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Asset Management: How to Get Started!

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GHD





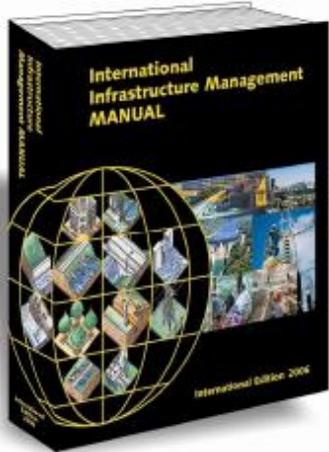
Agenda

- ▶ AM Intro/Background
- ▶ How to Start an Asset Management Program For Your Utility
 - What Is the State of Your Physical Assets?
 - How are Levels of Service created?
 - How Will Assets be Managed?
 - How is Business Risk Determined?
 - How is the AMP Used in the Day-To-Day?
 - How and When will the AMP Be Improved/Updated?
- ▶ Questions

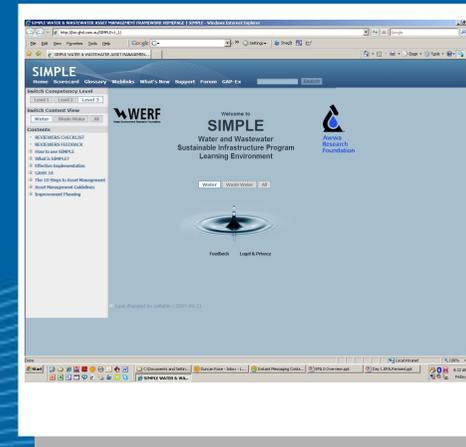


Who is GHD?

- Australian-based international company with 100 offices worldwide
- 6000+ management consultants, engineers, scientists, planners, architects
- Literally, “wrote the book” on Best Practices
- Hundreds of engagements over two decades



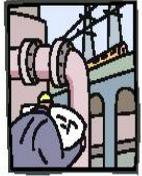
World's Best Practices



Asset Management Practitioners Workshop
A workshop for senior water & wastewater utility managers

Total Asset Management:
The Australian/
New Zealand Experience

Western Workshop
October 23rd and 24th, 2002
Golden Gate Park
Hall of Flowers
(Arboretum)



USEPA
OFFICE OF
WASTEWATER
MANAGEMENT

PARSONS
ASSET MANAGEMENT
CENTER (PAMC)



GHD Asset and Facilities Management

- ▶ GHD has been consulting in Asset Management for 25 years
- ▶ GHD are considered one of the leading Asset Management consultants in the world
- ▶ GHD's Roger Byrne is an original principal author of the "International Infrastructure Management Manual"
 - Considered the 'must have' guide to AM
- ▶ GHD has over 50 manuals that cover the full range of Asset Management areas
- ▶ GHD have been chosen by the US EPA to conduct AM training workshops across the USA
- ▶ WERF / AwwaRF commissioned GHD to create 'SIMPLE' – a web-based tool that enables the user to learn step-by-step on how to sustainably implement AM techniques





How AM got started

- ▶ The Australia / New Zealand beginnings
- ▶ IIMM
- ▶ PAS55
- ▶ PSAB 3150
- ▶ GASB 34



Infrastructure is the foundation to sustained quality of life





Consequences of asset failure can be severe





Changing utility business environment

- ▶ Demand to do more with existing resources
- ▶ Need to make every dollar work – to better use capital and operating budgets
- ▶ Move from *reactive* to *proactive* work environment



A paradigm shift...

- ▶ Transition from *building and operating* to *managing* assets
 - Extending asset life
 - Optimizing maintenance and renewal
 - Developing accurate long-term funding strategies
 - *Sustain long term performance!*



GHD's Approach to Asset Management

- ▶ Mentoring and Guidance of Staff
- ▶ Step-by-Step Implementation Practices
- ▶ Knowledge Transfer
- ▶ Incorporating Change Management Practices
- ▶ Leverage Existing Organizational Knowledge
- ▶ Pilot Projects



The Definition of Advanced AM

Advanced Asset Management (“AAM”) is

- ▶ a **management paradigm** and a **body of management practices**
- ▶ that is applied to the **entire portfolio** of infrastructure assets at all levels of the organization
- ▶ that seeks to **minimize the total cost** of acquiring, operating, maintaining and renewing the assets
- ▶ within an environment of **limited resources**
- ▶ while **continuously delivering the service levels** customers desire and regulators require
- ▶ at an **acceptable level of business risk** to the organization
- ▶ In a **cultural environment** that encourages maximum development and satisfaction of our human assets.



Why Start an Asset Management Program?

► Benefits of AMP:

- Identify assets where rehabilitation or replacement will be cost effective.
- Understand and manage critical assets.
- Focus maintenance efforts using risk.
- Optimize its maintenance and capital needs to reduce the life cycle cost of ownership.
- Understand the long-term future renewal, rehabilitation and replacement expenditure requirements of the organization and assist in the development of plans to mitigate the various expenditure peaks.

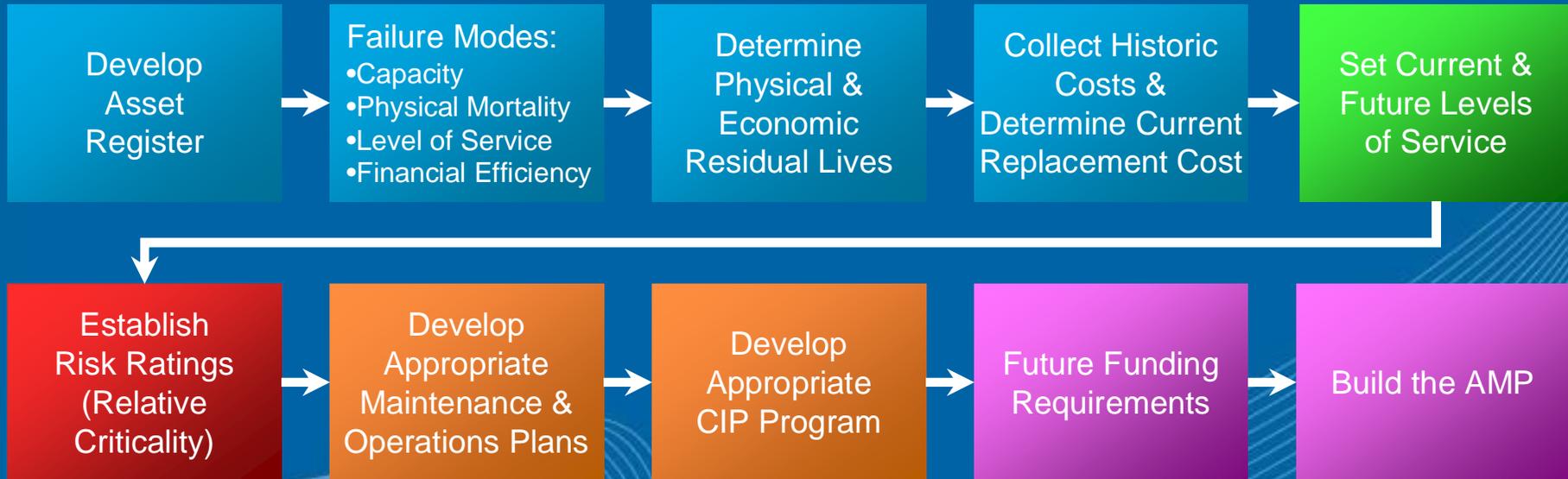


Creating an Asset Management Plan



Investment Decision Making Process

- Current State of our Assets?
- Required Sustained Level Of Service?
- Which Assets are Critical to Sustained Performance?
- Management Strategies for the Assets
- Best Long-Term funding strategy





How to Get Started?

- ▶ Using your available data, whether on paper or spreadsheet or database you can develop an asset management plan (AMP)
- ▶ When starting, just focus on a small asset group as a pilot project.
- ▶ The AMP will need to eventually include incorporate existing and projected operational efforts and capital projects, prioritized based on condition, level of service, and risk.



Step 1 -Develop Asset Register

- ▶ Need to establish an asset hierarchy, a definition of the maintenance managed item (MMI) and the data attributes required to support the asset management decision-making process.
- ▶ Develop an asset register for a pilot asset group, consolidating all inventories available. The asset register will contain an asset hierarchy and asset attributes, defined by a data framework specifying data attributes required to support asset management decisions.
- ▶ Confirm asset data gaps based on the agreed asset hierarchy structure by reviewing existing asset information held in asset registers. Gaps of missing or incomplete data can then be identified.



Develop Asset Register

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Step 01 Step 2 Step 3 Step 4 Step 5 Step 6 Step 7 Step 8 Step 9 Step 10

Develop Asset Register for Sewer Pumping Stations

Asset ID: i

Asset Name: Sewer Pumping Stations

Install Date (YYYY-MM-DD): i [Calendar](#)

Material:

Total Number/Linear Footage:

Manufacturer:

Parent Asset: Water

Business Unit/Functional Organization:

Funding Source:

Asset Location:

Map/Page/Grid:

Asset Type:

Status:

Probability of Failure:	Undefined	Capacity Residual Life:	Undefined
Consequence of Failure:	Undefined	Level of Service Residual Life:	Undefined
Raw Risk Score:	Undefined	Physical Mortality Residual Life:	Undefined
Mitigation Factor:	0	Financial Efficiency Residual Life:	Undefined
BRE:		Imminent Failure Mode:	Undefined

Left Panel:

- WHISKEY BOTTOM
 - 12" Valve
- Pressure Regulating Valve
 - College Ave.
- GORMAN RD
 - 12" Valve
 - Hollifield
- Hunt Club Rd.
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- Shared Septic Systems
- TEST
- Water Master Meters



Step 2 - Establish Condition

- ▶ Estimate install date, rehabilitation dates, remaining useful life, and projected replacement dates for major equipment, if data is not already available.
- ▶ Review the existing asset condition assessment protocols and make recommendations for improvement.
- ▶ Finalize the condition assessments for the pilot asset group. Condition ratings for all assets can be loaded into TeamPlan2TM.



Condition Assessment

- ▶ *You can't judge a book by its cover.*



- ▶ *It's what's on the inside that counts.*



Condition Assessment

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Assess Performance & Failure Modes* for Sewer Pumping Stations

Condition Rating:

Capacity Rating:

Performance Rating:

Reliability Rating:

Financial Efficiency Rating:

Comments:

* Note: Failure Modes will be determined in Step 06

[Save Changes](#)

Probability of Failure:	Undefined	Capacity Residual Life:	Undefined
Consequence of Failure:	Undefined	Level of Service Residual Life:	Undefined
Raw Risk Score:	Undefined	Physical Mortality Residual Life:	Undefined
Mitigation Factor:	0	Financial Efficiency Residual Life:	Undefined
BRE:		Imminent Failure Mode:	Undefined



Step 3 - Residual Life Estimates

- ▶ Need to estimate the residual life for all assets. The residual life estimates will be based on identifying the four failure modes and selecting the imminent failure mode.
- ▶ If good data is not available, the residual life will default to the remaining original design life using the original installation date.



How Much Residual Life is Left?



Name the Movie:

Planes, Trains and Automobiles (a Hughes Entertainment Production)

Name the Year:

1987



Residual Life Estimates

Step 01 Step 02 **Step 03** Step 04 Step 05 Step 06 Step 07 Step 08 Step 09 Step 10

Determine Residual Life for Parks and Recreation

Maximum Potential Life: **i i**

Effective Economic Life: **i i**

Capacity Residual

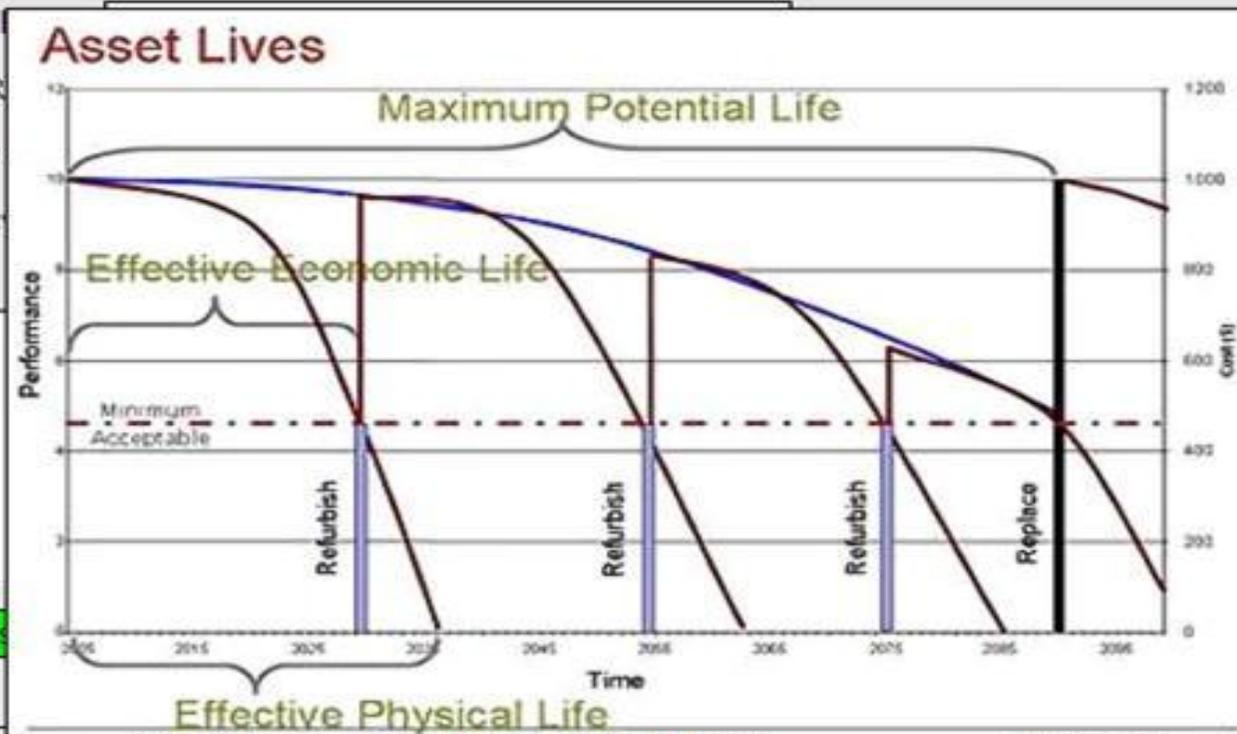
Level of Service R

Physical Mortality

Financial Efficiency

Comments:

Save Changes



Probability of Failure:	Undefined	Capacity Residual Life:	Undefined
Consequence of Failure:	Undefined	Level of Service Residual Life:	Undefined
Mitigation Factor:	Undefined	Physical Mortality Residual Life:	Undefined
RPF:	Undefined	Financial Efficiency Residual Life:	Undefined

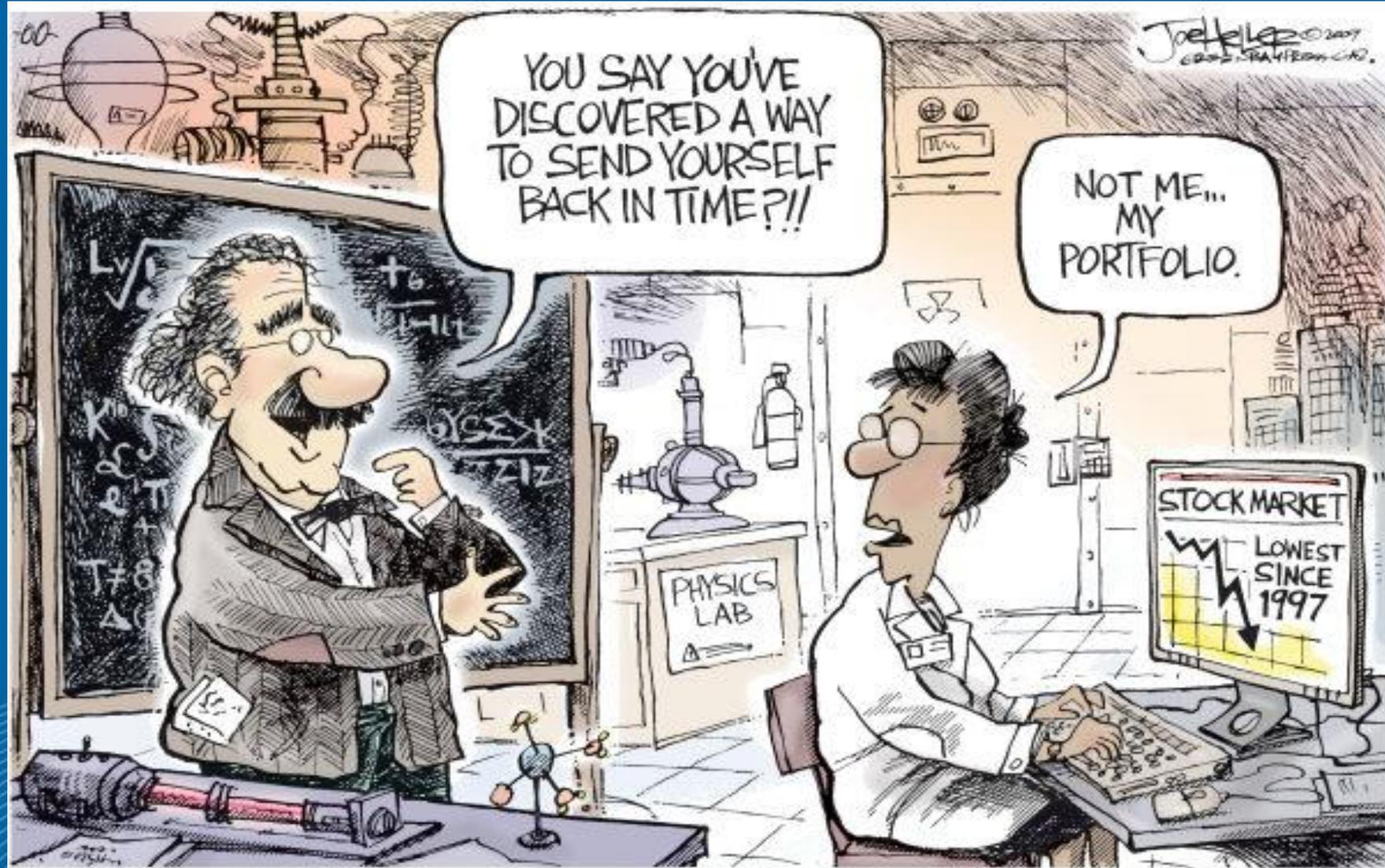


Step 4 - Replacement Cost Valuation

- ▶ Develop protocols for estimating replacement costs for all asset types.
- ▶ Enables valuing assets based on current replacement cost (rather than a historical cost) basis.
- ▶ Protocols will identify both top down and bottom up approaches to determining replacement costs.



Step 4 - Replacement Cost Valuation





Step 4 - Replacement Cost Valuation

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Step 01 Step 02 Step 03 **Step 04** Step 05 Step 06 Step 07 Step 08 Step 09 Step 10

Determine Life Cycle & Replacement Costs for Sewer Pumping Stations

Historical Cost:

Lump Sum Replacement Cost:

Unit Price:

Total Unit Cost:

Total Replacement Cost: i

Rehab Cost Fraction: i

Maximum Number of Rehabs: i

Number of Rehabs to Date: i

Date of Last Renewal (YYYY-MM-DD): i [Calendar](#)

Comments:

Probability of Failure:	Undefined	Capacity Residual Life:	Undefined
Consequence of Failure:	Undefined	Level of Service Residual Life:	Undefined
Raw Risk Score:	Undefined	Physical Mortality Residual Life:	Undefined
Mitigation Factor:	0	Financial Efficiency Residual Life:	Undefined
BRE:		Imminent Failure Mode:	Undefined

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Step 5- Review of Levels of Service (LOS)

- ▶ Develop current and future LOS criteria for the assets
- ▶ LOS statements typically include measurable service levels, such as number of odor complaints or overflows per year.



Levels of Service (LOS)

Community Outcome	Core Value	Activity Strategic Outcomes	Customer Levels of Service (CLOS)		Technical Levels of Service (TLOS)	
			Current Target (2008)	Proposed Target (2012)	Current Target (2008)	Proposed Target (2012)
Environmental						
Water sources are protected.	Water Quality	Protect water quality	Meet DOH requirements, and coordinate with local land use councils.	As per current	Well head program - time of travel zones are inspected biannually by staff looking for potential sources of contamination	As per current
The drinking water is safe.	Water Quality	Water quality is safe for drinking	75% of customers believe the drinking water is safe to drink 70% of customers believe the drinking water has a good taste	80% of customers believe the drinking water is safe to drink 75% of customers believe the drinking water has a good taste	Comply with 100% of DOH WAC 246.290 monitoring requirements. Maintain fluoride concentration between 0.8 – 1.3 mg/L in distribution system. Maintain pH concentration between 7.6 and 8.3 in distribution system.	As per current As per current As per current



Step 5 - Levels of Service (LOS)

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Set Target Levels of Service (LOS) for Sewer Pumping Stations

Design Capacity:

Actual Performance:

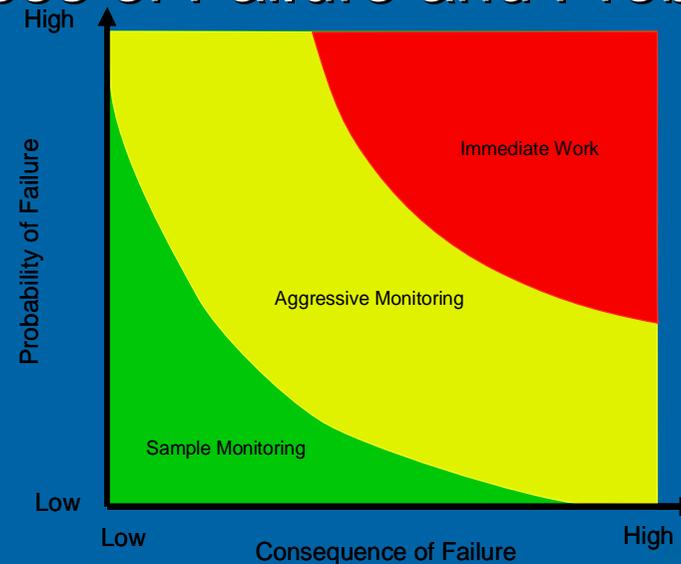
Issues:

Probability of Failure:	Undefined	Capacity Residual Life:	Undefined
Consequence of Failure:	Undefined	Level of Service Residual Life:	Undefined
Raw Risk Score:	Undefined	Physical Mortality Residual Life:	Undefined
Mitigation Factor:	0	Financial Efficiency Residual Life:	Undefined
BRE:		Imminent Failure Mode:	Undefined



Step 6 - Evaluate Business Risk Exposure (BRE)

- ▶ Dust off Hazard Mitigation Plans!
- ▶ Review Consequences of Failure and Probability of Failure metrics.



- ▶ Develop BRE scores for all assets within a pilot asset group.
- ▶ BRE scores will serve as the basis for subsequent asset inspection prioritization and will be used for the renewal cost forecasting.



Business Risk Exposure (BRE) - Criticality

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Determine Business Risk ("Criticality") for Sewer Pumping Stations

Probability of Failure:

Consequences of Failure

Social: (Current Weight: 0.334)

Economic: (Current Weight: 0.333)

Environmental: (Current Weight: 0.333)

Business Risk Mitigation Factors (Asset Resiliency)

Asset Redundancy:

Containment:

Failure Response:

Facility Bypass:

Monitoring:

Comments:

Probability of Failure:	Undefined	Capacity Residual Life:	Undefined
Consequence of Failure:	Undefined	Level of Service Residual Life:	Undefined
Raw Risk Score:	Undefined	Physical Mortality Residual Life:	Undefined
Mitigation Factor:	0	Financial Efficiency Residual Life:	Undefined
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Step 7 - Management Strategies

- ▶ Need to review and document the current operation and maintenance practices. The information will then be used to make recommendations for updating current business processes to optimize asset management decisions.
- ▶ Standards can then be developed for:
 - Evaluating maintenance requirements, and tracking maintenance costs by individual asset
 - Recording time, materials, and plant costs associated with maintaining individual assets
 - Assigning maintenance costs to an individual asset
 - Developing and implementing consistent failure codes assigned to an asset every time a reactive maintenance visit is made



Example Management Strategies

▶ Example Management Strategies:

– Pipe

- PVC/HDPE/DI – 100 years
- AC – 70 years
 - Small Diameter AC – 60 years
- CI – 80 years
 - Small Diameter CI – 70 years
- Note: No effective rehab for pressurized water mains.

– Hydrants

- Pre-1970 Hydrants not efficient to operate/rehab, so MS is 35 years of useful life.
- Post -1970: Rehab every 10 years. Max Life = 50 years

– Meters

- Large Meters (>1") – Minor PM every 2 years, Major PM every 20 years. Max Life = 60 years
- Small Meters (1" and smaller) – 15 years, then toss.



Management Strategies

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Forecast Operations, Maintenance, and Administrative Costs for Sewer Pumping Stations

Estimated Annual Current Operations Cost: (\$)

Projected Annual Operations Cost Trend: (%)

Estimated Annual Current Maintenance Cost: (\$)

Projected Annual Maintenance Cost Trend: (%)

Comments (O&M):

Estimated Annual Current Administration Cost: (\$)

Projected Annual Administration Cost Trend: (%)

Comments (Administration):

Probability of Failure:	Undefined	Capacity Residual Life:	Undefined
Consequence of Failure:	Undefined	Level of Service Residual Life:	Undefined
Raw Risk Score:	Undefined	Physical Mortality Residual Life:	Undefined
Mitigation Factor:	0	Financial Efficiency Residual Life:	Undefined
BRE:		Imminent Failure Mode:	Undefined



Step 8 - Identification of CIP projects

- ▶ Need to recommend, prioritize and estimate costs for capital improvements of assets in the pilot asset group to provide any required asset life extensions.
- ▶ Then develop procedures where business cases are to be prepared for the CIP projects.
- ▶ The business cases require a Jurisdiction's staff to have an understanding of;
 - Current and future demands
 - Operational and maintenance requirements of the asset
 - Asset condition, imminent failure mode, and estimated residual life
 - Business risk exposure
 - Renewal cost and
 - Life cycle costs



Identification of CIP projects

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Determine Capital Investment for Sewer Pumping Stations

[Add Event](#) | [Remove Event](#)

Capacity:	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	0	0	0	0	0	0	0	0	0	0	0
Level of Service:	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	0	0	0	0	0	0	0	0	0	0	0
Mortality:	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	0	0	0	0	0	0	0	0	0	0	0
Renewal (Calculated):	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Financial Efficiency:	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	0	0	0	0	0	0	0	0	0	0	0

Probability of Failure:	Undefined	Capacity Residual Life:	Undefined
Consequence of Failure:	Undefined	Level of Service Residual Life:	Undefined
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Mitigation Factor:	0	Financial Efficiency Residual Life:	Undefined
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Step 9 - Life Cycle Cost Projections

- ▶ Determine the lowest life cycle cost for assets in the pilot asset group, based on the best time for renewal or replacement of assets.
 - A 100-year time period can be used for modeling to support replacement of all assets in the pilot asset group at least once during the planning period.
- ▶ Current valuation tables and graphs (not historic values) will be used to understand the current state of the assets.
 - These graphs provide details on the replacement, depreciated values, and asset counts detailed by key systems and major asset classes.
- ▶ Graphs are based on the current replacement cost, estimated book value, and the maximum potential life of assets and asset classifications.
 - The graphs present the District's future investment estimate. The graphs build the total predicted cash flow by summing the following:
 - Estimated rehabilitation and replacement cost
 - Cost estimates for new levels of service and growth
 - Operations and maintenance costs



Life Cycle Cost Projections

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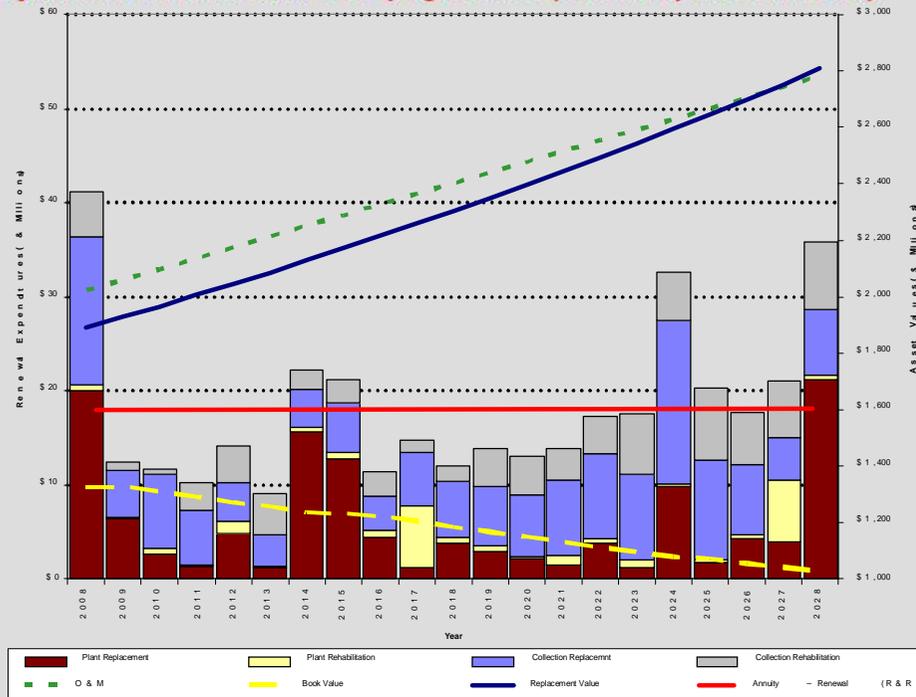
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Step 01 Step 02 Step 03 Step 04 Step 05 Step 06 Step 07 Step 08 Step 09 Step 10

Projection of Costs for Sewer Pumping Stations (Future Expenditure Curve)



Probability of Failure:	Undefined	Capacity Residual Life:	Undefined
Consequence of Failure:	Undefined	Level of Service Residual Life:	Undefined
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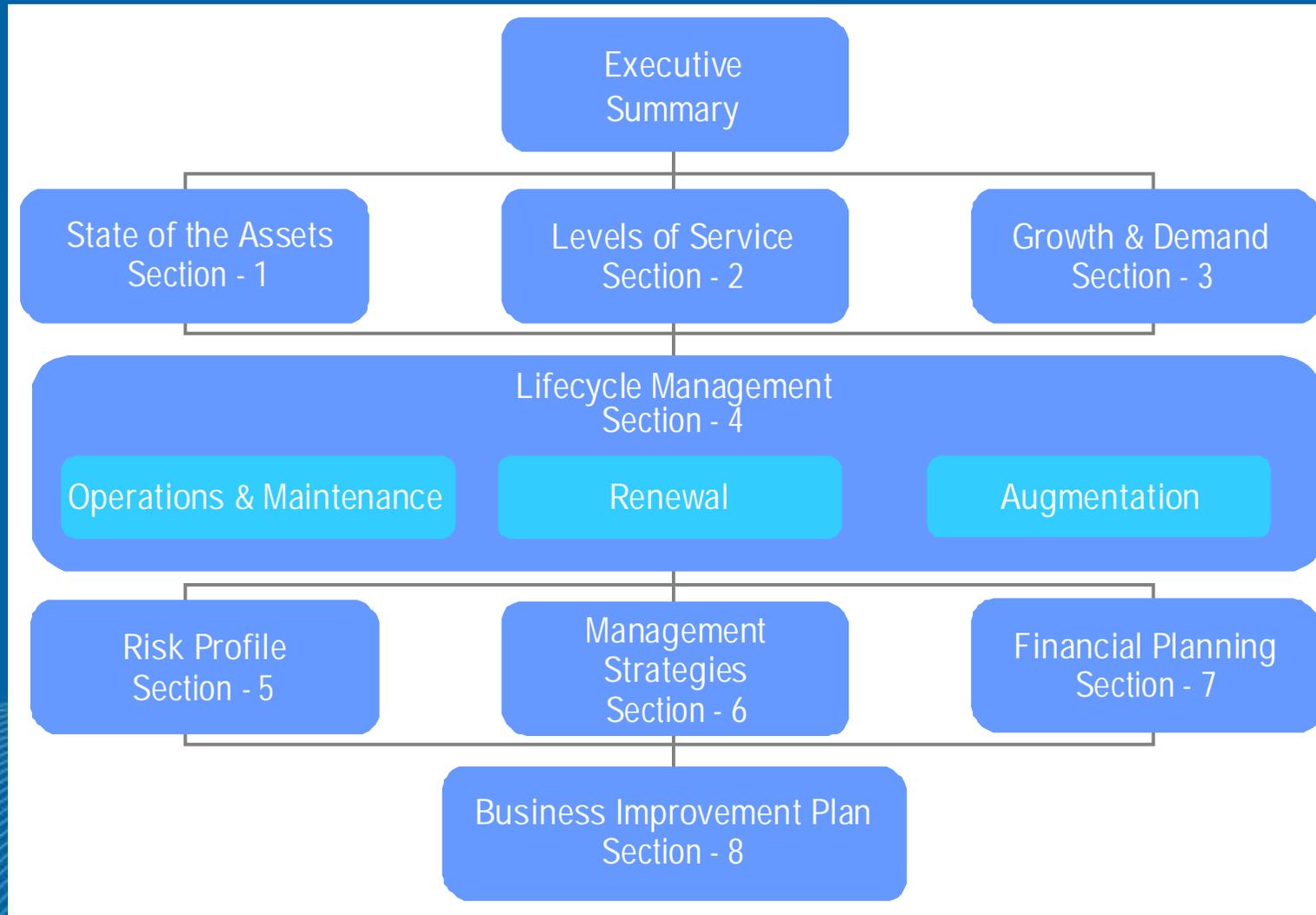
Last Step! - Asset Management Plan (AMP)

- ▶ Develop a detailed outline of the asset management plan (AMP) for the pilot asset group.
 - The asset management plan will be based on the current level of knowledge and information held by staff and information collected from the assessment process.

- ▶ A sample outline for an AMP is as follows:



Asset Management Plan (AMP)





Use of Asset Management Plan

- ▶ Sell and Tell Your System's Story!
- ▶ Determine Lowest Life-Cycle Cost to Operate Your System at the Lowest Acceptable Risk.....
- ▶ While Meeting the Needs of Your:
 1. Customers
 2. Regulators
 3. Electeds
 4. Management
 5. Staff



Getting AM Program Started

Questions?