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Asset Management

2nd IWA Leading-Edge Conference & Exhibition on

Strategic Asset Management

Implementing an Asset Management Approach to Capital Investment Planning

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Asset Management Capital Planning Process

1. **Define Asset Management Drivers, Strategies, Goals, and Objectives**
2. **Determine Performance Measures and Service Levels**
3. **Assess and Analyze Asset Data and Establish Policies and Procedures**
4. **Conduct Asset Inventory and Condition Assessment**
5. **Develop 25 Year Capital Investment Plan (CIP)**
6. **Analyze and Review Financial and Rate Implications**

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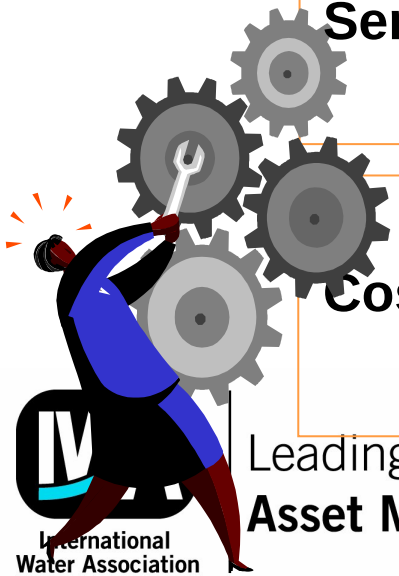
Drivers for Asset Management

External Forces	■ Regulatory compliance ■ Growth and demand ■ **Pressures from the public and elected officials**
Asset Age & Condition	■ Aging and deteriorating infrastructure ■ **Solid justification for capital investments and O&M programs**
Service Levels	■ **Demand for improved service levels and reliability** ■ Prevention of critical asset failures
Cost Efficiency	■ **Drive to do "more with less" through optimized decisions and efficiency** ■ **Move towards a "businesslike" culture**



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Linking Asset Management and Capital Planning to Strategic Planning

What Are Service Levels?

- A commitment to deliver a specified level of service, quality, and reliability to customers and stakeholders
- A mechanism to communicate and report performance results, focus organizational efforts, and prioritize capital and O&M investments
- A linkage between your strategic objectives and operational or tactical strategies
- A key tool used by industry regulators

Sample Service Level Measures

Strategic Goal	Measure(s)	Target	Function(s)
Provide best in class customer service	Avg. days to install new meter / service	95% within 30 days	Engineering, distribution, customer service
	Average call hold time	95% of calls answered < 2 minutes	Customer service call center
	Total meters receiving actual read every month	99% read (non-estimated) every month	Customer service, Metering
Ensure quality, safe, and reliable supply to the public	Days to repair out of service fire hydrants	99% within 10 Days	Distribution maintenance
	Total low pressure incidents	Provide 40 PSI at customer property	Distribution operations and maintenance
	Event response time	Arrive on site within 30 minutes of event notification (break, leak, etc.)	Distribution operations and maintenance

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An Information "Gap Analysis" is a Critical First Step

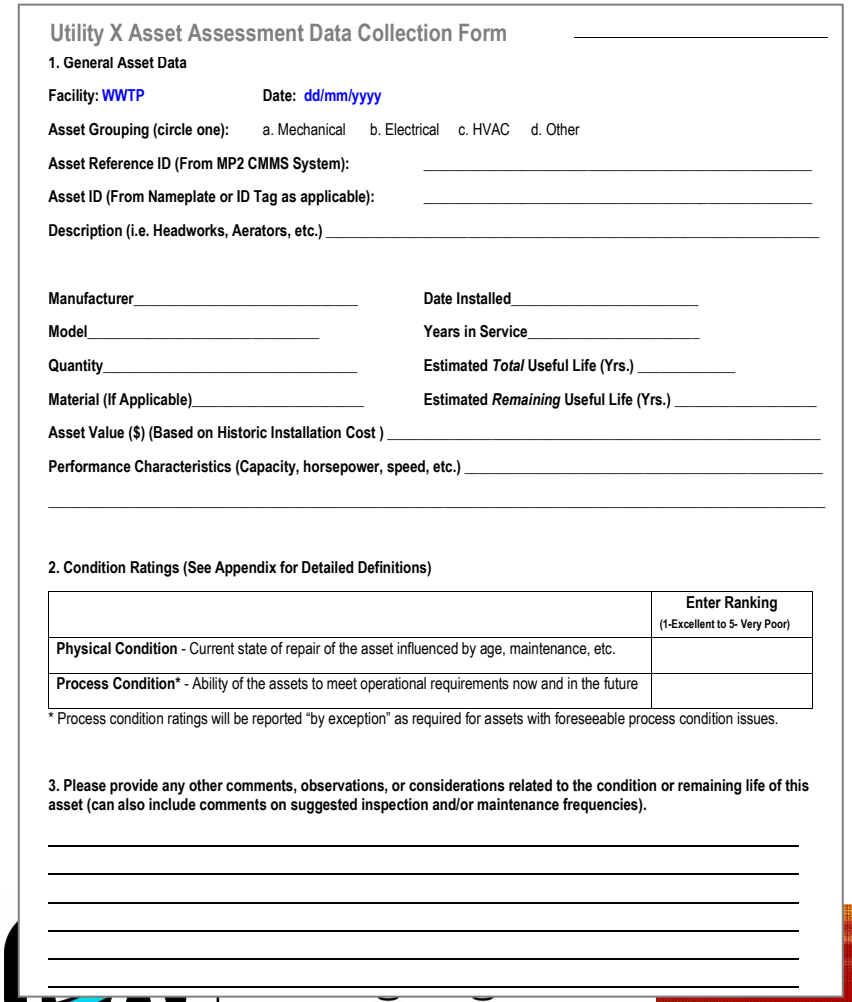
- Review and validate existing data and information and identify gaps
  - Master list of plant assets from CMMS records
  - Historic asset valuation and cost records (from schedule of values if available)
  - Financial plans and records
  - Plant permits (environmental)
  - Applicable O&M records

Outputs From This Process Should Include

- Baseline asset inventory list
- Policies and procedures for data collection and management
- Asset criticality and condition assessment guidelines
- Defined asset hierarchies

- Facility Code
  - → Process Area Code
    - → Equipment Code
      - → Equipment Number

Standard Asset Inventory and Condition Criteria Are Used to Capture Information



Utility X Asset Assessment Data Collection Form

1. General Asset Data

Facility: WWTP Date: dd/mm/yyyy

Asset Grouping (circle one): a. Mechanical b. Electrical c. HVAC d. Other

Asset Reference ID (From MP2 CMMS System): _____

Asset ID (From Nameplate or ID Tag as applicable): _____

Description (i.e. Headworks, Aerators, etc.) _____

Manufacturer_____ Date Installed_____

Model_____ Years in Service_____

Quantity_____ Estimated *Total* Useful Life (Yrs.) _____

Material (If Applicable)_____ Estimated *Remaining* Useful Life (Yrs.) _____

Asset Value ($) (Based on Historic Installation Cost) _____

Performance Characteristics (Capacity, horsepower, speed, etc.) _____

_____

2. Condition Ratings (See Appendix for Detailed Definitions)

	Enter Ranking (1-Excellent to 5- Very Poor)
Physical Condition - Current state of repair of the asset influenced by age, maintenance, etc.	
Process Condition* - Ability of the assets to meet operational requirements now and in the future	

* Process condition ratings will be reported "by exception" as required for assets with foreseeable process condition issues.

3. Please provide any other comments, observations, or considerations related to the condition or remaining life of this asset (can also include comments on suggested inspection and/or maintenance frequencies).

_____

_____

_____

_____

_____

_____

- Consistent data fields and attributes based on industry practice
- Expected useful life estimates
- Physical and process condition rating guidelines
- Final data uploaded into CMMS systems for ongoing planning

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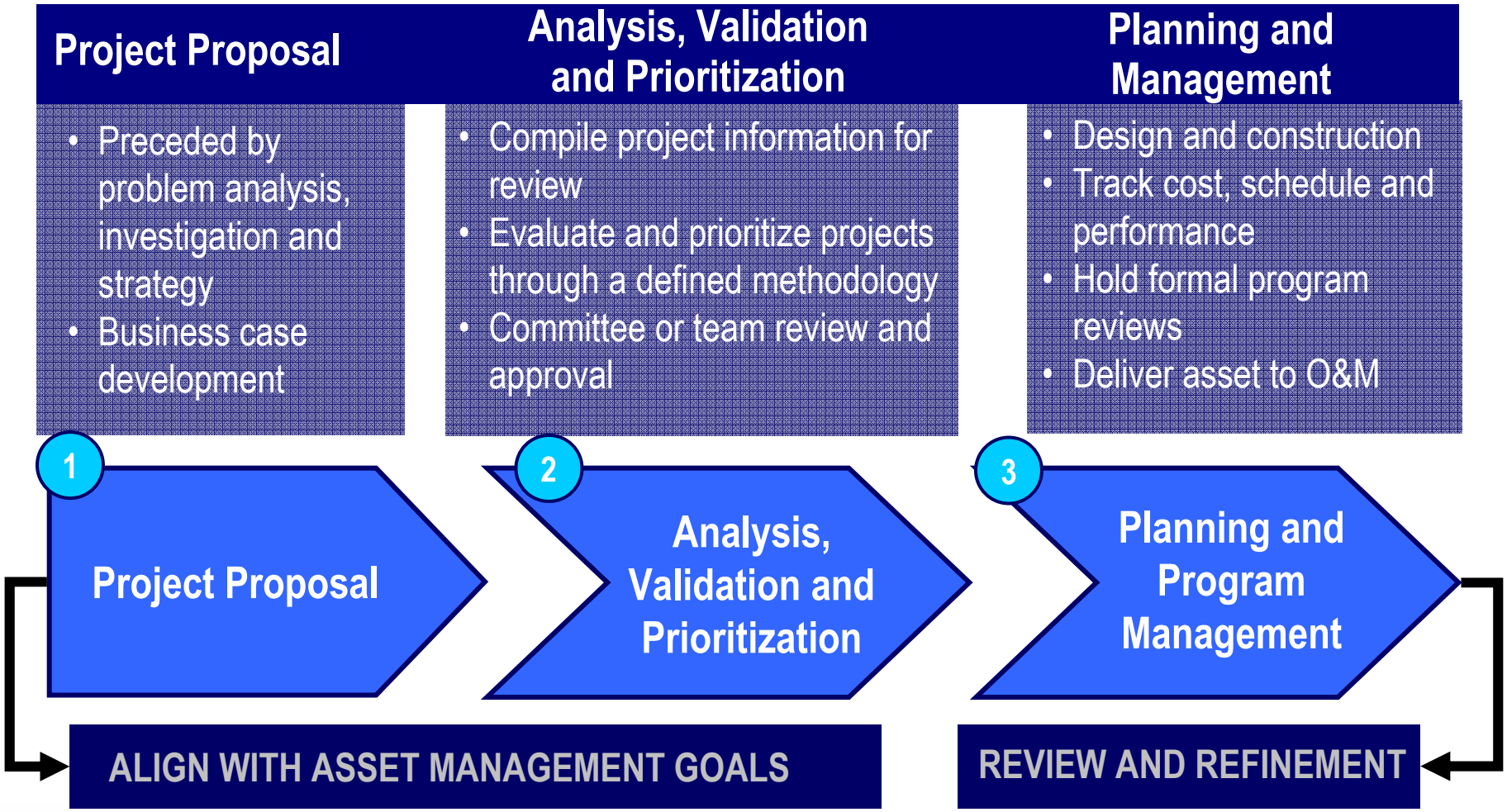
CIP Process Overview



Project Proposals Via "Business Cases"

- Build business discipline and common processes
- Encourage analysis of options and alternative solutions
- Document customer and environmental impacts
- Ensure alignment with strategic asset management goals

New Pumping Station X

1. Project Description and Purpose

2. Service Level (Customer and Environmental Impact)

3. Risk and Criticality Analysis

4. Life Cycle Cost Analysis
- **Design and construction (capital)**
- **Operations and maintenance**

5. Financial Analysis
- **NPV, ROI, IRR, Cost / Benefit**
- **Funding source**
- **Financial Condition**

6. Other Issues, Recommendations and Alternatives

Typical Capital Project Categories

1. Rehabilitation / Renewal / Replacement – projects aimed at replacing assets that are reaching the end of their useful lives based on condition, likelihood, and consequence of failure.

2. Growth – projects required to serve new growth and/or increased demand

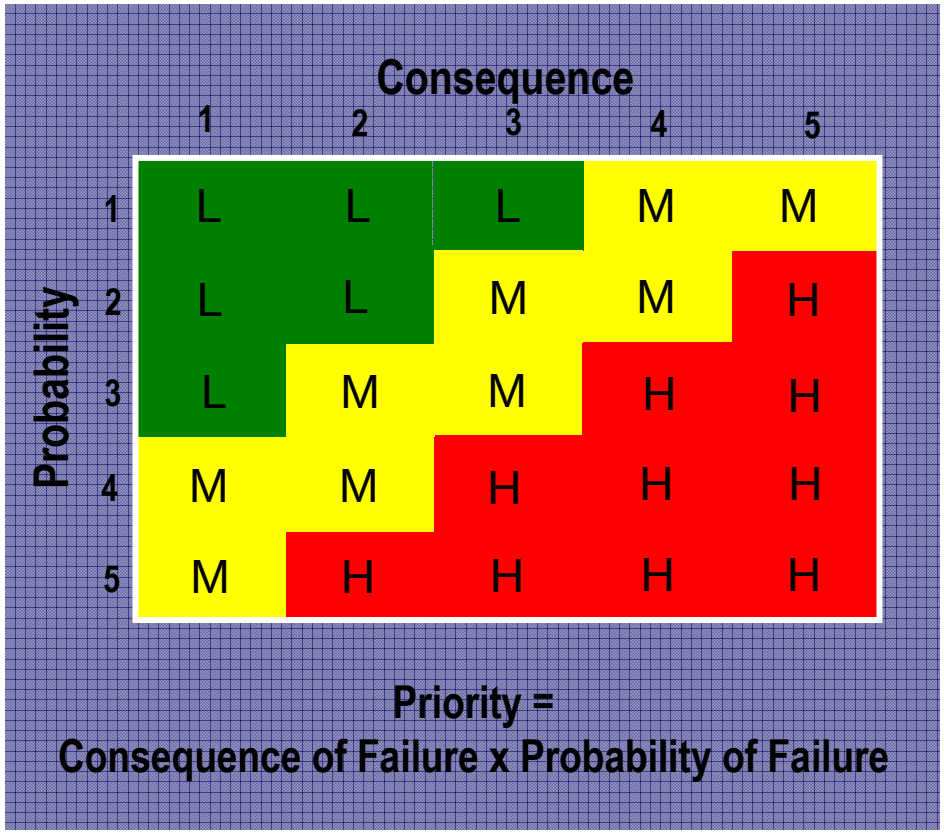
3. Enhancements – projects initiated to improve service levels, reduce risk, or meet changing regulatory requirements

Using these categories helps to realign the CIP when major business drivers change (i.e. regulatory, estimated growth and demand, service level targets, etc.)

When Compiling and Reviewing Project Business Cases, Think About….

- Project assumptions **– Can they change?**
- Project risks **– What are the largest risks and can they be mitigated?**
- Evaluation of alternatives **– What are the most viable alternatives and what is the "optimal"?**
- Project impacts **– What impact will the project have when complete?**
- Data and information accuracy and completeness – **What additional information would help to justify the project?**

Projects Can Then Be Prioritized Through Criticality Analysis



Consequence Categories

- Environmental
- Public Safety
- Regulatory Compliance
- Public Image
- Service Level and/or Reliability
- Financial Loss

Impact Scores

- 1 Insignificant to 5 Catastrophic

Probability Scores

- 1 Rare to 5 Almost Certain

The Process Leads to a Dynamic, Comprehensive, Accurate and Rational CIP

3. Component / Process

WW CIP - Kildare Rd WWTP Components / Process Details

Description	Annual Expenditure 2006	2007	2008	2009	2010	Five-Year Expenditure 2006-2010	2011-2015	2016-2020	2021-2025	Total
Kildare Road Treatment Plant										-
X1 Land / Property	0.5	0.2	-	-	-	0.7	-	-	-	0.7
X2 Influent Screening	-	0.3	0.1	-	-	0.4	-	0.5	-	0.9

2. Project Details

WW CIP - Project Summary - Utility X

Project Number	Description	Total Cost ($ Million)	Schedule
A1	Broadway St. Extension To Service New Growth	12	2006-08
A4	Park to E. Hampden Trunk Sewer Upgrade To Increase Flow Capacity	15	2009-10

Wastewater Capital Investment Plan - Utility X ($ in Millions)

1. Summary

Project Number	Description	Annual Expenditure 2006	2007	2008	2009	2010	Five-Year Expenditure 2006-2010	2011-2015	2016-2020	2021-2025	Total
	Growth - Sewers and Pump Stations										-
A1	Broadway St. Extension	0.5	0.2	-	-	-	0.7	0.2	-	-	0.9
A2	Alameda Trunk Sewer Capacity Expansion	-	-	0.4	0.2	0.1	0.7	-	-	-	0.7
A3	North Area Pumping Station	-	-	-	-	0.4	0.4	2.1	-	-	2.5
A4	Park - E. Hampden Trunk Sewer	12	0.2	0.1	-	-	15	-	0.2	-	17
A5	Misc Sewer and PS Capacity Upgrades	-	-	0.3	0.2	0.2	0.7	12	11	15	4.5
	Growth - Treatment Plants										-
B1	Capacity Expansion - West Area Treatment Plant	-	0.4	2.5	2.0	0.3	5.2	0.2	-	-	5.4
B2	South Treatment Plant Upgrade	0.9	12	-	-	-	2.1	-	-	-	2.1
B3	Kildare Road Treatment Plant	-	-	-	0.8	12	2.0	2.0	-	-	4.0
B4	Misc Treatment Plant Capacity Upgrades	0.2	0.1	0.3	0.5	0.3	14	14	2.0	0.8	5.6
	Total - Growth	**2.8**	**2.1**	**3.6**	**3.7**	**2.5**	**14.7**	**7.1**	**3.3**	**2.3**	**27.4**
	Enhacement, Rehabilitation, Renewal - Sewers and Pump Station										-
C1	Main St. Sewer Rehabilitation	-	-	-	0.4	0.2	0.6	0.4	-	-	10
C2	Odor Control - PS/ Sewers North Area	0.2	0.3	0.2	-	0.1	0.8	-	0.2	-	10
C3	Pumping Station 6 Renwal	-	-	-	0.4	0.2	0.6	0.1	-	-	0.7
C4	Risk Reduction and CSO Improvement Program	-	-	0.4	0.4	0.1	0.9	0.5	0.6	0.2	2.2
C5	Overall Sewer Rehab Program	0.2	0.2	0.2	0.4	0.3	13	12	14	10	4.9
	Enhacement, Rehabilitation, Renewal - Treatment Plants										-
D1	SCADA System Enhancement	-	15	2.5	0.1	-	4.1	-	-	-	4.1
D2	Solids Handling Improvements	-	-	-	0.5	0.2	0.7	0.4	-	-	11
D3	Rehab Work - East Treatment Plant	-	0.1	0.3	0.4	0.5	13	0.4	0.2	0.3	2.2
	Total - Enhancement, Rehab, and Renewal	**0.4**	**2.1**	**3.6**	**2.6**	**16**	**10.3**	**3.0**	**2.4**	**15**	**17.2**

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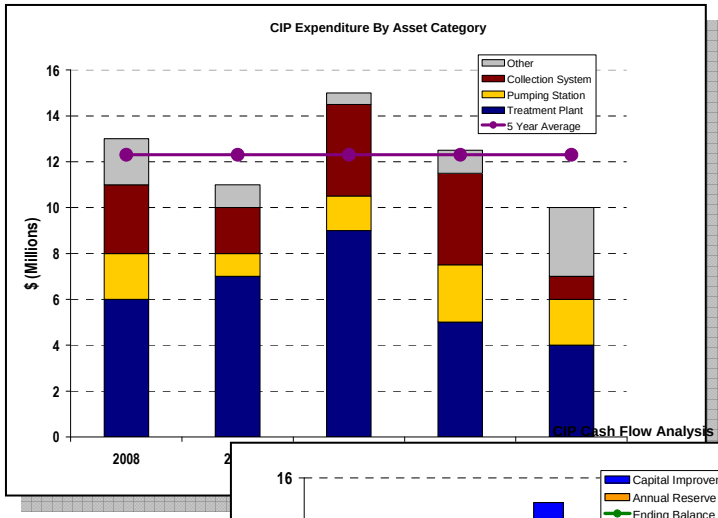
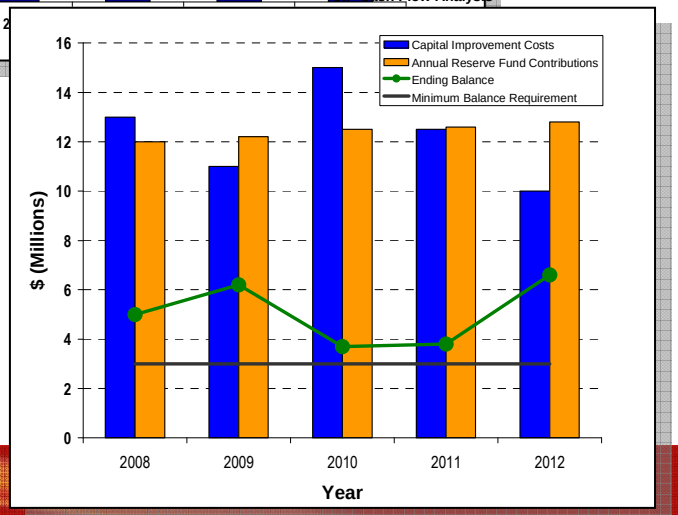
A Critical Relationship: Capital Planning, Financial Planning, and Asset Management

- An iterative process
  - Service Levels
  - Asset Investments
  - Financial Implications
  - Customer Impacts, i.e., rate increases
  - Acceptable
    - YES, we're done
    - No, what service level is acceptable?
- Ensure that funding requirements are identified, customer impacts understood, and stakeholders are aligned

A Final CIP Document Should Include Summary Financial Charts and Analyses

- Debt requirements and overall financial implications
- Multi-year financial forecast and cash flow summary
- Long term rate requirements and other user charges / fees





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Capital Planning Implementation Case Study

Spartanburg Water System and Sanitary Sewer District

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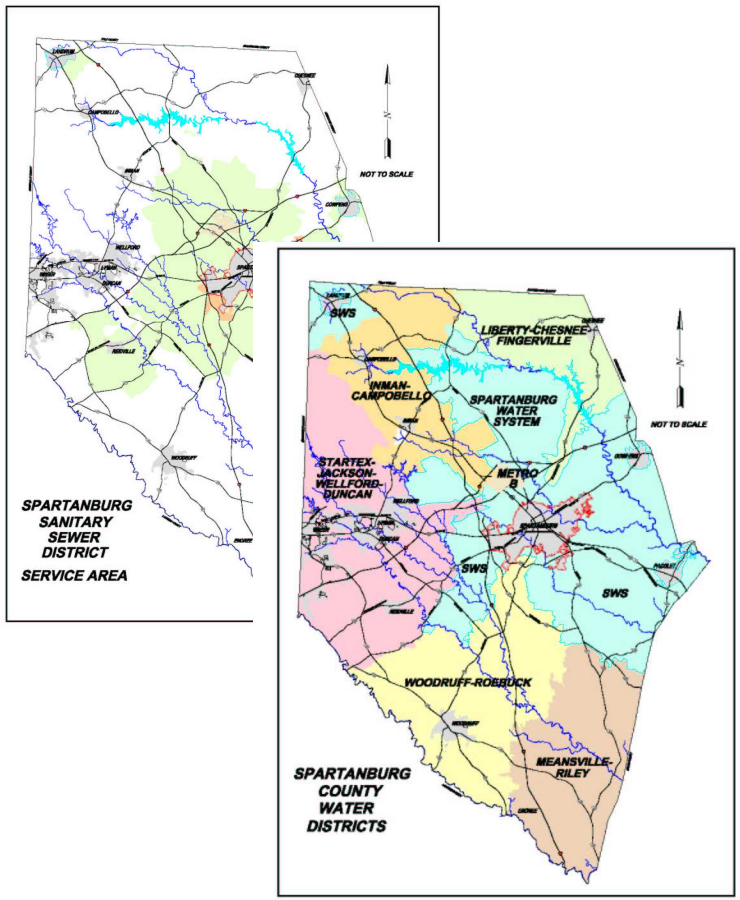
About Spartanburg Water



- Serve the greater Spartanburg SC Area
  - 58,000 Water connections
  - Wholesale water provided to 7 water districts
  - 37,500 Sewer connections
- Have averaged 3+% annual growth rate
- Have a significant CIP focused on growth demands and regulatory compliance
  - $110M USD from 2000-2010
  - Lake Blalock expansion and rehabilitation
  - Fairforest and Lawson Fork WWTP upgrades

Our Infrastructure and System

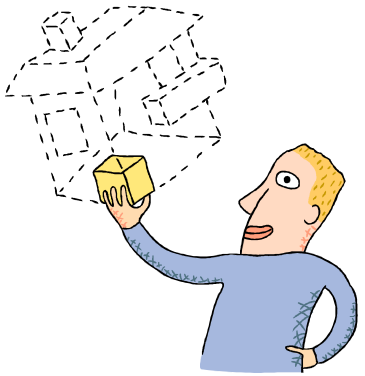
- Have 3 WTFs and 13 Water Storage Facilities
  - Lake Blalock WTF: 102.2 ML/day
  - RB Simms WTF: 242.3 ML/day
  - Landrum WTF: 3.8 ML/day
- Have 11 Regional WWTFs and 77 Pump Stations
  - Fairforest Regional WWTF: 94.6 ML/day
- Other Infrastructure
  - 2,012 km of water mains and 766 km of sewer lines
  - 3 Dams and Reservoirs

Key Challenges and Issues

- Implementation of a large capital program ($110M USD+)
  - Driven by system growth demands and regulatory compliance
- Ongoing rapid growth and development with minimal master planning
- Need for increasing rates and customer expectations
- Need to justify ongoing expenditure for rehabilitation and renewal to ensure service level performance and sustainable utility management

Drivers For Improved Capital Planning

- Ensuring a balance between Rehabilitation and Renewal (R&R) projects and growth / regulatory compliance
- Developing a formalized approach to project identification and proposals through "business cases"
- Providing a consistent mechanism and process for project prioritization
- Develop sustainable management practices for the utility
- Improved information and communication with board, customers, the community and other stakeholders



Spartanburg Water
Case Study: Capital Planning Process

Key Project Goals and Drivers Included:

- Pilot and implement a business case approach to capital improvement planning
  - Collaboration between all disciplines across the utility (technical services, operation & maintenance, human resources, finance, engineering, etc.)
  - Include service level measures to help prioritize capital investment decisions
  - Enhance and formalize a process for capital / O&M planning and prioritization using business cases, cost/benefit, and criticality analysis
  - Include a public / stakeholder support program to communicate value and benefit and strengthen support for required capital investment

Sample Project
Business Case Summary
Water Main Rehabilitation

Project Type: Rehabilitation / Renewal / Replacement

Project Description / Purpose:

This project is the rehabilitation/replacement of approximately 19,000 linear feet of water main located in the Spartanburg Water System service area. The project consists of the replacement of existing 8” and 14” water mains. The purpose and justification for this project is:

- Enhance an aging pipeline infrastructure
- Eliminate repetitive corrective and costly maintenance
- Minimize the potential for reduced pressure / water quality episodes
- Provide a reliable supply line into a high density / critical supply area of the distribution system

Sample Project Business Case Summary
Water Main Rehabilitation

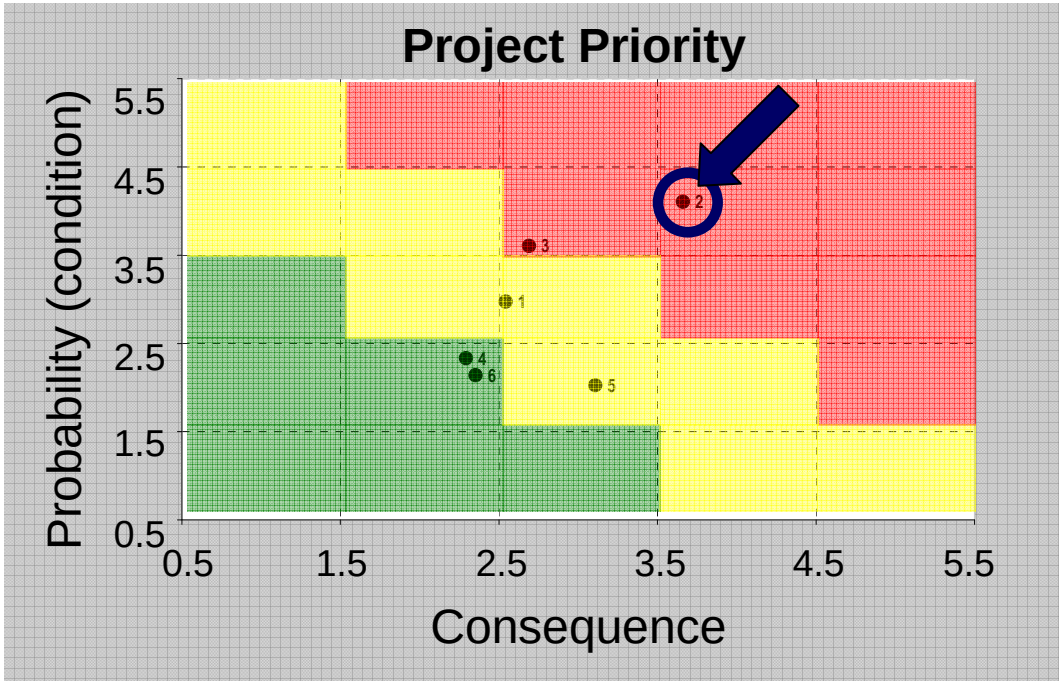
Service Level (Customer and Environmental) Impact

- From 1981 to present, both sections of pipeline have experienced multiple failures.
- This particular type of pipe, cast iron pipe (from WWII era), has failed with greater frequency than other parts of system.
- Pipe failures of this magnitude have serious consequences such as:
  - Disruption of service including special facilities such as hospitals and schools
  - Disruption to traffic on major roadway through the city
  - Adverse impact on water quality, and during a major event a "Boil Water Advisory" may be warranted in the downtown-regulated system
  - Loss of public confidence and trust in a safe water supply

Sample Project
Business Case Summary Outcome
Water Main Rehabilitation

The water main rehabilitation project received the highest score based on probability and consequence of failure and also had a positive NPV

The second high priority project was a sewer R&R project to reduce SSOs and allow for future growth



Projects Were Scored and Weighted Based on Consequence of Failure….

Consequence Category	Weight
Environmental Impact	**25%**
Public and Employee Safety	**25%**
Public Image	**11%**
Service Level/Reliability	**19%**
Financial Impact	**20%**

Scoring Criteria Example – Environmental

1 - Insignificant	Negligible impact (<$2,000). Damage reversible within one week
2 - Minor	Material damage of local community importance ($2,000 – 20,000). Prosecution possible. Damage fully reversible within three months
3 - Severe	Serious damage of local community importance ($20,000 – $100,000). Prosecution probable. Damage fully reversible within one year.
4 - Major	Serious damage of regional or national importance ($100,000 - $1M). Prosecution expected. Environmental impact reversible within 10 years.
5 - Catastrophic	Serious damage of regional or national importance (>$1M). Prosecution assured. Environmental impact not reversible.

And Probability of Failure Based on Physical and Process Condition

1 - Excellent	Fully operable, well maintained, and consistent with current standards. Little wear shown and no further action required.
2 – Good	Sound and well maintained but may be showing slight signs of early wear. Delivering full efficiency with little or no performance deterioration. Only minor renewal or rehabilitation may be needed in the future.
3 - Moderate	Functionally sound and acceptable and showing normal signs of wear. May have minor failures or diminished efficiency and with some performance deterioration or increase in maintenance cost. Moderate renewal or rehabilitation needed.
4 - Poor	Functions but requires a high level of maintenance to remain operational. Shows abnormal wear and is likely to cause significant performance deterioration in the near term. Near term scheduled replacement or rehabilitation needed.
5 – Very Poor	Effective life exceeded and/or excessive maintenance cost incurred. A high risk of breakdown or imminent failure with serious impact on performance. No additional life expectancy with immediate replacement or rehabilitation needed.

Proposed Service Levels Were Also Developed to Help Prioritize Projects

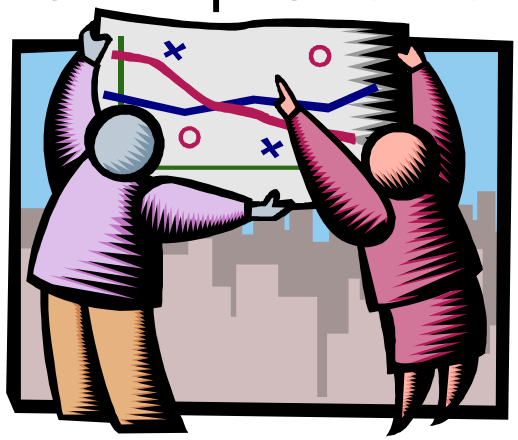
	Description	Area/Type	Vote Totals
1	Number of NPDES Permit Discharge / Compliance Failures	Customer and Regulatory	21
2	Total Water Quality Incidents/Failures of SDWA Compliance	Customer and Regulatory	19
3	Worst Served Customers (System areas with highest number of breaks, pressure complaints, and/or water quality complaints)	Customer and Regulatory	18
4	Extend water/wastewater infrastructure to unserved areas (strategic plan element)	Customer and Regulatory	16
5	Reduce the total number of SSO's by 5% from the previous year	Customer and Regulatory	15
6	Inadequate Water Pressure Events (Customer Water Pressure < 30-40 PSI)	Customer and Regulatory	14
7	Total Percent of Non-Revenue (Unaccounted for) Water (Distribution System Water Loss)	Customer and Regulatory	14
8	Average Total Response and Restoration Time (minutes) for Emergency Events (i.e. blockages, collapses, spills) – Dispatch, Journey, Repair	Customer and Regulatory	14
9	Total Water Quality Complaints (Discoloration, Taste/Odor, Request Analysis, Air in Lines, Other)	Customer and Regulatory	13
10	Distribution System Integrity – Breaks and Leaks per 100 Miles (QualServe #15)	Customer and Regulatory	12

Lessons Learned

- Cross functional CIP working groups were a great process catalyst and improved collaboration between departments
- Ongoing training and focus is required to ensure that the process remains in place
- Projects that score high tend to address immediate needs, have a measurable impact on service levels, and are easy to justify with stakeholders
- Business case development helps to identify what data is really important, but is also a time and resource consuming process

Benefits Gained

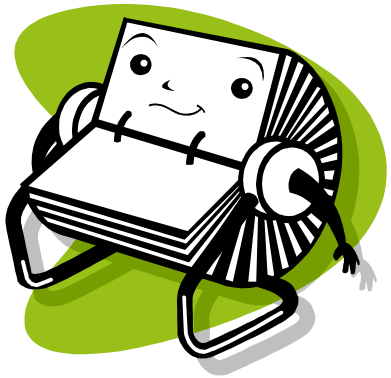
- Improved use of cross function teams within the company
- Enhanced tools (e.g., business case analysis, ROI) for managers to use and apply
- Improved alignment the Capital Improvement Plan to the Strategic Plan



Planned "Next Steps"

- Refine the process and scoring procedures to utilize for "new growth" projects
  - Criteria will change (i.e. new growth driven by ROI, alignment with strategic plan, etc.)
- Implement across a wider portfolio of projects utility-wide with next iteration of the CIP
- Develop a public / stakeholder support program to communicate value and benefit and strengthen support for required capital investments

Contact Information



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