WATER SYSTEM DEPRECIATION:

A CAPITAL PLANNING TOOL FOR THE WELL-MANAGED UTILITY

ABSTRACT

Water system resources are increasingly stretched thin as capital costs rise, grant funding recedes, climate conditions pose source and quality challenges, economic pressures on users complicate the balance of full cost recovery and affordability, and all while system infrastructure is aging. As a result, water systems must adopt and implement policies and practices that promote well-managed and operated water systems, both physically and financially. Depreciation, though considered a paper transaction, represents a real cost that is at the core of one of the most critical discussions for water system sustainability. Though not a silver bullet, depreciation can be used to help system managers plan for reinvesting in a manner that ensures the system will be around for decades to come.

Depreciation is a familiar concept for accountants and tax professionals. For most water systems, depreciation appears as a line item in annual audits and financial statements but is not always well understood as it does not require a cash payment in the year it is recorded. In general, depreciation is intended to represent the orderly allocation of the cost of a capital asset over its useful life. As opposed to treating the entire purchase cost of the asset as a one-year expenditure, depreciation can represent the annual cost of utilizing the asset each year it is in service. This concept provides a basis for recovering the cost of system capital assets specifically from those benefitting from such assets.

There are two common trains of thought associated with depreciation and its purpose: 1) recovery of initial investment of an asset, and 2) setting aside funds for replacement of that asset. While the former is the textbook definition of depreciation, the latter can be the foundation of a proactive financial management strategy that supports sustainability of the system. The intent of this paper is to provide guidance and tools that water systems can use to enhance system renewal/replacement and general capital planning by applying an understanding of system depreciation. This document explains the basis for depreciation as applied within water system financial reports, summarizes depreciation methods and how they can relate to capital planning, and describes how to implement depreciation-based values into budget and reserve planning efforts.

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PROBLEM STATEMENT:

HOW CAN DEPRECIATION EXPENSE FIT INTO A PRACTICAL PLAN FOR SYSTEM REPLACEMENT?

Rural and municipal water systems alike struggle to balance prudent financial planning with maintaining affordable and competitive rates. The industry is making progress, however, as decision-making groups are discussing reserve planning and capital asset management strategies. The discussion often involves the challenge of “funding depreciation”. Utilities are faced with determining what “funding depreciation” means and how to apply it. To the extent that depreciation represents the portion of system capital that is “used up” every year, the inclusion of depreciation as a component of overall revenue requirements is essential to keeping the system in consistent working order and to maintain its worth.

As explained in this four-part paper, “funding depreciation” is a significant step in developing a comprehensive plan for physical and financial sustainability. Part 1 of this paper explains depreciation from an accounting perspective and Part 2 discusses depreciation in terms of system renewal on from a system management perspective. Part 3 contains discussions of special circumstances where treatment of depreciation can be particularly complicated, and Part 4 provides guidance on utilizing the depreciation concept in promoting sustainable water systems.

PART 1: DEPRECIATION AND FINANCIAL REPORTING

UNDERSTANDING DEPRECIATION

Before tackling how utilities can use depreciation as a tool within an overall plan promoting sustainability, it is important to understand what depreciation is and how/why it is calculated. This section of the paper defines depreciation, summarizes depreciation methodologies, and provides additional important definitions.

What is Depreciation? Figure 1 provides a snapshot of a statement of revenues, expenses and net position, referred to as the Income Statement, from a financial report for a fictitious rural water system. The income statement is similar to the budget in that it reports actual revenue and expenses, but whereas a budget accounts for debt service obligations and capital reinvestment, the income statement reports depreciation and amortization. The Income Statement contains a two-year comparison of operating revenues, and operating expenses, including depreciation and amortization. Depreciation and amortization are similar concepts that can be confusing and are described below.

Table 1: Example Income Statement

OPERATING INCOME	2018	2017
Metered Sales to Customers	$4,687,500	$4,500,000
Membership	$55,000	$20,000
Other	$130,000	$125,000
Total Operating Revenues	**$4,872,500**	**$4,645,000**
OPERATING EXPENSES	**2018**	**2017**
Purchase of Water	$1,280,000	$1,241,600
Maintenance	$480,000	$510,000
Administrative and General	$1,560,000	$1,528,800
Communications	$40,000	$40,000
Utilities	$110,000	$108,000
Transportation	$45,000	$45,000
Depreciation	$644,575	$647,355
Amortization	$210,000	$210,000
Other Expenses	$4,900	$5,000
Total Operating Expenses	**$4,347,475**	**$4,335,755**
NET OPERATING INCOME	**2018**	**2017**
Net Operating Income	**$498,025**	**$309,245**
NONOPERATING REVENUES (EXPENSES)	**2018**	**2017**
Interest Income	$65,000	$61,000
Interest Expense	($159,600)	($161,196)
Gain (loss) on Sale of Assets	$12,000	($3,600)
Total Nonoperating	($82,600)	($103,796)
CHANGE IN NET POSITION	**2018**	**2017**
Change in Net Position	**$415,425**	**$205,449**

Depreciation is defined by the Internal Revenue Service as "the systematic and rational allocation of the acquisition cost of an asset, less its estimated salvage or residual value, over the asset's estimated useful life."[1] From an operational viewpoint, agencies such as the National Association of Regulated Utilities and the Federal Energy Regulatory Commission refer to depreciation as the "loss in service value of an asset not restored by current maintenance." The practice of depreciating capital assets is a means of accounting for the cost of purchasing fixed assets over the entire useful life rather than only in the year of purchase. When an asset having a useful life of greater than one year is purchased, the expense associated with that asset is capitalized, and subsequently depreciated if it has a defined useful life (land is an inexhaustible asset and is typically not depreciated). The capitalization and depreciation of costs associated with purchase of an asset normalizes the cost by spreading it over useful life.

Whereas depreciation is associated with the loss in value of tangible assets, **amortization** as it applies to the financial statement is a similar concept but applied to non-tangible assets. Amortization represents the loss in value of items such as water rights, long-term water sales contracts, and other non-physical utility assets and is typically not funded.

From an accounting standpoint, depreciation plays a role in determining net income, calculating taxes due (for private utilities), establishing credit standing, etc. From a public utility operations standpoint, the concept of allocating capital asset value over an extended period as opposed to expensing it in the year of purchase is useful in rate-setting. Ideally, including annual depreciation as a revenue requirement results in the recovery of the capital asset value depleted in each year of service from the customers responsible for the portion of asset depletion in that year. As a result, depreciation plays an important role in three key areas: 1) conformance with required accounting standards, 2) utility asset management, and 3) equitable rate-setting. The first two are addressed in the remainder of this paper. The third is discussed in brief but is a topic worthy of its own paper and is not covered in the detail warranted herein.

[1] Internal Revenue Service Manual Part 1, 1.35.6 Property and Equipment Accounting, **1.35.6.5 (07-26-2016)**.

IMPORTANT DEFINITIONS

There are a number of methods to calculating depreciation.
Before that discussion, however, it is helpful to review some related terms:

Amortization: allocation of the cost of an intangible asset over the expected life of the asset.

Assets: Property, including cash, reserves and property/equipment owned by the Utility that can be converted to cash.

Balance Sheet: A statement of financial position that shows what is owed to others and the net asset value.

Book Value: The cost of the asset less accumulated depreciation.

Capital Asset: Infrastructure that will provide benefit now as well as into the future and has been converted from cash or debt proceeds to a physical asset with value approximately equal to the converted cash/debt proceeds.

Capitalization: An asset exchange involving the conversion of cash or debt proceeds to a physical capital asset which is then depreciated.

Depreciated Asset/System Value: The original cost less accumulated depreciation. Also referred to as Book Value.

Depreciation: A method of accounting for the cost of purchasing fixed assets over the useful life of the asset, rather than only in the year of purchase.

Equity: The net value of system assets, or the value less depreciation.

Inexhaustible Assets: Assets with no limit on useful life that are not depreciated (such as land and land improvements).

Intangible Asset: Assets that do not have a physical presence and are not capitalized. Examples include contracts, software. The value of such assets can be amortized.

Liability: Amount owed to others.

Net Asset Value: The total asset value less depreciation.

Net Salvage Value: The value of an asset at the end of its fully-depreciated life less disposal costs.

Original Cost: The cost of the capital asset at the time it was originally placed in service.

Present Value: The value of an asset in a future year expressed in terms of the current year, disregarding the effects of inflation.

Renewal/Replacement: The replacement or refurbishment of a capital asset with a new asset capable of meeting service demands of replaced asset; can be rehabilitation of an existing capital asset that extends the useful like.

Reserves: Funds available to meet cash needs (short-term or long-term).

Revenue Requirements: Annual expenses and costs incurred in providing water utility service. This generally includes operation and maintenance expenses, interest payments on debt, cash-funded capital, principal payments on debt, and contributions to reserves.

Salvage Value: The estimated amount that is expected be received for an asset at the end of its useful life.

Sustainability: In water system operational terms, the ability to maintain a level of service of consistent quality, including meeting regulatory requirements, and quantity by completing routine maintenance and reinvestment at a pace designed to maintain system operational ability over the long term. In financial terms, the ability of a system to annually meet operational, maintenance, and capital investment/reinvestment needs by generating revenues sufficient to meet the short- and long-term expenditures required to maintain consistent operational ability.

Undercapitalized: The situation in which investment or reinvestment does not keep up with or exceed the rate at which system capital assets are depreciating or the rate at which it has been determined by some other means that the system needs to reinvest to maintain sustainability.

Useful/Service Life: A time period over which the capital asset can be expected to operate, expressed in months or years.

DEPRECIATION METHODS

Records of capital asset value and depreciation are very important for both financial reporting purposes and for capital asset management. Depreciation is most commonly calculated using one of four methods, all of which are based on the original cost and do not account for the effects of inflation. Table 2 summarizes typical useful lives for capital assets as used in depreciation calculations for financial reporting purposes. The straight-line depreciation percentage value is also shown and is simply the inverse of the expected service life. For practical purposes, small similar capital assets, such as meters, are commonly grouped and treated as one asset. For grouped capital assets, service life is estimated based on the average of all components.

In addition to grouped capital assets, sometimes an entire water system will be treated as one capital asset. This is often the case when a system does not have detailed asset records dating back to initial system startup or any detailed asset records at all. In such cases, system depreciation can be estimated on a capital asset group- or whole system-basis using a composite depreciation percentage. Values from the literature indicate that typical percentages range from 2.0 to 2.5 for a complete water system providing both treatment and distribution and slightly less at 1.7 to 2.0 for a purchased water system.

Attachment 1 to this document provides guidelines for typical useful lives according to a more detailed water system capital asset list. Table 3 provides a description for each of the four methods and the formulas for calculating depreciation. Table 4 summarizes the appropriateness of each method for various asset types, along with advantages and disadvantages.

Table 2: Typical Expected Lives and Depreciation Percentage Applied in Accounting

TYPICAL EXPECTED LIVES - ACCOUNTING		
	EXPECTED SERVICE LIFE	DEPRECIATION VALUES
Structures & Improvements	20-50 Years	2.0% - 5.0%
Electric Pumping Equipment	20 Years	5.0%
Distribution Reservoirs	50 Years	2.0%
Water Mains	75 Years	1.3%
Meters	20 Years	5.0%
Office Furniture & Equipment	5 Years	20.0%
Tools & Shop Equipment	5 Years	20.0%
Vehicles	5-10 Years	10.0% - 20.0%
Complete Water System (Composite Rate)	40-50 Years	2.0% – 2.5%
Purchased Water System (Composite Rate)	50-60 Years	1.7% - 2.0%

Table 3: Summary of Depreciation Methods

Depreciation Method	Description	Calculation
1. Straight-Line	The simplest and most common method of calculating depreciation. Under this approach, the annual depreciation charge is the same for each year of useful life for the asset. This is the default approach for utilities but does not necessarily reflect the actual decline in use of every type of asset.	$\frac{Original\ Cost - Salvage\ Value}{Useful\ Life}$
2. Units of Production	Depreciates based upon the number of units produced/used compared to the estimated total life in units.	$\frac{\#\ of\ Units\ Produced}{Life\ in\ \#\ of\ Units} \times (Cost - Salvage\ Value)$
Accelerated Methods: 3. Double-Declining Balance and 4. Sum of Years Digits	Accelerated depreciation methods to recognize a higher utilization at the beginning of the asset's life. They are most commonly used by private utilities for tax determination purposes and are not commonly used by public utilities.	$Double\ Declining\ Balance$: $\frac{Original\ Cost - Salvage\ Value}{Useful\ Life} \times 2$ $Sum\ of\ Years\ Digits$: $\frac{Service\ life - Year\ of\ Service + 1}{Sum\ of\ Years\ of\ Service}$
Modification: Condition-Based Approach	Uses the physical characteristics of the asset to estimate remaining useful life.	*Evaluate current condition and compare against established condition benchmarks*

Table 4: Applicability of Depreciation Methods

Method	Applicability	Best Application of Method	Advantages	Disadvantages
1. Straight-Line	All capital assets	Can be reasonably applied to most assets unless there is evidence that degradation of value is not uniform.	Simple, easy to understand, results in stable annual capital-related expense over asset life	Not reflective of degradation for all assets, assumes decline in asset value is directly correlated with time in service
2. Units of Production	Capital assets with measurable units	Appropriate for cases in which the actual degradation of the asset is tied to hours of usage (e.g. pumps/motors) or miles driven (vehicles).	More accurate for assets with mileage or other units attached to productivity	More complicated than straight-line, reliant upon an accurate estimate of total units
Accelerated Methods: 3. Double-Declining Balance and 4. Sum of Years Digits	All capital assets	By assuming higher rates of decline in early years as opposed to uniform decline, approach may be more reflective of actual use of certain assets. However, the calculations are still arbitrary and not tied to actual asset condition. May be unnecessarily cumbersome for public utilities.	More accurate reflection of asset's productivity levels throughout asset's life	Projects larger expense (depreciation) and in the beginning of asset's life, and correspondingly may underrepresent the net value. Results in users early in asset life paying a proportionally higher share of asset cost.
Modification: Condition-Based Approach	Capital assets that can be regularly physically measured	A solid managerial approach that that is focused on long-term planning.	Provides an objective measure of the position within the asset's life, encourages greater asset management, results are useful in physical asset management	Complicated to implement

The best method of depreciation for a water system varies and depends upon the needs of the individual system. Governmental accounting standards, introduced in the next section, allow the use of traditional methods or the condition-based modified approach that accounts for preservation and extension of useful life. Most systems use straight-line depreciation, which in some instances results in over-estimation of annual depreciation due to common practices by utility managers and operators to extend capital asset lives as long as possible. Often beyond expected life, this supports the Condition-Based Approach that better accounts for actual asset condition. Although more labor-intensive, the Condition-Based Approach can be a highly effective tool for overall utility management.

A COMPONENT OF REQUIRED FINANCIAL REPORTING

The General Accounting Standards Board (GASB) is an organization that sets generally accepted accounting practices (GAAP) for state and local governments. It is important for water systems to follow the established accounting practices to establish credit worthiness and generally demonstrate the financial health of the system. In 1999, the GASB issued *Statement No. 34, Basic Financial Statements and Management's Discussion and Analysis for State and Local Governments* (GASB-34), which changed, among other things, reporting requirements related to system investment. Under GASB-34, systems are required to report the estimated value of capital investments, including depreciation. The goal of GASB-34, as it relates to water utilities, is to increase the transparency of the financial condition. Not following GAAP or GASB-34 reporting practices may have funding repercussions, such as the ability to obtain funding from the Drinking Water State Revolving Fund and similar programs for which systems are required to demonstrate an ability to repay the loans. Related pronouncements to GASB-34 have also been issued but are not discussed herein.

GASB-34 requires that public water systems utilize an accrual method of accounting, in which expenses and revenues are recorded at the time they are incurred, rather than on a cash-flow basis. The difference between these two methods of accounting and financial reporting can be illustrated in terms of a water bill: on an accrual basis, the revenue associated with a water bill is booked at the time the bill is generated, or the time the income is earned; on a cash basis, the revenue is booked at the time it is received, typically 10 to 15 days after the bill is generated. Table 5 provides a comparison of accrual- and cash-basis accounting.

Table 5: Basic Differences between Accrual-Based and Cash-Based Accounting Practices

	ACCRUAL-BASED ACCOUNTING	CASH-BASED ACCOUNTING
Level of Effort:	Complicated	Simple
Timing of Expenditure:	At time it is incurred	At time cash is paid out
Timing of Revenue:	At time revenue is earned	At time revenue is received
GAAP:	Recommended	Not Recommended

While depreciation is a required reporting component per GASB-34, it has been argued that depreciation is not necessarily a good reflection of system reinvestment needs. One line of reasoning notes that public utilities are in the habit of routinely performing major maintenance, thereby maintaining the value of the capital assets. In this case depreciation would have less relevance than the actual expenditures on system renewal and replacement. On the other hand, it has also been noted that if a system is not annually reinvesting in its capital assets, reporting depreciation on the financial statement does not necessarily indicate what could be a potentially deteriorating condition of the system. To allow flexibility, GASB-34 allows systems to utilize either the traditional approach of reporting total capital asset value and depreciation or a modified approach that focuses on actual capital reinvestment. The latter requires detailed capital planning for budget purposes, funding development, and rate-setting purposes but results in an overall better approach by focusing on recording the annual cost of maintaining infrastructure, essentially promoting sustainability.

The modified approach is a more accurate reflection of how the system is managed and maintained but requires a rigorous asset management program that covers all system capital assets and regular condition assessments that drive the development of capital planning values. The modified approach requires documentation that capital assets are being preserved at or above established levels of conditions and specifically requires:

- Maintenance of an up-to-date inventory of eligible capital assets;
- Identification of annual cost of maintaining capital assets;
- Condition Assessment (every three years); and
- Comprehensive documentation and record-keeping.

The Modified approach can be an important component to an overall capital planning approach that recognizes the fact that system managers and decision makers are more concerned about the cost of maintaining and replacing infrastructure than simply how much system value has been depleted (depreciated). Nonetheless, the traditional concept of depreciation does merit a good understanding by utility managers.

WHAT FINANCIAL STATEMENT COMPONENTS DO AND DON'T SAY ABOUT YOUR SYSTEM

The intent of the GASB-34 financial reporting requirements is to provide a more transparent view of utility financial health. A utility that is not keeping up with capital asset replacement will see declining depreciated asset values as well as total annual depreciation values over time as system components reach their assumed useful lives. A utility that is actively reinvesting will see increasing or relatively steady depreciation values.

But depreciation alone does not tell the whole story, as it does not indicate the value of system investment. Another component of the required financial reporting is the Balance Sheet, which is a statement of financial condition representing liabilities and net asset value to determine total asset value. Among the net assets reported in the Balance Sheet are Fixed Capital Assets – property, plant and equipment used in daily utility operations. The Balance Sheet also lists, among other things, Cash and Cash Equivalents (cash available within 90 days) and Long-Term Investments (assets requiring more than one year to be converted to cash). Table 6 gives some general guidance as to how year-to-year changes in key Balance Sheet values can indicate the financial health of a system. Note that the examples in Table 6 are simplified generalizations meant to help understand the relationship between the Balance Sheet entries. In practice, there may be exceptions.

Table 6: General Balance Sheet Trends

ASSUMES: ANNUAL REVENUE AND O&M EXPENSE (EXCLUDING DEPRECIATION) REMAIN UNCHANGED				
CAPITAL ASSETS LESS DEPRECIATION TO DATE	CASH & CASH EQUIVALENTS	LONG-TERM INVESTMENTS	POTENTIAL EXPLANATION	POTENTIAL IMPACT TO FINANCIAL HEALTH
Decreasing	Increasing	Steady or Increasing	Not investing in system; potentially funding capital reserves	**OK** if funding reserves; **Negative** if not funding reserves or if recurring trend
Decreasing	Steady or Decreasing	Steady or Decreasing	Not investing in system; Not funding capital reserves	**Negative** if repeated over time
Increasing or Steady	Steady or Decreasing	Steady or Decreasing	System investment is being made with rate revenue and/or Cash/Reserves	**Positive**

Regarding the far left column in Table 6, capital assets can be listed either as net of depreciation, referred to as Book Value, or in full with depreciation shown as a deduction. The book value from one year to the next will change based on capital investment. Ideally, a system will be reinvesting annually at a level equal to or exceeding depreciation, in which case the capital asset value will remain relatively stable or will increase. If the capital asset value is consistently decreasing over time, it may be that the system is undercapitalized, or not reinvesting at a rate that promotes sustainability, with potential negative impacts to the financial health of the system (far right column in Table 6). This is not necessarily bad if the utility choses to approach system reinvestment through large periodic projects instead of annual reinvestment but is generally not a sign of good capital asset management.

SUMMARY OF DEPRECIATION AND FINANCIAL REPORTING

Part 1 of this report introduced the financial terms most often encountered by water systems to help systems understand what they mean, why depreciation matters to a water system, how to calculate depreciation, and what depreciation and other components of required financial reporting can say about financial health. Important takeaways from Part 1 include the following:

- Depreciation is generally defined two related but different ways depending upon perspective:
  - The allocation of an asset's cost (less salvage value) over its intended useful life (accounting perspective); and
  - The annual loss in service value not restored by current maintenance (operational perspective).
- The GASB Statement 34 and subsequent related pronouncements were developed to increase transparency in financial reporting for public water systems.
- Under GASB-34, public water systems are required to utilize accrual accounting, calculate depreciation on capital assets and include depreciation and system values in financial reporting. Failure to do so can have funding repercussions.
- Multiple methods can be used to calculate depreciation:
  - **Straight-Line:** Simple and most commonly used, but generally not a good representation of declining infrastructure service level.
  - **Units of Production**: Appropriate for capital assets for which wear and tear can be linked to usage (vehicles based on miles driven, pumps based on runtime hours, etc).
  - **Accelerated Methods:** Not generally used by public utilities.
  - **Condition-Based Approach**: Based on asset management principles, this involves periodic evaluation of physical asset condition and detailed record-keeping. While the most time-intensive method of those discussed herein, this provides the most realistic value of annual capital asset degradation and is therefore a more useful measurement for required reinvestment than traditional depreciation.
- It is important for water system managers to understand the annual depreciation values for capital assets and how they were derived. Understanding the method used, managers can utilize depreciation values or modify those values for use in capital planning.
- It is a good idea to become familiar with annual financial reports. Compare net asset values from one year to the next and understand the reason for fluctuating values so as to explain the results if necessary.

It has been established that systems are required to report depreciation on all capital assets along with depreciated system value. As required by GASB-34, depreciation appears as an expense in the income statement (see Table 1). Where does it go from there? Ideally it is a cash transfer to a reserve account to be used for reinvestment in the system, but that is not always the case. Part 2 of this document addresses why it is important (and how) to convert depreciation values to a real expense to the benefit of system sustainability.

PART 2: DEPRECIATION AND PRACTICAL SYSTEM MANAGEMENT CONSIDERATIONS

Depreciation in its traditional form serves an important financial reporting need but does not necessarily support best practices for promoting and maintaining physical and financial system sustainability. The primary objections to the use of depreciation in financial reporting by water systems have to do with 1) oversimplified approach to a capital asset's useful life and 2) basis on original cost of the capital asset, both of which lead potential differences between the depreciated value and the asset's replacement cost. The conclusion can thus be made that **strictly funding depreciation is not the most appropriate approach to planning for capital renewal/replacement**. The follow-up to that statement is that **depreciation values can be useful in gauging the magnitude of future replacement needs**. This portion (Part 2) of the document outlines how depreciation can play a role in developing a practical approach to capital replacement.

FINANCIAL VERSUS MANAGERIAL GOALS

One of the difficulties with the concept of depreciation has to do with the difference between classic Financial and Managerial perspectives. Financial statements based on accounting standards do not always provide system managers with capital asset information in its most useful form. System managers and decision makers are interested in capital asset replacement cost more so than depreciated value of assets as the traditionally-calculated depreciated asset values typically do not align with the actual condition of capital assets. Depreciation alone is simply not directly useful in terms of system sustainability. By definition, depreciation is based on original cost and does not account for on-going investment and routine maintenance geared toward extending the capital asset life. To allow flexibility for systems to account for actual annual expenditures related to maintaining existing infrastructure, GASB-34 allows for a modified approach based on condition assessment.

In the absence of a rigorous condition assessment practice, however, the usefulness of depreciation as a measure of system reinvestment is high. When adjusted to reflect the time value of money associated with future replacement costs, depreciation values can be extremely useful. Systems are well-served by implementing practices that meet both financial reporting requirements and support the efforts of system management to maintain system capital assets in a manner. This approach works to maximize the useful life of infrastructure and translates to responsible management of system finances.

DEPRECIATION AND SYSTEM VALUE

When capital investment is made, the system converts one asset – either system cash or debt proceeds – to a physical capital asset with a value presumably equal to the cash outlay. When cash or cash reserves are utilized, the immediate value of system assets is essentially unchanged, the asset is just represented differently on the financial statement. When debt is incurred to add a capital asset or replace an asset, the system adds a liability. As the capital asset depreciates, it loses value, represented by depreciation. Prudent financial planning involves compensating for that loss in value by directing a revenue amount commensurate with the annual depreciation either into a capital reserve account for future reinvestment or into completing system renewal, either through a cash investment or through funding capital asset replacement debt. This approach is intended to maintain overall system value over the long-term.

By completing routine maintenance and periodic replacement, consistent quality and quantity levels of water service to system users can be maintained. Although raising water rates is not easy, customers expect service to be consistent and expect managers and decision makers to responsibly maintain and preserve the value of the investment that has been made by the customer base. These often unspoken expectations fit nicely with a strategy that routinely reinvests at a level meeting or exceeding annual depreciation of the system.

CAPITAL ASSET CONSUMPTION IS A REAL EXPENSE

For a water system to provide water at reliable quality and service levels, the condition and value of the system infrastructure must be maintained at a generally consistent level. Capital costs are normally referred to as expenditures rather than expenses due to the long-term implications of capital assets and association with system value. For the purpose of discussion herein, depreciation is considered a capital-related expense. **Depreciation represents consumption of a capital asset – the "cost" of using that asset in a given year and thus should be treated as a real expense.**

Consider the illustration in Figure 1, where the blue bars represent value of a water system over time in current year dollars or absent of the effects of inflation. The original system value, in dark blue, decreases over time due to depreciation while providing a consistent level of service throughout its useful life. This is the depreciated value for the given year on the X axis. For that to happen, there are periodic infusions of capital into the system – pump replacements, watermain replacements, etc. Theoretically, these capital infusions occur annually and are equal to the portion of the system depreciated annually. Due to the time value of money, straight-line depreciation does not adequately cover the capital inflation cost; however, depreciation does provide an estimate of the system that has been "used up" and is therefore represents a real expense when it comes to considering total revenue requirements for any given year of operation. Depreciation can be used as a surrogate capital value against which a system measures current rate-funded capital investment, debt service principal, and planned deposits to capital reserves in a given year.

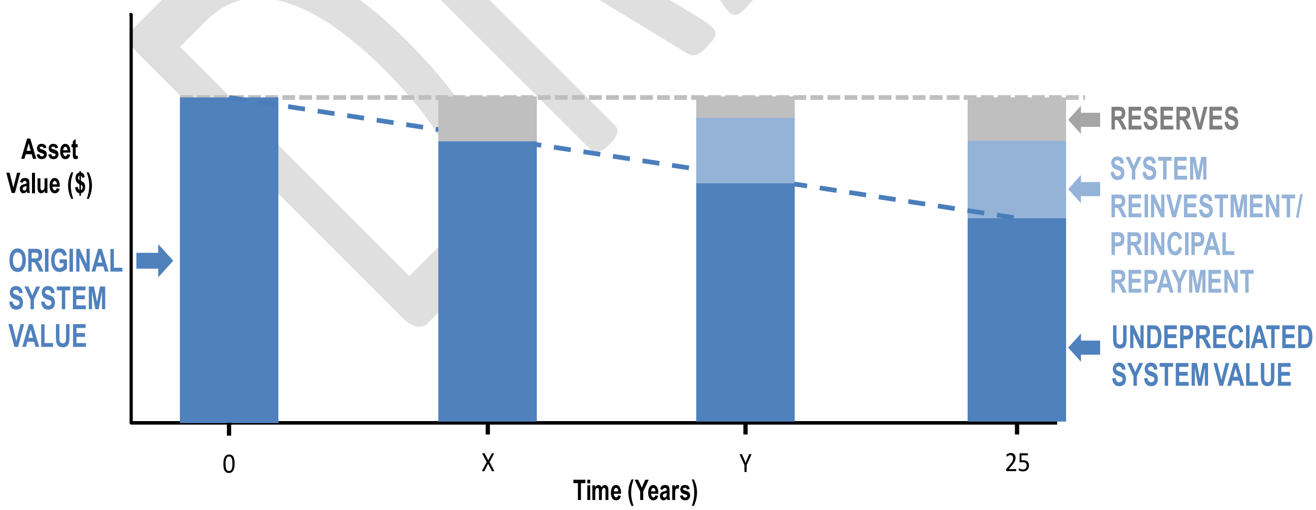

Figure 1: Present Worth Illustration of System Value

Now consider the $500,000 capital asset with a 20-year life illustrated in Figure 2. If an annual cost index of three percent is assumed, the replacement value of the capital asset at the end of its 20-year useful life will be $375,753 more than the sum of accumulated depreciation on the asset. Assuming that annual depreciation is deposited to capital reserves for future replacement, an annual interest rate of 7.2 percent throughout the 20-year period would be required to accumulate cash reserves equal to the future end-of-life replacement value.

In terms of representing the full cost of service, including operating and use of capital, depreciation is thus a real expense. The phrase “Pay me now or pay me later” is often used to describe the impact of failing to fund depreciation only to arrive down the road at a series of catch-up replacement projects requiring potentially unplanned capital funds. As a result, prudent capital planning accounts for not only depreciation, but also the shortfall between the dashed line in Figure 2 and the top of the orange portion of the bars.

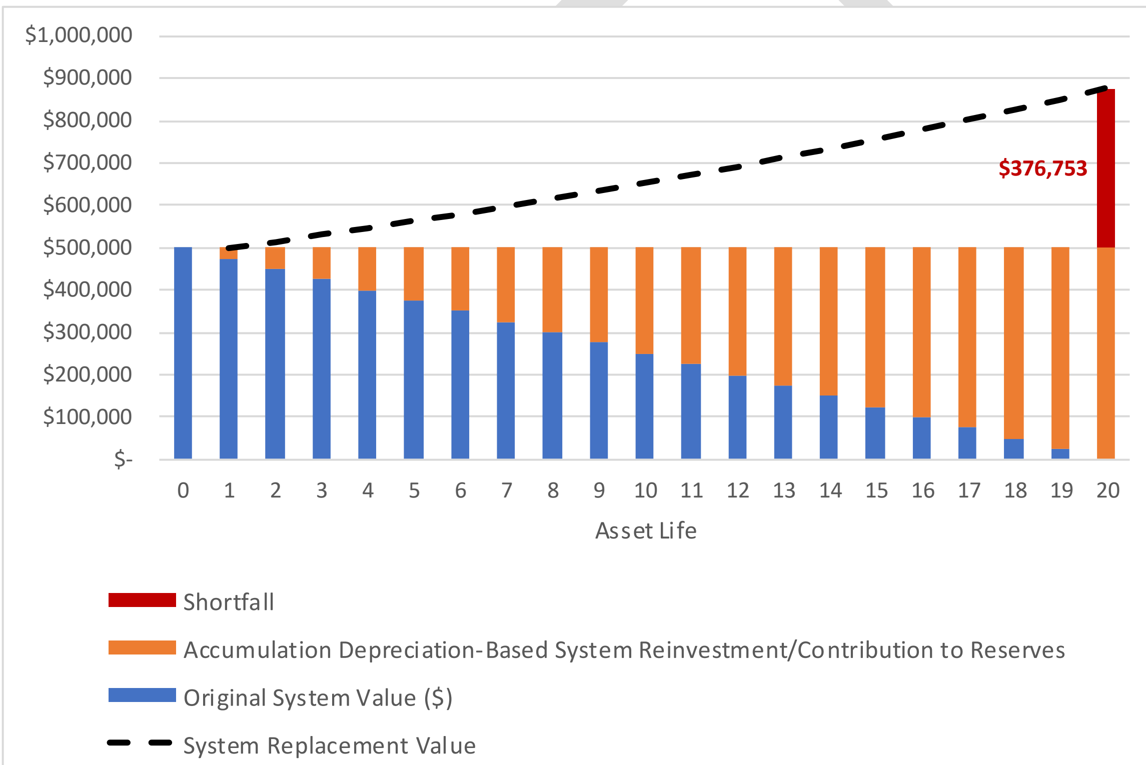

Figure 2: Comparison of Accumulated Depreciation and Future Replacement Value

DEPRECIATION-BASED CAPITAL RESERVE PLANNING STRATEGIES

The illustration in Figure 2 shows that accumulated depreciation is not adequate to meet future replacement value when the time value of money is taken into consideration. Ideally, a system would know exactly when replacement would be required, exactly what it would cost, and exactly how many users and how many gallons of water would be sold between now and the time of replacement, so user fees could be perfectly dialed in to collect the revenue needed for the future expense. This is obviously not practical.

To address the shortfall described in the previous section, best practices in capital asset management involve planning for annual rate-funded renewal/replacement and/or deposits to capital reserves. The right approach is specific to each utility based on capital funding philosophy, but under just about any circumstance it is a best practice to ensure that annual rate-funded capital asset investment, capital asset debt principal replacement, and/or contributions to capital asset reserves are at least equal to annual depreciation values. This best practice supports the definition of depreciation as the estimated cost of capital asset use and ensures that ratepayers are providing revenue reflective of the full cost of service. Figure 3 illustrates this baseline reserve-planning concept.

Total Annual Depreciation
\- Cash Funded Capital Improvements
\- Debt Service Principal

= Minimum Contribution to Reserves

Figure 3: Baseline Approach to Funding Capital Reserves

Tables 3 and 4 introduced depreciation methods from an accounting standpoint, including non-traditional condition-based depreciation. Although the units of production and accelerated methods may provide an estimate of annual system cost that more closely resembles actual cost, these methods are not accepted under GASB-34 and are less useful than accounting for the actual replacement cost, so are likely not useful to utility management. There are essentially three common approaches to consider when planning annual contributions to a capital renewal/reserve fund. These approaches are listed below, presented in Table 7 and explained individually in following paragraphs.

1. **Straight-Line Depreciation**: This is a **good** approach that aligns with a financial statement. If accurate capital asset records are available, this is a simple way to plan for a portion of future investment needs. However, it is most often inadequate to provide for full cost replacement. Another way in which the accounting and managerial perspectives can differ is in the assumed expected life of capital assets. If utilizing straight-line depreciation for capital planning, recall the typical asset lives assumed for financial reporting shown in Table 2. Attachment A to this paper contains a more detailed table with typical capital asset lives used by system managers and engineers based on experiences within the industry. When planning for future replacement, the values in Attachment A should be considered.

2. **Depreciated Replacement Cost**: This approach is **better** than using annual depreciation as a basis for reserve contributions as it results in reserve building that more closely matches future reinvestment needs. This is likely not an accepted practice from an accounting standpoint but is a more accurate approach to budgeting for actual replacement needs.
3. **Condition-Based Depreciation**: From a sustainability asset, this is the **best** approach to proactively planning for system renewal needs but requires specific and detailed evaluation and record-keeping to meet GASB standards. This approach is the best fit in terms of meeting managerial goals of water systems. Not all capital assets may be eligible for this approach, or the effort entailed for some may not be worth the outcome, and a combined approach may be used. For financial reporting purposes, GASB-34 does allow different approaches for different asset types.

The **Straight-Line Depreciation** and **Depreciated Replacement Cost** approaches are relatively straightforward. Straight-Line depreciation involves equally dividing the original value of a capital asset by the years of service to obtain the annual cost. Depreciated replacement cost involves estimating the replacement cost at the end of useful life and then dividing the replacement cost by the expected years of service to obtain the annual cost. When estimating future replacement, there are different levels of effort that can be applied depending on the desired accuracy and cost the system can afford. The increasing levels of accuracy/effort include but are not limited to utilization of: 1) Consumer Price Index as annual indices, 2) construction sector cost indices, such as the Engineering News Record (ENR) or RS Means, and 3) detailed system-specific design cost analysis. Straight-line depreciation meets financial reporting requirements but incorporating the replacement cost is a better tool for estimating annual capital cost from a management perspective.

The Condition-Based approach is labor-intensive but is much more reflective of actual capital needs. Minimum requirements to meet GASB-34 using a condition-based approach include:

- Infrastructure condition assessments completed at least every three years;
- Documented description of criteria used to measure and report capital asset condition;
- Documentation of the intended condition level at which the capital asset will be maintained; and
- Five-year estimates of the cost anticipated to maintain the capital asset at the intended condition level.

While this paper is focused on depreciation and not condition assessment, it is worth mentioning that there are several tools and methods, both direct and indirect, available to assist in evaluating system condition and forecasting renewal needs. The more data that is available regarding items such as pipeline breaks by age and materials, standard pump lives, frequency of filter rehabs for a given water sources, etc., the more accurate the condition assessment will be.

Table 7: Summary of Common Capital Reserve Planning Approaches

CAPITAL REPLACEMENT BUDGETING STRATEGIES

	GOOD	BETTER	BEST
APPROACH	**STRAIGHT-LINE DEPRECIATION**	**DEPRECIATED REPLACEMENT COST**	**CONDITION-BASED DEPRECIATION**
DATA NEEDS	· Original or Estimated Capital Asset Costs by Component or Group · Date in Service · Expected Useful Life · Capital Improvements Plan (CIP) · Existing Debt Schedules · Future Debt Schedules based on CIP	· Original or Estimated Capital Asset Costs by Component or Group · Date in Service · Expected Useful Life · Schedule of Anticipated Replacement · Recent capital cost indexing values (20-year average of the Construction Cost Index as of December 2018 = 3.07%) · Capital Improvements Plan (CIP) · Existing Debt Schedules · Future Debt Schedules based on CIP	· Original or Estimated Capital Asset Costs by Component or Group · Date in Service · Maintenance records and planning maintenance schedule · Document condition assessments (every three years) · Established condition level desired to be maintained · Criteria/method(s) that will be used to evaluate condition
ANNUAL CAPITAL PLANNING VALUE CALCULATION	· **Depreciation =** (Original Capital Asset Value - Assumed Salvage Value) ÷ Expected Useful Life in Years	· **Replacement Cost =** Original Cost x (1 + Capital Index Percentage) ^ (Expected Useful Life in Years) · **Depreciated Cost =** Calculated Replacement Cost ÷ Expected Useful Life in Years	· Based on condition assessment tools/ methods, develop annual reinvestment values

WHAT TO DO WITH IT	· Calculate a capital-related revenue requirement value for rate-setting purpose by evaluating annual depreciation value against the sum of:
	  · Rate-Funded Capital
	  · Debt Principal Payment
	· Total Annual Depreciation less the sum of the items above provides a guideline for the minimum contribution to Capital Reserves that should be included in the budget/CIP
			· Incorporate periodic rehabilitation projects into the CIP
			· Budget for identified capital maintenance needs
			· Include calculated contributions to reserves within capital-related revenue requirements for the purpose of rate-setting

THE ROLE OF DEPRECIATION IN RATE-SETTING

In the interest of financial responsibility, water system managers and decision makers place great emphasis on controlling expenses. Minimizing expenses translates to savings for ratepayers. It is no secret that industry-wide, systems face challenges related to full cost pricing due to general misunderstanding of the value of water. As grant funding becomes increasingly scarce it is ever more important to be sure that water rates are based on the true and total revenue requirements identified to maintain system sustainability. This includes accounting for depreciation as a capital-based revenue requirement or ensuring that total capital-based revenue requirements meet or exceed annual depreciation. Figure 4 illustrates revenue requirements for rate-setting purposes, highlighting the difference between cash-basis and utility-basis revenue requirements.

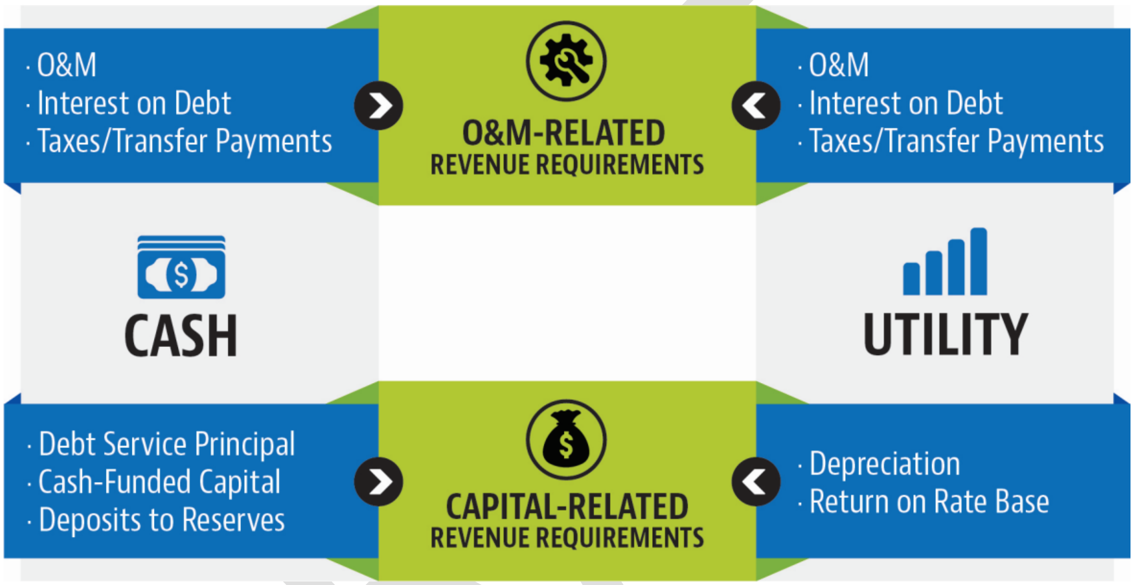

Figure 4: Rate Revenue Requirements – Cash Basis and Utility Basis

Rate-setting based on the cash-basis revenue requirements on the left includes actual expenditures for debt service payments, capital investment, and deposits to reserves. Because it is comprehensive and an actual reflection of planned capital investment, this approach is how utilities normally determine the needed amount of rate revenue from year to year. From a rate-setting perspective, it is particularly important to understand actual cash expenditures.

When considering rate revenue requirements on a utility-basis, it is important that the capital-related revenue requirements on the right are adequate to match those on the left, unless the utility plans to use accumulated reserve funds. As a result, to ignore depreciation as a revenue requirement would have a negative impact on system sustainability, as resulting revenue would be inadequate and the system would not be able to reinvest in its infrastructure.

An additional consideration, addressed in Part 3 of this paper, is when a system has a significant value of infrastructure that was funded by grants or other non-utility sources. The value of these capital assets must be reflected in the depreciation value to avoid under-estimating the annual capital-related revenue requirements. If all capital assets are not fully accounted for, systems may not be planning for the long-term reinvestment in capital that wasn't originally paid for by rate payers.

THE ROLE OF DEPRECIATION IN RATE EQUITY

Another important consideration for accounting for depreciation as a measure of minimum contribution to capital reserves can be made from a rate-setting perspective. Consider how depreciation promotes generational equity, or the concept that each generation of system users should pay their fair share of use of the infrastructure, regardless of its age or how it was originally funded. To achieve an equitable rate structure, the portion of the system that is "used up" every year must be fairly charged to the customers that "used it". Further, to maintain consistent performance of the system to provide service that is reliable both in terms of quantity and quality, system renewal should be ongoing, essentially at the same pace as the system value is depleted. While that does not necessarily mean annual capital expenditures must offset physical depreciation, it may; or it may mean investment into reserves to be used at a future renewal trigger point.

For example, the reservoir in the Figure 5 is expected to perform at its intended level of service for 50 years. For each of those years, customers of the system receive a benefit from use of the reservoir, regardless of its undepreciated value. As a result, the customer base each year should pay for one fiftieth of the original value of the capital asset, ideally indexed to the current year, to both reflect the replacement cost of the asset and properly represent the full cost of providing service in the current year. Why one-fiftieth (1/50) of the cost indexed to the current year? Because that represents the replacement cost for the portion of the asset used in the current year. This philosophy ensures that each generation pays for its share of use of the system, regardless of outstanding debt owed or undepreciated value, assuming the capital asset is properly maintained to perform at its intended level of service. And this concept supports the straight-line depreciation method, with the caveat that depreciation of original cost is inadequate for future replacement. This ultimately supports depreciated future replacement cost as the front-runner for depreciation-based capital planning when the development of condition-based assessment planning values are not an option.

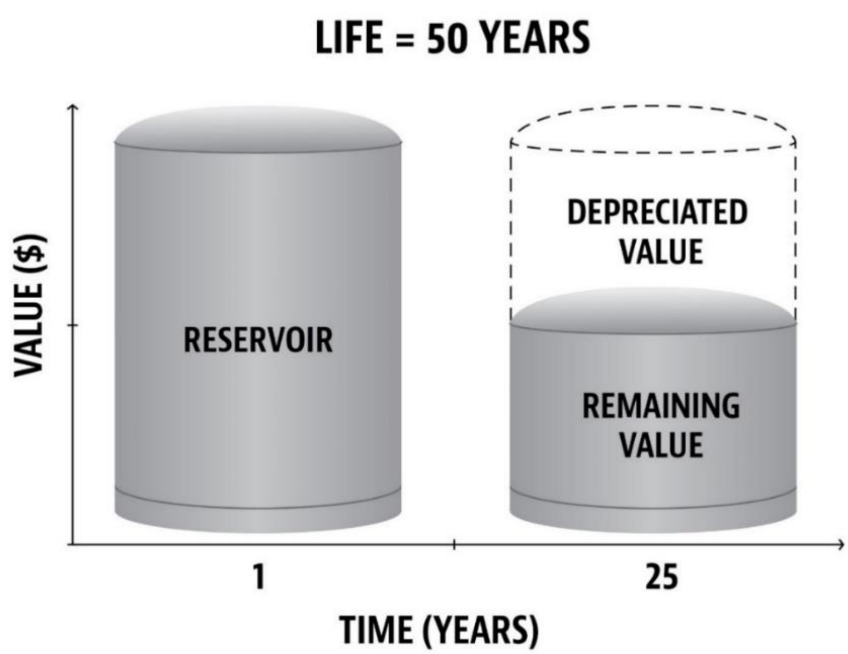

Figure 5: Depreciation Illustration

SUMMARY OF DEPRECIATION AND PRACTICAL SYSTEM MANAGEMENT CONSIDERATIONS

Part 2 of this report discussed the value and use of depreciation as a surrogate capital planning value from a system management perspective. Important points are noted below.

- The objective of prudent capital planning is to identify the annual level of reinvestment required to support a reliable, sustainable system.
- From a system management perspective, depreciation represents consumption of a capital asset. While traditional depreciation is most often insufficient to represent the actual cost of capital asset consumption due to its basis on original cost without accounting for the time value of money, it can be a useful surrogate value for capital planning.
- Total rate revenue requirements consist of both O&M-related and Capital-related revenue requirements. Depreciation is a capital-related revenue requirement in terms of utility-basis revenue requirements and should not be overlooked. Ignoring depreciation as a revenue requirement has a negative impact on system sustainability, as it does not provide adequate revenue and as a result does not enable the system to reinvest in its infrastructure.
- Annual reinvestment through debt service principal, rate-funded capital and contributions to reserves should, at a minimum, be equal to annual depreciation.
- When basing annual reinvestment on straight-line depreciation, managers are advised to consider the useful lives included in the financial calculation and whether adjustment is appropriate based on historical experience and current system knowledge.
- Capital reserve funding approaches based on straight-line depreciation versus condition assessment are at opposite ends of the spectrum in terms of simplicity and accuracy. If condition-based assessment is not an option, depreciated replacement value is a consideration that will provide a better planning value for future capital needs.
- From a rate-setting perspective, the practice of funding depreciation, at a minimum, through annual system renewal plays a role in maintaining generational equity.

PART 3: SPECIAL TOPICS

DONATED OR GRANT-FUNDED CAPITAL

It is rare to find a system that is constructed entirely of capital assets paid for by user rates. For nearly every system there are instances where capital assets have been donated or funded by grants, both referred to as contributed capital. Regardless of funding mechanism, contributed capital assets are a legitimate component of total recorded system value and should be considered when evaluating reinvestment planning. While GASB-34 requires systems depreciate these capital assets, they are not treated the same when used to establish an overall rate base for rate-setting (a topic outside the scope of this paper). How best can we account for these capital assets when addressing renewal and replacement funding? If depreciation is funded as a surrogate capital investment value, should the users be charged for a capital asset for which they did not originally fund? This section will provide discussion on the impacts of contributed capital in annual cost to ratepayers and system value to help answer these questions.

If we think of depreciation as representing the value of the system that is consumed during one year of operation, the rate revenue generated in that year should be sufficient to replace the portion of capital consumed. Again, there are special considerations in rate-setting practices that address contributed capital.

In terms of accounting for contributed capital within a reserve planning strategy, the next logical question is: then how does the donation of a capital asset benefit the ratepayers if they are charged to replace it? To answer this, we need to consider the fundamental purpose of prudent reserve planning, which is to build and maintain utility finances at a sufficient level to meet ongoing renewal/replacement needs for the entire system, including contributed components. The intent is to consistently invest either through capital renewal/replacement or reserve funding to place the system in a position where an eventual significant reinvestment need does not cause a staggering increase to ratepayers. The following discussion illustrates how contributed capital provides the utility with the opportunity to maintain system value.

IMPACT OF VARIED CAPITAL FUNDING OPTIONS TO THE RATEPAYERS AND SYSTEM VALUE

The financial impact of donated capital assets is compared with the financial impact of debt-funded capital assets in Figures 6 and 7. Figure 6 represents depreciation on a $50,000 donated capital asset with a 20-year life. The black portion of the bars illustrate the declining value of the capital asset and the red portion illustrates cumulative depreciation. By the end of the 20-year useful life, the capital asset is replaced at a greater cost ($87,675) than accumulated depreciation due to the time value of money at an assumed three percent rate of inflation. If depreciation has been funded, ratepayers over the 20-year period have theoretically been charged $2,500 annually for use of the capital asset, for a cumulative cost of $50,000. If depreciation has not been funded over the 20-year period, the system is back where it started, has not increased system value, and potentially undercharged the ratepayers in the short-term only to most likely result in a need to charge them considerably more for replacement of the "free" capital asset. The system will have lost the opportunity to maintain system value.

Figure 7 is an example of depreciation on the same $50,000 capital asset with a 20-year life, but assuming the capital asset has been funded by debt (paying off a loan) rather than as a contribution or using grant funding. The capital asset value declines at the same rate as in Figure 6, but the red portion of the bar in this case represents cumulative principal repayment made by the ratepayers, which totals $50,000 over a 20-year loan payment equaling the life of the asset. The additional component in the debt funding example is the gray portion of the bar, which represents cumulative interest paid (3 percent annually) over the life of the capital asset. Payments made by the ratepayers over the 20-year period for debt service and interest would be approximately $3,360 per year.

The annual interest cost represents the savings to the ratepayers in the case of contributed capital versus debt funding. After 20 years, if depreciation has been funded according to Figure 6, the utility would have 57 percent of the cash needed to replace the capital asset (plus any earnings on that balance). After paying off the debt in Figure 7, during which time depreciation would typically not be funded so as not to charge the same ratepayers twice for the same capital asset, the utility would have none of the cash needed to replace the capital asset and would likely issue debt again for that purpose. In addition, the ratepayers would have been charged approximately $3,360 per year in the debt scenario versus $2,500 per year.

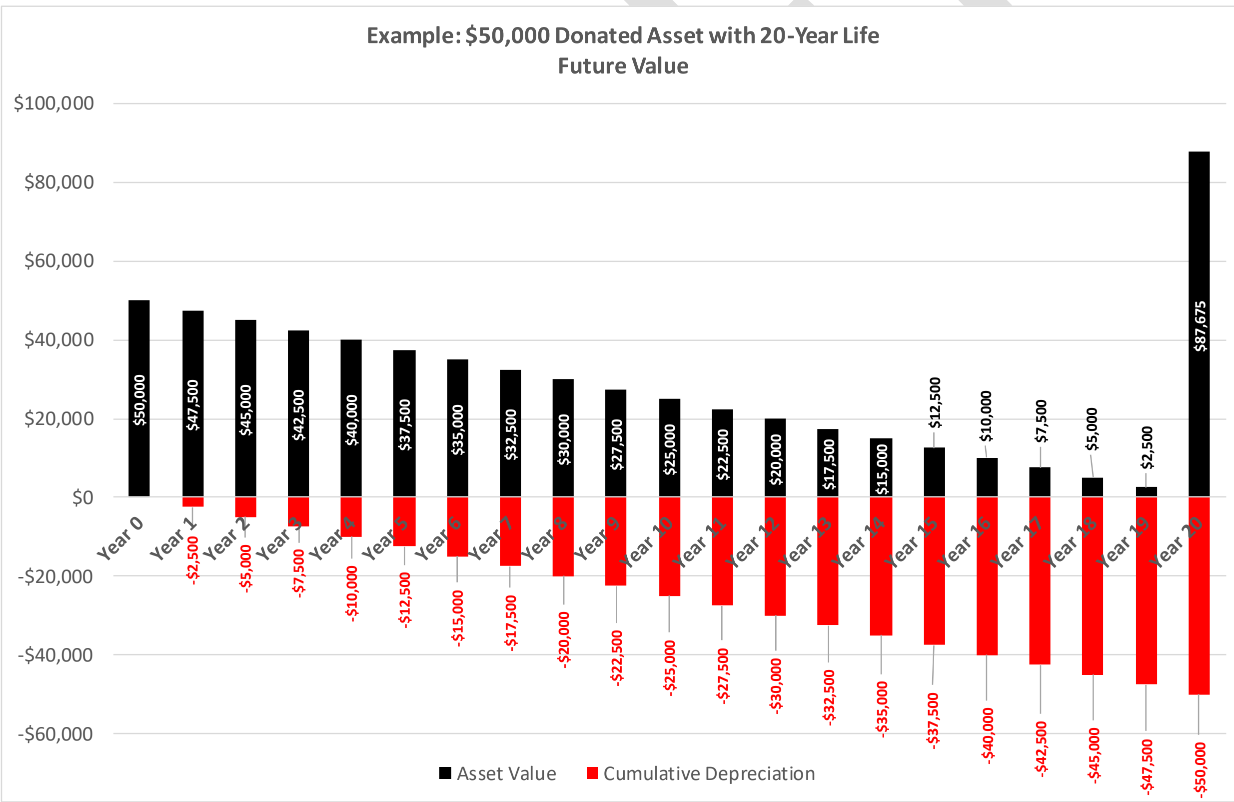

Figure 6: Example of Depreciation of 20-Year Donated Capital Asset

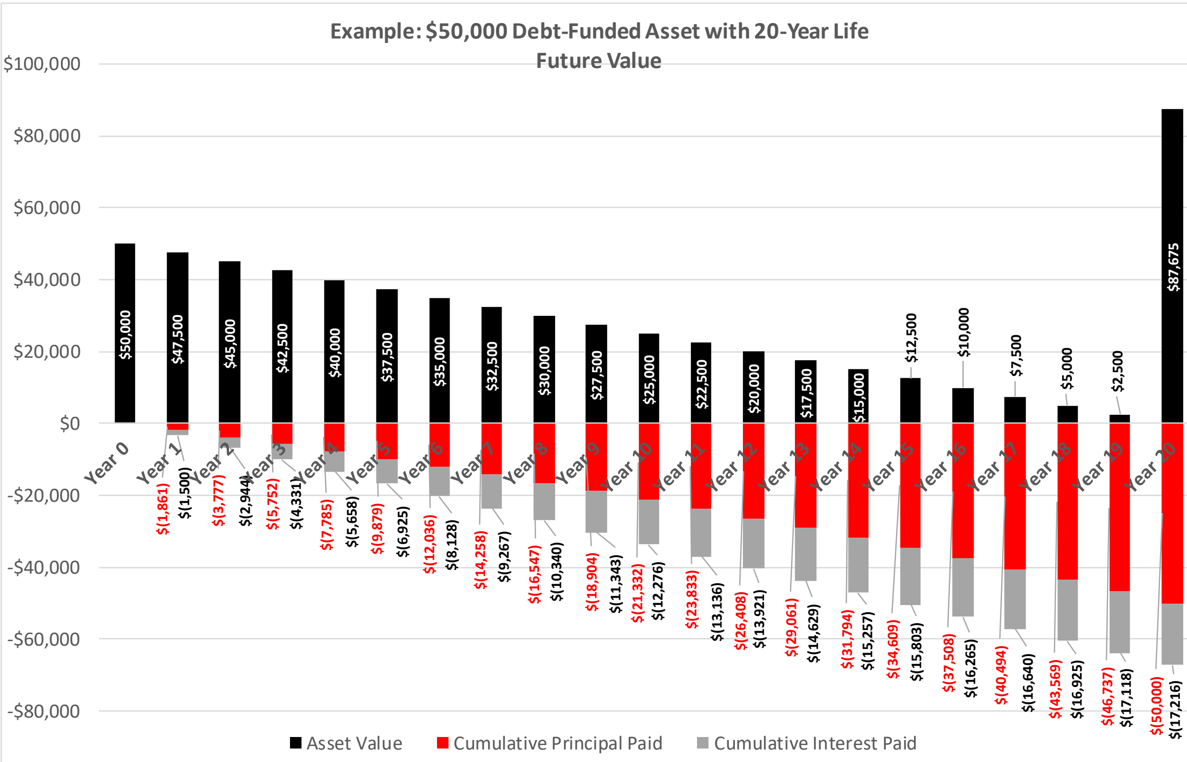

Figure 7: Example of Debt-Funding of 20-Year Capital Asset

In these examples it is easy to see the benefit of contributed capital to the ratepayers, but what if the system pays for the capital asset using rate revenue or cash reserves instead of receiving the asset as contributed capital? Figure 8 presents a visual description of the impact on system value when purchasing the $50,000 capital asset under contributed capital and cash-funded capital scenarios. Assume the existing system value (including cash and the book value of capital assets) is $500,000. In the contributed capital scenario, the value of the contributed asset is added to the existing system value. In the cash-funded example, the use of cash to purchase the capital asset results in the conversion of cash to a physical asset with an associated value. This asset exchange, illustrated in the third bar in Figure 8, does not result in an increase in system value. That's ok! The ability of the system to use cash for the capital asset purchase results in interest cost savings to the customer base. Ideally, the reserve cash used for the purchase has been acquired over a number of years by funding a depreciation-based capital reserve by incorporating an annual reserve funding component into the rate revenue requirements. By doing so, the utility can program periodic capital purchases/improvements without creating the need for irregular and potentially significant rate spikes.

This is not to say that utilities should not utilize debt for funding reserves. For large infrastructure projects, low-interest debt available to utilities is a good option in terms of overall financial planning and rate-setting. But building a capital reserve that affords the utility the ability to cash-flow as much of its programmed capital as possible is a hallmark of financial sustainability.

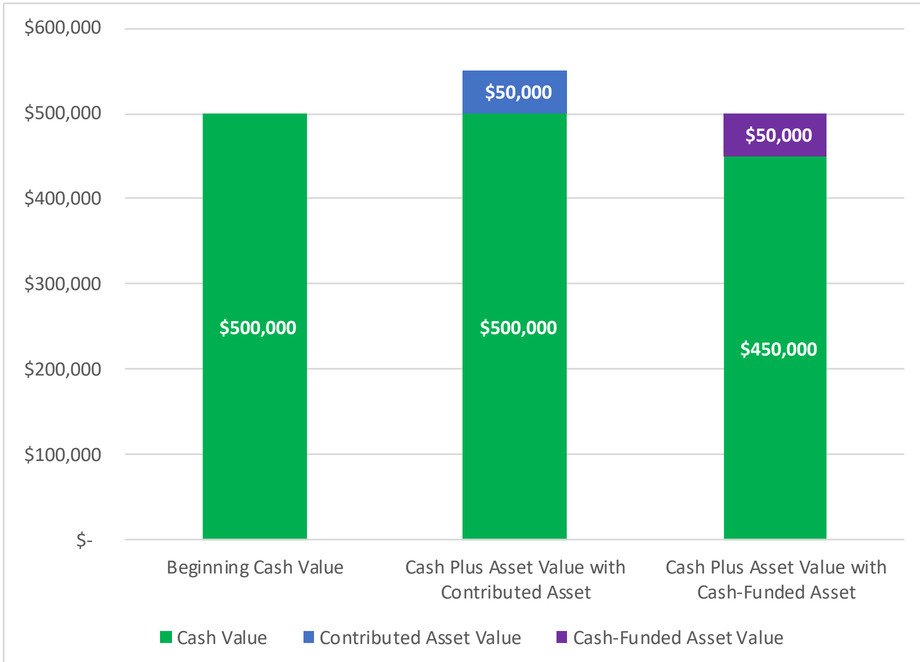

Figure 8: Comparison of Theoretical System Value under Different Funding Mechanisms for $50,000 Capital Asset

SO HOW SHOULD A WATER SYSTEM ADDRESS DEPRECIATION ON DONATED OR GRANT-FUNDED CAPITAL?

In short, per GASB-34 systems must report depreciation on donated or grant-funded capital. It is good practice to designate capital as either contributed or non-contributed in asset records for the purpose of rate-setting.

For the purpose of reserve planning, it is prudent to account for depreciation on contributed capital when building reserves into rate revenue requirements to avoid getting behind in system reinvestment. As noted, rate planning is not discussed specifically herein but systems should be aware of situations in which contributed capital cannot be included in the rate base. Refer to the American Water Works Association M1 Manual: Principles of Water Rates, Fees, and Charges.

BETTER MATCHING DEPRECIATION WITH ASSET ACTUAL LIFE

The discussion thus far has been that traditional straight-line depreciation is generally inadequate for future replacement, and ideally systems should reinvest at some level above annual depreciation. This is a general rule that must be weighed given unique system conditions.

For many systems, pipelines represent a significant portion of total system value. Depending on climate, soil conditions, construction methods, and maintenance practices, pipelines may be the longest-lasting capital assets in the system. Due to the significant value of a pipeline network and common practice of depreciating the entire network as a group, depreciation is never reflective of the actual decline in system value.

Suppose a system has significant investment in pipelines which were installed at a cost share with a government entity. Accountants typically view pipelines as 50 to 75-year capital assets. In reality, it has been found that pipelines can last much longer. A 2012 report by the American Water Works

Association (AWWA) found that the average life for pipe in the Midwest are: 85 to 135 years for cast iron, 50 to 110 years for ductile iron, and 55 years for PVC. This, of course, can vary based on specific system conditions, but given this information, it is easy to see how depreciating pipelines as a group over 75 years, for instance, will not well-represent all pipelines. Some pipelines will have shorter than expected useful lives and some will have longer; thus, depreciating a large quantity as a group could result in significantly overstating understating depreciation cost, particularly for a large system. It is reasonable to consider depreciating pipelines grouped by material and age. Figure 9 is a comparison of the annual depreciation calculated for $100,000,000 investment in a pipeline network consisting of 14 percent PVC pipe and the balance as cast iron and ductile iron.

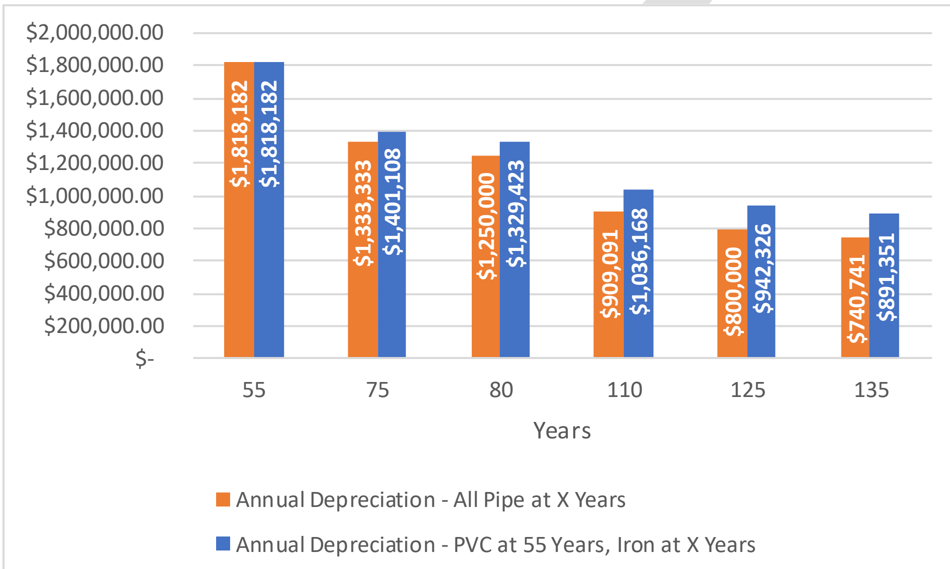

Figure 9: Annual Depreciation on $100,000,000 Pipeline System at Various Useful Lives

The orange bars in Figure 9 show the annual depreciation cost for all pipe, regardless of material, at various years indicated on the X axis. The blue bar shows the calculated depreciation if the PVC pipe is depreciated over 55 years and the cast iron and ductile iron pipe is depreciated at the number of years indicated on the X axis. The illustration shows the difference caused by assumed useful life. By compiling line break data and condition at the time of replacement, a system-specific replacement strategy can be developed, and more accurate depreciation or renewal/replacement values can be derived.

The point of this illustration is not to justify an investment level less than or greater than annual depreciation, but to demonstrate the point that depreciation alone does not provide the best guide for structuring reinvestment levels. A system with a practice involving regular pipeline rehabilitation might be better off building reserves for future investment in vertical infrastructure and limited reserves for future pipeline reinvestment. The point is that the more system-specific information you can include in the basis for capital investment/reserve planning approach, the more fitting and the plan will be.

LIFE CYCLE COST APPROACH TO CAPITAL PLANNING

A capital sustainability planning tool often used by utility managers, related to the topics of both depreciation as an annual expense and condition assessment, is that of Life Cycle Cost Analysis (LCCA). LCCA is used to develop short- and long-range maintenance and capital needs for specific infrastructure components and minimize the overall cost of operation. The LCCA includes consideration of:

- Initial capital cost;
- Lifetime operation and maintenance cost;
- Periodic repair or renewal cost;
- Replacement cost;
- Salvage value; and
- Debt-related costs – loan interest, administrative fees, etc.

The LCCA can be calculated to compare alternatives or to evaluate future handling to an asset in terms of rehabilitation or replacement. By evaluating cost over the expected life, a system can determine at what point the cost associated with continued O&M and on-going renewal of a capital asset exceeds the cost of replacement. Consider the simplified illustration of a pump station in Table 8, which is set up to compare O&M and capital reinvestment cost for the pump station over time on the basis of annual cost per thousand gallons. The values in Table 8 are entered in future dollars and need to be converted to Present Value dollars using the following formula:

$$Present\ Value = \frac{Future\ Value}{(1+discount\ factor)^\wedge Years}$$

The discount factor typically used is a Federal Discount Value published annually effective October 1 or the Federal fiscal year. The rate is calculated by the US Treasury based on average market yields on interest-bearing market securities that have a minimum of 15 more years to maturity. By law the rate can change no more than one quarter of one percentage point annually. The rate for the FY19 fiscal year was 2.875 percent.

The total of lines 1 through 4 of Table 8 would be summed in line 5 and converted to Present Value dollars (line 6) using the equation described above. The O&M would likely be consistent until some point later in the useful life, in which more maintenance may be required. For this particular asset, if rehabilitation was completed every 10 years, as the life approaches 30 years the system manager would likely evaluate the financial impact of completing another 10-year rehabilitation versus replacing the facility, indicated by the red question marks in year 30 and 31 on lines 3 and 4. The annual cost per thousand gallons pumped could then be compared to evaluate the difference in cost if the system continues to extend the useful life versus replacing the asset. Based on the conclusions of the LCCA, the manager can incorporate planning level O&M, renewal, and/or replacement values into the short- and long-range budget and capital plans. Note that system management should consider whether the effort required to complete LCCA is worthwhile, as in some cases, management may have enough historical data to accurately predict and plan for renewal and replacement.

Table 8: Example: Outline of Life Cycle Cost Calculation for Pump Station

	Year 1	Years 2-9	Year 10	Years 11-19	Year 20	Years 21-30	Year 30	Year 31
1. **Construction**	**$**							
2. **O&M**		**$**	**$**	**$**	**$**	**$**	**$**	**$**
3. **Repair/Renewal**			**$**		**$**		**$?**	
4. **Replacement**								**$?**
5. **Total (Future $)**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**
6. **Total (Present $)**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**
7. Thousand Gallons Pumped	X	X	X	X	X	X	X	X
8. **Cost ($) per Thousand Gallons Pumped**	**$/X**	**$/X**	**$/X**	**$/X**	**$/X**	**$/X**	**$/X**	**$/X**

LCCA is an excellent tool to support efforts to maximize infrastructure life, provide cost savings by minimizing emergency repairs, rehabilitate or replace assets before they fail, and potentially delay future improvements. Such proactive measures allow more time for systems to develop funding for improvements. Generally speaking, as a utility increases its planned (proactive) maintenance activities, emergency repairs (reactive) will decline. Figure 10 illustrates this relationship and how the optimal level of proactive versus reactive maintenance occurs at the lowest point on the total maintenance cost curve.

Zack – I'll send you maintenance cost graphic for here

GENERAL RESERVE PLANNING GUIDELINES

A discussion of financial planning would not be complete without mention of guidelines for various reserve funds maintained by a system. Though not the focus of this paper, when considering funding a capital reserve it is important to evaluate other reserve funding practices or needs. Reserves are an important component of the cost of operating and maintaining a system. Table 9 provides a summary of common water reserve funds general target guidelines, though targets will be system-specific. Existing policy and/or debt covenants may require reserve accounts to be funded in a certain priority.

Table 9: Common Reserve Funds and Guidelines

RESERVE FUND	DESCRIPTION/PURPOSE	RECOMMENDED TARGET GUIDELINES
Operating	Cash available to ensure the utility can meet on-going O&M expenses despite seasonal revenue fluctuations	Minimum one-eighth of annual operating and maintenance expense (45 days); 45-120 days, sometimes up to one year of O&M
Debt Service	Restricted account required by bond/loan covenant, held for the life of the loan and used for final debt retirement	As specified in bond/loan documents, typically equal to the highest annual payment within repayment period
Capital	Cash set aside for capital renewal/replacement, or future system expansion, based on desired approach to capital funding	A strategic target is normally set based on specific capital funding goals of the system; some examples of common approaches include one year of depreciation, a five-year average of rate-funded capital investment, a percentage of the annual capital improvements plan, and capital asset management-based annual reinvestment calculations
Emergency	A reserve fund specifically established to offset revenue needed in the event of unplanned expenditures or events, such as a drought	Approaches vary; sometimes based on the cost of replacement of the most critical and expensive infrastructure, or designed to replace a critical revenue loss, such as in a drought situation
Rate Stabilization	Similar to an emergency reserve designed to avoid rate spikes and minimize necessary rate adjustments when expenses are higher than anticipated and/or revenues are less than anticipated for any reason	A target is not always specified, sometimes set as the amount of revenue associated with a certain percent rate increase

SUMMARY OF SPECIAL TOPICS

- Donated or Grant-Funded capital assets must be depreciated and reported under GASB-34.
- A contributed capital asset will increase system value, as will a debt-funded capital asset once the debt liability is retired.
- A cash-funded capital asset is an asset exchange which theoretically does not increase system value.
- Regardless of funding mechanism, the system will incur annual depreciation expense on the capital asset.
- The savings to rate payers when a capital asset is contributed versus debt- or cash-funded are associated, respectively, with interest cost on debt and inflationary impacts on the cost of replenishing reserves.
- Special rules exist for dealing with contributed capital for the purpose of rate-setting.
- For capital planning purposes, regardless of the assumed expected life used for calculating depreciation for financial reporting, it makes sense to consider using system-specific data, if available, particularly for assets typically grouped such as pipelines.

- Life Cycle Cost Analysis is a practical tool that system managers can use to evaluate future O&M, renewal, and replacement needs for specific infrastructure/facilities.
- Systems are advised to evaluate annual capital reserve funding needs in the context of overall system reserve needs.

AUGUST 26, 2019

ESTABLISHING A ROAD MAP FOR CAPITAL IMPROVEMENT PLANNING

System sustainability is heavily dependent on solid capital planning practices. Systems have millions of dollars invested in the ground and in vertical capital assets, and ratepayers expect responsible physical and financial management. Toward that end, systems should fund depreciation, at a minimum, as a mechanism for meeting ongoing renewal/replacement needs and to maintain system value.

Below are some general steps to developing a capital reserve funding strategy.

AE2S NEXUS The Financial Link

SDARWS South Dakota Association of Rural Water Systems

COBANK

IF YOU DON'T HAVE A DETAILED CAPITAL ASSET INVENTORY, CREATE ONE:

The degree of detail in capital asset listings for most small and regional water systems varies greatly. In some cases, little information related to original system infrastructure is available. If that is the case, create a record based on the best information available, and estimate the original construction costs if not specified. The system's auditor should be able to provide an explanation as to how the annual reported value is derived. You simply need something with which to start, the more accurate the better.

IMPLEMENT CONDITION ASSESSMENT PRACTICES:

If not already performing regular condition assessment as part of an overall asset management program, begin collecting data that will help you get there. Regular evaluation of infrastructure will structure maintenance practices and capital programming to result in timely replacement of infrastructure prior to the point where the cost to maintain operation at the desired service level exceeds the cost of replacement. Such a practice starts with the basic information of capital asset age, material, and intended useful life.

DEVELOP A FIVE-YEAR (MINIMUM) CIP:

Based on known system expansion or replacement needs, create a schedule consisting of costs and funding mechanisms. If possible, extend the plan beyond five years to provide decision makers with a look over the horizon. This will provide the benefit of time to build rate revenues to the necessary level and to explore potential funding options.

PROJECT FUTURE DEBT SERVICE PRINCIPAL & INTEREST PAYMENTS BASED ON THE CIP:

Calculate the annual principal payments associated with any CIP items that will be funded using debt. The principal component of the debt service requirement represents reinvestment in the system.

DEVELOP ANNUAL RENEWAL/REPLACEMENT VALUES:

Either using forecasted depreciation, replacement cost-based depreciation, or annual values resulting from condition assessment, develop a five- to 10-year estimate of annual capital renewal/reinvestment.

COMPARE THE ANNUAL RENEWAL/REPLACEMENT OR DEPRECIATION VALUE TO THE SUM OF ANNUAL PRINCIPAL PAYMENTS AND CASH-FUNDED CAPITAL:

If planned system investment through principal payments and cash-funded capital is less than the annual renewal/replacement, designate the difference as a revenue requirement to be contributed to capital reserves.

DISCUSS CAPITAL RESERVE PLANNING APPROACH WITH DECISION MAKERS:
Determine as a group the most appropriate approach to funding future renewal/replacement. This may require some educational efforts. While the nuances of any system's given circumstances will dictate the right answer for how much to be reserving and how much to be reinvesting, the key is that policy makers are evaluating their specific circumstances and making an informed decision that is revisited as circumstances change.

CONTINUE TO UTILIZE STRAIGHT-LINE DEPRECIATION FOR FINANCIAL REPORTING:
Unless you have a rigorous capital asset management program in place that will meet GASB-34 requirements or until you can implement such a program. Meeting the financial reporting requirements is important, so be sure to do that. At the same time, from a managerial standpoint strive to utilize either a modified form of depreciation that accounts for the time value of money or an asset management approach that accounts for efforts and costs invested to maximize capital asset useful life.

ULTIMATELY WORK TO IMPLEMENT A RIGOROUS ASSET MANAGEMENT PROGRAM:
By developing a process to meet both the financial reporting requirements and provide valuable information for the purpose of capital planning, both objectives are met. Condition-based capital asset management requires considerable effort as compared to the traditional depreciation calculation but can provide significant reward in terms of cost savings to the customers. Proactive capital asset management also demonstrates a commitment to good financial stewardship.

INCLUDE ANNUAL RENEWAL/REINVESTMENT IN YOUR CAPITAL BUDGET/CIP:
Regardless of renewal timing, consideration of funding either capital or reserves at a level at least equal to annual depreciation is an essential cost that should not be overlooked. It is an essential component of financial sustainability.

THE ATTACHMENTS TO THIS DOCUMENT CAN ASSIST IN IDENTIFYING THE RIGHT LEVEL OF CAPITAL RESERVE FUNDING FOR A UTILITY. TOOLS NEEDED TO DEVELOP A BASELINE PLAN FOR CAPITAL INVESTMENT/REINVESTMENT INCLUDE:

- List of capital assets/capital asset groups, including original cost, date in service and expected life;
- List of outstanding debt, with annual principal repayment identified;
- List of current capital improvement plan, if available, including planned funding source (grant, debt, membership/connection charges, user fees, etc.);
- Any records or information related to replacement or rehabilitation of capital assets, or any other information that will help determine remaining useful life of capital assets and set a schedule for planning rehabilitations/replacements; and
- Existing capital-related reserve account balances.

GOOD PLANING STARTS TODAY!

Understanding how depreciation can help develop a strategy for system reinvestment is the first step in developing a sustainable capital renewal/replacement strategy. Taking an incremental approach to gradually increasing reinvestment or contributions to reserves can be used to slowly build rate revenues to the level needed to adequately address reinvestment needs. In the meantime, good maintenance practices can be applied to further extend the life of the capital assets and provide for an accurate and orderly approach to both physical and financial sustainability.

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Disclaimer: The authors and sponsors of this paper are not certified public accountants. The information herein is intended to help system managers understand how to apply the concept of depreciation in managing renewal/reinvestment in water system capital assets. Readers are advised to consult an accountant for definitive answers to financial reporting questions.