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Utility Manual (2006)

Bill Young
Harriman Utility Board

UTILITY MANUAL

October 2006

Bill Young, Utility Finance Consultant

MTAS
Municipal Technical Advisory Service
In cooperation with the Tennessee Municipal League

THE UNIVERSITY of TENNESSEE

The purpose of this manual is to provide cities with a better understanding of funding water and sewer utility operations. Water and sewer operations are often very costly, but they provide a public health service. Also, water and sewer services are necessary if communities are to grow and attract new investment.

This manual is to be viewed as a tool in helping cities make sound financial decisions. Each utility operation is different, and not everything discussed is applicable in every city's situation.

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The Municipal Technical Advisory Service (MTAS) was created in 1949 by the state legislature to enhance the quality of government in Tennessee municipalities. An agency of the University of Tennessee Institute for Public Service, MTAS works in cooperation with the Tennessee Municipal League and affiliated organizations to assist municipal officials.

By sharing information, responding to client requests, and anticipating the ever-changing municipal government environment, MTAS promotes better local government and helps cities develop and sustain effective management and leadership.

MTAS offers assistance in areas such as accounting and finance, administration and personnel, fire, public works, law, ordinance codification, and water and wastewater management. MTAS houses a comprehensive library and publishes scores of documents annually.

MTAS provides one copy of our publications free of charge to each Tennessee municipality, county and department of state and federal government. There is a $10 charge for additional copies of "Utility Manual."

TABLE OF CONTENTS

DEFINITIONS

ENTERPRISE FUND This type of fund is used when operations are financed and operated in a manner similar to private business. The costs (expenses, including depreciation) of providing the service is recovered through user charges.

SCHEDULE OF REVENUES, EXPENSES, AND CHANGES IN NET ASSETS This statement was formerly known as the income statement. It analyzes revenues and expenses in order to determine the change in net assets (profit or loss).

STATEMENT OF NET ASSETS This statement was formerly known as the balance sheet, and is a statement of assets, liabilities, and net assets.

DEPRECIATION The orderly expensing of a long-term asset over its useful life rather than it being totally expensed at the time it is acquired.

LONG-TERM ASSET Assets that have a useful life of several years or longer. Examples in a water and sewer system are pumps, pipes, and vehicles.

CAPITAL BUDGET An informal budget used to plan new water and sewer projects and equipment purchases over the next several years

Note about accounting changes: *In recent years the Governmental Accounting Standards Board (GASB) issued changes to the terminology and presentation of certain financial information. One of the biggest changes affecting utilities is that grants now appear as part of the profit and loss of the utility rather than as contributed capital.*

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ENTERPRISE FUNDS

Cities usually operate their utility services in one of two ways. The city may have a separate utility board of commissioners that oversees and funds all utility operations, or the water and sewer utilities may be part of the city budget, and the aldermen serve as the utility board. In either situation water and sewer utility funds should be set up in a separate fund known as an enterprise fund. Cities may have one enterprise fund for the water operation and another enterprise fund for the sewer operation. However, in most cases it is perfectly permissible to have a combined water and sewer fund. This option has three important advantages for the city:

- Combination of earnings from one department with losses from another may allow the city to have a combined positive net income. (This is most helpful in cities where water makes an income and sewer has a loss);
- Costs can be spread over a larger customer base; and
- Consolidation makes it easier to address administrative, management, and bookkeeping problems.

If the utility elects to operate with a combined fund, bookkeeping should still segregate expenses for water and sewer so that accurate records will be maintained for the cost of operating the water and sewer systems. This is especially important when the utility is seeking grants and loans, as most agencies want to see the costs for water and sewer separately as they compare to revenues.

Enterprise funds differ from the city's general fund in several ways. Enterprise funds are concerned with income, while the general fund looks at both income and fund balance. Producing an income is important because it is the means of providing funds for capital projects, new equipment, etc. that the utility operation needs. Also, depreciation is used as an expense item in the enterprise fund, while it is recognized only partially in the general fund. This manual provides more information about all these issues in subsequent sections.

EXAMPLE OF GENERAL FUND FINANCIAL REPORT

XYZ City **GENERAL FUND FINANCIAL REPORT** **F/Y Ending June 30**

	BUDGET	ACTUAL	VARIANCE
Revenues:			
Local Taxes	$3,000,000	$3,100,000	$100,000
Licenses and Permits	$30,000	$35,000	$5,000
Other Revenues	$200,000	$190,000	($10,000)
Total Revenues	**$3,230,000**	**$3,325,000**	**$95,000**
Expenditures:			
General Government	$300,000	$290,000	$10,000
Administrative	$200,000	$210,000	$(10,000)
Police Department	$650,000	$640,000	$10,000
Fire Department	$600,000	$620,000	$(20,000)
Parks and Recreation	$300,000	$275,000	$25,000
Streets	$650,000	$655,000	$(5,000)
Total Expenditures	**$2,700,000**	**$2,690,000**	**$10,000**
Excess of Revenues Over Expenditures	**$530,000**	**$635,000**	**$85,000**

EXAMPLE OF WATER/SEWER FINANCIAL REPORT

XYZ City **WATER/SEWER FINANCIAL REPORT** **F/Y Ending June 30**

	ENTERPRISE FUND
Revenues:	
Water Sales	$800,000
Sewer Sales	$600,000
Service Charges	$20,000
Other Revenues	$25,000
Total Revenues	**$1,445,000**
Operating Expenses:	
Operating and Maintenance	$700,000
Depreciation	$150,000
Administrative	$250,000
Other Expenses	$100,000
Total Expenses	**$1,200,000**
Operating Income	$245,000
Interest Income	$25,000
Interest Expense	$(200,000)
Change in Net Assets	$70,000
Beginning Net Assets	$500,000
Ending Net Assets	$570,000

*(**Note:** the Governmental Accounting Standards Board (GASB) has changed some of the financial reporting standards, which alters the presentation of the general fund and enterprise fund statements. Most utilities will work with the auditors to present these changes. MTAS is also available to assist staff and officials with understanding the new requirements)*

One other very important aspect of the enterprise fund is the fact that some loan and grant regulations require having a separate fund in order to obtain these monies. This is to assure the lender that there are sufficient revenues being generated by the utility operations to repay the debt.

STATE OF TENNESSEE REQUIREMENTS

In 1987, the state legislature passed the Wastewater Facilities Act (T.C.A. § 68-221-1001B1015). This provides a method for the state to intervene in the financial affairs of any financially distressed, publicly owned wastewater facility. This act established the Wastewater Finance Board (WWFB) to oversee financially distressed municipal wastewater systems. (Utility districts have a similar oversight board that covers their operations: the Utility Management Review Board, T.C.A. § 7-82-701 B 706). In 1997 the Wastewater Facilities Act was amended to also include authority over financially distressed water systems that do not already have a combined fund with the sewer system.

Cities are required to have an annual independent audit of their financial records. Each of these audits is submitted by the auditor to the Tennessee Comptroller of the Treasury. Audits that show a net loss or negative net assets are forwarded to the staff of the Wastewater Financing Board for further review and possible action if the system falls into one or more of the following situations:

- Three consecutive years of net losses;
- Being in default on any long term debt; or
- Deficit in net assets.

City management will be asked to appear before the WWFB and submit a plan, for board approval, that will eliminate the deficits and operate the enterprise fund in a positive manner. The WWFB has established certain guidelines for the city to accomplish this:

- Deficit in net assets—the WWFB may allow the city a period of time of up to 10 years to eliminate the deficit; or
- Three years consecutive losses—the WWFB may allow the city a period of time of up to three years to begin operating with a positive net income.

In addition, certain amendments have been made to the law to reduce the number of cities classified as financially distressed. These amendments include:

- New wastewater systems do not have to include depreciation as an expense during the first seven years of operation; and
- Amounts derived from tap fees, connection charges, or other related fees and charges shall be considered revenue.

In cities with financially distressed water or wastewater funds, city officials have probably been made aware of the situation by their independent auditors and the state comptroller's office. Cities and utility districts with systems that are considered financially unsound are required to answer to the appropriate board.

In Tennessee, the state comptroller prescribes accounting standards and procedures. Some of the alternatives discussed in this manual exceed "recommended practices and procedures." The comptroller has the final say over what's acceptable in municipal accounting practices.

FUNDING SOURCES

A water and sewer utility operation has several options for generating revenues through its normal service provisions. These consist of user charges, tap fees, service fees, penalties or late charges, and surcharges.

USER CHARGES

Generally, most of the revenues of a water and sewer utility are in the form of user charges. These charges are measured and accounted for by water meters. Water usage is calculated on a monthly basis (normally) and this usage is applied to the city's water rates. Typical rate structures consist of a minimum bill for usage levels of zero to 2,000 gallons and a charge for each thousand gallons used over the minimum. Some water rate structures may have several declining rate steps.

EXAMPLE OF A WATER/SEWER RATE STRUCTURE

First 2,000 gallons (minimum bill)	$ 8.00
Excess over 2,000 gallons	$ 2.75 per thousand gallons

EXAMPLE OF A WATER DECLINING RATE STRUCTURE

First 1,000 gallons (minimum bill)	$ 7.50
Over 1,000 to 5,000 gallons	$ 2.50 per thousand gallons
Over 5,000 to 10,000 gallons	$ 2.00 per thousand gallons
Over 10,000 to 100,000 gallons	$ 1.50 per thousand gallons
Over 100,000 gallons	$ 1.00 per thousand gallons

EXAMPLE OF AN ASCENDING RATE STRUCTURE

First 1,000 gallons (minimum bill)	$ 7.50
Over 1,000 to 5,000 gallons	$ 1.75 per thousand gallons
Over 5,000 to 10,000 gallons	$ 2.00 per thousand gallons
Over 10,000 to 100,000 gallons	$ 2.25 per thousand gallons
Over 100,000 gallons	$ 2.50 per thousand gallons

Cities will use an ascending or increasing-block rate schedule when there is a need to encourage water conservation as a result of increased demand on a dwindling water supply.

In many cities sewer charges are based on water usage amounts determined from meter readings. If the city provides only sewer service it will obtain the usage amounts from the utility districts or whoever is providing water service. In the past sewer charges were typically structured like water rates, although in some cities the sewer rate was expressed as a percentage of the water bill. Today, for many utilities sewer charges are now higher than water charges as the costs of meeting all the requirements of operating a sewer system have increased dramatically. In addition, sewer rate structures typically may use increasing block rates.

RATES

Several factors should be considered when determining the rate schedule for water and sewer services:

- Operating and maintenance costs;
- Depreciation;
- Debt principal and interest; and
- Capital requirements (this would include new lines, equipment, etc.).

Rates should be put in place sufficient to generate revenues to fund these items and to build a cash reserve to handle emergencies and other fund needs.

One of the most important points to consider is the necessity of planning and monitoring water and sewer fund needs. Cities often wait until they are in financial distress before increasing rates. Then large rate increases are necessary. These increases upset customers and hurt the public perception of the utility operation. A planned program of much smaller, gradual rate increases will help provide the needed income and prevent the city from getting into financial distress.

MTAS has a publication entitled *Basics of a Utility Rate Study* that provides more information about rates. It is available free of charge to your city, and can be obtained from an MTAS consultant or by calling the MTAS office. Also, MTAS finance and utility consultants can assist you with rate issues or perform a rate study for your city to help you determine exactly what your water/sewer rates need to be.

METERS

The main source of information for revenue is water meter readings. Care should be taken to make sure meters are properly read and maintained. Any discrepancies or questions about readings should be noted and handled before billings are sent to customers. Occasionally, a meter reading may have to be estimated due to inaccessibility of the meter location. The account should be noted as estimated for future reference and, if at all possible, should be read at the next billing period.

AUTOMATED METER READING

One of the more recent changes in meter reading is the availability of automated meter reading (AMR). AMR is being done in several forms. Devices may be installed on the meter that require the meter reader to use only a touch wand to obtain the reading. Apartment buildings and condominiums that are metered separately may be networked so that touching only one meter reads an entire group. There also are radio read devices that let the meter reader simply drive past the location. A special device on the meter sends a signal that is picked up by the equipment in the meter reading truck.

METER MAINTENANCE

It is important that water meters record usage as accurately as possible. Water meter readings result directly in water and sewer revenues for your city. As meters age they become more inaccurate and usually fail to record all of the water passing through them. Therefore, a regular program for changing out older water meters should be put into place. Replacing older meters on schedule will help the city maintain the revenue level it needs. Recommended schedules include changing out the meters every six to eight years or when a meter has recorded 1 million gallons of usage. Large industrial or commercial meters should be tested periodically to certify their accuracy as many times these larger revenue sources will account for the greater

percentage of the city's revenues. It is always better to test these meters at the location under the same conditions as normal service. Also, remember that sewer billings are computed based on water usage. If the water reading is less than accurate it will also affect sewer revenue.

OTHER METERING CONCERNS

It is usually recommended that each separate service location have its own water meter and sewer service. Sometimes multifamily dwellings will service all users through one master meter. The city needs to have policies in place that address minimum billing and other rates in master metering or the system will not realize as much revenue from these master meters as they normally would from individual metering. However, additional revenues in these situations may be offset by increased maintenance costs of the lines and meters necessary to serve each customer. Cities need to establish uniform policies for handling customer metering concerns for cases such as multifamily dwellings and commercial and industrial customers. This will allow your employees to answer customer questions and ensure that the city that it is treating all its customers fairly.

UNMETERED SERVICES

Some user charges, such as fire hydrants and sprinklers, are unmetered. Flat charges are billed each month so that the service is available if needed. Usually these charges are based on the number of hydrants or sprinkler heads in service. Fire hydrants, or fire protection, is usually charged to the city's general fund.

One very important thing to remember is that utilities derive 80 to 90 percent of their revenues through user charges.

TAP FEES

Whenever customers request a new service tap for either water or sewer, a tap fee should be required. Sometimes cities charge artificially low tap fees as a means of encouraging new growth. When the tap fee doesn't even cover installation costs the difference must be made up through user charges to all ratepayers.

In establishing tap fees cities should consider that the new customer is connecting to an existing plant system for which they have shared no costs. To this extent tap fees must include more than just the cost to the utility of the physical installation. Several methods of calculating tap fees may be used. Primarily, they will use asset or plant in-service costs being shared by all customers. This cost should be updated from time to time to reflect customer/cost changes. It is not unusual for cities to charge $1,000 to $2,000 for tap fees. Although this may seem high, it is relatively low compared to the cost of digging a well or installing a septic tank. City auditors or MTAS accounting personnel can assist in calculating the tap fee.

Tap fees will be recorded as revenues of the system. Tap fees provide an important resource for water and sewer utilities to recover installation costs from customers.

SERVICE FEES

Water and sewer utilities should charge customer service fees for various parts of their operation. One reason is that customers using the utilities' labor, equipment, and materials should bear the largest burden of the cost. This helps keep rates lower for all users and provides important revenues to the utilities.

TYPES OF FEES

Customer Service Fees: Whenever a customer requests that a water meter be put into service a utility employee usually must go to the service location to obtain a meter reading and turn the meter on. A flat fee to recover the employee's labor and vehicle cost is charged. Normally these fees range from $20 to $50 per service call and are nonrefundable if the service is ended.

Collection/Reconnection Fee: When a customer service visit is necessary to either collect a bill or reconnect a service that was terminated for nonpayment, the utility may charge the customer a service fee. Typically these fees also are $20 to $50 per service call and are nonrefundable.

Damage Costs: Occasionally a customer will damage a water meter or meter connections by turning the service on or off without using the proper tools. A utility may want to have the customer reimburse the costs of the meter, connections, etc. that were damaged. Actual labor costs or a customer service fee may also be charged.

Fees for calls outside of normal working hours: The utility may choose to charge customers for customer-initiated service calls outside of normal working hours. This charge may be actual costs incurred or a flat fee that has already been established for these types of calls. Either way the goal is to recover some, or all, of the costs involved.

Returned check service fees: A city may choose to charge a service fee for handling returned checks. This is easily justified since some costs are incurred by the water and sewer utility to collect these monies. Sometimes having a published charge discourages customers from giving the utility bad checks. Cities should consult their auditors or attorneys when establishing these fees as there are maximum charges allowable under state law.

It is important for utilities to view service fees as a way to recover the costs of providing specific services to their customers. Utilities should avoid inflated service fees that can harm customer relations. Also, it is important that the customer be aware of fees *before the service is provided*. At the time a customer applies for service he should be given a handout that lists appropriate policies or fees. These may also be published in local newspapers and newsletters/inserts that customers receive. This is especially important when there are any changes to existing fee schedules.

PENALTIES OR LATE CHARGES

Normally, utility billings specify a date by which the bill should be paid. Customers can be encouraged to make payment by this date through the use of a penalty or late charge. (Sometimes late charges are referred to as forfeited discounts.) If the billing is not paid by the due date a charge (typically 5 to 10 percent) will be added to the amount due. Utilities, like all other businesses need to maintain a steady cash flow in order to pay their bills. The late charge will help keep the cash flowing, and, when it is necessary to add the penalty, help offset the extra cost of collecting past due accounts.

SURCHARGES

Some city sewer systems have industrial customers that inject large amounts of industrial waste into the sewer. These customers may have to operate under a National Pollutant Discharge Elimination System (NPDES) permit specifying certain levels of waste that will be collected and treated by the system. If these levels are exceeded, the

customer may be charged a penalty or surcharge. This surcharge is assessed because it costs more for the lines, pumping stations, and plants to handle and treat this type of waste. A surcharge also may encourage industrial customers to develop pretreatment programs to treat these types of wastes before they enter the city sewer system. The purpose of surcharges is to recover some costs that otherwise would have to be paid by all customers through higher rates. It is also to encourage industries to be in compliance with their waste discharge permits. MTAS can provide the city with operational technical assistance to help determine surcharges.

DEPRECIATION

One of the most misunderstood aspects of water and sewer utility accounting is depreciation. Since depreciation does not involve paying out cash funds, like all other expenses, many city officials don't want to recognize it as a legitimate expense. In accounting terms depreciation is the orderly write-off of a long-term asset over its useful life. Rather than expensing a new piece of equipment, such as a truck, at the time of the purchase, a portion of the cost of the truck is expensed each year for several years. In reality, depreciation is very important to a city's utility operation for another reason. By funding for the depreciation expense each year, the utility can generate funds to purchase a new truck when the old one is no longer of use. Depreciation provides the city with an orderly way to have the funds necessary for new capital purchases. Rather than being viewed in a negative way, depreciation should be seen for its positive results.

OTHER FUNDING SOURCES

City water and sewer operations need to make capital purchases and improvements. Some of these, such as a small line installation or a vehicle, may be of relatively low cost and paid for out of normal operating funds. Some capital projects, a new water plant for example, may cost several million dollars. For these types of projects the city will need to obtain grants and loans and repay these costs over a number of years. Whenever possible cities should apply for grants to help lower the amount that has to be borrowed. Certainly interest costs are a major consideration, so cities should "shop around" for the best available rate. When you consider that a water or wastewater plant may be financed over 30 years or more, the interest costs may total more than the amount borrowed over the term of the loan. In recent years many cities have refinanced their debt to take advantage of declining interest rates. Remember also that interest expense is a part of the income statement of the utility operation. Certainly any time a city is going to incur a major new debt, it should complete a revenue/rate study to be sure it can pay the principal and interest.

MTAS has available a free publication entitled *Finding Money III*, which is an excellent resource for cities to use to help them locate sources of grants and loans. To obtain a copy you may contact the utility or finance consultants, or call the MTAS office.

CAPITAL BUDGETS

One of the most often neglected areas water and sewer utility operations is long-range planning for capital needs. In accounting terms an expense item is generally something that is considered consumed shortly after its purchase. Examples are office supplies, hand tools, and nuts and bolts. Capital purchases or projects are those larger, more expensive, items that have a longer useful life. If you install 2,000 feet of new sewer line you expect that line to last for several years. The cost of the line and its installation would not be expensed on the income statement but would be recorded as a

capital item on the balance sheet. At the end of the financial year capital items are recorded as a part of the utility plant and are then depreciated over their useful life.

City water and sewer utilities should develop a plan for capital needs for the next four to five years. This will help to accomplish several things:

- The city will have a plan for the orderly replacement of equipment and utility infrastructure;
- This plan will help the city provide necessary funding for the projects; and
- The plan will allow the city to prioritize its needs and schedule the work.

EXAMPLE OF A CAPITAL BUDGET

XYZ City **CAPITAL BUDGET** **F/Y 2000 - F/Y 2004**

CAPITAL ITEM	F/Y 2006	F/Y 2007	F/Y 2008	F/7 2009	F/Y 2010
Maple Street Water Line	$20,000	$10,000			
Replace Pick-Up Truck			$12,000		
New Pump @ Water Plant				$30,000	
Elm Street Line Upgrade		$10,000	$10,000	$10,000	$10,000
New Backhoe	$25,000				
TOTAL	**$45,000**	**$20,000**	**$22,000**	**$40,000**	**$10,000**

The capital budget should be viewed as a tool for the city to use and revise as needed. It will need to be updated on an annual basis. The capital budget also helps the city demonstrate to ratepayers where revenue dollars are being used to improve water and sewer operations.

OPERATIONS AND COST-CONTROL MEASURES

Proper attention to the operation of a municipal utility can have a positive impact for the city in several ways. Routine maintenance ensures a better, more reliable service for customers. Maintaining and promoting a trained, efficient work force leads to good operations. Keeping accurate accounting, billing, operational, and other records helps city officials make sound operating decisions. Perhaps most importantly, and most overlooked by many cities, is that paying attention to the operation of the water and sewer systems reduces operating costs.

CUSTOMER ACCOUNTING

Customer accounting consists of several different issues. A good customer accounting system will reduce bad debt loss and improve internal control, cash flow, and net income.

CUSTOMER BILLING

Customer billing for water and sewer services is usually done on a monthly basis. Billing may be done "in house" by the city's computer system; billing software packages are readily available. Some cities may choose to use an outside billing service. In that case the city will read the meters and provide the information to the vendor for billing.

In smaller systems all of the billings may be prepared and mailed at one time. Larger systems may want to do cycle billing. Meter reading routes are divided into groups called cycles. Billings are prepared and mailed using these cycles based on a monthly schedule. Cycle billing can help the city have a smoother work flow and provide a better cash flow. Whether billings are done all at once or by cycles, care should be taken to send customers their bills at approximately the same time each month. This cuts down on customer complaints and allows them to better budget for the utility payment.

As a part of the billing and accounting process, cities should maintain proper accounts receivable records. Billing totals and payments should be recorded and balanced to accounts receivable totals. One way to accomplish this is for cities to maintain an open balance that reflects outstanding balances on each customer's account. The open balance would contain an "aging" of account balances so that past due accounts could be flagged for collection. Accounts receivable should be balanced monthly.

COLLECTIONS

Normally, cities collect water and sewer billings through walk up/drive up collections or through the mail. These payments usually consist of cash or personal checks. In recent years cities have added alternative payment methods that take advantage of current technologies. Bank drafts, credit cards, and Internet banking are ways to speed collection for the water and sewer fund and provide convenience for the customer.

Cities should establish policies regarding collections of past due payments and bad debts. Generally, a customer will be given a reasonable amount of time to pay the bill without incurring any penalties. For example, a customer's bill would be mailed to them on the 10th of the month and they would have until the 25th to render payment. If the bill is not paid by the due date, a penalty amount, normally a percentage of the outstanding balance, is added to the customer's account. If the bill remains unpaid the customer will be notified that payment is past due. Cities sometimes mail a notice that states that the customer's bill is past due and gives a date by

which the bill must be paid before further action, up to and including termination of service, is taken. Care should be taken that customers are informed of their right to dispute the past due amount. Any disputes should be handled before a service is terminated. This will save the city legal problems and perhaps public embarrassment later on.

DEPOSITS

Customers should be charged a deposit adequate to ensure that the city will not lose appreciable amounts of money from unpaid bills and bad debts. A deposit should be sufficient to cover the amount that would be outstanding before the service would be cut off for nonpayment. In calculating deposit amounts remember that the customer is still using the water/sewer service from the time the meter is read through whatever time period the city uses for cut offs. The deposit amount needs to be enough to cover this usage period as much as possible.

Some utilities have policies that provide for the waiver or refund of deposits if the customer meets certain requirements. For instance a homeowner who provides a notice of good payment history from a previous utility provider may have the deposit waived, or all residential customers who maintain a good payment record for two consecutive years of service will have their deposits refunded. If you establish these types of policies, remember that the purpose of a deposit is to ensure payment for outstanding bills if the customer is unwilling or unable to pay.

NONREFUNDABLE CONNECTION FEES

Instead of deposits cities may want to use nonrefundable connection fees. A deposit is recorded as a liability on the balance sheet and will need to be accounted for as long as the customer has the service. A nonrefundable connection fee is recognized as revenue when it is received, and no records need be maintained to keep track of the payment as with a deposit.

OPERATIONS

Trained and competent personnel, properly maintained facilities and equipment, and a planned program of capital improvements are some of the operational concerns that confront city water and sewer systems. Proper attention to these concerns will result in more efficient service to customers, better quality of water supplied or wastewater treated, and cost savings to the city.

TRAINED AND COMPETENT PERSONNEL

Cities should employ competent, professional personnel in utility operations. Water and wastewater plant operators should meet at least the state minimum certification requirements. Operators must regularly update their training so that they are able to comply with the latest federal and state regulations. Operations and maintenance personnel need to also have the proper certifications in their respective areas and have a thorough knowledge of the systems' pumping stations, tanks, lines, etc. Operational problems caused by ill-trained or incompetent personnel can cost the city valuable dollars in lost revenues, equipment failures, and even fines resulting from operational or health violations. One of the most important ways for cities to attract and maintain excellent personnel is to provide pay and benefits that are competitive with other area utilities.

PROPERLY MAINTAINED FACILITIES

The value of the assets of a city water and sewer system will most often amount to millions of dollars. Maintaining those assets will cost the city substantial monies in the annual budget. But proper maintenance will actually result in significant

long-term savings. Maintenance extends the life of equipment, lines, pumps, etc. and thus prolongs costly replacements. Also, poor maintenance usually results in more operational problems. This often will cost the city in overtime pay or even having to contract outside workers to effect repairs and restore service. Employees should follow regular maintenance schedules and make necessary repairs as needed.

WATER LOSS AND INFILTRATION/INFLOW

Two areas of concern for water and sewer systems are control of water loss from the water system and infiltration/inflow (I & I) into the sewer system. Water loss can be measured in terms of accounted for losses and unaccounted for losses. Water loss comparisons are made by looking at the reports of actual water treated and pumped into the system by the water plant and comparing them with gallons billed and sold to customers. It is important to understand that every thousand gallons treated and pumped at the water plant costs the water system in labor, chemicals, pumping charges, etc. A certain amount of unmetered water is going to pass through the water system each month. Some of that water loss can be identified and accounted for. These accounted for losses are the result of:

- Washing filters at the water plant;
- Water from fire hydrants used in firefighting;
- Water used in flushing of water lines (especially important to flush dead end lines); and
- Leaks that have been found and repaired.

In order to account for these losses, city utility personnel, or perhaps the city engineer, may have to estimate the amount of water lost. This is done by knowing line sizes, flow rates, etc. Once cities have identified all the losses they can, the remainder of the water loss is classified as unaccounted for. Unaccounted for water loss is usually caused by leaks and by meters that are either stopped or registering less than the actual flow of water through them. As a general rule cities should strive for a 10 to 15 percent unaccounted for loss.

Infiltration/inflow (I & I) occurs when outside ground water enters the sewer system. I & I can cost utilities tremendous amounts of money in pumping and treatment costs. Ground water can enter the sewer system in several different ways:

- Through cracks or breaks in the sewer lines;
- Through manholes that are either leaking or located in a low lying area that is prone to being underwater; and
- Through storm water drains or downspouts that are connected to the sewer system.

Many sewer systems are built with pumping stations that pump to the treatment plant. Obviously, if a lot of outside ground water is entering the system, it must be pumped as well. The resulting additional pumping costs are lost dollars as no customer is being billed for the I & I. Once the I & I reaches the plant the treatment costs rise as well through additional labor costs, chemicals, pumping, etc., which are necessary to treat the waste. In a very rainy season, I & I will amount to thousands of dollars each month. In very bad I & I situations the sewer plant may be operating at capacity because of the excess water, and plant expansions costing thousands, or even millions, of dollars have to be made

Utilities can do several things to help eliminate I & I. Manholes located in low lying areas need to be either raised or moved. Utility employees can inspect manholes when it is raining to see if outside ground water is entering. Leaking manholes

can be replaced or repaired. Many sewer utilities use cameras that can be put through sewer lines to check for leakage. These camera units can be bought (perhaps cities located near each other could agree to purchase and share a camera) or rented. There also are companies that cities can contract with to film their lines. Once identified, a priority list can be established for the orderly replacement of the leaking lines. Through the use of smoke testing, utilities can find storm drains and downspouts that are connected to the sewer system. Property owners can be notified to remove the drains and downspouts from the system. Those who refuse may be cited under the city's sewer use ordinances.

PLANNED PROGRAM OF CAPITAL IMPROVEMENTS

One of the most important planning tools for utility operations is the capital improvements plan. Cities can best use their revenue dollars and provide their customers with the most reliable service when long-range planning is done. Areas where capital improvements planning should be done include:

- Water and sewer line extensions or replacements;
- Pump rebuilds and/or replacements;
- Water meter replacements;
- Water tank replacements, refurbishing, and additions;
- Renovation or replacement of water treatment plants;
- Renovation or replacement of wastewater treatment plants; and
- Major equipment and vehicle replacements or additions.

Once capital projects are identified, a list should be compiled of all projects needing completion and their approximate cost. Then, city staff and officials can prioritize the list as to completion dates over the next four or five years. Once this is accomplished, cities will have a much better idea of the funds that will be needed for each project. The result is a capital projects budget, a very helpful tool for the utilities,. Unlike the normal city budget, the capital budget is not fixed; it is merely a guide. It will need to be updated annually, as new projects arise and current projects are completed.

In addition to planning the use of operating funds, the capital budget allows cities to do long-range planning for major projects, such as new treatment plants, that will require the city to obtain grants or borrow funds. By planning for these projects several years in advance cities are able to find the best possible sources of funds at the cheapest interest rates. Also, sufficient rates can be put into place to pay the new debt service and ensure that the city still has enough income for normal operations and maintenance.

MANAGEMENT ISSUES

Responsibility for the utility system lies ultimately with the city's governing body. Therefore, city officials need to have at least a basic understanding of utility operations. The governing body has several important roles. It:

- Sets policies, procedures, and guidelines for the utility operation;
- Hires and maintains a competent, well-trained staff; and
- Provides the resources for the staff to carry out the utility's functions.

Every city utility system should have a policies and procedures manual that contains the utility's rules and regulations. Employees should be expected to follow the policies and procedures as established by

the governing body. This makes the employees' job much easier as they have clear guidelines to follow when dealing with customers and making daily decisions regarding utility operations. The manual also lets city officials hold employees accountable for those rules. The policies and procedures will need to be updated and modified from time to time as the operations of the utilities and state and federal laws change. Policies should also be set for water and sewer line extensions. These policies should address how new developments will be served and how new lines are to be funded. This helps ensure that extensions are handled in a fair and uniform manner.

One of the challenges for management is staffing. Utility managers should have the expertise to oversee the operation and be able to work closely with city officials to help them understand the needs of the system. Utility personnel should be expected to read and interpret new regulations. Training opportunities must be provided so that staff can maintain high levels of operation and maintenance. And, officials should expect the utility management to be accountable for the operation of the water and sewer system. Likewise, management should hold staff responsible for the work that they do. A wage, salary, and benefit plan should be put in place that is equitable and provides a means to retain competent staff. Utilities can obtain surveys through MTAS, development districts, and other organizations that can help them put together their plan.

City officials are ultimately responsible for the financial situation of the water and sewer system. They must set the rates, borrow the monies, and authorize the budgets. Management staff and officials must work together closely to ensure that resources are provided for the operation, maintenance, and expansion of the system.

WATER AND SEWER SYSTEM SECURITY

Water and sewer systems are complex and vast operations which, by their nature, are open to possible terrorists attack. Much of the water and sewer system is open and cannot be totally shielded from vandalism or destruction. However, there are steps that can be taken to minimize the danger and to deal with any situations that arise.

The greatest threat to water and sewer systems is likely to come from someone who is home grown, instead of an international terrorist group. Almost every city utility system has someone who is a disgruntled customer or ex-employee. These people may seek to damage the system in such a way as to render it difficult to provide water or treat wastewater. For example, they may destroy the power supply to the water plant making it impossible to treat and pump water. It is not likely that a substance could be introduced into the water supply that would injure or kill vast numbers of people, but many other activities could be done to damage the system. Water and sewer systems have many potentially dangerous chemicals, such as chlorine, stored on site, Also, as previously mentioned, they could choose to damage the treatment plant, pumping stations, or water storage tanks. Cities could be without water or sewer service for hours, days, or even weeks. At the greatest extreme, a terrorist could simply kill the certified and trained personnel leaving the system with no qualified operators.

Water and sewer systems should take every step to mitigate this threat. First and foremost cities should have planning and preparation in place to deal with an event should it occur. A plan should be developed that involves not only the utility staff, but also local law enforcement, fire, rescue, medical, and any other emergency staff that would be a part of the plan. If everyone knows

their contacts and roles in an emergency it will be much easier to deal with a crisis than trying to pull this together when working under the stress of an event. Another important part of mitigating the threat is taking preventive steps now. Locking facilities and limiting access to the system is important. Cameras and alarms may be installed where appropriate. Screening personnel as part of the hiring process may prevent the disgruntled employee or ex-employee. Making utility personnel responsible for being alert to potential threats is vital. For example, personnel should always question anyone they see around the facilities to determine if they are present for legitimate purposes, and they should report any unusual activity. And, utility staff should take seriously any threat made by anyone. Sometimes it's easy to brush off the local who has been disgruntled with the utility for years. But this may be the one time they are ready to act.

Hopefully no utility will ever have to face a terrorist action. If plans and preparations are in place the situation will go much smoother and the remedy be much quicker. MTAS utility consultants are available to assist you with more detailed information on security measures and help you evaluate your current situation.

APPENDIX I

WASTEWATER SERVICE CONNECTION FEES

Prepared by Ron Darden, Municipal Management Consultant

Municipal wastewater connection fees are commonly charged to new customers based on the existence of a water meter or on some other basis such as per unit. Some municipalities charge varying fees depending on the size of the water meter. When calculating such a fee, be sure to follow these guidelines:

- Make wastewater fees fair to residential, commercial, and industrial customers;
- Base service connection fees on the premise of one wastewater connection for one customer;
- Require new customers to pay for the cost of connecting to the wastewater system;
- Do not allow residential customers to share a common meter or connection to avoid the rate system designed for the recovery of capital and operating costs;
- Do not permit commercial and industrial customers to use a single meter or connection to avoid capital and operating costs of the wastewater system; and
- Require all customers to pay a minimum wastewater service connection fee.

This report outlines a procedure for determining a wastewater service connection fee, sometimes referred to as a tap fee, based upon equity, the actual cost of making the connection, and use of the system. Following this procedure will result in these benefits:

- The often ambiguous application of connection fees to commercial and industrial buildings will be minimized;
- Residential, commercial, and industrial customers will be treated equally in terms of system usage, equity, and cost;
- Flexibility will be maintained in subsidizing new business development on a case–by-case basis from the city general fund when the city determines it to be in the public interest; and
- The need for future rate increases will be minimized.

EQUITY

Service connection fees should be charged as a means of recovering some of the costs for prior capital expenses and for the actual costs of making the connection. When properly applied, these fees keep the present ratepayers from paying the costs of adding new customers to the system. It is a common practice to base part of these costs on wastewater system equity. Equity represents capital costs that previous customers have already paid for over the years in tap fees and other capital contributions. New customers coming onto the system should be required to make a contribution equal to the equity per customer for customers already in the system. Fairness requires that they pay for, or buy into, prior capital costs of the system.

Here is an example of equity per customer:

Assets June 30, 1999	$11,330,869
Liabilities June 30, 1999	8,429,243
Total Equity June 30, 1999	$ 2,901,625

Equity per customer (total equity divided by an assumed 3,961 customers) is $732.55

Using this analysis, the connection fee would be $732.55 as an equity contribution to capital recovery. This represents previous contributions to capital made by present customers.

INSTALLATION COSTS

While the actual installation costs will vary from city to city, this example uses an estimated installation cost of $1,085.08 when made in a paved area and $868.08 when made in a nonpaved area. The applicant for a wastewater connection permit may have the option of employing a licensed plumber, approved by the city, to make the actual installation or paying the estimated wastewater system costs for the installation.

Regardless of the option used, the installation should conform to city standards and specifications. When the applicant furnishes the installation, he should pay an inspection fee to the city. Additionally, the plumber may be required to obtain a street-cut permit to ensure that the street is properly repaired. Where an existing installation has already been made and the piping has been installed to the property line, do not charge the applicant for actual installation based on units. If only one physical service connection is made in the street surface, the applicant should not have to pay an additional fee.

SYSTEM USAGE

In an effort to make the tap fee as fair and objective as possible, we present here a method based on commercial, industrial, and institutional water consumption requirements outlined in State of Tennessee, Department of Environment and Conservation, Design Basis for New Sewage Works (see attached tables). These consumption standards are commonly used by engineers in designing water and wastewater systems. A city may, on a case-by-case basis, make adjustments in connection fees for targeting business growth. It would seem appropriate that such adjustments be made with contributions from the city's general fund so that the integrity of the wastewater rate system is maintained.

Now that the equity costs of the wastewater connection fee have been determined and the actual installation costs have been estimated, it is important to equate the application of these connection fees to wastewater system customer usage. Using 100 gallons per day of water per person and 2.5 residents per household, average usage is 7,500 gallons per month. This average, 7,500 gallons per month, becomes the basic measure of usage associated with one connection or one unit. The application of all other uses will be computed according to the above-referenced design standards.

Here is a list of standard water consumption requirements and examples of their application to service connection fees:

RESIDENTIAL	100 gallons per day, per person
Apartments and Condominiums	100 gallons per day, per person (Based on the number of meters or rental units)
Schools	16 gallons per day, per person (Based upon projected enrollment)
Churches	3 gallons per day, per person (Based upon membership enrollment)
Civic Clubs	3 gallons per day, per person (Based upon membership enrollment)
Hospitals	300 gallons per day, per bed
Nursing Homes	195 gallons per day, per bed (Based upon the number of patients)
Rooming Houses	100 gallons per day, per person (Based upon the number of roomers)

COMMERCIAL AND INDUSTRIAL

Car Wash	1500 gallons per day, per wash rack*
Child Care Center	10 gallons per day, per child and adult
Industrial Plant	30 gallons per day, per employee*
Launderette	250 gallons per day, per machine
Laundry	5000 gallons per day*
Motels	38 gallons per room, per day
Office Building	12 gallons per day, per 100 SF*
Physician's Office	200 gallons per day, per examining room*
Restaurants	20 gallons per day, per seat
Retail Store	150 gallons per day, per 1000 SF floor*
Service Station	10 gallons per day, per vehicle served*
Shopping Center (no food)	150 gallons per day, per 1000 SF floor
Theater	3 gallons per day, per seat

**Community Water Systems,* Fifth Ed., by Joseph S. Ameen, S.M., Sanitary Engineer.

APPLICATIONS EXAMPLE

A 10,000 square foot office building. The basic equity connection fee, as previously calculated, is $732.50. The number of units is 12 gallons per day per 100 square feet (from the above usage standards) or 1,200 gallons per day. Multiplied by 30 days in the month, the usage is 36,000 gallons per month. Divide this by the 7,500-gallon base for each unit or tap and you get 4.8 units. To determine the connection fee, multiply 4.8 by $732.55 and add the costs for actual physical connection fees in the paved or surfaced areas or areas outside paved areas.

The connection fee for such an office building would be:

Installation by the customer

4.8 x $732.55 (equity fee)	$3,516.24
Installation provided by customer	0.00
Inspection fee (assumed)	150.00
Total cost of equity and installation	**$3,666.24**

Installation by the City

4.8 x $732.55 (equity fee)	$3,516.24
Installation provided by the city in street	1,085.08
Total cost of equity and installation	**$4,601.32**

4.8 x $732.55 (equity fee)	$3,516.24
Installation provided by the city out of street	868.08
Total cost of equity and installation	**$4,384.32**

Additional application examples are provided following the summary.

SUMMARY

This wastewater connection fee procedure allows the new customer to pay a share of the capital and capacity costs of the system and pay the actual costs for making the connection. It keeps the present ratepayers from paying the costs of adding new customers, and it minimizes the need for future increased wastewater rates. Although these fee structures are more comprehensive than those used by many systems, they are based on system costs and accepted design standards for wastewater usage. The procedure requires new customers to pay their fair share; it does not rely on existing customers to pay the costs. The service connection fee is the sum of the equity contribution and the installation costs plus the standard usage factor.

ADDITIONAL APPLICATION EXAMPLES OF WASTEWATER CONNECTION FEES

Apartments, rooming houses, condominiums, duplexes, triplexes, etc. Each unit is assessed a fee of $732.55. The actual cost of installing the connection is added to the fee. These are treated just like a single residential unit.

Barber Shop 100 gallons per day per chair. Using two chairs, 100 x 2 x 30 days equals 6,000 gallons per month usage. 6,000 gal./7,500 residential base usage equals 0.8 connections. The connection fee would be $586.04 plus the actual cost of installation.

Beauty Shop 125 gallons per day per chair. Using four chairs, 125 x 4 x 30 days equals 15,000 gallons per month usage. 15,000 gal/7,500 residential base usage equals two connections. The connection fee would be 2 x $732.55 or $1,465.10 plus the actual cost of installation.

Car Wash 1500 gal per day per wash rack. Using six wash racks, 1500 x 6 x 30 days equals 270,000 gallons per month usage. 270,000 gal./7,500 residential base usage equals 36 connections. The connection fee would be 36 x $732.55 or $26,371.80 plus the actual cost of installation.

Child Care Center 10 gallons per day per child and adult. Using 20 persons, 10 x 20 x 30 days equals 6,000 gallons per month. 6,000 gal./7500 residential base usage equals 0.8 connections. The connection fee would be 0.8 x $732.55 or $586.04 plus the actual cost of installation.

Church Three gallons per day per member. Using 300 members, 3 x 300 x 30 days equals 27,000 gallons per month usage. 27,000 gal./7,500 residential base usage equals 3.6 connections. The connection fee would be 3.6 x $732.55 or $2,637.18 plus the actual cost of installation. If the connection serves a separate building at the church, an estimate of the number of people who will use the building should be used for the number of members.

Dentist Office 750 gallons per day per chair. Using two chairs, 750 x 2 x 30 days equals 45,000 gallons per month usage. 45,000 gal/7,500 residential base usage equals six connections. The connection fee would be 6 x $732.55 or $4,395.30 plus the actual cost of installation.

Department Store 40 gallons per day per employee. Using four employees, 40 x 4 x 30 days equals 4,800 gallons per month usage. 4,800 gal/7,500 residential base usage equals 0.64 connections. The connection fee would be 0.64 x $732.55 or $468.83 plus the actual cost of installation.

Drug Store 500 gallons per day. 500 x 30 days equals 15,000 gallons per month usage. 15,000 gal./7,500 residential base usage equals two connections. The connection fee would be 2 x $732.55 or $1,465.10 plus the actual cost of installation.

Hospitals 300 gallons per day per bed. Using 100 beds, 300 x 100 x 30 days equals 900,000 gallons per month usage. 900,000 gal/7,500 residential base usage equals 120 connections. The connection fee would be 120 x $732.55 or $87,906 plus the actual cost of installation.

Launderette 250 gallons per day per machine. Using 10 washing machines, 250 x 10 x 30 days equals 75,000 gallons per month usage. 75,000 gal./7,500 residential base usage equals 10 connections. The connection fee would be 10 x $732.55 or $7,325.55 plus the actual cost of installation.

Laundry 5,000 gallons per day. 5,000 x 30 days equals 150,000 gallons per month usage. 150,000 gal./7,500 residential base usage equals 20 connections. The connection fee would be 20 x $732.55 or $14,651.10 plus the actual cost of installation.

Motel 63 gallons per day per room. Using 50 rooms, 63 x 50 x 30 days equals 94,500 gallons per month usage. 94,500 gal/7,500 residential base usage equals 12.6 connections. The connection fee would be 12.6 x $732.55 or $9,230.63 plus the actual cost of installation.

Nursing Homes 195 gallons per day per bed. Using 25 beds, 195 x 25 x 30 days equals 146,250 gallons per month usage. 146,250 gal./7500 residential base usage equals 19.5 connections. The connection fee would be 19.5 x $732.55 or $14,284.73 plus the actual cost of installation.

Office Building 12 gallons per day per 100 square feet. Using 10,000 square feet, 12 x 100 x 30 days equals 36,000 gallons per month usage. 36,000 gal./7,500 residential base usage equals 4.8 connections. The connection fee would be 4.8 x $732.55 or $3,516.24 plus the actual cost of installation.

Physician's Office 200 gallons per day per examining room. Using four rooms, 200 x 4 x 30 days equals 24,000 gallons per month usage. 24,000 gal./7500 residential base usage equals 3.2 connection fees. The connection fee would be 3.2 x $732.55 or $2,344.16 plus the actual cost of installation.

Residential single unit 100 gallons per day per person. Using 2.5 persons per household for 30 days, the monthly water usage is 7,500 gallons. This monthly usage represents one equity connection fee. The equity connection fee is $732.55. The cost of actual installation would be added to this fee to establish the wastewater connection fee.

Restaurant 20 gallons per day per seat. Using 40 seats, 20 x 40 x 30 days equals 24,000 gallons per month usage. 24,000 gal./7500 residential base usage equals 3.2 connections. The connection fee would be 3.2 x $732.55 or $2,344.16 plus the actual cost of installation.

Schools 16 gallons per day per person. Using 300 enrollment, 16 x 300 x 30 days equals 144,000 gallons per month usage. 144,000 gal/7,500 residential base usage equals 19.2 connections. The connection fee would be 19.2 x $732.55 or $14,064.96 plus the actual cost of installation.

Service Station 10 gallons per day per vehicle. Using 75 vehicles, 10 x 75 x 30 days equals 22,500 gallons per month usage. 22,500 gal./7,500 residential base usage equals three connections. The connection fee would be 3 x $732.55 or $2,197.65.

Shopping Center 150 gallons per day per 1,000 square feet. Using 20,000 square feet, 150 x 20 x 30 days equals 90,000 gallons per month usage. 90,000 gal./7,500 residential base usage equals 12 connections. The connection fee would be 12 x $732.55 or $8,790.60 plus the actual cost of installation.

APPENDIX II

DESIGN BASIS FOR NEW SEWAGE WORKS

DISCHARGE FACILITY	Design Units	Flow (gpd)	BOD (lb/day)	TSS (lb/day)	Low Duration (hr)
Dwellings	per person	100	0.17	0.20	24
Schools with showers & cafeteria	per person	16	0.04	0.04	8
Schools without showers & with cafeterias	per person	12	0.025	0.025	8
Boarding schools	per person	75	0.20	0.20	16
Motels at 65 gal/person (rooms only)	per person	130	0.26	0.26	16
Trailer courts at 3 persons/trailer	per trailer	225	0.60	0.60	24
Restaurants	per seat	40	0.20	0.20	16
Interstate or through-highway restaurants	per seat	180	0.70	0.70	16
Interstate rest areas	per person	5	0.01	0.01	24
Service stations	per vehicle serviced	10	0.01	0.01	16
Factories	per person per 8-hr. shift	25	0.05	0.05	Operating Period
Shopping centers (no food)	per 1000 sq. ft. of ultimate floor	150	0.01	0.01	12
Hospitals	per bed	300	0.60	0.60	24
Nursing homes (add 75 gal. for laundry)	per bed	120	0.30	0.30	24
Homes for the aged	per bed	60	0.20	0.20	24
Child care centers	per child & adult	10	0.01	0.01	Operating Period
Laundromats, 9 - 12 machines	per machine	250	0.30	0.30	16
Swimming pools	per swimmer	10	0.001	0.001	12
Theaters, auditorium type	per seat	5	0.01	0.01	12
Picnic areas	per person	5	0.01	0.01	12
Resort camps, day & night with limited plumbing	per campsite	50	0.05	0.05	24
Luxury camps with flush toilets	per campsite	100	0.10	0.10	24
Churches (no kitchen)	per seat	3	0.005	0.005	Operating Period

** Includes normal infiltration*

NOTE: In all cases, use actual data from similar facilities when possible. Note variations due to factors such as age, water, conservation, etc. Submit all design data used.

Source: TDEC Water Pollution Control: Design Criteria for Sewerage Works

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