water demand. In addition, the nature of the work will require special skills in order to deal with the technical interrelationships. This program has a limited time frame of approximately ten years and should best be managed in a manner similar to the current program underway at the wastewater treatment plant using external expertise and resources.

The second program involves the pipeline rehabilitation and replacement program. This program will continue for many years to come and in fact extends for the entire planning period of the master plan. The program approach will involve firstly a prioritization process, and then the initiation of the projects on an individual basis. There are a number of variations as to how this program can best be initiated. However, this ongoing program is of such a nature and with such a long and extended time frame that DWSD should develop a

dedicated team “in house” to manage this important aspect of the CIP. Some external resources will be needed in the early stages to initiate the process.

The master plan recommends that DWSD adopt a formal “Asset Management Program” in order to assist in the prioritization process, and to apply as a tool in the development of a long term program. This is recognized as an early priority in the CIP.

The scope of the CIP as projected is such that the current resources within DWSD will need to be expanded or supported significantly in order to expedite the work as scheduled.

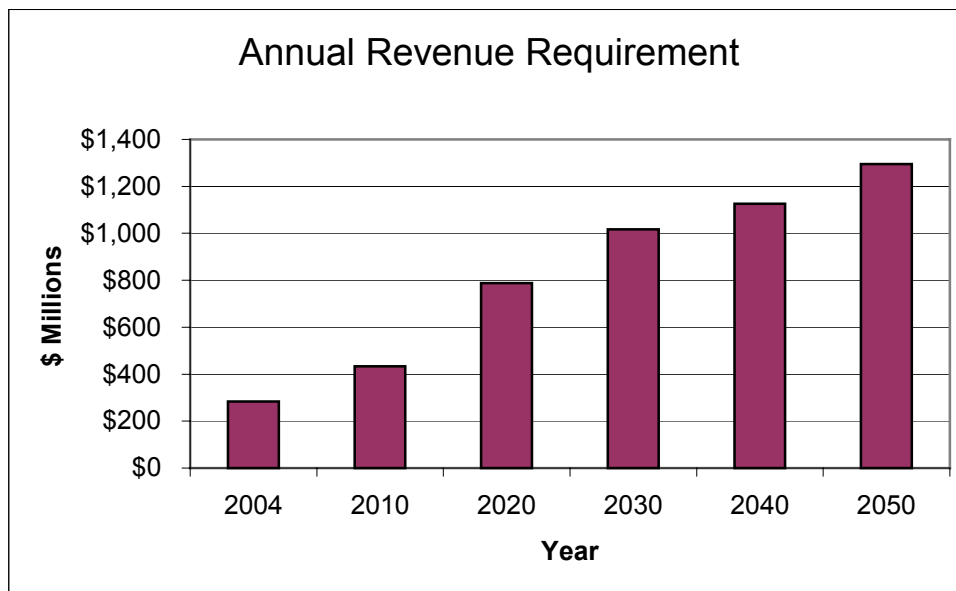
SECTION 8

Summary

The Detroit Water and Sewerage Department has engaged in a large-scale master planning effort for its water system. The purpose of the master plan is to assess the Department's infrastructure needs over the next 50 years. The CIP includes preparing a long-term financial plan of the combined impacts of the water master plan, assessing the water treatment plant needs, replacement and rehabilitation of various components of the water systems, and technology upgrades. The estimated capital costs for the capital improvement program is approximately \$8.9 billion in Year 2003 dollars. These capital expenditures will place a significant financial burden on the Department as well as the City of Detroit retail customers and the wholesale suburban customers.

Overall, the annual revenue requirement is projected to increase from \$283.4 million in FY2004 to \$1.3 billion in FY2050 as shown in Figure 9. Revenue requirements are based on both capital and O&M costs inflated at 3% per year. A significant amount of these expenses will be incurred in the early years, and it is projected that more than half of the total, or approximately \$4.6 billion will be needed by the year 2020. For the initial time frame up until 2010, rates are projected to increase by an average of approximately 7.4 percent annually; however, these average annual rates of change will fall significantly towards the end of the analysis timeframe. The impact of the CIP will be mitigated by the long implementation time frame of the CIP and the advantages of replacing expiring debt with newly issued bonds.

FIGURE 9
Annual Revenue Requirement



* Inflation at 3% is included in Revenue Projections.

Over the fifty years implementation timeframe, the revenue requirement for the Department is projected to increase by an average rate of approximately 3.4 percent per year. The timing of the increases is much more heavily front-loaded with the required increases being much larger in the early years than later years. Rate increases are projected to increase at an average annual rate of between 5% and 8% per year for the first twenty years.

APPENDIX A

CIP Details

APPENDIX A1

New Infrastructure

CWMP Recommended CIP Projects with Estimated Costs by 2010

Category	Facility / Pipe Route Name	Location	Description	Capital Costs (in \$1,000)	Total Capital Costs (in \$1,000)	CWMP Adjusted Schedule and Costs (in \$1,000)						
						2003/ 4	2004/ 5	2005/ 6	2006/ 7	2007/ 8	2008/9	2009/10
Pumping Stations and Reservoirs	Chesterfield Booster Pumping Station and a 20 MG (7 MG for Balancing and 13 MG for Emergency storage) Reservoir	Chesterfield Township	Cost for the 7 MG for Balancing Storage	\$3,150	\$15,150	\$ -	\$ -	\$ 1,619	\$ 13,531	\$ -	\$ -	\$ -
			Cost for the 13 MG for Emergency Storage	\$5,800								
			Pump Station	\$6,200								
	Romeo Booster Pumping Station and 20 MG Reservoir for Emergency Storage	Village of Romeo	Pump Station	\$29,200	\$41,400	\$ -	\$ -	\$ -	\$ 750	\$ 4,250	\$ 18,200	\$ 18,200
Storage Tanks	10 MG (6 MG for Balancing and 4 MG for Emergency Storage) High Ground Storage Tank West of Newburgh pumping station	8 Mile west of Sheldon	Cost for 6 MG for Balancing Storage	\$2,700	\$5,900	\$ -	\$ -	\$ 1,600	\$ 4,300	\$ -	\$ -	\$ -
			Cost for 4 MG for Emergency Storage	\$1,800								
			Distribution Piping	\$1,400								
Pumping Stations	Springwells WTP High Lift Pumping Upgrades	Springwells Water Treatment Plant	High Lift Pumps (450 MGD @ 350 ft)	see WTP	see WTP							
	Michigan Avenue Station Upgrades	Michigan Avenue Booster Station, Wayne	Pump Station Expansion	\$2,200	\$2,200						\$2,200	
	Wick Station Upgrades	Wick Rd. Booster Station - Romulus	Add 18 MGD line pumping capacity (54 MGD @ 250 ft)	\$4,100	\$4,100						\$4,100	
New Pipes	31 Mile Road New Pipeline	From Romeo to Springfield Twp.	Approximately 19 miles of 60-inch to 72-inch to 84-inch diameter pipe	\$133,800	\$133,800	\$ -	\$ -	\$ 1,000	\$ 12,000	\$ 41,575	\$ 39,613	\$ 39,613
	Orion Pipe Loop	From Independence Twp. to Orion Twp.	Approximately 7 miles of 54-inch to 60-inch diameter pipe	\$25,500	\$25,500	\$ -	\$ -	\$ -	\$ 9,650	\$ 15,850	\$ -	\$ -
	14 Mile Extension	From Wixom to South Lyon	Approx. 2 Mile; 72-inch diameter	\$15,200	\$15,200	\$ -	\$ -	\$ -	\$ -	\$ 1,700	\$ 6,750	\$ 6,750
Parallel Pipes	8 Mile Road Transmission Main (Required for additional capacity)	From WSC to Newburgh Station	Approx. 5 Mile; 60-inch diameter	\$29,800	\$29,800	\$ -	\$ -	\$ 1,000	\$ 5,350	\$ 6,709	\$ 8,371	\$ 8,371
	24 Mile Road Parallel Main	Chesterfield Twp. to Rochester	Approximately 13 miles of 36-inch to 42-inch to 48-inch diameter pipe	\$38,000	\$38,000						\$ 38,000	
	Parallel Pipes Downstream of Newburgh Booster Station	Livonia, 8 Mile Road from Newburgh Station to Newburgh Road	Approximately 0.4 miles of 60-inch diameter pipe	\$2,100	\$2,100						\$ 2,100	
	Parallel Pipes in NW Detroit	From Springwells WTP to WSC	Approximately 8 miles of 16-inch to 30-inch to 36-inch diameter pipe	\$17,100	\$17,100						\$ 17,100	
	14 Mile Road Parallel Main	Between Franklin and Haggerty Stations	Approximately 5 miles of 36-inch diameter pipe	\$13,400	\$13,400						\$ 13,400	
	Wick Road Parallel Main	From Wick Station Suction to Ypsilanti Station	Approximately 11 miles of 36-inch to 42-inch diameter pipe	\$30,800	\$30,800						\$ 30,800	
	Parallel Adams Road Main	Downstream of Adams Rd. Station	Approximately 1 mile of 30-inch diameter pipe	\$1,700	\$1,700							\$ 1,700
	Parallel Warren Main	Edison / Schoenherr from 10 Mile to 14 Mile	Approximately 4 miles of 42-inch diameter pipe	\$12,300	\$12,300							\$ 12,300
Grand Total				\$388,450	\$388,450	\$0	\$0	\$5,219	\$45,581	\$70,084	\$180,633	\$86,933

- 1 The green highlights indicate that it is already included in DWSD 2003 CIP but with a different cost associated (redundant CWMP projects). Refer to DWSD Water Supply System CIP (2003) in pages 29, 38 and 39.
- 2 The Orion Pipe Loop is listed as Orion Pump Station in the DWSD Water Supply System CIP (2003) under the Pump Stations & Reservoirs Category (see Page 39).
- 3 All costs in this Table are in 2003 Dollars.

CWMP Recommended CIP Projects with Estimated Costs by 2020

Category	Facility / Pipe Route Name	Location	Description	Capital Costs (in \$1,000)	Total Capital Costs (in \$1,000)	CWMP Recommended Schedule (Thousand Dollars)					
						2011/12	2012/13	2013/14	2014/15	2015/16	remaining (2016-2020)
WTP	Lake Huron WTP treatment upgrades	Lake Huron WTP	Add treatment capacity (from 400 MGD to 490 MGD)	see WTP	see WTP						
Storage Tanks for Balancing	High ground storage tank North of Orion Station	Brown East of Baldwin, Orion Township	New 20 MG high ground storage tank and associated piping (approximately 8 miles of 36-inch, 42-inch, and 48-inch diameter pipe)	\$30,200	\$30,200	\$15,100	\$15,100				
Storage Tanks for Emergency	Newburgh Booster Station Reservoir	Newburgh Booster Station	New 20 MG High Ground Storage Tank	\$12,200	\$12,200			\$6,100	\$6,100		
	SW of Adams BST High Ground	SW of Adams BST High Ground	New 10 MG High Ground Storage Tank	\$9,100	\$9,100			\$4,550	\$4,550		
Pumping Stations	Joy Rd. Station Upgrades	Joy Rd. Station	Additional 15.2 MGD line pumping added (line total 61.6 MGD @ 286 ft.)	\$3,200	\$3,200						\$3,200
	WSC Station Upgrades	West Service Center	Replace Intermediate Line pumps (60 MGD @ 185 ft.)	\$4,600	\$4,600						\$4,600
	Lake Huron WTP high lift pumping upgrades	Lake Huron WTP	New high lift pumps for new south feed (140 MGD @ 500 feet)	see WTP	see WTP						
New Pipes	Second Feed from Lake Huron WTP	Port Huron to Chesterfield Township	Approximately 40 miles of 42-inch, 54-inch, 96-inch, 108-inch and 120-Inch diameter pipe	\$388,200	\$388,200	\$5,000	\$83,000	\$86,000	\$84,000	\$72,000	\$58,200
	Haggerty pipe loop	Pontiac to north of Haggerty Pump Station	Approximately 16 miles of 54-inch, 60-inch, and 84-inch diameter pipe	\$104,400	\$104,400				\$26,100	\$26,100	\$52,200
	Michigan Avenue pipe loop	Hannan Road from Cherry Hill to Tyler	Approximately 6 miles of 36-inch diameter pipe	\$16,500	\$16,500						\$16,500
	The extension of the 24 Mile main to the west of Rochester station	24 Mile Rd. / Walton Blvd. from Rochester Station to Squirrel Rd.	Approximately 6 miles of 72-inch diameter pipe	\$42,600	\$42,600					\$8,520	\$34,080
Parallel Pipes	Parallel pipes downstream of Haggerty Station	14 Mile Rd. from Haggerty Station to Welch Rd.	Approximately 1 mile of 42-inch diameter pipe	\$2,700	\$2,700						\$2,700
	Parallel pipes upstream of Wick Station	Wick Rd. from Inkster to Wickham Rd.	Approximately 2 miles of 36-inch diameter pipe	\$5,500	\$5,500						\$5,500
	Parallel pipes downstream of Michigan Ave. Station	Michigan Ave. from Lamphere to Hannan	Approximately 2 miles of 24-inch to 30-inch diameter pipe	\$4,100	\$4,100						\$4,100
Grand Total				\$623,300	\$623,300	\$20,100	\$98,100	\$96,650	\$120,750	\$106,620	\$181,080

All costs in this Table are in 2003 Dollars.

CWMP Recommended CIP Projects with Estimated Costs by 2030

Category	Facility / Pipe Route Name	Location	Description	Capital Costs (in \$1,000)	Total Capital Costs (in \$1,000)
WTP	Lake Huron WTP treatment upgrades	Lake Huron WTP	Add treatment capacity (from 490 MGD to 593 MGD)	see WTP	see WTP
Pumping Stations	North Service Center capacity upgrades	North Service Center	Additional 110 MGD pumping capacity for line pumps (350 MGD @ 370 feet)	\$11,400	\$11,400
	Lake Huron WTP high lift pumping upgrades2	Lake Huron WTP	Additional 160 MGD high lift pumps for new south feed (300 MGD @ 500 feet)	see WTP	see WTP
	Michigan Avenue Station upgrades	Michigan Avenue Station	Replace reservoir pumps for additional head (17.28 MGD @ 250 feet)	\$1,400	\$1,400
	Franklin Station Upgrades	Franklin Station	Additional 30 MGD line pumping (120 MGD @ 250 ft.)	\$5,500	\$5,500
	Haggerty Station Upgrades	Haggerty Station	Additional 24 MGD line pumping	\$5,000	\$5,000
	Romeo Station Upgrades	Romeo Station	Additional 33.6 MGD line pumping added (line total 120 MGD @ 300 ft.)	\$2,200	\$2,200
Storage Tanks for Emergency	Storage tank in Ypsilanti Booster Station	Ypsilanti Booster Station	New 20 MG High Ground Storage Tank	\$12,200	\$12,200
New Pipes	Transmission main to supply Brighton	Pontiac Trail from West of Wixom to I-96 to Kensington Road to Buno Road	Approximately 12 miles of 42-inch, 48-inch, and 54-inch diameter pipe	\$40,100	\$40,100
	Continue second feed from Lake Huron WTP	Chesterfield Station to NSC	Approximately 16 miles of 72-inch and 84-inch diameter pipe	\$110,500	\$110,500
Parallel Pipes	Parallel pipes downstream of Haggerty Station	14 Mile Road from Welch Road to Beck Road	Approximately 4 miles of 42-inch diameter pipe	\$13,600	\$13,600
	Parallel pipes upstream of Joy Road Station	Joy Road from Wayne Road to Joy Road Station	Approximately 4 miles of 36-inch diameter pipe	\$10,800	\$10,800
	Parallel Orion Twp. pipes	Giddings Road from Walton Blvd. to Green Rd.	Approximately 2 miles of 42-inch diameter pipe	\$6,300	\$6,300
	Parallel Pipes Downstream of Newburgh Station	Livonia, 8 mile Rd. from Haggerty Rd. to Meadowbrook Rd.	Approximately 1.0 miles of 30 inch diameter pipe	\$2,300	\$2,300
Grand Total				\$221,300	\$221,300

All costs in this Table are in 2003 Dollars.

CWMP Recommended CIP Projects with Estimated Costs by 2040

Category	Facility / Pipe Route Name	Location	Description	Capital Costs (in \$1,000)	Total Capital Costs (in \$1,000)
WTP	Lake Huron WTP treatment upgrades	Lake Huron WTP	Additional treatment capacity (from 593 MGD to 658 MGD)	see WTP	see WTP
Pumping Stations and Reservoirs	Columbus Pumping Station and Emergency Storage Tank	Columbus Township	New station with line pumping only (294 MGD @ 300 feet)	\$57,100	\$68,700
			New 20 MG high ground storage tank for emergency storage	\$11,600	
	Oakland Pumping Station	Oakland Township	New station with line pumps (78 MGD @ 260 feet; ultimate capacity)	\$33,200	\$45,200
New 20 MG high ground storage tank for Emergency Storage	\$12,000				
	Lake Huron WTP high lift pumping upgrades ²	Lake Huron WTP	Additional 100 MGD pumping capacity for south feed (400 MGD @ 500 feet)	see WTP	see WTP
Storage Tanks for Emergency	W of Springfield High Ground	W of Springfield High Ground	New 10 MG High Ground Storage Tank	\$4,600	\$4,600
New Pipes	31 Mile Road New Pipeline	Casco Township to Romeo Station	Approximately 17 miles of 84-inch to 96-inch diameter pipe	\$91,100	\$91,100
	Springfield pipe loop	Independence Township to Wixom	Approximately 28 miles of 42-inch to 60-inch to 72-inch diameter pipe	\$117,900	\$117,900
Parallel Pipes	Parallel pipes in NW Detroit	Midland from Evergreen to Pierson, Tireman from Central to Cloverlawn	Approximately 0.7 miles of 24-inch diameter pipe	\$1,100	\$1,100

Grand Total \$328,600 \$328,600

All costs in this Table are in 2003 Dollars.

CWMP Recommended CIP Projects with Estimated Costs by 2050

Category	Facility / Pipe Route Name	Location	Description	Capital Costs (in \$1,000)	Total Capital Costs (in \$1,000)
WTP	Lake Huron WTP treatment upgrades	Lake Huron WTP	Additional treatment capacity (from 658 MGD to 695 MGD)	see WTP	see WTP
Storage Tanks	New 10 MG (8 MG for balancing and 2 MG for emergency storage) high ground storage tank and associated piping (approximately 1,700 feet of 42-inch diameter pipe) in western grid	Kensington South of Jacoby, Brighton Township	Cost for 8 MG for Balancing Storage Cost for 2 MG for the Emergency Storage	\$4,000 \$900	\$4,900
Storage Tanks for Emergency	East of Salem BST High Ground	East of Salem BST High Ground	New 10 MG High Ground Storage Tank	\$8,200	\$8,200
Pumping Stations	North Service Center upgrades	North Service Center Station	Additional 50 MGD pumping capacity for line pumps (400 MGD @ 370 feet)	\$3,800	\$3,800
	Romeo Station Upgrades	Romeo Station	Additional 52.8 MGD pumping capacity (172.8 MGD @ 300 feet)	\$4,100	\$4,100
	Newburgh Station Upgrades	Newburgh Station	Additional 12 MGD pumping capacity (64 MGD @ 200 feet)	\$2,700	\$2,700
	Oakland Station upgrades	Oakland Station	Additional 126 MGD pumping capacity (204 MGD @ 260 feet)	\$9,200	\$9,200
	Franklin Station Upgrades	Franklin Station	Additional 61.2 MGD line pumping capacity (151.2 MGD @ 250 feet)	\$11,000	\$11,000
	Salem Pumping Station	Salem Township	New station with line pumps (25.9 MGD @ 200 feet)	\$6,100	\$6,100
New Pipes	Second feed to Flint	Springfield Township to Genesee County	Approximately 12 miles of 36-inch diameter pipe	\$16,200	\$16,200
	Joy Road pipeline extension	Plymouth Township west to Ann Arbor	Approximately 8 miles of 36-inch diameter pipe	\$10,800	\$10,800
	Brighton – Ann Arbor pipe loop	From Brighton to Ann Arbor	Approximately 22 miles of 48 inch to 72-inch diameter pipe	\$87,500	\$87,500
	New West Chicago Road pipeline	West Chicago Station to Stark Road	Approximately 4 miles of 36-inch diameter pipe	\$9,700	\$9,700
Parallel Pipes	Parallel pipes in NW Detroit	8 Mile Rd. from Evergreen to St. Marys, Schoolcraft from Lamphere to Schoolcraft Pump Station, Grand River from Bennett to WSC	Approximately 8 miles of 24-inch diameter pipe	\$14,100	\$14,100
	Parallel Pipes downstream of Joy Rd. Station	Joy Rd. from Joy Station to Sheldon	Approximately 0.6 miles of 24-inch diameter pipe	\$1,100	\$1,100
	Parallel Pipes downstream of Wick Rd. Station	Hannan Rd. from Wick to Huron River Dr. – Van Buren Twp.	Approximately 1.5 miles of 24-inch diameter pipe	\$2,600	\$2,600
	Parallel Pipes downstream of Franklin Station	Inkster Rd. from Franklin Station to Maple Rd.	Approximately 1.0 miles of 24-inch diameter pipe	\$1,700	\$1,700
	Parallel Pipes Downstream of Newburgh Station	8 mile Rd. from Meadowbrook Rd. to Sheldon Rd.	Approximately 3 miles of 30 inch diameter pipe	\$5,200	\$5,200
	Parallel Pipes downstream of Adams Rd. Station	Squirrel Rd. from Walton Blvd. to South Blvd., Walton Blvd. from Squirrel Rd. to Avon Twp.	Approximately 5 miles of 24-inch diameter pipe	\$8,600	\$8,600
Grand Total				\$207,500	\$207,500

All costs in this Table are in 2003 Dollars.

CWMP Recommended CIP Projects and Estimated Costs for WTPs in Addition to the Needs Assessment Projects

Northeast WTP

CWMP Item No.	Item Description	Category	Priority	Cost (thousand dollars)	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	Years 2016-2020	Years 2021-2030	Years 2031-2040	Years 2041-2050	
NE-15	Residuals Treatment Facility	Residual	1	30,000 (A total of 18 million was already included in the DWSD 2003 CIP from 2004/05 to 2007/08 in Page 36, so the remaining 12 million was distributed)						\$ 12,000											
NE-16	Filtered Water Storage Improvements	Storage	1	\$ 3,827			\$ 957	\$ 957	\$ 957	\$ 957											
Subtotal					\$ 15,827	\$ -	\$ -	\$ 957	\$ 957	\$ 957	\$ 957	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

Springwells WTP

CWMP Item No.	Item Description	Category	Priority	Cost (thousand dollars)	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	Years 2016-2020	Years 2021-2030	Years 2031-2040	Years 2041-2050	
SPW-10	Residuals Treatment Facility	Residual	2	40,000 (A total of 21 million was already included in the DWSD 2003 CIP from 2006/07 to Remaining in Page 35. The 40 - 6 (allocated DWSD CIP) = 34 million was distributed)							\$ 20,000	\$ 14,000									
SPW-11	Filtered Water Storage Improvements	Storage	1	\$ 6,598			\$ 1,649	\$ 1,649	\$ 1,649	\$ 1,649											
Subtotal					\$ 40,598	\$ -	\$ -	\$ 1,649	\$ 1,649	\$ 1,649	\$ 1,649	\$ 20,000	\$ 14,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

Southwest WTP

CWMP Item No.	Item Description	Category	Priority	Cost (thousand dollars)	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	Years 2016-2020	Years 2021-2030	Years 2031-2040	Years 2041-2050	
SW-8	Residuals Treatment Facility	Residual	1	39,296 million are already in DWSD 2003 CIP. So, it's not included again here.																	
SW-9	Filtered Water Storage Improvements	Storage	1	\$ 2,698			\$ 675	\$ 1,263	\$ 760												
SW-10	UV Disinfection	Ozone (T&O) and UV Disinfection		51,000 (A total of 25 million was already included in the DWSD 2003 CIP for the Ozone in Page 36. The 51 -25(allocated DWSD CIP for Ozone) = 26 million for UV was distributed)													\$ 26,000				
Subtotal					\$ 28,698	\$ -	\$ -	\$ 675	\$ 1,263	\$ 760	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 26,000	\$ -	\$ -	\$ -

Waterworks Park WTP

CWMP Item No.	Item Description	Category	Priority	Cost (thousand dollars)	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	Years 2016-2020	Years 2021-2030	Years 2031-2040	Years 2041-2050	
WWP-1	Additional Improvement under WW-534	New Plant	1 to 2	The cost of \$14.4 million was already included in the DWSD CIP, so it's not included again here.																	
WWP-2	UV disinfection system	Disinfection	3	\$ 16,000												\$ 1,500	\$ 14,500				
Subtotal					\$ 16,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,500	\$ 14,500	\$ -	\$ -	\$ -

SOURCE WATER PROTECTION

CWMP Item No.	Item Description	Category	Priority	Cost (thousand dollars) (1)	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	Years 2016-2020	Years 2021-2030	Years 2031-2040	Years 2041-2050	
SWP-1	Develop a Source Water Protection program and implementation strategy. Comprehensive review of the DWSD intakes watersheds, develop additional watershed data; review of available SWP tools and programs	Study	2	\$ 1,000						\$ 500	\$ 500										
SWP-2	Internal education and public outreach on SWP. Working with MDEQ and SEMCOG and local governments to form a watershed alliance or equivalent task group; get involved in other watershed management issues	Public outreach /education	3	\$ 500							\$ 200	\$ 200	\$ 100								
SWP-3	Install a monitoring network for source water protection; develop a monitoring strategy and program; working with other utilities and agencies	Monitoring	3	\$ 1,500								\$ 500	\$ 1,000								
SWP-4	Develop a GIS based pollutant database model, rank the potential pollutant sources; further develop the still-developing particle transient model into a pollutant time-of-travel and concentration prediction model; watershed pollutant loading estimates	Model	3	\$ 2,000									\$ 500	\$ 1,000	\$ 500						
SWP-5	Continuous program implementation and monitoring program CIP needs; additional study, equipment replacement cost	Varies	3	\$ 150/year						\$ 150	\$ 150	\$ 150	\$ 150	\$ 150	\$ 150	\$ 150	\$ 750	\$ 1,500	\$ 1,500	\$ 1,500	
Subtotal					\$ -	\$ -	\$ -	\$ -	\$ -	\$ 650	\$ 850	\$ 850	\$ 1,750	\$ 1,150	\$ 650	\$ 150	\$ 750	\$ 1,500	\$ 1,500	\$ 1,500	\$ 1,500
Total					\$ 112,422	\$ -	\$ -	\$ 3,281	\$ 3,869	\$ 3,366	\$ 15,256	\$ 20,850	\$ 14,850	\$ 1,750	\$ 1,150	\$ 650	\$ 1,650	\$ 41,250	\$ 1,500	\$ 1,500	\$ 1,500

1 The Source Water Protection is a voluntary activity to DWSD, and is unlikely to be mandated by the EPA. DWSD, maybe with MDEQ's input, will determine the desired effort in this area. The cost presented is a suggested figure, it will be determined by the actual scope.
 2 The dark red number indicates that this project has been re-scheduled from CWMP Task D recommended schedule of completion by 2013 to the current schedule shown in this table.
 3 All costs in this Table are in 2003 Dollars.

APPENDIX A2

Needs Assessment Projects for Three Water Treatment Plants

APPENDIX A3

Rehabilitation and Replacement

Proposed Transmission Pipe Rehabilitation/Replacement by Planning Year (Based on KANEW Results)

Pipe Category	Replacement Cost (in \$1,000)											
	2004	2005	2006	2007	2008	2009	2010	2011 ~ 2020	2021 ~ 2030	2031 ~ 2040	2041 ~ 2050	
Original Proposed by												
Rescheduled to	2010	2011	2012	2013	2014	2015	2016~2020	2016~2020	2021 ~ 2030	2031 ~ 2040	2041 ~ 2050	
Cast Iron	\$33,461	\$28,353	\$28,583	\$16,941	\$25,696	\$20,568	\$23,095	\$184,827	\$108,976	\$47,156	\$24,369	
Steel	\$5,499	\$8,421	\$8,252	\$8,424	\$7,956	\$10,733	\$8,970	\$46,417	\$38,659	\$40,408	\$28,238	
Duct Iron	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Concrete	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$13,308	\$62,846	
Total Costs	\$38,960	\$36,774	\$36,835	\$25,365	\$33,652	\$31,301	\$32,065	\$231,244	\$147,635	\$100,872	\$115,453	

Grand Total \$830,155

All costs in this Table are in 2003 Dollars.

Proposed Transmission Pipe Rehabilitation/Replacement by Planning Year (Based on Service Criteria)

Pipe Category	Replacement Cost (in \$1,000)										
	2004	2005	2006	2007	2008	2009	2010	2011 ~ 2020	2021 ~ 2030	2031 ~ 2040	2041 ~ 2050
Rescheduled to	2010	2011	2012	2012	2013	2014 and 2015	2016~2020	2016~2020	2021 ~ 2030	2031 ~ 2040	2041 ~ 2050
Cast Iron	\$7,362	\$7,362	\$7,362	\$7,362	\$7,362	\$7,362	\$7,362	\$988	\$0	\$3,025	\$0
Steel	\$4,598	\$4,598	\$4,598	\$4,598	\$4,598	\$4,598	\$4,598	\$0	\$0	\$0	\$0
Concrete	\$606	\$606	\$606	\$606	\$606	\$606	\$606	\$0	\$9,212	\$7,720	\$17,761
Total Costs	\$12,567	\$12,567	\$12,567	\$12,567	\$12,567	\$12,567	\$12,567	\$988	\$9,212	\$10,745	\$17,761

All costs in this Table are in 2003 Dollars.

Grand Total \$126,672

Estimated Rehabilitation/Replacement Cost for the DWSD Distribution Mains

Recommended Schedule by Year	Costs (in \$1,000)	Re-scheduled Costs in (\$1,000)
2003	\$63,782	
2004	\$53,267	\$30,928
2005	\$50,347	\$46,855
2006	\$47,697	\$36,972
2007	\$46,107	\$25,000
2008	\$43,742	\$26,000
2009	\$42,386	\$5,000
2010	\$46,904	\$21,000
2011	\$40,329	\$97,000
2012	\$36,432	\$31,000
2013	\$35,345	\$47,094
2014	\$32,902	\$10,000
2015	\$30,781	\$10,000
2016	\$28,736	\$61,932
2017	\$26,858	\$61,932
2018	\$25,133	\$61,932
2019	\$23,552	\$61,932
2020	\$22,208	\$61,932
2021	\$20,950	\$20,950
2022	\$19,839	\$19,839
2023	\$18,834	\$18,834
2024	\$18,075	\$18,075
2025	\$17,317	\$17,317
2026	\$16,634	\$16,634
2027	\$16,005	\$16,005
2028	\$15,483	\$15,483
2029	\$14,966	\$14,966
2030	\$14,486	\$14,486
2031	\$14,091	\$14,091
2032	\$13,669	\$13,669
2033	\$13,240	\$13,240
2034	\$12,851	\$12,851
2035	\$12,534	\$12,534
2036	\$12,222	\$12,222
2037	\$11,928	\$11,928
2038	\$11,617	\$11,617
2039	\$11,316	\$11,316
2040	\$11,111	\$11,111
2041	\$11,155	\$11,155
2042	\$10,912	\$10,912
2043	\$10,627	\$10,627
2044	\$10,346	\$10,346
2045	\$10,069	\$10,069
2046	\$9,796	\$9,796
2047	\$9,525	\$9,525
2048	\$9,258	\$9,258
2049	\$8,993	\$8,993
2050	\$8,730	\$8,730
Total	\$1,093,086	\$1,093,086

- 1 The costs are estimated by Detroit Model project CS-1332 based on high-life expectancy scenario of pipes.
- 2 All costs in this Table are in 2003 Dollars.
- 3 The Green highlights indicate that the costs were from DWSD 2004-2008 Water System CIP (2003).
- 4 The dark red number indicates that the project has been re-scheduled from recommended one (shown in the left column) to that shown in the right column.

Estimated Annual Average Rehabilitation and Replacement Cost for the DWSD's WTPs Through Year 2050

Plants	Current Capacity*	Future Capacity		Full Asset Value	Division of Asset		Annual Rehabilitation / Replacement		Annual Cost Summary	
	(MGD)	(timeline)	(MGD)		(in \$1,000)	Structures 75%	Equipment 25%	Structures 1%	Equipment 3.3%	2011 ~ 2023
Lake Huron	330	2011 to 2023	535	\$ 695,500	\$ 521,625	\$ 173,875	\$ 5,216	\$ 5,796	\$ 11,012	
		2024 to 2050	700	\$ 910,000	\$ 682,500	\$ 227,500	\$ 6,825	\$ 7,583		\$ 14,408
Waterworks Park	240		240	\$ 312,000	\$ 234,000	\$ 78,000	\$ 2,340	\$ 2,600	\$ 4,940	\$ 4,940
Northeast	300		340	\$ 442,000	\$ 331,500	\$ 110,500	\$ 3,315	\$ 3,683	\$ 6,998	\$ 6,998
Springwells	540		540	\$ 702,000	\$ 526,500	\$ 175,500	\$ 5,265	\$ 5,850	\$ 11,115	\$ 11,115
Southwest	180		240	\$ 312,000	\$ 234,000	\$ 78,000	\$ 2,340	\$ 2,600	\$ 4,940	\$ 4,940
<u>ANNUAL GRAND TOTAL</u>									\$ 39,005	\$ 42,402

* Current treatment capacities represent existing facility capacities prior to implementation of the Needs Assessment Plan for Springwells, Northeast, and Southwest. Water Works Park is based on the new facility.

All costs in this Table are in 2003 Dollars.

Estimated Annual Average Rehabilitation and Replacement Cost (in thousand dollars) for the DWSD's Existing and Proposed Water Pumping Stations and High-ground Storage Tanks Through Year 2050

No.	Pumping Station and Storage Tanks	Year 2004		Planning Interval of 2011 to 2020					Planning Interval of 2021 to 2030					Planning Interval of 2031 to 2040					Planning Interval of 2041 to 2050										
		Existing Ultimate Capacity (MGD)	Reservoir Volume (MG)	Comments	Full Asset Value (in thousand dollars)		Division of Asset Structures Equipment		Annual Rehabilitation / Replacement		Full Asset Value (in thousand dollars)		Division of Asset Structures Equipment		Annual Rehabilitation / Replacement		Full Asset Value (in thousand dollars)		Division of Asset Structures Equipment		Annual Rehabilitation / Replacement		Full Asset Value (in thousand dollars)		Division of Asset Structures Equipment		Annual Rehabilitation / Replacement		
					Pumping	Storage	1%	3.33%	Pumping	Storage	1%	3.33%	Pumping	Storage	1%	3.33%	Pumping	Storage	1%	3.33%	Pumping	Storage	1%	3.33%					
1	Adams Road	109	10		\$ 24,191	\$ 4,500	\$ 16,595	\$ 12,095	\$ 166	\$ 403	\$ 24,191	\$ 4,500	\$ 16,595	\$ 12,095	\$ 166	\$ 403	\$ 24,191	\$ 4,500	\$ 16,595	\$ 12,095	\$ 166	\$ 403	\$ 24,191	\$ 4,500	\$ 16,595	\$ 12,095	\$ 166	\$ 403	
2	Eastside (Caryon)	30	10		\$ 7,013	\$ 4,500	\$ 8,006	\$ 3,506	\$ 80	\$ 117	\$ 7,013	\$ 4,500	\$ 8,006	\$ 3,506	\$ 80	\$ 117	\$ 7,013	\$ 4,500	\$ 8,006	\$ 3,506	\$ 80	\$ 117	\$ 7,013	\$ 4,500	\$ 8,006	\$ 3,506	\$ 80	\$ 117	
3	Electric Avenue	24	6.6	2-3.3 MG Tanks	\$ 5,632	\$ 2,970	\$ 5,786	\$ 2,816	\$ 58	\$ 94	\$ 5,632	\$ 2,970	\$ 5,786	\$ 2,816	\$ 58	\$ 94	\$ 5,632	\$ 2,970	\$ 5,786	\$ 2,816	\$ 58	\$ 94	\$ 5,632	\$ 2,970	\$ 5,786	\$ 2,816	\$ 58	\$ 94	
4	Farmington ²	----	----																										
5	Ford Road	900	10		\$ 20,230	\$ 4,500	\$ 14,615	\$ 10,115	\$ 146	\$ 337	\$ 20,230	\$ 4,500	\$ 14,615	\$ 10,115	\$ 146	\$ 337	\$ 20,230	\$ 4,500	\$ 14,615	\$ 10,115	\$ 146	\$ 337	\$ 20,230	\$ 4,500	\$ 14,615	\$ 10,115	\$ 146	\$ 337	
6	Franklin	164	10		\$ 35,048	\$ 4,500	\$ 22,024	\$ 17,524	\$ 220	\$ 584	\$ 37,852	\$ 4,500	\$ 23,426	\$ 18,926	\$ 234	\$ 631	\$ 40,588	\$ 4,500	\$ 24,794	\$ 20,294	\$ 248	\$ 676	\$ 45,962	\$ 4,500	\$ 27,481	\$ 22,981	\$ 275	\$ 766	
7	Haggerty	86	10	New Pump Station	\$ 19,382	\$ 4,500	\$ 14,191	\$ 9,691	\$ 142	\$ 323	\$ 21,702	\$ 4,500	\$ 15,351	\$ 10,851	\$ 154	\$ 362	\$ 23,985	\$ 4,500	\$ 16,492	\$ 11,992	\$ 165	\$ 400	\$ 23,985	\$ 4,500	\$ 16,492	\$ 11,992	\$ 165	\$ 400	
8	Inley	575	20		\$ 87,527	\$ 9,000	\$ 52,763	\$ 43,763	\$ 528	\$ 1,459	\$ 87,527	\$ 9,000	\$ 52,763	\$ 43,763	\$ 528	\$ 1,459	\$ 87,527	\$ 9,000	\$ 52,763	\$ 43,763	\$ 528	\$ 1,459	\$ 87,527	\$ 9,000	\$ 52,763	\$ 43,763	\$ 528	\$ 1,459	
9	Joy Road	94	10	2-5 MG Tanks	\$ 22,661	\$ 4,500	\$ 15,830	\$ 11,330	\$ 158	\$ 378	\$ 24,232	\$ 4,500	\$ 16,616	\$ 12,116	\$ 166	\$ 404	\$ 24,232	\$ 4,500	\$ 16,616	\$ 12,116	\$ 166	\$ 404	\$ 24,232	\$ 4,500	\$ 16,616	\$ 12,116	\$ 166	\$ 404	
10	Michigan Avenue	29	6.8	1-3.5 MG (east) and 1-3.3 MG (west)	\$ 7,745	\$ 3,060	\$ 6,932	\$ 3,872	\$ 69	\$ 129	\$ 9,706	\$ 3,060	\$ 7,913	\$ 4,853	\$ 79	\$ 162	\$ 11,645	\$ 3,060	\$ 8,883	\$ 5,823	\$ 89	\$ 194	\$ 11,645	\$ 3,060	\$ 8,883	\$ 5,823	\$ 89	\$ 194	
11	Newburgh	52	0	No Reservoir	\$ 15,160	\$ 9,000	\$ 16,580	\$ 7,580	\$ 166	\$ 253	\$ 15,160	\$ 9,000	\$ 16,580	\$ 7,580	\$ 166	\$ 253	\$ 15,160	\$ 9,000	\$ 16,580	\$ 7,580	\$ 166	\$ 253	\$ 15,160	\$ 9,000	\$ 16,580	\$ 7,580	\$ 166	\$ 253	
12	North Service Center	227	20	2-10 MG Tanks	\$ 46,372	\$ 9,000	\$ 32,186	\$ 23,186	\$ 322	\$ 773	\$ 55,287	\$ 9,000	\$ 36,643	\$ 27,643	\$ 366	\$ 921	\$ 63,297	\$ 9,000	\$ 40,648	\$ 31,648	\$ 406	\$ 1,055	\$ 66,639	\$ 9,000	\$ 42,319	\$ 33,319	\$ 423	\$ 1,111	
13	Northwest	50	10		\$ 11,538	\$ 4,500	\$ 10,269	\$ 5,769	\$ 103	\$ 192	\$ 11,538	\$ 4,500	\$ 10,269	\$ 5,769	\$ 103	\$ 192	\$ 11,538	\$ 4,500	\$ 10,269	\$ 5,769	\$ 103	\$ 192	\$ 11,538	\$ 4,500	\$ 10,269	\$ 5,769	\$ 103	\$ 192	
14	Orion	14	0	No Reservoir	\$ 3,306	\$ -	\$ 1,653	\$ 1,653	\$ 17	\$ 55	\$ 3,306	\$ -	\$ 1,653	\$ 1,653	\$ 17	\$ 55	\$ 3,306	\$ -	\$ 1,653	\$ 1,653	\$ 17	\$ 55	\$ 3,306	\$ -	\$ 1,653	\$ 1,653	\$ 17	\$ 55	
15	Rochester	58	0	No Reservoir	\$ 13,315	\$ -	\$ 6,657	\$ 6,657	\$ 67	\$ 222	\$ 13,315	\$ -	\$ 6,657	\$ 6,657	\$ 67	\$ 222	\$ 13,315	\$ -	\$ 6,657	\$ 6,657	\$ 67	\$ 222	\$ 13,315	\$ -	\$ 6,657	\$ 6,657	\$ 67	\$ 222	
16	Roseville ²	----	----																										
17	Schoolcraft	80	10		\$ 18,102	\$ 4,500	\$ 13,551	\$ 9,051	\$ 136	\$ 302	\$ 18,102	\$ 4,500	\$ 13,551	\$ 9,051	\$ 136	\$ 302	\$ 18,102	\$ 4,500	\$ 13,551	\$ 9,051	\$ 136	\$ 302	\$ 18,102	\$ 4,500	\$ 13,551	\$ 9,051	\$ 136	\$ 302	
18	West Chicago	36	10		\$ 8,383	\$ 4,500	\$ 8,691	\$ 4,191	\$ 87	\$ 140	\$ 8,383	\$ 4,500	\$ 8,691	\$ 4,191	\$ 87	\$ 140	\$ 8,383	\$ 4,500	\$ 8,691	\$ 4,191	\$ 87	\$ 140	\$ 8,383	\$ 4,500	\$ 8,691	\$ 4,191	\$ 87	\$ 140	
19	West Service Center	148	20	2-10 MG Tanks	\$ 31,983	\$ 9,000	\$ 24,991	\$ 15,991	\$ 250	\$ 533	\$ 31,983	\$ 9,000	\$ 24,991	\$ 15,991	\$ 250	\$ 533	\$ 31,983	\$ 9,000	\$ 24,991	\$ 15,991	\$ 250	\$ 533	\$ 31,983	\$ 9,000	\$ 24,991	\$ 15,991	\$ 250	\$ 533	
20	Wick Road	80	10		\$ 17,673	\$ 4,500	\$ 13,336	\$ 8,836	\$ 133	\$ 295	\$ 17,673	\$ 4,500	\$ 13,336	\$ 8,836	\$ 133	\$ 295	\$ 17,673	\$ 4,500	\$ 13,336	\$ 8,836	\$ 133	\$ 295	\$ 17,673	\$ 4,500	\$ 13,336	\$ 8,836	\$ 133	\$ 295	
21	Ypsilanti	54	0	No Reservoir	\$ 12,429	\$ -	\$ 6,214	\$ 6,214	\$ 62	\$ 207	\$ 14,020	\$ 4,500	\$ 11,510	\$ 7,010	\$ 115	\$ 234	\$ 15,596	\$ 9,000	\$ 16,798	\$ 7,798	\$ 168	\$ 260	\$ 15,596	\$ 9,000	\$ 16,798	\$ 7,798	\$ 168	\$ 260	
22	St. Clair Shores ²	----	----																										
23	Chesterfield Booster Pumping			in Chesterfield	\$ 6,185	\$ 9,000	\$ 12,093	\$ 3,093	\$ 121	\$ 103	\$ 6,185	\$ 9,000	\$ 12,093	\$ 3,093	\$ 121	\$ 103	\$ 6,185	\$ 9,000	\$ 12,093	\$ 3,093	\$ 121	\$ 103	\$ 6,185	\$ 9,000	\$ 12,093	\$ 3,093	\$ 121	\$ 103	
24	Romeo Booster Pumping			in Village of Romeo	\$ 26,131	\$ 9,000	\$ 22,065	\$ 13,065	\$ 221	\$ 436	\$ 29,495	\$ 9,000	\$ 23,748	\$ 14,748	\$ 237	\$ 492	\$ 29,495	\$ 9,000	\$ 23,748	\$ 14,748	\$ 237	\$ 492	\$ 34,612	\$ 9,000	\$ 26,306	\$ 17,306	\$ 263	\$ 577	
25	Columbus Pumping Station			in Columbus	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 33,458	\$ 4,500	\$ 21,229	\$ 16,729	\$ 212	\$ 558	\$ 59,667	\$ 9,000	\$ 38,833	\$ 29,833	\$ 388	\$ 994	
26	Oakland Pumping Station			in Oakland Township	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 11,012	\$ 4,500	\$ 10,006	\$ 5,506	\$ 100	\$ 184	\$ 33,965	\$ 9,000	\$ 25,982	\$ 16,982	\$ 260	\$ 566	
27	Salem Pumping Station			in Salem Township	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,060	\$ -	\$ 1,530	\$ 1,530	\$ 15	\$ 51	
28	High Ground Storage Tank West of Newburgh pumping			8 mile west of Sheldon	\$ -	\$ 4,500	\$ 4,500	\$ -	\$ -	\$ -	\$ -	\$ 4,500	\$ 4,500	\$ -	\$ -	\$ -	\$ -	\$ 4,500	\$ 4,500	\$ -	\$ -	\$ -	\$ -	\$ 4,500	\$ 4,500	\$ -	\$ -	\$ 45	\$ -
29	High ground storage tank North of Orion Station			Brown East of Baldwin, Orion	\$ -	\$ 4,500	\$ 4,500	\$ -	\$ -	\$ -	\$ -	\$ 9,000	\$ 9,000	\$ -	\$ -	\$ -	\$ -	\$ 9,000	\$ 9,000	\$ -	\$ -	\$ -	\$ -	\$ 9,000	\$ 9,000	\$ -	\$ -	\$ 90	\$ -
30	High ground storage tank in Western grid (Kensington)			Kensington South of Jacoby, Brighton	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,250	\$ 2,250	\$ -	\$ -	\$ 23	\$ -
31	High Ground Storage Tank SouthWest of Adams pumping station				\$ -	\$ 2,250	\$ 2,250	\$ -	\$ -	\$ -	\$ -	\$ 4,500	\$ 4,500	\$ -	\$ -	\$ -	\$ -	\$ 4,500	\$ 4,500	\$ -	\$ -	\$ -	\$ -	\$ 4,500	\$ 4,500	\$ -	\$ -	\$ 45	\$ -
32	High ground storage tank in West of Springfield				\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,250	\$ 2,250	\$ -	\$ -	\$ -	\$ -	\$ 4,500	\$ 4,500	\$ -	\$ -	\$ 45	\$ -
33	High ground storage tank in eastern of Salem pumping station				\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,250	\$ 2,250	\$ -	\$ -	\$ 23	\$ -
SUM (in \$1,000)																													
ANNUAL GRAND TOTAL PER PLANNING INTERVAL (in \$1,000)																													
					Annual R&R Cost (2011-2020) =					Annual R&R Cost (2021-2030) =					Annual R&R Cost (2031-2040) =					Annual R&R Cost (2041-2050) =									
					\$ 3,363 \$ 7,333					\$ 3,588 \$ 7,709					\$ 4,051 \$ 8,726					\$ 4,545 \$ 9,848									
					\$ 10,696					\$ 11,297					\$ 12,776					\$ 14,393									

- NOTES
1 Ultimate capacity includes both line and reservoir pumping capacities.
2 Station is operated by DWSD, but not connected to DWSD's transmission system. Station serves customer's distribution system only.
3 Bold number is the new capacity needed determined by the CWMP.
4 All costs in this Table are in 2003 Dollars.