OFFICE OF THE CITY AUDITOR

AUDIT OF THE
PERFORMANCE OF DALLAS WATER UTILITIES' (DWU'S)
FINANCE AND ACCOUNTING SYSTEMS
AND WATER OPERATIONS

Thomas M. Taylor, CPA
City Auditor

Prepared by:

Paul Garner, CCP, CSP
Senior Audit Manager

Tony Aguilar
IT Auditor

Melinda Milner, MCP, CCA
IT Auditor

December 27, 2002
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Memorandum

CITY OF DALLAS

December 27, 2002

Honorable Mayor and Members of the City Council
City of Dallas

We have conducted an audit of certain operations of the Dallas Water Utilities (DWU) as a result of a request from Dallas Water Utilities. We reviewed the water treatment facilities, pumping operations, metering operations, the billing system (CIABS), and the credit and collections operations of DWU.

As a result of our inquiries, examinations, and reviews, we conclude that issues are present in the account reconciliation process, accountability of water, and water operations. Several factors are present that if resolved, could increase water revenues and decrease the upward trend of unaccounted for water.

The management of DWU has not addressed one of the most significant operational issues facing it, management control over operations. Inaccurate management reporting systems, including CIABS and manual reports, a lack of thorough analysis, and follow-up are negatively affecting inventory control resulting in lost water. Many of the causes impacting inventory control are well known and have been previously identified by the staff of DWU. However, procedures and methodologies to address the causes, effects, and prevention of inventory loss have been neglected.

Paul T. Garner for

Thomas M. Taylor, CPA
City Auditor

c: Teodoro J. Benavides, City Manager

AUDIT OF THE PERFORMANCE OF DWU'S FINANCE AND ACCOUNTING SYSTEMS AND WATER OPERATIONS

CONTENTS

EXECUTIVE SUMMARY

We have conducted an audit of a limited number of operations involving the performance of DWU's Finance and Accounting Systems and Water Operations for the period October 1, 1997 through September 30, 2002 as a result of a request from Dallas Water Utilities. We reviewed the water treatment facilities, pumping operations, metering operations, the customer information and account billing system (CIABS), and the credit and collections operations of DWU. As a result of our inquiries, examinations, and reviews, we conclude that there are several factors that could increase water revenues and decrease the upward trend of unaccounted for water. We have summarized our major findings below.

Finance and Accounting

- The management and staff of DWU question the accuracy of the data provided by the CIABS system; the system of record for water usage and billing.
- Reconciliation of DWU clearing account 0007 was out of balance by more than $9 million for approximately 2 years.
- The Martin Luther King Service Center (MLK) was out of balance by $146,000 for approximately one year due to a lack of proper management and inadequate internal controls at that center.
- DWU does not perform a monthly reconciliation of water produced to water billed or a monthly reconciliation of water billed to revenue collected.
- Water rates do not include a provision for payment in lieu of taxes (PILOT) as recommended by the American Water Works Association (AWWA).

Water Operations

- During the last year, unaccounted for water has increased to over 17% of water produced.
- The calculation for unaccounted for water (UAW) is not based on the AWWA standard.
- The current funding of pipeline infrastructure replacement is not sufficient to replace the equipment within its estimated serviceable life of 50 years.
- The conversion of meters from compound to turbine meters may be resulting in a significant loss of revenue.
- Water loss due to main breaks is not calculated.
- Water loss is occurring due to inaccurate meters.
- DWU's leak detection program has been rendered ineffectual by reducing the staffing down to ¼ of an FTE.

- Portable meters are not being properly monitored for actual consumption.
- Combined service and domestic service permits are issued at no charge resulting in lost revenue.
- Private contractor meter pricing for standpipe fire line services is lower than the actual cost of the meter.

We commend the department for accepting our recommendations and taking steps to resolve these issues.

INTRODUCTION

Authorization

We have conducted an audit of the performance of DWU's Finance and Accounting and Water Operations. We conducted this audit under the authority of Chapter IX, Section 2 of the Dallas City Charter, and in accordance with the Annual Audit Plan approved by the City Council.

Scope and Methodology

The objectives of our audit were to:

Finance and Accounting

- Identify financial controls of water collections in DWU, Office of Financial Services, and Environmental Health Services that relate to DWU revenue recognition.
- Identify procedures employed to collect, post, and reconcile cash receipts of water revenue and recommend process improvements.
- Review reconciliation processes of water revenue related to:
    - Daily deposit of cash receipts
    - Posting of CIABS data to Resource
    - Exception handling
- Determine the types of transactions processed in CIABS.
- Identify unbilled accounts and make recommendations to ensure all accounts are billed.
- Determine the cause of the $9 million out-of-balance condition in the Resource 0007 account.
- Review the methodology and accuracy of the 1999/2000 rebates.

Water Operations

- Determine if the amount of unaccounted for water is reasonable.
- Determine, for wholesale customers, if the amount of water recorded by the meter readers is accurately input and billed in CIABS.
- Determine if the distribution system transmission valves are tested annually.
- Determine if the installed turbine meters are properly matched to the customer's usage patterns.

INTRODUCTION

- Determine if the by-pass valves are locked to prevent unauthorized usage.
- Determine if the water meter testing program is effective at identifying defective meters and replacing them in a timely manner.
- Evaluate the adequacy of the resources allocated to detect leaks to mains and/or service lines.
- Determine if control and reporting is adequate in the water operations of DWU.

We performed our audit in accordance with generally accepted government auditing standards and included tests of the financial records and other audit procedures that we considered necessary in the circumstances.

Our audit covered the financial, operations and billing systems areas of DWU for the period October 1, 1997 through September 30, 2002.

To develop an understanding of the finance and accounting and billing systems and water operations of DWU, we reviewed the following:

- AWWA M1 – American Water Works Association – Principles of Water Rates, Fees, and Charges
- Allied Interstate, Inc. – RFP – Citywide Collection Services
- KPMG – Annual Financial Report – September 30, 2001
- KPMG – FY2000 & FY2001 DWU audit workpapers
- KPMG – City of Dallas Water Utilities – Analysis of Account 0007 – A/R-Cash Clearing, January 14, 2002
- City of Dallas – Comprehensive Annual Financial Report – September 30, 2001
- City of Dallas – Proposed Annual Budget – FY1999, FY2000, FY2001
- Administrative Directive 4-10 – Delinquent and Uncollectible Accounts Receivable

INTRODUCTION

- Cancel/Rebills Presentation – "Insure accurate billing and correction of customer accounts"
- AWWA Journal – "Committee report: water accountability", July 1996, Pgs. 108-111
- CIABS Report 113A – Daily CIABS Water Billing (December 2001 – March 2002)
- CIABS Report BH305C – Account Adjustments Report
- CIABS Report BH305D – Cancel/Rebill (2/2000-10/2001)
- CIABS Exception Reports – CA100D-A, CA100E, CA101B-A, CA113, CA113A, CA130B, BW125
- DWU Billed Revenue Report – FY88-FY02 (as of 02/08/02)
- 10-Year Average Pumpage Report

The scope of our audit was to perform an analysis and evaluation of the:

- Water Production Operations
- Customer Billing
- Financial and Water Production Reconciliation
- Unaccounted for Water

We interviewed DWU staff and conducted site visits at the Eastside, Elm Fork and Bachman water treatment plants, White Rock Pumping Station, and the Meter Repair Shop for the purposes of gaining an understanding of water operations.

Additionally, we interviewed DWU staff in Accounting & Finance, Revenue & Business Systems, Internal Audit, Credit & Collections, Remittance Processing, Billing Records, Lobby Operations, Communications and Information Services (CIS) staff, and the MLK Pay Station to obtain an overview of DWU's finance, accounting, and billing functions.

We observed meter reading for a commercial account and a residential meter route. We also observed the testing for meter accuracy at a commercial account.

INTRODUCTION

Background

Dallas Water Utilities provides water supply, storage, treatment, pumping and distribution as well as wastewater collection and treatment. DWU has nearly 300,000 retail and wholesale accounts. Customer accounts serve approximately 1.8 million water customers. Within that customer base, water is supplied to approximately 20 municipal customers. DWU operates three water treatment plants—Eastside, Elm Fork and Bachman. The daily production capacity is in excess of 800 million gallons. There are approximately 4,600 miles of water pipeline infrastructure. DWU requested the assistance of the City Auditor's Office in addressing the accuracy of their data and the adequacy of their internal controls.

Overall Conclusion

We identified certain policies, procedures, and management practices that can be improved to reduce operating costs and enhance water revenues. Our audit was not designed or intended to be a detailed study of all of the financial and operations areas. Accordingly, the opportunities for improvement presented in this report are not all-inclusive of areas where improvements may be needed.

OPPORTUNITIES FOR IMPROVEMENT

As a result of our inquiries, examinations, and analyses, we conclude that there are several factors that could increase water revenues, improve efficiencies for business and water operations, improve internal controls and accountability, and decrease the upward trend of unaccounted for water.

1. The water produced by the Dallas Water Utilities is not accurately accounted for.

Over 17% of water produced, or approximately 26.3 billion gallons, is not accurately accounted for which is significantly higher than industry standard recommendations. For the City of Dallas, the cost of producing 26.3 billion gallons of water is over $7.5 million. Industry guidelines for unaccounted for water (UAW) are based on the American Water Works Association (AWWA) and Environmental Protection Agency (EPA) recommended maximum UAW of 10%. The incremental production cost between the industry-recommended UAW of 10% and the City of Dallas UAW of 17% is approximately $3.1 million.

There were six primary factors identified by DWU and the City Auditor's Office that could cause UAW.

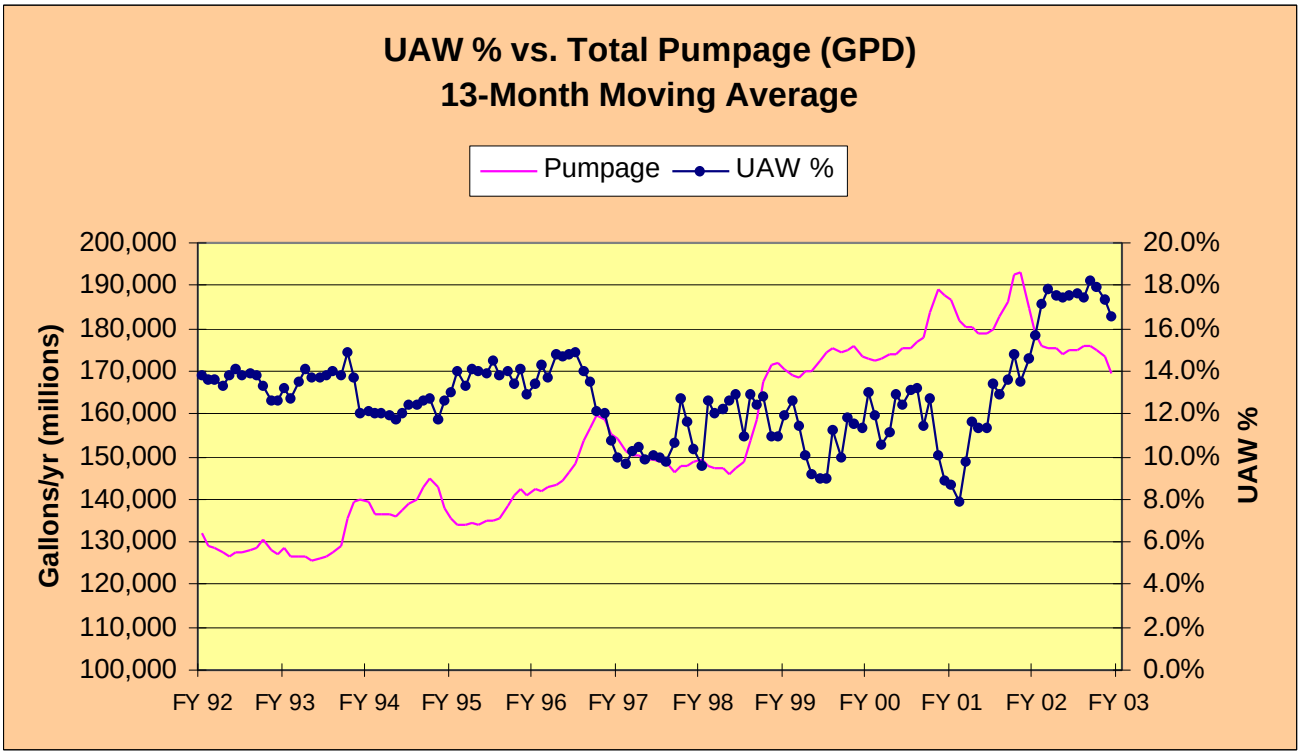
- CIABS system inaccuracy
- Unidentified leakage
- Water meter inaccuracy
- Water main breaks
- City usage (authorized unmetered or non-quantified usage)
    - Fire
    - Streets
    - Main flushing
    - Landscaping
- Theft (unauthorized usage)

DWU has the opportunity to reduce a portion of the potential unaccounted for water with the implementation of procedures to meter or quantify all authorized uses of water. The processes and procedures in place now are best guess estimates.

An analysis of the UAW rate was based upon a 13-month moving average. Since January 1999 the rate has been steadily climbing during the past three years. For

OPPORTUNITIES FOR IMPROVEMENT

FY 2002, the City of Dallas average UAW rate exceeded 17% per month. The chart below reports the total UAW and total pumpage for the past 10 years.



Since March 2001, the rate of increase has far surpassed any prior year UAW trends. In an 8-month time period spanning March 2001 to November 2001, the rate increased from 12.3% to 18.4%, or a fifty percent increase. Since peaking at 18.4%, UAW has averaged over 17% per month through September 2002. (Note that the UAW calculations are based on a DWU originated methodology and not upon the AWWA standard guidelines).

The American Water Works Association (AWWA) and the Environmental Protection Agency (EPA) have established that the goal for unaccounted for water should be less than 10% of total water production. This rate was reported in the AWWA Journal dated July 1996. The AWWA's Distribution and Plant Operations Division requested that the AWWA Leak Detection and Water Accountability Committee research the issue and publish updated official UAW guidelines. Prior to the establishment of the less than 10% guideline, the previous AWWA statement on the UAW level was published in 1957. This statement said that:

"Unaccounted for water may vary from 10 to 15 percent in a well operated system where the consumption is between 100 and 125 gpcd (gallons per capita

OPPORTUNITIES FOR IMPROVEMENT

per day). Good performance is generally indicated by a metered ratio of 85-90 percent (unaccounted for water of 10-15 percent) where the use of water is between 100 and 125 gpcd."

Since the last AWWA statement was published over 45 years ago, significant changes have occurred in the industry affecting operating costs and technology adoption. Treatment plant expansions, distribution system construction, development of additional water supplies, regulatory compliance, and energy costs have all contributed to the rise in the total cost of producing and distributing water. To offset the increased operating costs, technological advances have focused on reducing water loss. These advances include leak detection, more accurate metering devices, instrumentation to test meter accuracy, rate of flow recording and data collection. As a result of the advances, the Leak Detection and Water Accountability Committee recommended that the goal for UAW should be less than 10 percent. No stipulation was made as to the size and production/consumption capacity of the water utility.

The AWWA has published a guideline and methodology for determining lost water and the costs associated with that water loss. The methodology relies upon an accurate process for recording and reporting water pumpage (supply) and consumption. Pumpage is recorded by the treatment plants and is maintained on individual log sheets. The recording of water consumption consists of the following processes:

- Meter reading
- Uploading meter data into CIABS
- CIABS calculating the amount of water consumed for the billing period
- CIABS producing bills for water consumption

The amount of water produced on a daily basis by DWU's three water treatment plants is measured and recorded independently by each plant. Records are maintained of the amount of water used in production, water held in storage and water pumped for consumption. Our study and observation of treatment plant operations indicates the methods employed by the technical staff provide a high degree of accuracy and reliability in measuring water pumpage.

When the treatment plants release water into the distribution system, the delivered water is either metered or unmetered at its final destination. Metered water usage is processed, calculated, and billed on the CIABS system. Unmetered water consists of internal City usage, theft, and lost water (due to main breaks, meter

OPPORTUNITIES FOR IMPROVEMENT

accuracy, etc.) and is not calculated and tracked on a consistent basis.

DWU did not provide, nor do they ascertain, the information necessary to detail the causes of water loss by category. This has resulted in incorrect data being used for processing, billing, and reporting purposes. In the absence of this critical information, the City Auditor's Office evaluated each of the frequently cited loss factors to identify their relationship to unaccounted for water.

A. CIABS may be an unreliable tool for determining UAW.

When attempting to establish a reliable figure for UAW, it was brought to our attention by DWU personnel, that the Block Consumption report, the measure by which DWU tracks customer consumption, contained errors that would cause the UAW to be calculated incorrectly. Interviews with CIS staff supporting CIABS indicated that there was an unidentified problem with the data for a large Optional General Services customer or a software program that would cause the report to generate unreliable results from month to month. We also discovered through our interviews that the problem has been in existence since CIABS was first implemented in 1986.

DWU relies on a report referred to as the "Block Consumption Report" (report # BH614A), to report total system-wide consumption. The data from this report is input into a monthly spreadsheet report entitled "Schedule L – Retail Study, 2002 Study for FY 2003, Wholesale Treated Water Cost Allocation Factors" which is the reporting point for the monthly UAW. Closer inspection of the Schedule L report reveals that UAW is a forced calculation based on the difference between Total System Pumpage and Total System Metered quantities. The report basically tracks total sales of water to customer cities and residences and businesses (retail sales). Additionally, the amount of UAW allocated to wholesale customers is currently set at 2.033% (1.5% for metering inaccuracies, 0.5% for transmission main losses, .033% for compounding). Documentation to support the 2.033% rate could not be provided by DWU.

The lack of system integrity in this area may be indicative of shortcomings in other areas within CIABS.

B. Water meter accuracy is a contributing factor to increased UAW.

Meters lose their ability to accurately report water used primarily due to the physical wear and tear experienced by the meter. As the accuracy of the meter degrades, the amount of "free" water delivered to residential and business customers increases. This water is considered unaccounted for,

since it passes through the meter without registering usage, and is a contributing factor to the UAW rate. Additional information on water meter accuracy can be found in Finding 3.

C. Management's decision to not adequately fund leak detection activity is contributing to a higher UAW.

Main breaks are a significant factor in lost revenue to the City. The Distribution Division estimates that 6 to 7.5 billions gallons of water could be saved by implementing a leak detection program. A leak detection system can provide the tools and methodologies to seek and locate main breaks that may be the source of the leak. The retail value of the water that could be saved by the program is estimated to be between $8.2 million and $10.3 million. The reason cited by the division for not having a leak detection program is a lack of funding. Distribution estimates that it would take one supervisor and 5-two man crews to provide adequate leak detection services for the City at a total cost of $1.1 million (labor and capital) for the first year. They also estimate that 75-90% of all leaks could be identified and repaired using standard leak detection methods.

For the period 1996 – 2001, Dallas water main breaks have averaged over 2,300 per year. Main break frequency is reported but the volume of water lost due to the breaks is not routinely calculated and reported. Main breaks can be categorized as identifiable and unidentifiable. Identifiable breaks are those that are 1) visible to the eye either at the break point or 2) a result of a large amount of water congregating or flowing where water is usually not present. Unidentifiable breaks are those that are not visible. Examples include leakage into the ground (without surface pooling) and broken mains flowing directly into the storm sewer system.

Water main break repair activities consist of two main components, 1) repairing known leaks and 2) searching for leaks that are not readily visible or known.

Our investigation revealed that repair activity is focused on addressing the largest leaks first and progressively moving to the smaller leaks. According to the Distribution Manager, this "triage" process is standard operating procedure for the department. Smaller leaks may go unresolved for weeks while the larger ones are repaired. Two issues are raised in this environment. The first is a staffing issue that involves having sufficient resources to repair the majority of known leaks in a timely manner. The second issue concerns the ability to proactively search and identify unknown leaks within the system.

OPPORTUNITIES FOR IMPROVEMENT

The Distribution Manager explained that based on his current staffing levels he would have to continue the triage method of repair in the foreseeable future and that the City would continue to handle the larger leaks first. Since data is not readily available to report the amount of water lost through known leakage, it is difficult to estimate the financial impact of each repair. If the data were available, a cost/benefit analysis could be performed to determine if additional resources would be justified for repairing more leaks in a timely manner.

An important aspect of leak repair is the proactive detection of unseen or unknown leaks. These types of leaks typically occur underground and are invisible to the naked eye. Water from broken underground pipes can drain into storm sewers, stream channels or old unused pipes and may never be found unless accidentally identified or detected by various leak detection methods. Large system leaks can continue for years without detection. Although DWU has the equipment for one full-time crew, DWU has allocated less than ¼ of an FTE for leak detection on an as needed basis. Considering that the system is primarily composed of cast iron pipes and that almost one-half of the pipes are over 50 years old, DWU should follow the recommended industry guidelines in detecting and isolating leaks as outlined in AWWA Manual M36 (Water Audits and Leak Detection).

D. DWU is unable to accurately calculate UAW because they lack a standard, comprehensive methodology in determining water usage.

An integral procedure in determining water loss is to identify and establish how water is being used. This method is recommended by the AWWA in Manual M36. Two main categories are used to classify water produced: metered use and authorized unmetered use. The sum of metered and authorized unmetered water, in theory, should total the amount of water produced. Any difference between the amount of water produced and metered and authorized unmetered usage is UAW. Water loss attributable to leakage consists of two components: potential leakage and recoverable leakage. Potential leakage is that amount of water that cannot be accounted for. Recoverable leakage, once identified, has the potential to be repaired. The AWWA estimates that 75% of all potential losses are recoverable.

The AWWA standard methodology for determining UAW is shown below:

OPPORTUNITIES FOR IMPROVEMENT

Supply (water produced):

Elm Fork plant	
Eastside plant	
Bachman plant	
Total	**A**
Less: Metered Use	
Residential	
Business	
Wholesale	
Portable	
Sub-total	**B**
Less: Authorized unmetered use	
Firefighting and firefighting training	
Main flushing	
Storm drain flushing	
Sewer cleaning	
Street cleaning	
City landscaping	
Golf courses	
Swimming pools	
Construction sites	
Water quality testing	
	C
Total accounted for water:	**B+C (metered+authorized unmetered)**
Total Unaccounted for Water:	**A-B+C**

Any amount of unaccounted for water is an indication that water is being lost from the system. Water loss can be attributable to a number of factors, but the most common causes of this loss are unidentified leakage, metering inaccuracies, meter reading errors, accounting errors, and illegal connections. The AWWA Manual M36 provides detailed guidelines for determining lost water.

Most of the data we have received from DWU regarding leakage and authorized unmetered water use is based on one-time estimates as a result of our audit inquiries. Routine data capture is not performed on a consistent basis except in the case of main breaks where only the event data is captured. Water loss estimates are not made. According to the Distribution Manager, DWU does not routinely acquire leakage and unmetered water data for analysis purposes.

Our research indicates that DWU does not follow the AWWA guidelines for determining UAW. The water department employs the use of an Excel

OPPORTUNITIES FOR IMPROVEMENT

spreadsheet schedule to estimate UAW. This schedule is entitled "Schedule L – Retail Study, 2002 Study for FY 2003, Wholesale Treated Water Cost Allocation Factors." The UAW percentage reported on the schedule is the result of the difference between total pumpage and metered water calculated for the entire system. Although this does provide a generalized calculation for UAW, it is not based on the industry-accepted recommended methodology for capturing, analyzing, and determining UAW.

Since DWU does not follow the methodical approach to determining water loss, as recommended by the AWWA, the opportunity to identify cost savings opportunities regarding water loss is minimized.

We Recommend that DWU:

A. Define the maximum UAW

B. Quantify losses by category by using AWWA UAW methodology

C. Develop an action plan to address losses by category

D. Track UAW on a monthly basis using AWWA guidelines

Management Response:

Comment: Since receiving the preliminary audit, the departmental staff has identified, estimated and accounted for water usages within the system that will significantly reduce the UAW. We have estimated and quantified the normally suggested usages and these usages reduced the UAW from 17% to 9.98%. Some of these identified usages are for the water used to flush and maintain our water lines, water used to cool the ozone processes at two of our water treatment plants, water used to flush fire hydrants and water used for other crucial purposes. A spreadsheet describing these uses, provided to you previously, is attached.

OPPORTUNITIES FOR IMPROVEMENT

Fiscal Year 2002 Unbilled Water Worksheet

		Million Gallons	Million Gallons
	Total Water Pumped to System	**155,747.0**	
	Less: Water that was metered for billing		
	Metered to City of Dallas customers	75,503.9	
	Metered to wholesale customer cities	51,553.0	
	Total Water Billed	**127,056.9**	**127,056.9**
	Less: Accounted for and authorized uses		
1.	**CIABS Report Correction**	1,733.4	**1,733.4**
	Billed and collected revenues by CIABS however, consumption report needed adjustments due to a programming flaw that CIS is correcting		
2.	**Fires and Fire Training**	500.0	**500.0**
	Water used to fight fires and in fire training exercises		
3.	**Street Sweeping**	23.4	**23.4**
4.	**DWU Operational Uses**		**4,730.5**
	Dead-End Flush Points	100.9	
	Routine flushing at dead end mains to keep water quality fresh and meet required standards		
	Main Flushing	262.8	
	Routine continuous large main flushing to keep water fresh and meet standards		
	Chlorination Flushing/New Construction	111.0	
	Water used to pressure test and disinfect newly constructed mains		
	Elm Fork Ozone Cooling Water	2,482.0	
	6.8 million gallons of water is used daily at Elm Fork Water Treatment Plant for ozone cooling processes		
	Bachman Process Water	547.5	
	1.5 million gallons of water is used daily at Bachman Water Treatment Plant due to new construction and the resulting changes in treatment processes		
	Fire Hydrant Flushes	1,220.0	
	Based on flushing 65 fire hydrants per day at 30 minutes each and an additional 25% for Fire Dept non-fire use		
	Maintenance on Reservoirs	3.7	
	Seasonal maintenance work on water reservoirs		
	Testing Meters	2.7	
	Testing meters for accuracy		
5.	**Main Breaks**	3,051.4	**3,051.4**
	Based on 4 breaks per day of an 8-inch main for 2.5 hours and 60 psi of pressure, does not include time main was leaking prior to report		
6.	**Meter Accuracy (Estimated based on industry standards)**	3,114.9	**3,114.9**
	Total Authorized Unbilled Use		**13,153.7**
	Total Accounted For Water		**140,210.6**
	Main Leaks (Net unaccounted for water 9.98%)		**15,536.38**
	Total Water Pumped to System		**155,747.00**

OPPORTUNITIES FOR IMPROVEMENT

Comment: We suggest that you use a thirteen-month annual average instead of a thirteen-month moving average, a recommendation described in American Water Works Association's (AWWA) publication on how to calculate UAW. Using the AWWA recommended method; the UAW is reduced to 16.55%.
Comment: Please note that during the last five months of 2002, the actual numbers have decreased each month to a low of 3.81% for September.

Comment: Your comment that states, " the retail value of the water that could be saved by the program is estimated to be between $8.2M and $10.3M" is not correct. All customer demand was met and billed.

A. Define the maximum UAW
Dallas Water Utilities sets at 10% or less its goal for the maximum UAW of all water pumped. Although, 10% or less is the DWU UAW goal, a cost benefit analysis will be performed to determine the appropriateness of this goal. Any changes to the budget due to this item will be included in next year's budget proposal.
B. Quantify losses by category by using AWWA UAW methodology
DWU will identify and quantify losses by category using the AWWA UAW methodology.
C. Develop an action plan to address losses by category.
DWU will establish, in conjunction with the Fire Department, an action plan to address losses by category and it will become one of the Utilities' performance measures. Systems will be set up by March 2003 to maintain the information monthly.
D. Track UAW on a monthly basis using AWWA guidelines.
DWU will track UAW monthly using AWWA guidelines.

Auditor's Follow-up Comment:

The current percentage of unaccounted for water is over 17% and is based on the same methodology that DWU management has employed for years. DWU management, throughout the course of the fieldwork of the audit, contended that unaccounted for water was approximately one day's production or less than 1/3 of 1%.

The Assistant City Manager overseeing the operations of DWU, in a memo dated April 15, 2002, stated "All issues recently brought to your attention concerning the Water Department's account balances and billing have been researched. Responses provided by staff do not indicate a need for any corrective action."

Interviews with DWU staff, assimilation of evidence provided by the staff, and our

analysis of DWU existing management reports, substantiated our concerns over water inventory loss. The staff and management of DWU acknowledge the need for corrective action to address inventory control issues.

In an effort to more accurately assess unaccounted for water, we relied upon the use of industry-standard methodologies. We have developed and presented methods and procedures in this report whereby DWU management and their supervising management, can more reliably track and account for the water the City produces. DWU presented in their response the new methodology for assessing the percentage of unaccounted for water.

Processed, potable water has a retail value. The DWU management should concentrate on ways to market the water that is produced in excess of demand in lieu of downplaying its value. An innovative approach pursued by Ft. Worth was to sell municipal water to a bottled water company, Glacier Clear, LP, to increase revenues. We know of no such initiative by DWU.

2. The majority of the DWU infrastructure is beyond the serviceable life and continuing to age.

A. DWU's water infrastructure replacement program is occurring at a rate that could significantly increase operating and maintenance costs and revenue losses.

The replacement timeframe for DWU's pipeline infrastructure is approximately 130 years based upon their current funding level. DWU would need to replace 2% of the infrastructure per year to meet industry replacement guidelines. Currently, DWU is only replacing water infrastructure components at the rate of 2/3's of 1%. DWU's current annual expenditure for capital improvements is $218 million. Of the $218 million, $30-$35 million is spent on main replacement. Another $8-$9 million is set aside to fund other agencies projects that would affect DWU pipeline. An additional $30 million would be needed to meet the 2% or 50-year pipeline infrastructure replacement program.

- The Environmental Protection Agency published a report in September 2002 entitled, *The Clean Water and Drinking Water Infrastructure Gap Analysis*. The gap analysis covered a 20-year period, from 2000 to 2019. The analysis derived its estimates for funding both capital and operations and maintenance.

OPPORTUNITIES FOR IMPROVEMENT

The report stated, "*The analysis found that a significant funding gap could develop if the nation's clean water and drinking water systems maintain current spending and operations practices. However, this gap largely disappears if municipalities increase clean water and drinking spending at a real rate of growth of three percent per year."*

Per their estimates for drinking water alone, *"Estimates of capital needs for drinking water over the twenty-year period range from $154 billion to $446 billion with a point estimate of $274 billion."*

The three main causes stated in this report for the gap in infrastructure replacement were:

- Deferred maintenance
- Inadequate capital replacement
- Generally aging infrastructure

The majority of DWU's pipe is made of cast iron. The instability of soil in this region greatly affects the useful life of the water pipeline. In regard to capacity requirements, as it relates to a defined area of population growth, water pipelines have the potential to be stressed beyond capacity in order to meet customer demand. The EPA gap analysis report also states that, *"…the best way to determine remaining useful life of a system is to conduct period condition assessments."*

As of September 30, 2002, reporting requirements from the Government Auditing Standards Board 34 (GASB 34) will require the reporting of deferred maintenance expenditures. According to a report published by the AWWA, *Dawn of the Replacement Era, "…such a deferral of infrastructure expenditures will be reported to the financial markets and begin to impair the utility's credit rating and ability to raise capital."*

Additionally, the EPA report also recommends that a capital improvement plan be developed for a range of 1 to 5 years. GASB 34 recommends conducting condition assessments "…*to make the best life-cycle decisions regarding maintenance and replacement."* The last formal master distribution was developed internally by DWU in 1991. DWU plans to contract with an outside vendor to develop a master distribution plan this year.

OPPORTUNITIES FOR IMPROVEMENT

We Recommend that DWU:

A. Increase funding for the infrastructure replacement program to reduce the replacement rate from 130 years to 50-75 years.

B. Develop a comprehensive master distribution plan to determine current and future customer needs.

C. Perform periodic condition assessments to ensure the master distribution plan is meeting the water infrastructure and water delivery needs of the City. The older the system becomes the more frequently the assessments should be performed.

Management Response:

Comment: The FY 2002 capital program of $218M includes water and wastewater capital needs. In the last five years, an average of $37.5M has been spent on water and wastewater main replacements. An additional $8M has been allocated annually to fund other agencies projects that would affect DWU pipeline.

A. Increase the infrastructure replacement program to reduce the replacement rate from 130 years to 50-75 years.

Water will perform a cost benefit analysis and if the results so indicate, we will increase the pipeline infrastructure capital expenditures. This would require an additional water rate increase.

B. Develop an aggressive master distribution plan to determine current and future customer needs.

Water's last Distribution Master Plan was done in 1991 and the next one is scheduled for February 2003.

C. Perform periodic condition assessments to ensure the master distribution plan is meeting the water infrastructure and water delivery needs of the City.

Water has performed these with the most recent ones completed in 1974, 1984, 1987 and 1991. The next one is scheduled for 2004.

Auditor's Follow-up Comment:

A cost benefit analysis justifying the extension of the serviceable life of the DWU infrastructure should have been performed prior to extension of the serviceable life. However, the serviceable life was extended due to the reduction of capital expenditures for DWU infrastructure.

OPPORTUNITIES FOR IMPROVEMENT

3. Water meters are not accurately reflecting the amount of water delivered.

Water meters employed in various applications contribute to the amount of UAW by the inaccurate meter readings. The accuracy of the meters is critical for they directly affect water revenues. The table below shows the cause and effect of water meter inaccuracy.

Cause	Effect	Solution
Improper meter type for application	Lost water, lower revenue	Replace
Water flow not accurately measured	Lost water, lower revenue	Repair/replace
Improper calibration	Lost water, lower revenue	Calibrate

In larger commercial/industrial applications, different types of water meters can be employed. Two of the commonly used types are compound and turbine meters. Compound meters are known for their accuracy in recording water usage while turbine meters are recognized for their low maintenance features but accuracy is less under low water flow through the meter. In terms of cost, the compound meters are significantly more expensive and require a higher level of maintenance than turbine meters. While both types of meters have their advantages and disadvantages, we found that a cost/benefit analysis needs to be performed to determine which meter is best suited for the particular metering application. However, we had not seen where these analyses had been performed.

Another source of lost revenue comes from portable meters that are not adequately monitored. Users of the meters can damage the equipment and incur a set usage fee and loss of deposit. However these assessed costs may not cover the total water consumed or the repair cost of the meter.

For large meters (those greater than 2" in size), management's decision has been to not fund additional positions to test and repair these meters contributing to a higher UAW.

A. The use of turbine meters on some routes may be the source of lost revenue to the City.

The replacement of meters on the 8-83 route to accommodate the Automated Meter Reading (AMR) test program may be a cause for reduced consumption and revenue on the route. In September 2000, DWU implemented a meter replacement program on route 8-83 to provide a testing ground for a new AMR pilot test program. An AMR system automates the monthly meter reading process resulting in increased meter reading accuracy and a reduction in costs by reducing the number of personnel reading the meters. Meter replacements were performed during the time period

September 2000 through January 2001. Approximately 90 fire assembly meters were replaced with turbine meters.

The conversion to turbines was chosen because of compatibility considerations with the AMR equipment. An analysis of the consumption rate before and after the conversion indicates that approximately 278,000,000 *fewer* gallons of water were consumed in a comparable 5-month period after the conversion than before the conversion. This volume of water equates to lost revenue of approximately $380,000. Our meter sample only included companies that were using those meters during both 5-month periods. Businesses that began or terminated service during either of the 5-month periods were excluded from the analysis.

Turbine meters are designed to accurately and cost-effectively measure high flow rates. Their ability to accurately measure intermediate flow rates is also acceptable; however, at low flow rates they lose their ability to reliably measure water usage. According to the meter manufacturer, Badger, accuracy in the turbines drops dramatically at flow rates below 20 GPM (gallons per minute). The highest accuracy rate Badger reported was 85% at flow rates below 20 GPM, but they also indicated that this was a high estimate and that in actual practice it is significantly lower. If the turbine meter is not properly matched and suited to the application, the City could be losing revenue as a result of the turbine meters not registering all water consumed.

There are many factors, including meter conversion, to consider when analyzing the data on route 8-83. These factors include changes in consumption patterns, change in business operations, and weather conditions. Our initial indications are that there are opportunities to maximize revenue realized by the City through a systematic evaluation of the appropriate use of turbine and compound meters.

B. Analysis is not adequate in determining the correct meter to use in particular applications.

According to DWU management, DWU's meter of choice in large applications is a turbine meter because they are economical from a cost and maintenance perspective. Although the City at one time primarily installed compound meters, an effort was undertaken in the early 1990's to replace compound meters with turbine meters. Compound meters are known for accuracy in reporting water consumption at high and low flow rates, but their disadvantage is higher cost, higher maintenance, and higher meter reading costs because they typically contain 2-3 registers. According to data supplied

by the Meter Division, a 3" turbine costs $390 while a 3" compound meter costs $1,152 (approximately 195% higher than a turbine). DWU however, could not provide maintenance cost data for either type of meter.

From a strategic perspective, it is important to evaluate which meter generates the most overall value for the City. If all compound meters are the preferred meter of choice, revenue will be maximized, but the cost to maintain and repair damaged meters may prove the compound meters unprofitable. If the turbines are the preferred meter, revenue will be sacrificed at the expense of lower maintenance costs. In either case, depending on customer usage patterns, it is best to match a meter to the particular application in order to generate maximum return on investment (ROI). To determine which meter will offer the highest ROI for a particular application, it is necessary to perform a cost/benefit analysis structured for the particular application. Interviews with DWU personnel indicate that a cost/benefit analysis was not performed in the past to determine which meter would best fit the application. DWU's current decision-making process does not include a cost/benefit analysis as part of the evaluation.

C. Residential meters are not being replaced based upon their expected life cycle.

Based on a target replacement schedule of 15 years, DWU will never achieve its target without additional staff to replace the meters. The long-term effect is that the existing installed base will need more repairs, cost more to maintain, and register less water than delivered. Revenues will decline and costs will accelerate. When new installations are considered, the ability of the Meter Division to respond will be further strained.

Residential meters have a life cycle of 10 to 15 years. Over those years, the flow of water through the meter will gradually wear out the internal components of the meter and degrade the accuracy of the meter register. This unregistered water is, in effect, delivered free of charge to the consumer and the City is not collecting any revenue for the water. In some cases, the meter register actually reports more water than was actually delivered. The personnel of the Meter Repair shop indicated that in the majority of cases, meters are underreporting the amount of water that was actually delivered.

The DWU small meter (2" or less) replacement program was originally based upon the manufacturer's warranty period. This warranty period is typically 10-15 years for most manufacturers and is dependent on the size of the meter. For 1", 1 ½", and 2" meters, the warranty period is 10 years. For 5/8" meters, the warranty period is 15 years. For FY 2002, 17,870 5/8" meters were

replaced out of a total of 230,000 meters. This rate equates to an average meter life of 13 years, which is slightly ahead of the recommended replacement rate. For 1", 1 ½", and 2" meters, the installed base totaled 60,702 of which only 2,543 meters were exchanged. At this pace, the replacement rate is 24 years, which is considerably higher than the 10-year warranty period for these meters.

DWU has cited the primary cause of inadequate meter replacement is the lack of funding. Due to budget constraints, DWU has had to extend the serviceable life of the meters in excess of their warranty period.

D. Portable meters are a source of lost revenue to the City.

The accountability for measuring water usage on portable meters is not adequate. Although the rules transfer accountability for meter reading (bringing the meter in to be read) to the customer, in practice only 10% of the customers actually bring their meters in for a reading. If a customer does not bring their meter in for a reading, then they are charged a 50,000 gallon accrual to their water bill for the current month. For those 90% who do not bring their meter in for a reading, their reasoning is that it will cost them more to unhook the meter, drive it to the Meter Repair Center, then drive it back to their site than to just keep the meter and pay a monthly recurring charge for the 50,000 gallons consumption. At $1.62 per 1,000 gallons, the monthly charge for 50,000 averages $81. At such a low rate of charge, there is very little incentive to bring the meter in for a reading.

Additional issues arise from the DWU's current method of accounting for water meters. They include:

1. Customers retain the meter for more than 12 months.
2. Meters are returned with damaged registers so DWU is unable to identify the quantity of water used.
3. Customers continue to operate the meters even though they are in substandard condition which may give rise to backflow problems.
4. Customers report their meters as either lost or stolen even though they are not. This allows the customer to have free unrestricted access to water and to pump as much water free of charge as they need.
5. Customers use the portable meters to bypass the permanent meters at their house thereby obtaining water at no cost.
6. Meters are not inspected and tested once per year as required by the Texas Natural Resources Conservation Commission (TNRCC). Since

meters are not brought in by the customers and since the City does not enforce the use of the meters, the City is unable to test the meters to assure compliance with TNRCC rules and regulation covering backflow and siphonage.

The City provides temporary water facilities to contractors and individuals through the use of portable 3" turbine meters that can be attached to fire hydrants. This type of connection is normally to provide water for construction and landscaping and the term of use is 12 months. The deposit charge is $700. DWU currently has approximately 750 portable meters in use. In order to collect fees for water used, the customer is to bring the meter to the Meter Repair Center on a monthly basis for a meter reading. These readings are then used to bill the customer for the quantity used. If the customer does not bring his meter in for a reading, DWU accrues a maximum of 50,000 gallons per month to the customer's bill. To address these issues, other surrounding cities install and remove the fire hydrants for their customers. The added benefit of providing this service is that it reduces fire hydrant damage, claims liability, and injury and increases the accuracy of billing and inventory control.

E. Funding requests for additional large meter test crews have been denied for 8 years.

Since 1994, DWU has annually requested funding for additional large meter crews, only to be denied funding each year. Considering the volume of water that these large meters handle and the amount of potential lost revenue from each meter, the accuracy of the meters is paramount.

Large meters (those greater than 2") supply water to the City's largest industrial and commercial customers. These customers include Texas Instruments, Coca-Cola, Mary Kay, and many others. Large meters are installed at these customer sites and account for approximately 5% of total water revenue. As the meters age, they loose accuracy registering water flows due to wear and tear on the mechanical components. The average age of the proportional-style fire service meters is over 30 years and the average age of the compound meters is in excess of 35 years. In order to maintain the meter accuracy within AWWA standards of 98.5 to 101.5%, the moving parts within the meter must be inspected and replaced on a periodic basis. If a regular maintenance schedule is not maintained, the meters will allow more water to flow than will be registered thereby causing the customer to be billed for less water than they consumed. This lost water translates into lost revenue to the City.

OPPORTUNITIES FOR IMPROVEMENT

AWWA standards C701, C702, and C703 covering turbine, compound, and fire service meters respectively, recommend the following test schedule:

Meter Size	Test Interval	Installed Meters (2002)	Recommended Test/Repair Qty	Annual Test/Repair Rate
3 inch	Every 3 years	623	208	33%
4 inch	Every 2 years	641	321	50%
6 inch	Annually	945	945	100%
8 inch	Annually	218	218	100%
10 inch	Annually	72	72	100%
Total		2,499	1,764	

As the schedule indicates, the City should be testing 1,764 large meters. However, DWU was only able to test and/or repair 504 meters or 71% below the AWWA's recommended targets. To meet AWWA testing standards, the Meter Division recommends that 3 additional 2-man repair crews would need to be funded. Since the Optional General Services customers represent the City's largest individual revenue customers, it is important that all of the meters servicing these large customers be tested on a regular basis. Failure to routinely test the meters will result in lost revenue to the City.

We Recommend that DWU:

A. Perform a post-implementation review of those customers on route 8-83 to determine why the discrepancy occurred after conversion to the turbine meters using the AMR system.

B. Perform a cost benefit analysis to determine the optimum type of water meter to be installed based on customer usage.

C. Develop policies and procedures to better account for portable meter usage.

D. Assess the life cycle of residential meters to maintain an acceptable level of meter accuracy.

E. Increase the number of large meter crews to effectively maintain a higher level of large meter accuracy.

Management's Response:

Comment: DWU will use the most accurate meter for a particular application.

OPPORTUNITIES FOR IMPROVEMENT

A. Perform a post-implementation review of those customers on route 8-83 to determine why the discrepancy has occurred after conversion to the turbine meters using the AMR system.
Water will test meters on route 8-83 to ascertain the reduced usage and will make appropriate changes, if required.

B. Perform a cost benefit analysis to determine the optimum type of water meter to be installed based on customer usage.
Water will size meters in accordance with industry standards and size of pipe.

C. Assess the life cycle of residential meters to maintain an acceptable level of meter accuracy.
Water will use standards available to insure proper life cycle of meters and make changes, if appropriate.

D. Develop policies and procedures to better account for portable meter usage.
Water will increase charges and impose fines to improve compliance with procedures.

E. Increase the number of large meter crews to effectively maintain a higher level of large meter accuracy.
Water will perform a cost benefit analysis to determine the appropriate level of staffing to assure an acceptable level of accuracy for large meters (as determined by AWWA) and propose the increased level of staffing in next year's budget cycle.

4. The water rate charged may not be sufficient to meet current and future DWU financial obligations.

Water rates do not appear to be sufficient to meet capital expenditures or payment in lieu of taxes (PILOT).

A. The current rate of replacement for infrastructure will result in the age of the system to continue to get older, far exceeding the estimated serviceable life of 50 years.

To address this issue and reverse this aging trend, the amount of funds dedicated to infrastructure replacement will have to be increased from 2/3 of 1% to approximately 2% per annum.

This issue is also impacted by the new Government Accounting Standards Board (GASB) Statement Number 34. This states that the entity, DWU, must use either normal depreciation methods where "…expense should be measured by allocating the net cost of depreciable assets over their estimated useful lives in a systematic and rational matter." Should DWU choose not to employ this method, GASB 34 allows the use of a modified approach where the assets can have an extended life and depreciation is not charged. However GASB requires certain conditions to be met should DWU

OPPORTUNITIES FOR IMPROVEMENT

choose this approach.

B. PILOT is a cost element that should be included in the cost of water according to AWWA.

PILOT is used by some governmental entities as a source of revenue. Should the City determine that DWU should pay PILOT, the estimated cost to DWU would be approximately $11.3 million. This figure is derived from the value of the DWU assets inside the City limits, approximately $1.6 billion, and applying the property tax rate to this valuation. The impact on water rate of including PILOT has been estimated by DWU to be approximately 4.12%.

During the FY 2002-2003 budget process, PILOT was considered by the City Council and determined at the time not to be a feasible revenue source. City management continues to review the possibility of implementing PILOT.

We Recommend that DWU:

A. Determine the approach and asset life cycle that is best suited for DWU operations and if switching to the modified approach, comply with the GASB 34 requirements.

B. Include in their next rate request, the percentage necessary to pay PILOT.

Management's Response:

A. Determine the approach and asset life cycle that is best suited for DWU operations and if switching to the modified approach, comply with the GASB 34 requirements.
Water is currently in compliance with GASB 34 using the depreciation method.

B. Include the percentage necessary to pay PILOT in its next rate request.
Water currently transfers to the General Fund the following:

Street Fee based on 4% of all retail revenues		$11.8M.
Indirect costs for some services and for the building space		$5.3M
CIS for phones and automation		$6.8M
EBS for fleet maintenance		$2.6M
Fire for 311 and dispatching		$2.1M
Building inspections	$ 98,410	
Economic Development	$1,400,000	
Human Resources	$ 52,986	
Fire and Police	$ 19,643	
Financial Services	$ 91,615	

Courts (TQM)	$ 18,000	
Parks	$ 397,000	
Environmental Health	$ 122,140	
Code Compliance	$ 100,000	
Streets-inspector	$ 48,000	
Auditors Office	$ 200,000	
CIS 311 phone lines	$ 29,076	
International Affairs	$ 137,185	
Property Management	$ 158,000	
Copy Center (bill inserts)	$ 36,600	
Public Works	$ 197,331	
Public Works Partnership	$ 636,000	
GIS	$ 157,862	
Office of Development Services	$1,200,000	
Financial Services –AP Consolidation	$ 216,424	$ 5.3M
Total		$33.9M
9.3% of total revenues		
Pilot	$ 11.4M	$45.3M

The decision to invoke PILOT is a policy decision.

5. Financial controls over water payments, reconciliation of accounts, and collections are not adequate.

A. Between 1997 and Year-End 2001, the A/R cash clearing account 0007 grew from $427,472 to $9,051,578.

The clearing account should generally be closed out with a zero balance as transactions are posted. Under any circumstance, the account should be reconciled to zero at the end of a fiscal year.

The CIABS billing system was installed in 1986. The A/R cash clearing 0007 account has carried a balance since CIABS came online. The water rate rebate issued to DWU customers in FY1999 and FY2000 was carried over in the A/R Cash Clearing Account 0007 until January 2002. $6,511,986 was carried and comprised two rebate installments: $2,652,210 (FY1999) and $3,859,776 (FY2000). Additionally, an amount of $1,667,519 was identified as non-cash adjustments. The remaining amount of $785,184 was classified as an unapplied balance. This unapplied balance resulted from a 2-3 day timing delay between the receipt of payment and posting to the cash account. The non-cash adjustments and unapplied balance comprised of uncleared debit transactions, bank errors, refunds to customer accounts and other

miscellaneous transactions.

During KPMG's annual audit for period ending September 30, 2001, KPMG recommended the total rebate ($6,511,986) be posted to clear the A/R cash clearing account. An entry was posted on January 11, 2002.

During May 2002, DWU implemented procedures to reconcile accounts on a daily basis.

B. Weak internal controls are affecting collection efforts at the Martin Luther King (MLK) Center.

This Center has had ongoing internal control and account reconciliation issues. The MLK Center is managed and operated by Environmental Health Services (EHS). During the time frame of January 2001 through September 2001, MLK was out of balance approximately $146,734.38. EHS used 2-3 MLK employees spending 4-6 hours per day, over a 6-8 month period, for an estimated 720 to 1,440 hours to reconcile this out of balance condition. Two DWU employees from Accounting & Finance and one employee from DWU Internal Audit also spent 86 hours to reconcile the same outstanding balance.

During the time frame of February and March 2001, several duplicate postings of cash receipts were found to be the main cause for the outstanding balance. During this time, MLK processed payments manually and through a newly installed software package, Cashier for Windows (CFW). The following actions also added to the unreconciled amount:

- MLK cash receipts were not consistently deposited on a daily basis
- Amounts on cash receipts did not match the actual amount deposited into the bank account
- Payments were voided in CFW but not in CIABS
- Daily Cash shortages have occurred

DWU Internal Audit reconciled MLK Cash Receipts from $146,734.38 down to approximately $3,779.00. This amount was to be collected by DWU from EHS.

The amount of time expended and the time frame used to reconcile this out of balance condition is excessive and raises serious questions about the ability of the MLK staff to adequately safeguard funds.

OPPORTUNITIES FOR IMPROVEMENT

C. Monthly reconciliation procedures for water produced to water billed are not being performed.

The CIABS system proved to be unreliable in regard to data validity. We requested CIS to create a report from CIABS to compare four months of billing data. Of the four months of data that was retrieved, 6,292 records did not have a date associated with them. This impeded our ability to use this report to reconcile to this four-month block of data. Alternatively, we created an Excel spreadsheet from daily billing reports for this same time period. We compared daily water sales, but were not able to determine the daily gallonage billed to daily sales.

We Recommend that DWU:

A. Maintain procedures in order that the Cash Clearing Account 0007 nets to zero on a daily basis.

B. Monitor EHS' operations more closely in order to strengthen and tighten controls on collection and reporting of cash receipts for water payments.

C. Develop procedures to monitor, on a monthly basis, the amount of water produced to the amount of water billed (less UAW). Senior management should take action to investigate the causes of any significant variances.

Management's Response:

Comment: Your comment that the A/R cash clearing account 0007 should be reconciled to zero at the end of the fiscal year is impossible given that there are always outstanding items even at the end of the year.
Comment: Your comment on the differences between the allowance for doubtful accounts and the write-off, both Resource and CIABS are managed and maintained correctly as procedures are in place to assure this.

A. Maintain procedures in order that the Cash Clearing Account 0007 nets to zero on a daily basis.
   Water has reconciled this account daily since May 2002 and procedures are in place.
B. Monitor EHS operations more closely in order to strengthen and tighten controls on collection and reporting of cash receipts for water payments.
   The City Council awarded a contract on December 11, 2002 to Cliff Check Cashing Service to operate the locations. Contract conditions are under negotiations with Cliff Check Cashing Service to make this change as risk free as possible.

OPPORTUNITIES FOR IMPROVEMENT

C. Develop procedures to monitor bad debt expense more closely. Senior management needs to review reports that effectively track and monitor current and accrued bad debt expense.
   Water will develop, revise and strengthen internal control procedures and provide them to you for your evaluation.
D. Develop procedures to monitor, on a monthly basis, the amount of water produced to the amount of water billed (less UAW). Senior management should take action to investigate the causes of any significant variances.
   DWU will identify and quantify losses by category using the AWWA UAW methodology monthly.

Auditor's Follow-up Comment:

As recommended by DWU's external auditor, KPMG, in a report dated January 14, 2002, entitled "City of Dallas, Dallas Water Utilities, Analysis of Account 0007-A/R-Cash Clearing", KPMG states that "…each day this account should net to zero. DWU has erroneously carried this balance since CIABS came online, resulting in an overstatement of 0007-A/R Clearing."

We recommend DWU follow KPMG's guidance on this issue.