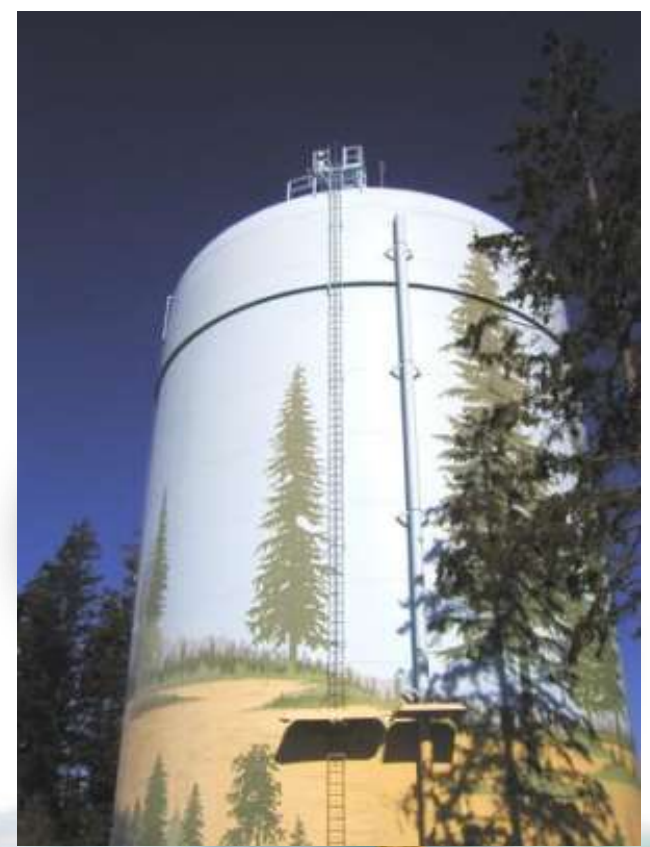




Asset Management at Sammamish Plateau Water and Sewer District

April 29, 2015



Asset Management – Imagine the Future

Reactive?

Or Proactive?



Asset Management – 2012 documentary

America's infrastructure is crumbling with potentially deadly consequences. CNBC reveals how our nation's bridges, roads and pipelines are in desperate need of repair and searches for solutions to the crisis.

THE RACE TO
REBUILD:
AMERICA'S INFRASTRUCTURE

“Infrastructure is not sexy, but it is important”



~ John Oliver “Last Week Tonight” March 2, 2015

INFRASTRUCTURE

IF ANYTHING EXCITING HAPPENS
WE’VE DONE IT WRONG

Presentation Overview



- District Overview
- Leadership Support
- Asset Management Definition
- In-house Asset Management
- EPA Asset Management Framework
- SPWSD and the EPA Framework
- Final Conclusions

Presentation Pointers

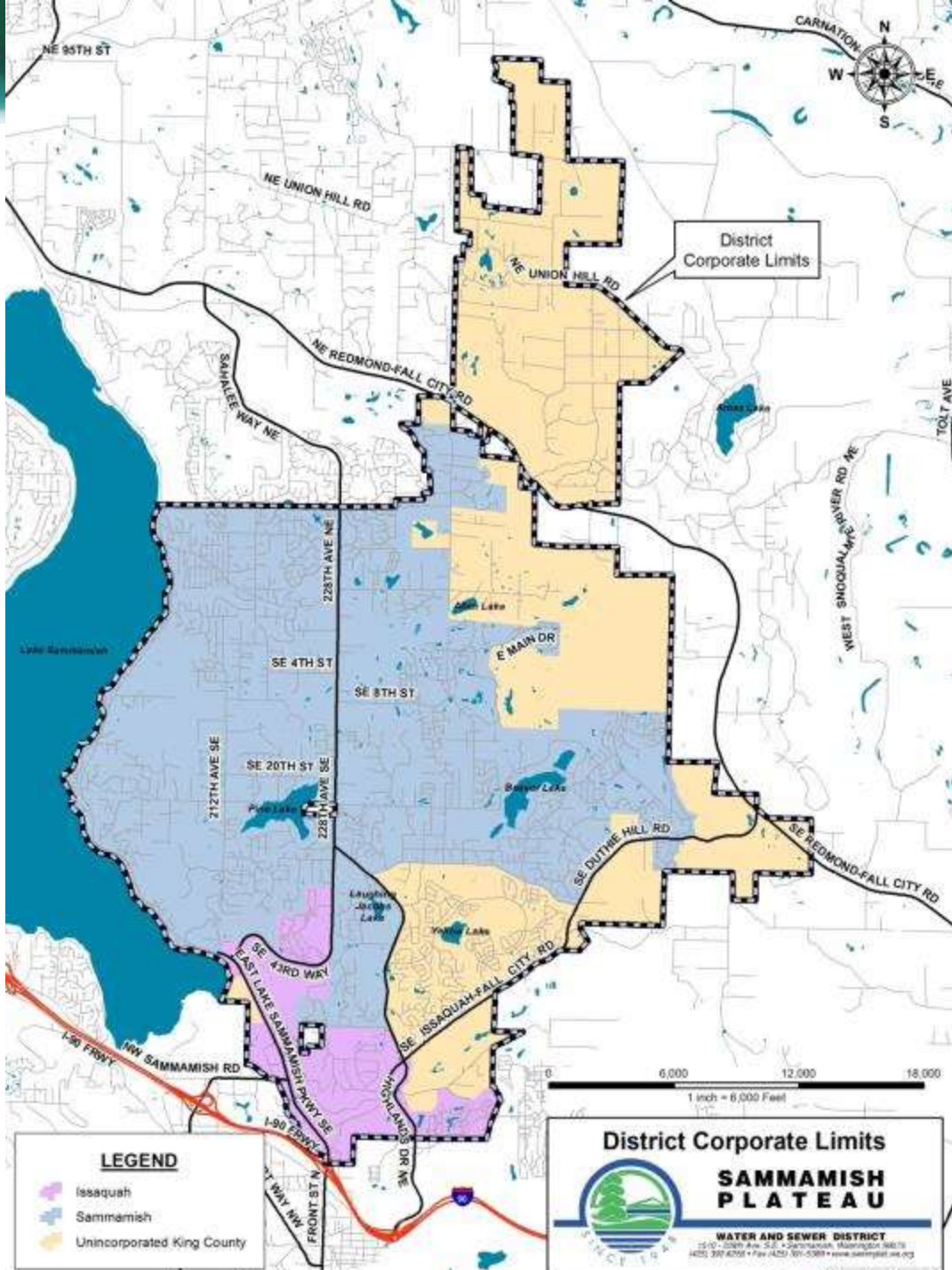


- Our Format
 - Definition and Purpose of EPA framework step
 - District How To
 - Lessons Learned
- Questions?
 - Write them down, we'll answer at the end
- Make it Yours

Mission Statement

Sammamish Plateau Water and Sewer District will provide **safe, efficient, and reliable** water and sewer services by being a leader in the planning and the practice of **fiscal and environmental stewardship.**





- Serves portions of the cities of Sammamish and Issaquah and parts of unincorporated King County
- Covers 29 square miles
- 51 Employees

The Water System – by the Numbers

- **12** groundwater wells
- **8** storage tanks
- **291** miles of water mains
- **17,000+** water connections
- **54,000** population
- **2** connections to regional water
- **1.8 billion** gallons pumped in 2014
- **45,000+** total water assets
- **\$577 million** est. replacement value



The Sewer System – by the Numbers

- **20** lift stations
- **176** miles of sewer mains
- **17,500** total sewer assets
- **11,000+** sewer connections
- **37,000** population
 - Septic
 - Another District
- **\$293 million** est. replacement value



Asset Management: Introduction



Asset Management Definition – per EPA

- Set of Best Practices for sustainable infrastructure
 - Desired level of service from your assets
 - Lowest life-cycle cost
 - Optimum approach rehab, repair or replacement



Leadership Support



- Leverages your Asset Management efforts
 - Asset management takes time and resources
 - Challenged to succeed without support

Asset Management Institutional Development

- Involve the whole organization
 - Developed Plan in-house
 - Used consultants to validate
 - More than a document
 - Develop business processes
 - Involve everyone!



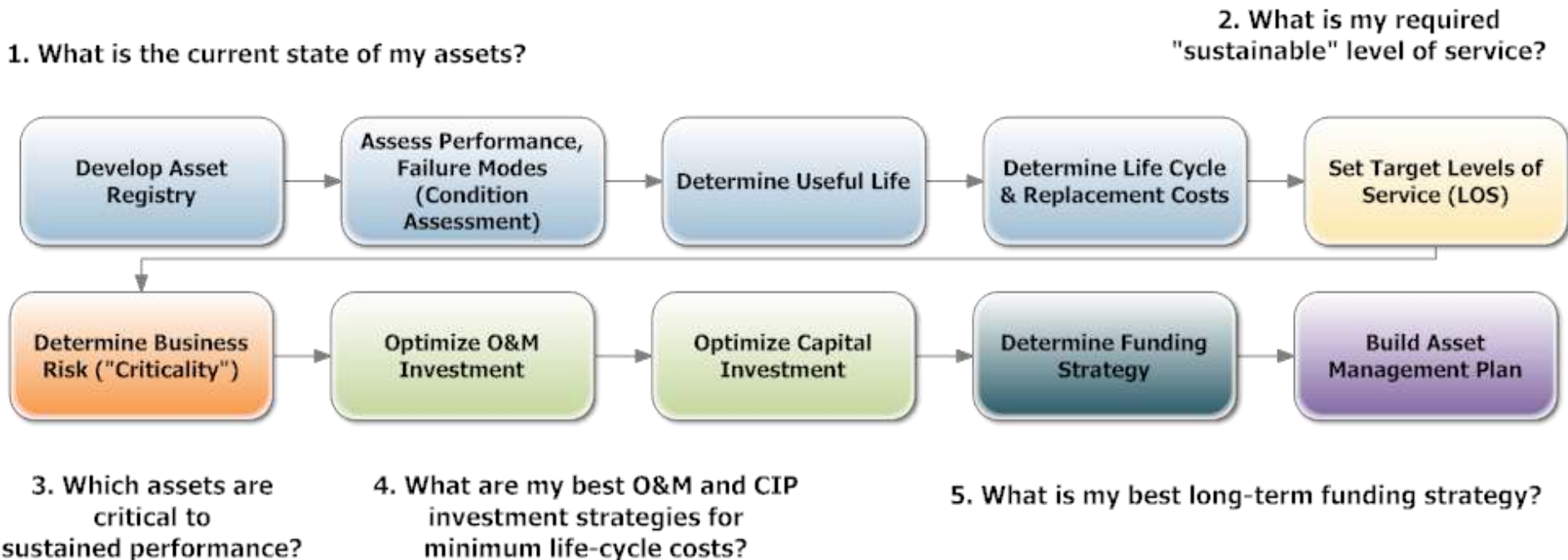
Asset Management Institutional Development

- Use an interdisciplinary team
 - Engineering, Operations, Finance and Administration
 - Provides shared ownership and removes silos



- Develop Asset Management steps in parallel
 - Each step of the framework has value
 - Combined, enhances overall awareness & management

Environmental Protection Agency (EPA) Asset Management Framework

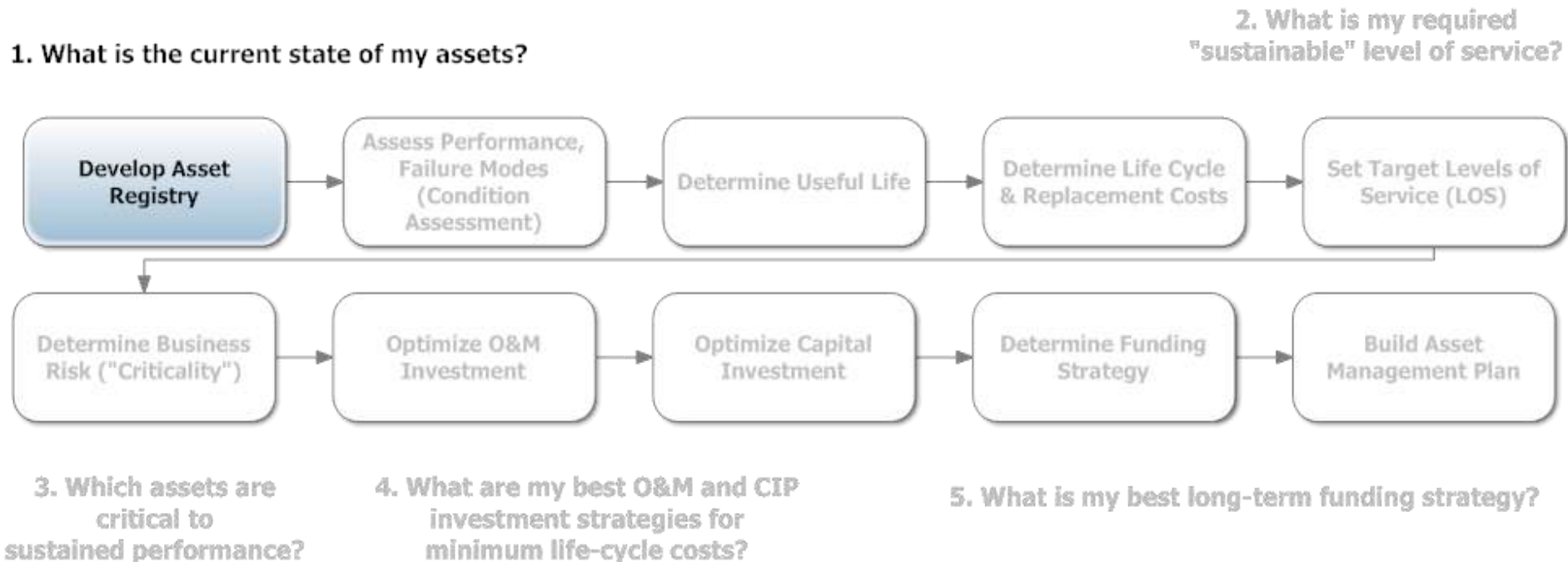




1 of 5 Core Questions

- What is the Current State of My Assets?
 - Develop Asset Registry
 - Assess Performance, Failure Modes (Condition Assessment)
 - Determine Useful Life
 - Determine Life Cycle & Replacement Costs

Asset Management 10-step process



Asset Registry: Definition and Purpose

EPA Definition

- Systematic recording of all assets an organization owns or for which it has responsibility
- Uses asset identification numbers to which attribute information can be linked

Purpose

- Provide database with assets owned, locations, condition, performance, remaining useful life and remaining value

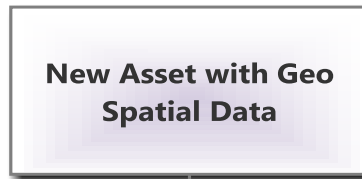
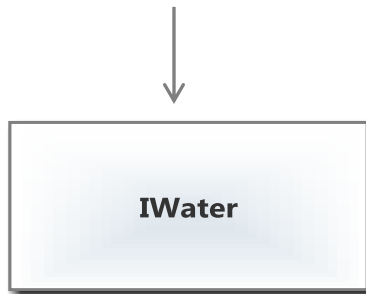
Building the Asset Registry

- The District was strategically positioned to implement asset management due to previous information technology investments:
 - Geographical Information System (GIS),
 - Computerized Maintenance Management System (CMMS), the program the District uses is called Maintenance Connection (MC),
 - Mobile applications



System Relationships

IWater is a mobile application used to perform paperless maintenance, inspections and condition monitoring of water and sewer assets



When a new asset is acquired that has a geographical location it is entered into GIS.

GIS assigns the new asset a unique identifier, provides its spatial relationship to other assets and exports the data to CMMS.

CMMS is a database of the District's assets. This system is used for tracking operations and maintenance, operational costs of assets and is the District's asset registry.

Users of the Asset Registry

Operations

Data Collection
Maintenance Management
General Operations

GIS

Database Management
Schema Design - Data Normalization

Engineering

CIP Planning
System Build Out
Development Management
Data Collection

Finance

Rate Setting
Revenue Forecasting
Budgeting
Preparation of Financial Statements

Conclusion: Effective implementation of asset management requires a master registry of all assets, which meets the needs of different departments. Eliminates need for multiple databases and integrates data requirements.

Initial Asset Management Plan Categories:

The asset management plan comprises assets in the following categories:

Water

- Mains
- Wells
- Booster Pumps
- Reservoirs

Sewer

- Mains
- Lift Stations

- Initial categories selected based on replacement values (biggest bang for the buck).
- Further development will include detailed asset categories.

Setting up the Asset Management Registry

- Select system: Maintenance Connection
- Start with the end in mind: Research and determine asset management plan data categories based on needs
- Involve all Departments for common understanding of definitions, roles and responsibilities and use of asset management fields
- Develop location for asset management fields



A Look at the New Asset Registry Fields

Water Main 05835 (WM005835) PK: 47379

[Details](#)
[GIS](#)
[Related Info](#)
[PMs](#)
[Attach](#)
[History](#)

[Specifications](#)
[Materials](#)
[Labor / Contacts](#)
[Contracts](#)
[Occupants](#)

Specifications

<input checked="" type="checkbox"/>	Name	Text Value
<input type="checkbox"/>	Uncategorized	
<input type="checkbox"/>	Asset Management	
<input type="checkbox"/>	A-YearsInService	14
<input type="checkbox"/>	B-UsefulLife	100
<input type="checkbox"/>	C-RemainingLife	86
<input type="checkbox"/>	D-PercentRemainingLife	90
<input type="checkbox"/>	E-ExpectedReplacementYear	2101
<input type="checkbox"/>	F-Criticality-AffectedServiceConnections	5
<input type="checkbox"/>	G-Criticality-IllnessInjury	1
<input type="checkbox"/>	H-Criticality-Deaths	1
<input type="checkbox"/>	I-Criticality-DurationOfLoss	5
<input type="checkbox"/>	J-Criticality-DistrictImage	1
<input type="checkbox"/>	K-Criticality-PrivateEconomicImpact	3
<input type="checkbox"/>	L-Criticality-FinancialImpact	1
<input type="checkbox"/>	M-Criticality-SpillFlood	5
<input type="checkbox"/>	N-Criticality-OdorTasteColor	3
<input type="checkbox"/>	O-Criticality-EnvironmentalCompliance	1
<input type="checkbox"/>	P-Rating-SCCR	2.7
<input type="checkbox"/>	Q-Rating-EFCR	1.0
<input type="checkbox"/>	R-Rating-Environmental	3.0
<input type="checkbox"/>	S-TotalCriticalityRating	2.2
<input type="checkbox"/>	T-Condition-RemainingLife	1
<input type="checkbox"/>	U_Condition_PhysicalInspection	

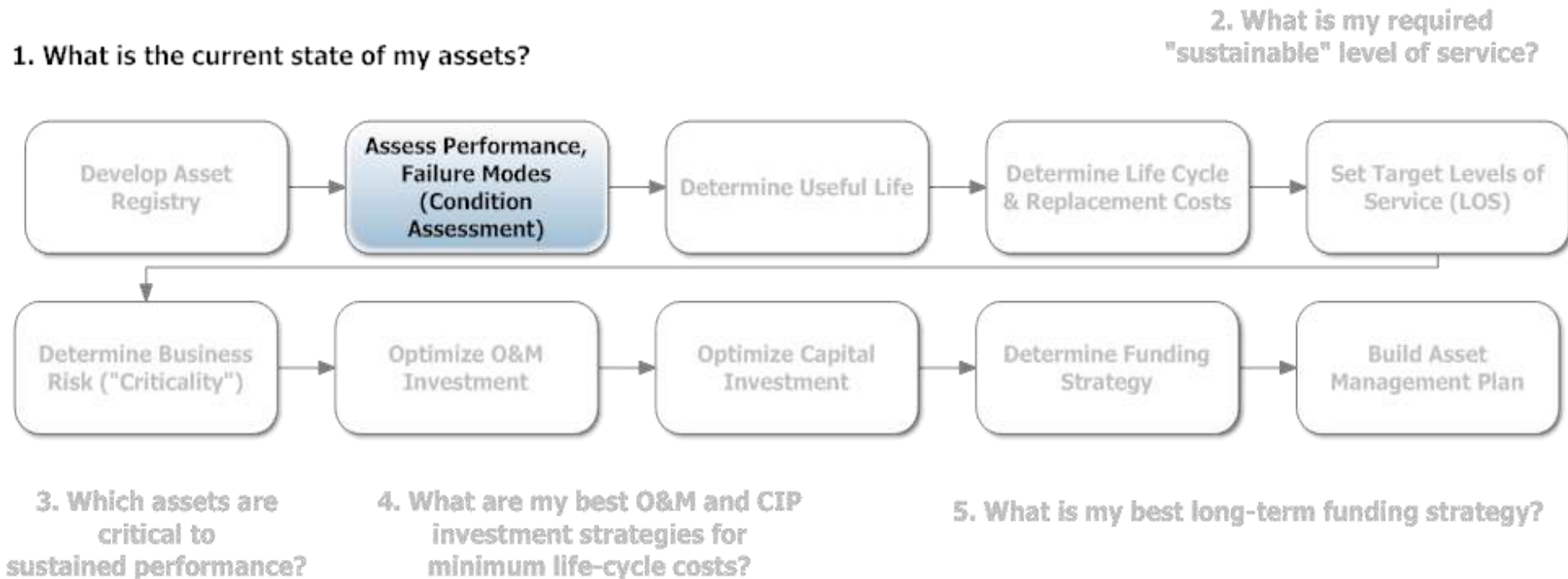
Asset Registry Uses

- Integrates and leverages GIS
- Provides asset information needed for replacement costs and rate modeling
- Helps analyze capital replacement projects
- Records history of condition when assets are observed
- Assists with fine-tuning operating and maintenance plans
- Optimizes operations expenditures to reduce the life-cycle costs of an asset

Lessons Learned

- **Asset Management Needs a Registry**
- **IT Involvement and Collaboration with Operations:** on the front end will help bridge compatibility issues and ensure systems are useable.
- **IT investment is key:** use flexible, robust systems to maintain asset information.
- **Good data:** garbage in = garbage out.
- **Focus on greatest return on investment:** Initial focus is major water and sewer assets comprising **98%** of the value of District assets.

Asset Management 10-step process



Condition Assessment: Definition and Purpose

Definition

- Condition assessment is the review and rating of an assets current state.
- Condition assessment is used to determine remaining useful life.

Purpose

- Provide insight to probability of an asset failing
- Provide timing for possible preventative maintenance, rehabilitation or replacement to maintain levels of service provided by the asset.



SPWSD 1st Step to Condition Rating

- Establish Rating Scale – started with EPA example and changed to fit District needs

Physical Condition Grade - Rating Guidelines		Remaining Life
0 Excellent	Asset is new or like new, fully operable, well maintained, and performs consistently at or above current standards. Little wear shown and no further action required.	100%
1 Good	Asset is sound and well maintained but may be showing some signs of wear. Delivering full efficiency with little or no performance deterioration. Virtually all maintenance is planned preventive in nature. At worst, only minor repair might be needed in the near term.	90%
3 Adequate	Asset is functionally sound, showing normal signs of wear relative to use and age. May have minor failures or diminished efficiency and some performance deterioration. Likely showing modest increased maintenance and/or operations costs. Minor refurbishment may be needed in the near term.	70%
5 Fair	Asset functions and requires some level of maintenance to remain operational. Shows some wear and may cause some performance deterioration in the near term, there would be some	50%
7 Poor	Asset functions but requires a sustained high level of maintenance to remain operational. Shows substantial wear and is likely to cause significant performance deterioration in the near term. Near term scheduled rehabilitation or replacement needed. Maintenance costs would be high relative to replacement.	30%
9 Very Poor/Bad	Very near end of physical life. Substantial on-going maintenance with short, recurrent maintenance intervals required to keep the asset operational. Unplanned corrective maintenance is common. Renewal (refurbishment or replacement) is expected in near term.	10%
10 Failing/Failed	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; immediate replacement or rehabilitation needed.	0%

How SPWSD Determines Condition Ratings

- Condition currently established in 2 ways –
 - **Desktop Review** using install date and assets projected useful life
 - **Physical Condition Assessment**
 - WATER
 - Hydrant surveys
 - Valve exercising
 - Leak detection
 - Watermain inspections reports (breaks, potholing, connections, etc.)
 - SEWER
 - Sewer manhole surveys
 - Lift station pump assessments
 - CCTV Inspection
 - I&I basin evaluation
- In the future: Implement emerging assessment technology

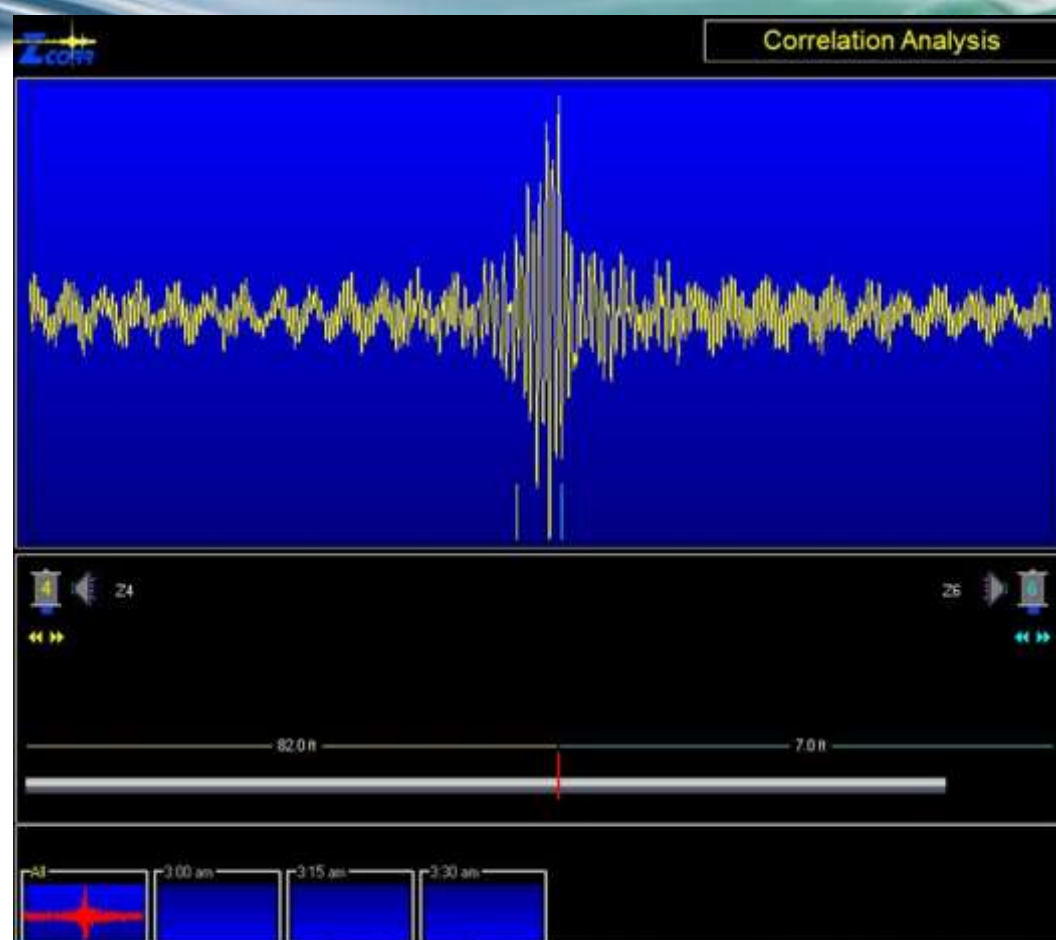
Water Main Leak Detection Program

- Leak detection is the process of using microphones to detect or hear the harmonics that are generated when a leak is present
- An indicator if there is an issue with a main
- Used as a data point for level of service and a potential trigger for further evaluation of mains, such as the need to pot hole to determine physical condition



Water Main Leak Detection Program Reports

- Reports generated by the program gives operators a visual image of what they are hearing
- With pipe diameter, material and length it can calculate the distance from a know point to where the leak is to identify the repair location
- If a leak is identified and a repair is needed, operations performs a physical condition assessment while the main is exposed



Pipe Information

Sensor Distance:	<input type="text" value="89.0 ft"/>
Pipe Material:	<input type="text" value="Ductile Iron"/>
Pipe Diameter:	<input type="text" value="8 inches"/>
Sound Velocity:	<input type="text" value="3958 ft/s"/>

Water Main Leak Detection Program

IWater Inspection Form

Inspection
Condition Ratings

Leak Detection

Date	Description
2/9/2015	Leak Detection

Mainline Flushing

Water Main ID	Pressure Zone	Source of Flush	Flush Stand
1418	475		

Condition Assessment: 3 Leak: No CL2 Residual:

Flow Calculator

Pipe Size	Pipe Length	Volume - Gallons
4	611.0660824429	
		Volume - Cu. Ft.

Calculator

Flush Time (Mins)	Flow Rate (GPM)	Volume - Gallons

Comments: No comment


Save **Cancel**

Water Main Leak Detection Program

Leak Detection

Date	Description
2/9/2015	Leak Detection

Save
 Cancel



Inspection
Condition Ratings

Condition Code 0

Asset is new or like new, fully operable, well maintained, and performs consistently at or above current standards. Little wear shown and no further action required.

Condition Code 1

Asset is sound and well maintained but may be showing some signs of wear. Delivering full efficiency with little or no performance deterioration. Virtually all maintenance is planned preventive in nature. At worst, only minor repair might be needed in the near term.

Condition Code 3

Asset is functionally sound, showing normal signs of wear relative to use and age. May have minor failures or diminished efficiency and some performance deterioration. Likely showing modest increased maintenance and/or operations costs. Minor refurbishment may be needed in the near term.

Condition Code 5

Asset functions and requires some level of maintenance to remain operational. Shows some wear and may cause some performance deterioration in the near term; there would be some serviceability loss. Moderate refurbishment may be needed in the near term.

Condition Code 7

Asset functions but requires a sustained high level of maintenance to remain operational. Shows substantial wear and is likely to cause significant performance deterioration in the near term. Near term scheduled rehabilitation or replacement needed. Maintenance costs would be high relative to replacement.

Condition Code 9

Very near end of physical life. Substantial on-going maintenance with short, recurrent maintenance intervals required to keep the asset operational. Unplanned corrective maintenance is common. Renewal (refurbishment or replacement) is expected in near term.

Condition Code 10

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; immediate replacement or rehabilitation needed.

**Assess Performance,
Failure Modes
(Condition
Assessment)**

Water Main 00163 (WM000163) PK: 37808

Details GIS Related Info PMs Attach History

Specifications Materials Labor / Contacts Contracts Occupants

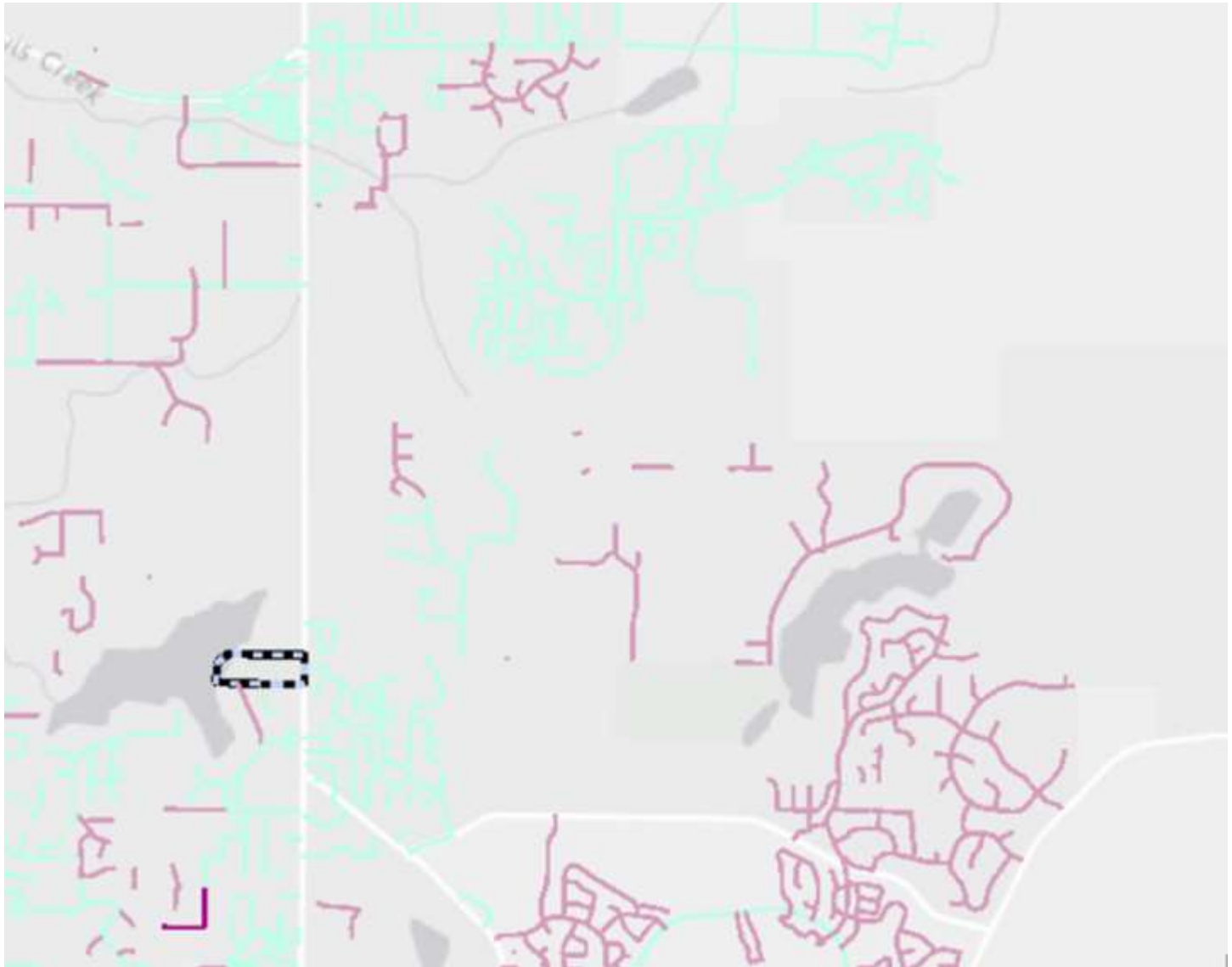
Specifications

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<input type="checkbox"/>	Asset Management	
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<input type="checkbox"/>	B-UsefulLife	100
<input type="checkbox"/>	C-RemainingLife	64
<input type="checkbox"/>	D-PercentRemainingLife	60
<input type="checkbox"/>	E-ExpectedReplacementYear	2079
<input type="checkbox"/>	F-Criticality-AffectedServiceConnections	5
<input type="checkbox"/>	G-Criticality-IllnessInjury	1
<input type="checkbox"/>	H-Criticality-Deaths	1
<input type="checkbox"/>	I-Criticality-DurationOfLoss	5
<input type="checkbox"/>	J-Criticality-DistrictImage	1
<input type="checkbox"/>	K-Criticality-PrivateEconomicImpact	3
<input type="checkbox"/>	L-Criticality-FinancialImpact	1
<input type="checkbox"/>	M-Criticality-SpillFlood	5
<input type="checkbox"/>	N-Criticality-OdorTasteColor	3
<input type="checkbox"/>	O-Criticality-EnvironmentalCompliance	1
<input type="checkbox"/>	P-Rating-SCCR	2.7
<input type="checkbox"/>	Q-Rating-EFCR	1.0
<input type="checkbox"/>	R-Rating-Environmental	3.0
<input type="checkbox"/>	S-TotalCriticalityRating	2.2
<input type="checkbox"/>	T-Condition-RemainingLife	4
<input checked="" type="checkbox"/>	U_Condition_PhysicalInspection	3
<input type="checkbox"/>	GIS	

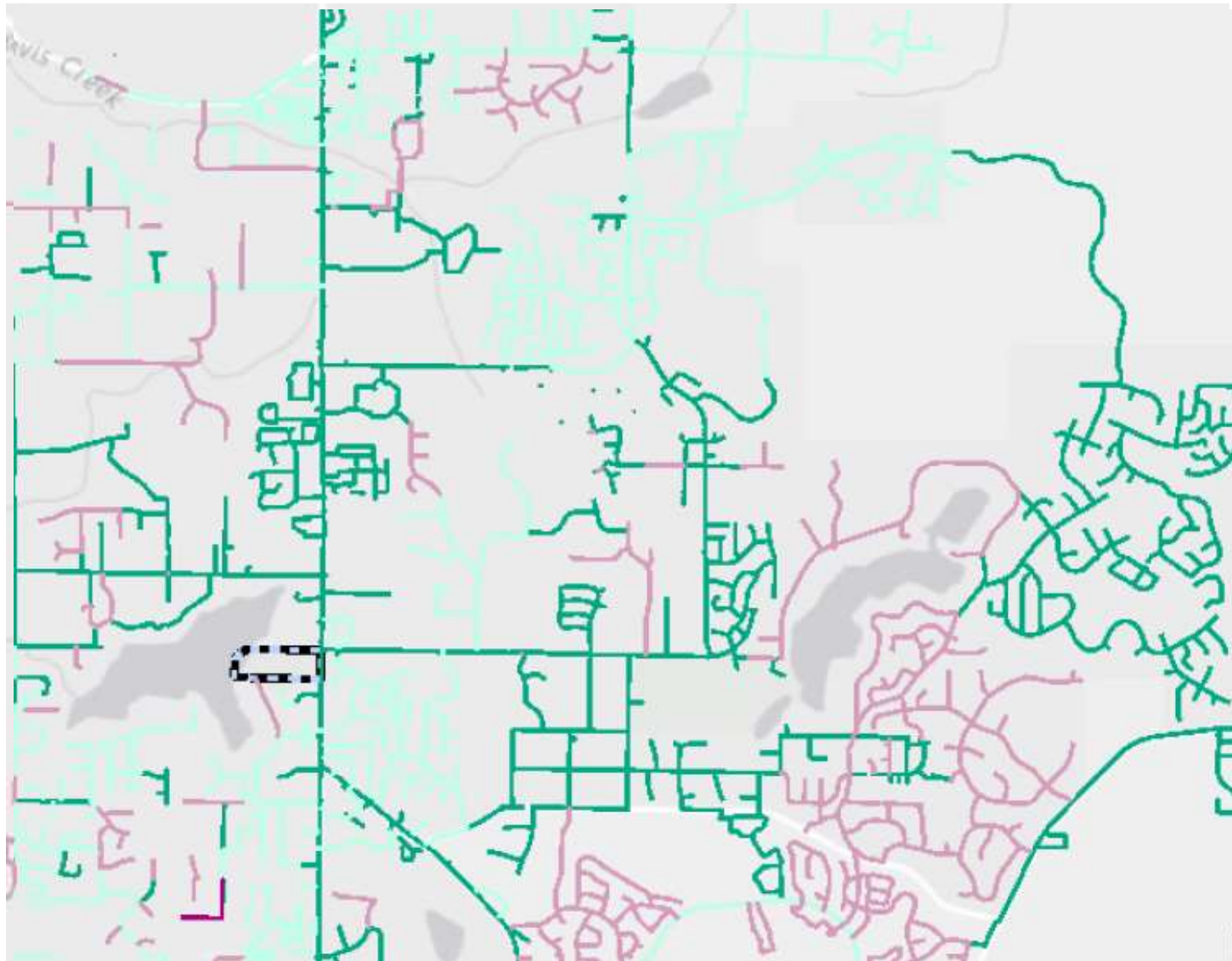
Leak Detection Completed in 2008



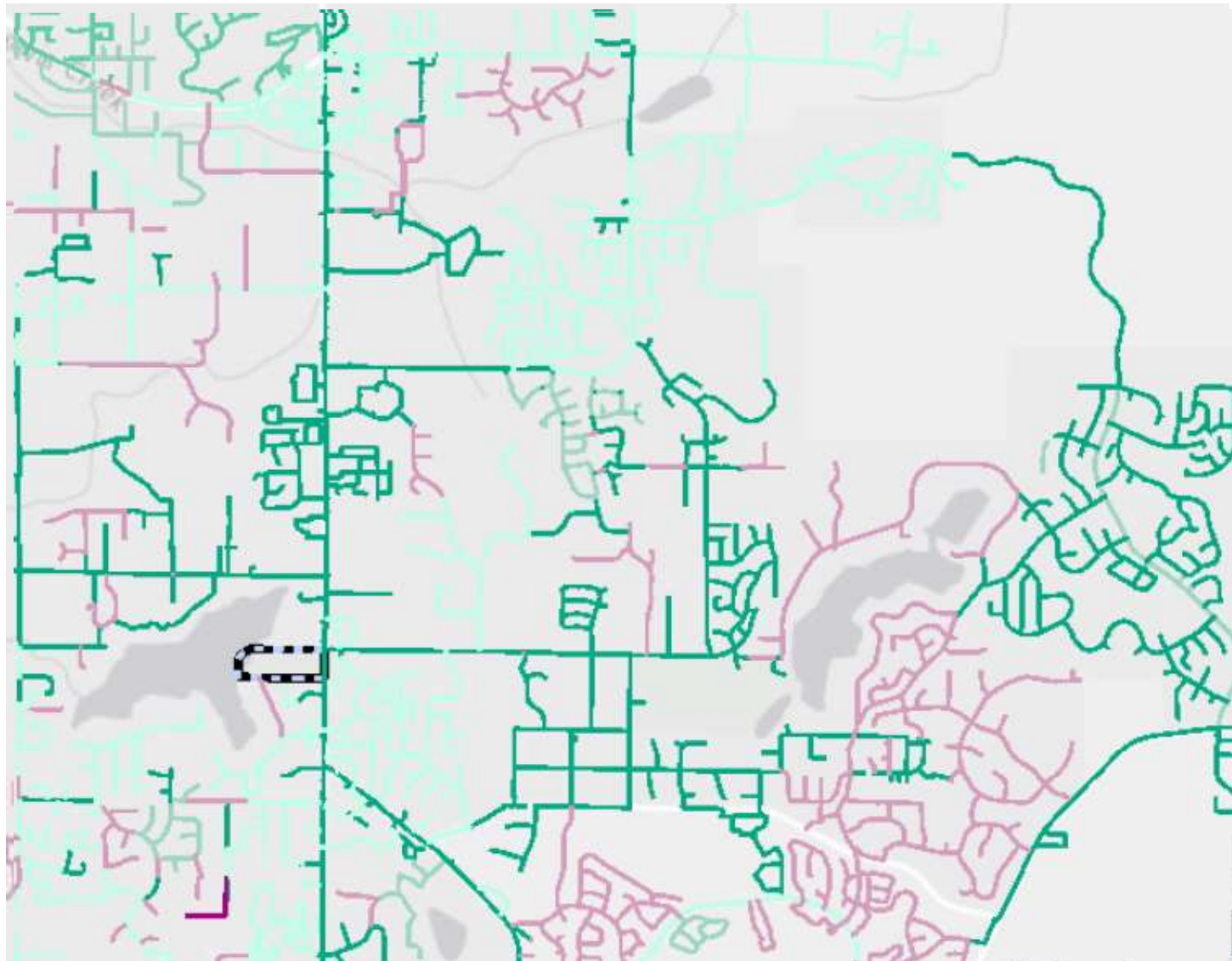
Leak Detection Completed 2008-2011



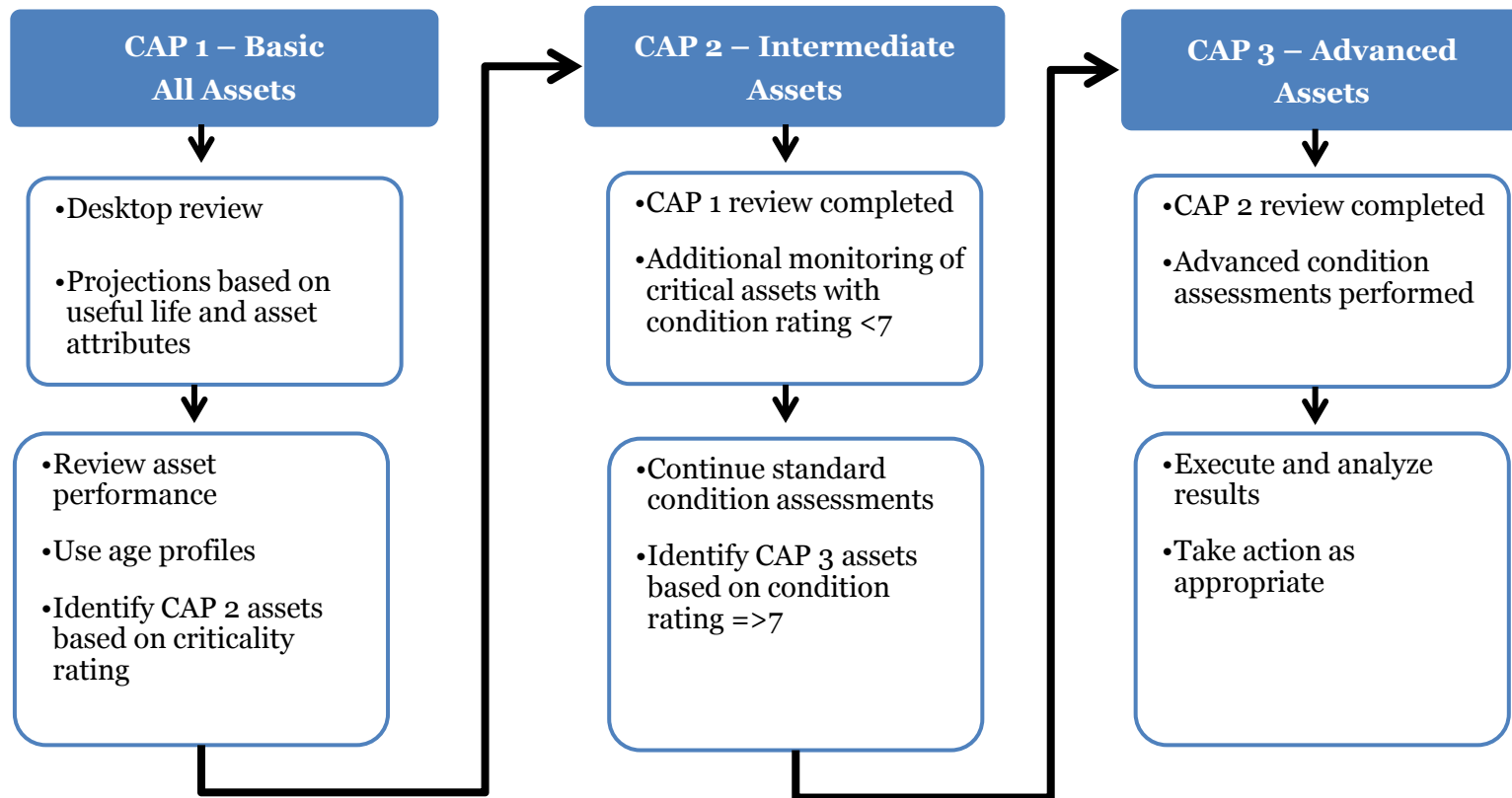
Leak Detection Completed 2008-2013



Leak Detection Completed 2008-2014



Condition Assessment Process (CAP)



- Focus resources on most critical assets
 - Use additional physical assessment tools and technology based on criticality and condition

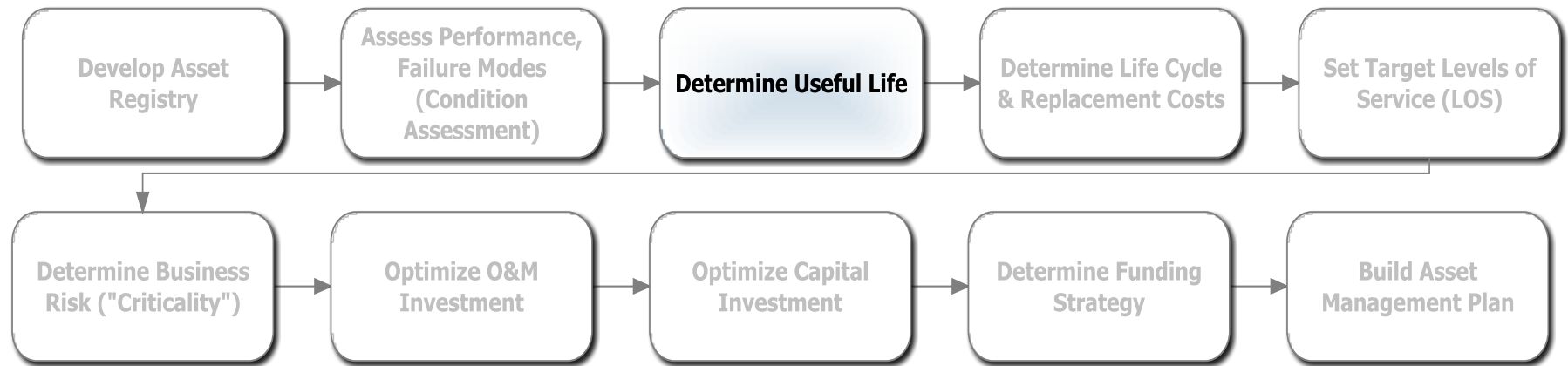
Lessons Learned

- Develop consistent rating scale across fields with option to use age for a rating
- Initial condition ratings – desktop review
- Provide training on use of scale and on-going support
- Place in CMMS desktop and physical condition ratings (track physical condition rating date, changes and reason)

Asset Management 10-step process

1. What is the current state of my assets?

2. What is my required "sustainable" level of service?



3. Which assets are critical to sustained performance?

4. What are my best O&M and CIP investment strategies for minimum life-cycle costs?

5. What is my best long-term funding strategy?

Useful Life: Definition and Purpose



Definition:

- Expanse of time before an asset is expected to fail

Purpose:

- Mitigate risks
- Plan for preventative maintenance, rehab or replacement
- Run the rate model to ensure adequate funding

How to Estimate Useful Life

- Determining useful life of underground assets
 1. Book value (IRS depreciation schedules)
 2. Industry standards
 3. Experience and field observations



How SPWSD Established Useful Life

- Began with District experience - major asset categories
- Researched useful life used by other jurisdictions
- Validated useful life estimates with outside consultants
- Developed final useful life schedule

Useful Life Before/After Example

- Ductile Iron (DI) Water Main: 86% of Water Mains

Before	After
40 Years	100 Years

- Polyvinyl Chloride (PVC) Gravity Sewer Main: 75% of Sewer Mains

Before	After
40 Years	100 Years





A water tower that has exceeded its useful life!

SPWSD Useful Life Schedule

Water Asset Useful Life Schedule

Useful Life of Water Assets

Water Main by Material	Useful Life
Asbestos Cement	80
Cast Iron	150
Ductile Iron	100
Galvanized	50
High Density Polyethylene (HDPE)	75
Polyvinyl Chloride	40
Steel	40

Water Asset Type	Useful Life
Well	60
Booster Pump	40
Tanks/Reservoirs	120
Fire Hydrant	75

SPWSD Useful Life Schedule

Sewer Asset Useful Life Schedule

Useful Life of Sewer Assets

Sewer Main by Material and Type	Useful Life
PVC Force Main	60
Asbestos Cement Gravity Main	50
C-900 PVC Gravity Main	75
PVC Gravity Main	100
Concrete (incl. reinforced) Gravity Main	75
Ductile Iron Gravity Main	60
High Density Polyethylene (HDPE) Gravity	70

Sewer Asset Type	Useful Life
Lift Station	25/75
Grinder Pump	50
Manhole	80



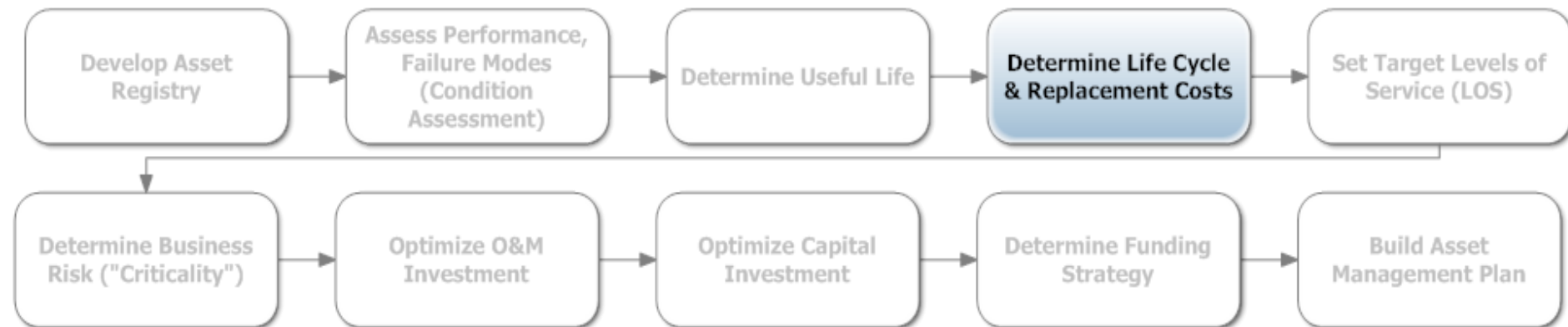
Lessons Learned

- Use internal experience and outside validation
 - Don't use the accounting depreciation schedules
 - Do update useful life schedules based on experience
- Differentiate lives for parent/child assets
 - Well: Building, pumps, motors, piping and valves
- Use useful life and age for estimating
 - Condition, capital replacement timing and rates
- Optimize O&M and replacement strategies

Asset Management 10-step process

1. What is the current state of my assets?

2. What is my required "sustainable" level of service?



3. Which assets are critical to sustained performance?

4. What are my best O&M and CIP investment strategies for minimum life-cycle costs?

5. What is my best long-term funding strategy?

Replacement Costs: Definition and Purpose

Definition

- The full cost to replace an asset



Purpose

- Projections are used for rate setting and future reserve needs



The Importance of Replacement Costs

- Used 125% of book value (original cost) as the basis for collecting rates meant for an asset replacement and repair reserve.
- Realized 125% of book value would not cover the long-term replacement costs of most assets due to long asset lives (average 90 years) and inflation.
- If replacement cost estimates are too low reserves will be insufficient resulting in more debt or steeper rate increases.
- Book values understate asset values

Replacement Cost Projections for Assets

- Used average Capital Plan costs, bid results and assessed values reports to estimate replacement values.
- Hired consultant to validate water and sewer main replacement costs and provide trenchless cost options.

Replacement Cost Projections for Assets

Water and sewer mains comprise 91% of the total replacement value for the District.

- The District established water and sewer main replacement philosophies used for projections:
 - Water Open Cut and Trenchless:
 - 90% Open Cut, 10% Pipe Bursting
 - Sewer Open Cut and Trenchless:
 - Gravity Mains: 67% Open Cut, 33% Slip Lining,
 - Pressurized Mains: 50% Open Cut, 50% Slip Lining
- Revised projections using consultant data.

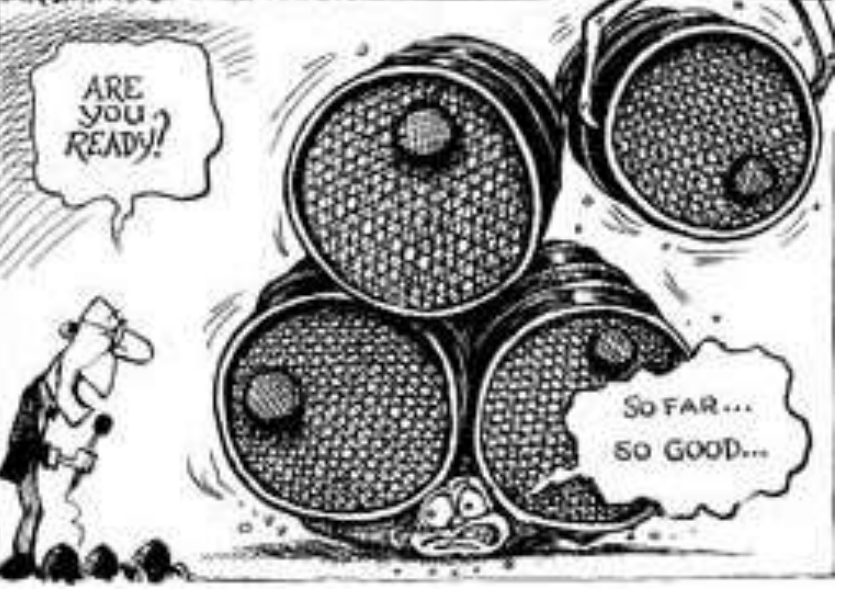
Replacement Values Before and After

Laurels Phase 1 Water Main Extension – Developer Reported Dedication Costs

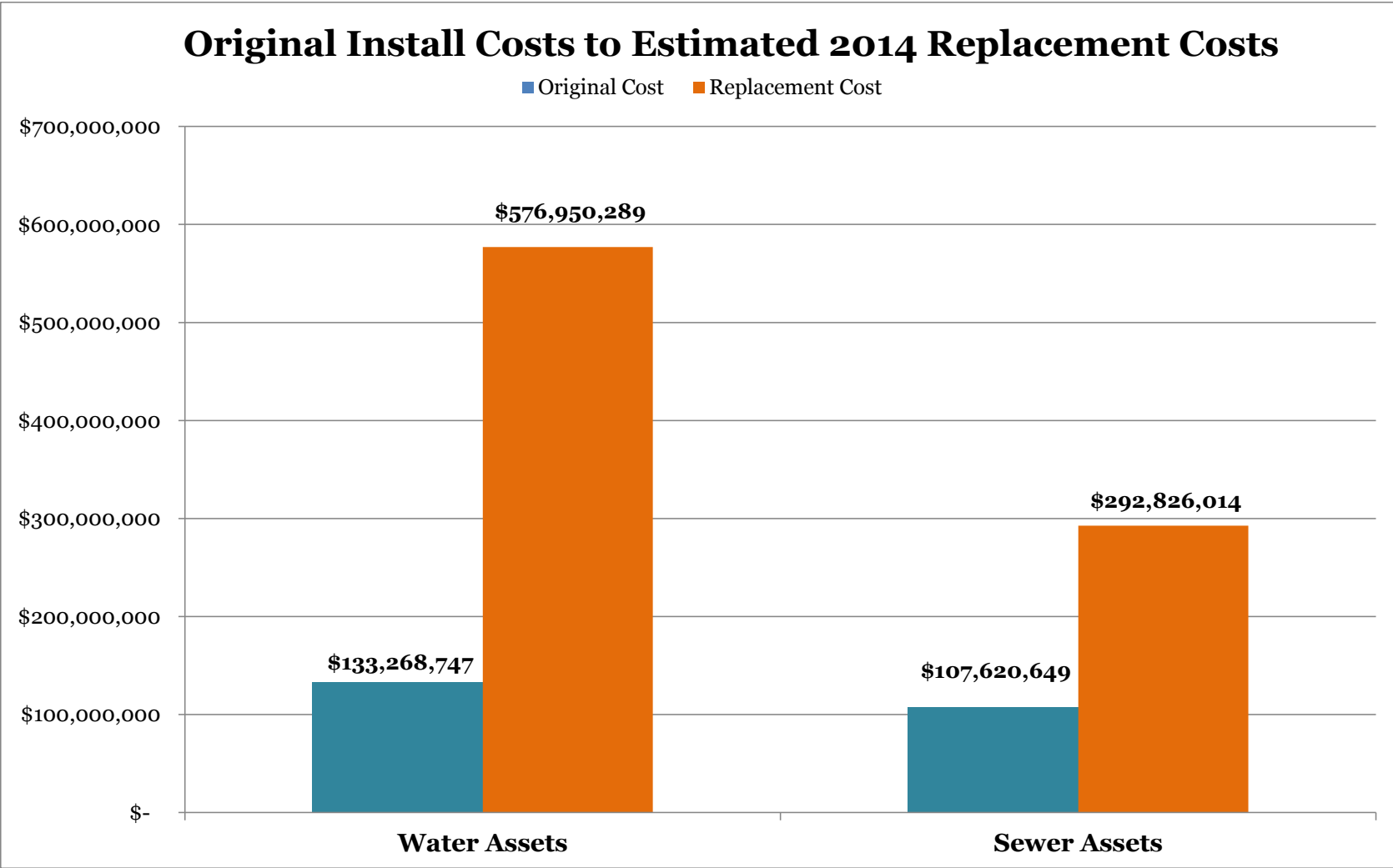
- 3,251 (182 lf 4” DI and 3,069 lf 8” DI) lineal feet of water mains and appurtenances installed in 2001 by a developer:

125% of Original Install	2014 Replacement Values
\$167,000	\$1,020,000

Determine Life Cycle & Replacement Costs



Replacement Cost Projections for Assets



Lessons Learned

- Focus on replacement costs first, with agency experience incorporate life-cycle costs.
- Projections are used for rate setting and future reserve needs so it is important to have replacement costs validated.
- Use market value instead of developer dedication costs
- Begin with agency experience
 - Mains: Engineering estimate and past capital projects
 - Facilities: insurance assessment for replacement
- Tie replacement costs with long-term funding strategy: combined the 4th and 9th EPA framework steps to illustrate to the Board.



2 of 5 Core Questions

- What is my required “sustainable” level of service?
 - Set Target Levels of Service (LOS)

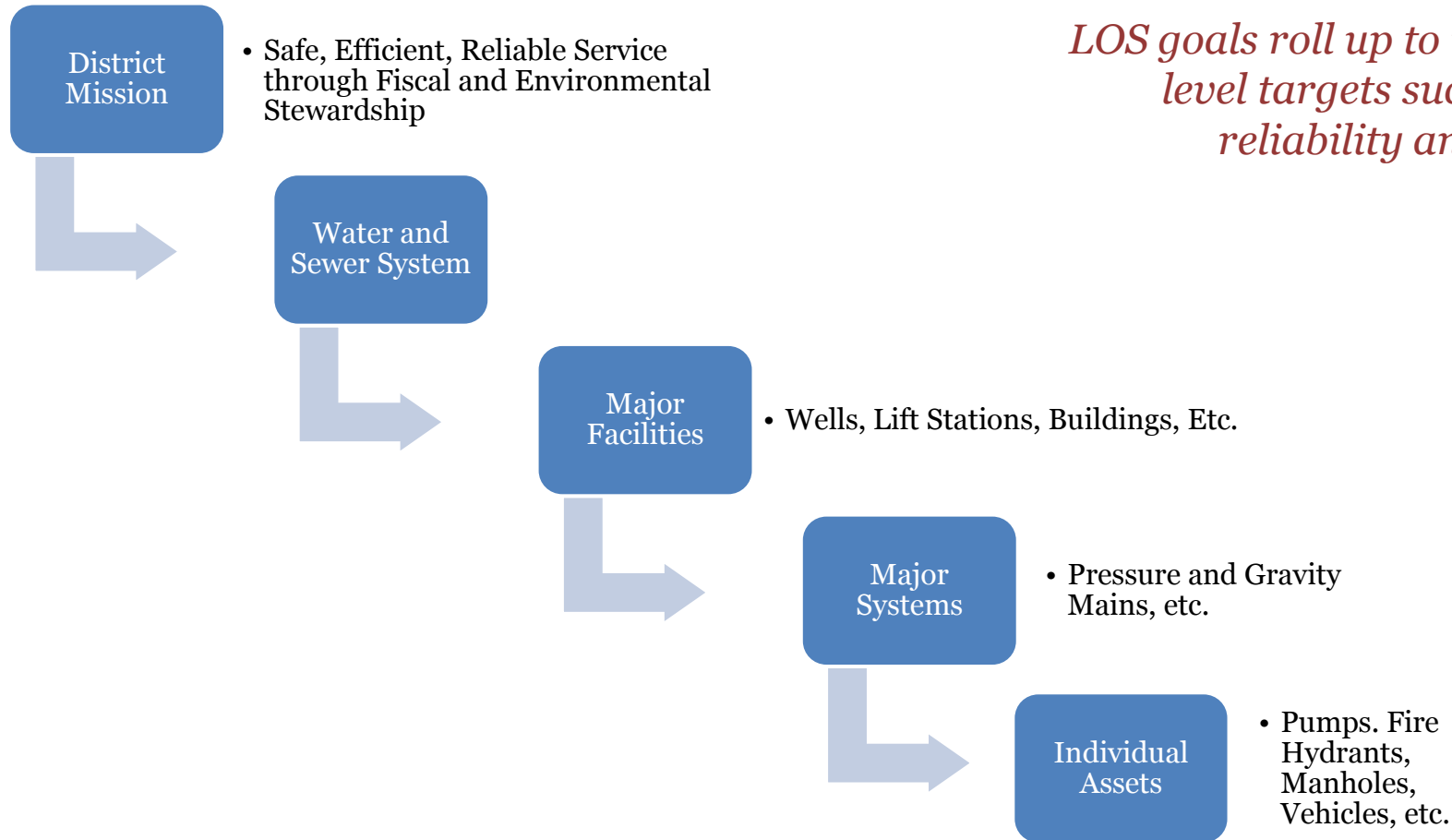
Asset Management 10-step process



Level of Service (LOS): Definition and Purpose

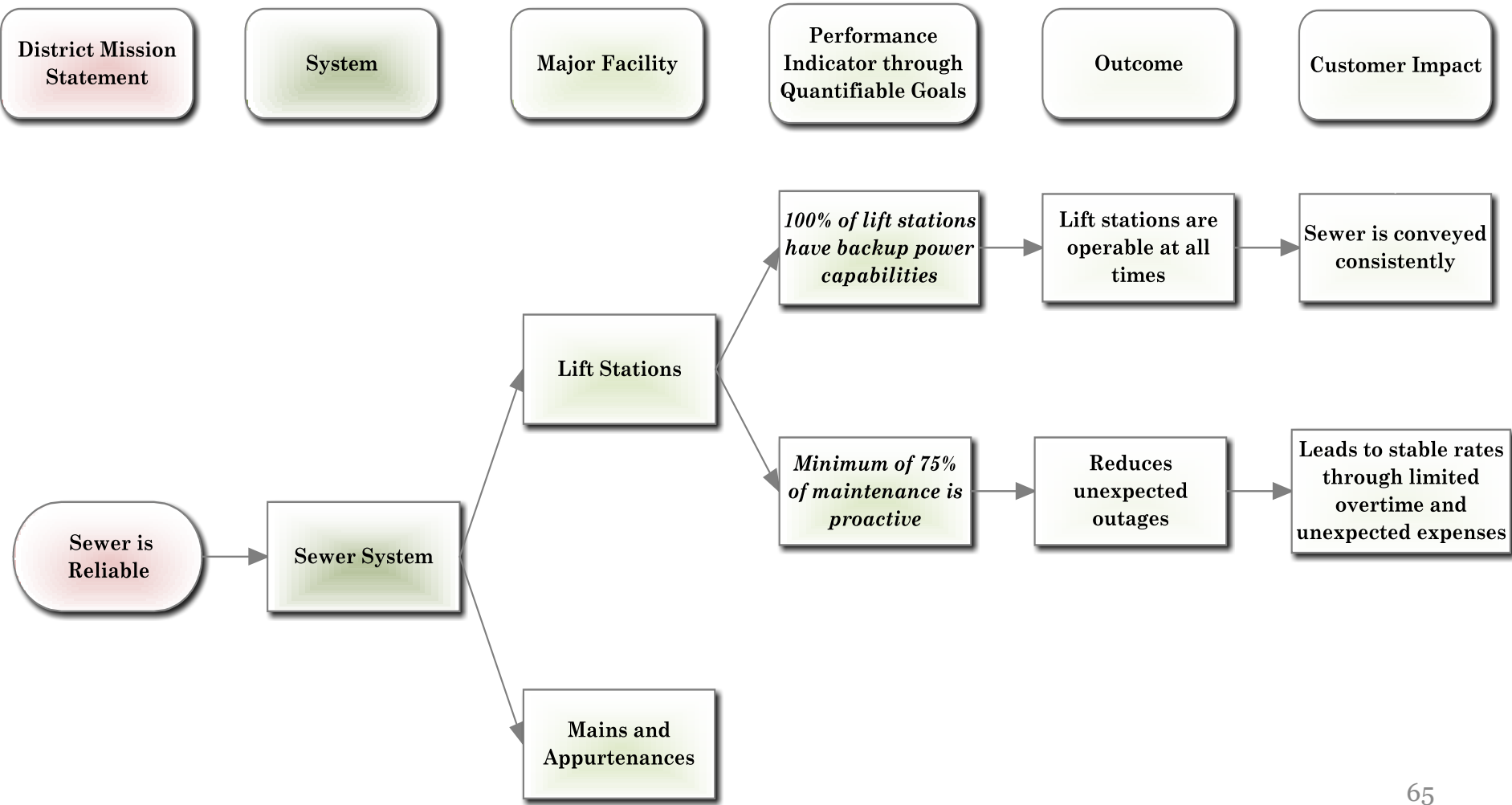
- Definition
 - Characteristics or attributes of a service that describe its required level of performance and service level expectations from customers
 - Describes how much, of what nature, and how frequently about the service
- Purpose
 - Monitor asset performance against expectations
 - Focus efforts and resources
 - Communicate service expectations and choices
 - Evaluate and Balance

LOS Structure



LOS goals roll up to meet higher level targets such as safety, reliability and efficiency

Example LOS for SPWSD



Lessons Learned

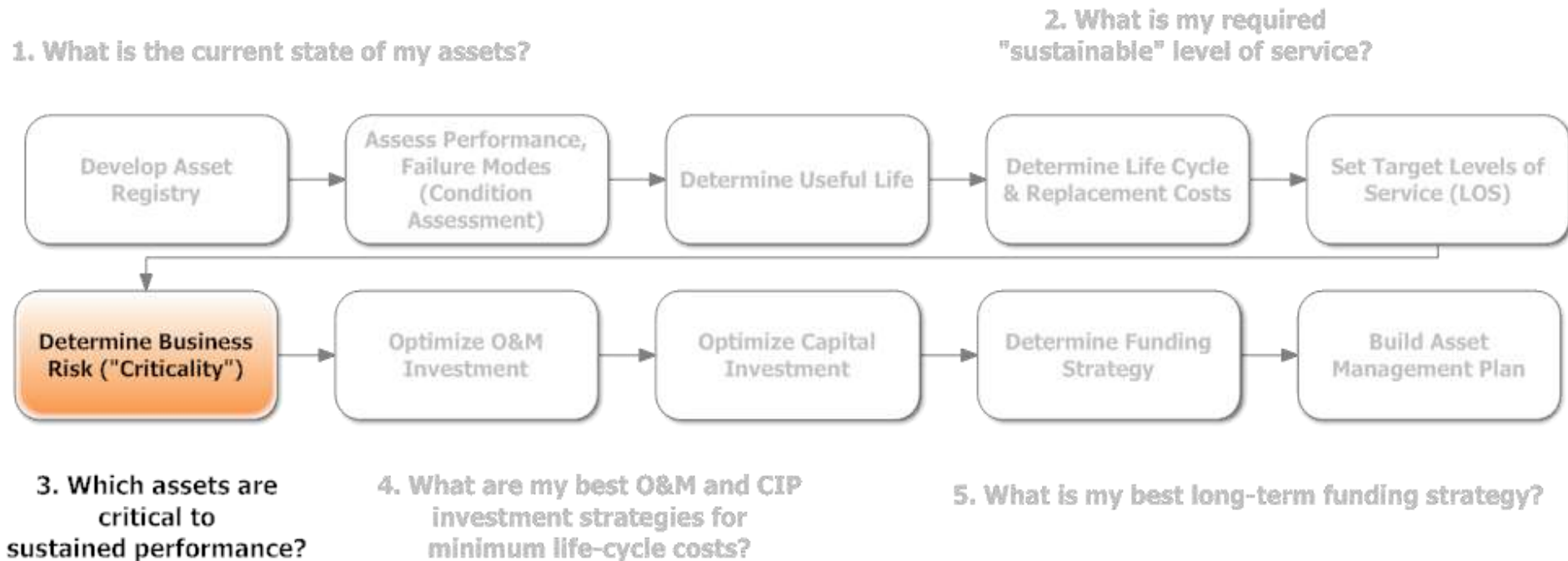
- Best if mission driven
- Establish systems to measure and report level of service in beginning
- Establish process for using data: feedback loop



3 of 5 Core Questions

- Which assets are critical to sustained performance?
 - Determine Business Risk (Criticality)

Asset Management 10-step process



Criticality: Definition and Purpose

Definition

- Criticality is based on the consequence of failure.
- Most important assets of the organization based on criticality rating factors:
 - Social, community and organizational
 - Economic/Financial
 - Environmental



Purpose

- Focus resources on the most important assets.

Setting Criticality Ratings

- Establish a rating scale – used EPA example and modified for District needs
- Mains
 - Established baseline ratings based on pipe diameter.
 - Identified more critical water and sewer mains based on location and potential consequence of failure.
- Facilities – reviewed individually by asset type

Setting Criticality Ratings

- Assets with higher consequence of failure were individually reviewed with the asset management team and subject matter experts using the criticality rating scales.



Determine Business Risk ("Criticality")

Water Criticality Rating Scale

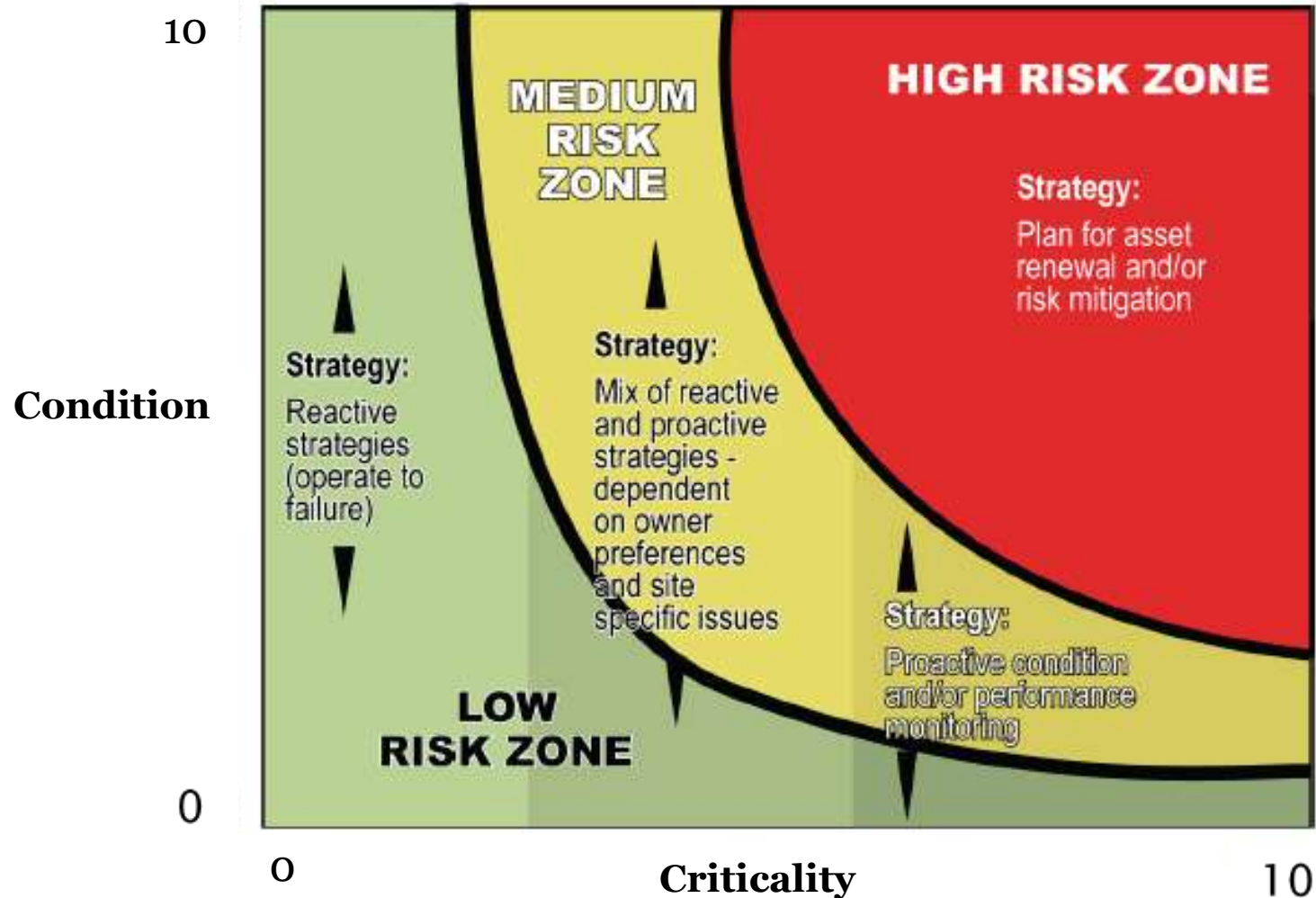
Failure of Consequence	Criticality Rating					
	1	3	5	7	9	10
	Limited Impact	Routine	Minor	Critical/Major	Severe	Catastrophic
Social/Community/Organizational - Weighted Score 60%						
# of service connections	0-19	20-59	60-99	100-200	201-349	350+
Number of illnesses/injury	1	1	1	1 - 3	>3	>3
Number of deaths	0	0	0	1	> 1	> 1
Duration of Loss	< 4 hrs.	< 4 hrs.	4 - 24 hrs.	4 - 24 hrs.	> 24 hrs.	> 24 hrs.
District's Image	No media or no consequence	Neutral coverage	Adverse media	Widely adverse media	Continual adverse media; lawsuit of merit	Nationally adverse media; lawsuit of merit
Private Economic Impact	Limited Impact	Minor Impact	Moderate Impact	Major Impact	Severe Impact	Catastrophic Impact
Economic/Financial - Weighted Score 10%						
Financial Impact	Low cost; <\$50K	Moderate cost; <\$100K	High cost; <\$200K	High cost; diverts \$; <\$300K	Agonizing change of priorities; <=\$500K	Likely to trigger rate increases and staff changes; >\$500K
Environmental - Weighted Score 30%						
Spill, flood	Short duration no property damage	Short duration no property damage	Some inconvenienced and little property damage	Many inconvenienced; moderate property damage	Severe health and habitat issues; some mandatory vacation of premises	Large areas vacated and closed to public access
Odor/Taste/Color	A few complaints	A few complaints	Moderate complaints	Extensive complaints and odor	Extensive area-wide complaints	Extensive area-wide complaints
Environmental Compliance	Minor violation - reporting only	Minor violation - reporting only	Regulatory sanction possible	Regulatory sanction likely	Extensive regulatory sanction	Severe sanctions

Determine Business Risk ("Criticality")

Sewer Criticality Rating Scale

	Criticality Rating					
	1	3	5	7	9	10
Failure of Consequence	Limited Impact	Routine	Minor	Critical/Major	Severe	Catastrophic
Social/Community/Organizational - Weighted Score 60%						
# of service connections	0-19	20-59	60-99	100-200	201-349	350+
Number of illnesses/injury	0	0	1	1 - 3	>3	>3
Number of deaths	0	0	0	1	> 1	> 1
Duration until repaired	< 4 hours	< 4 hours	> 6	> 12	> 12 hours	> 12 hours
District's Image	No media or no consequence	Neutral coverage	Adverse media	Widely adverse media	Continual adverse media; lawsuit of merit	Nationally adverse media; lawsuit of merit
Private Economic Impact	Limited Impact	Minor Impact	Moderate Impact	Major Impact	Severe Impact	Catastrophic Impact
Economic/Financial - Weighted Score 10%						
Financial Impact	Low cost	Moderate cost	High cost	High cost; diverts \$	Agonizing change of priorities	Likely to trigger rate increases and staff changes
Cost of fines & Cleanup	< \$5,000	> \$5,000	> \$15,000	> \$40,000	> \$75,000	> \$100,000
Cost of Repairs to System	<\$50K	<\$100K	<\$200K	<\$300K	< = \$500K	>\$500K
Environmental - Weighted Score 30%						
Volume of Spill (Gallons)	< 3,000	> 3,000	> 5,000	> 20,000	> 35,000	> 50,000
Spill, flood	Contained quantity onsite	Short duration, small quantity onsite	Moderate basement backups, some offsite spillage	Many inconvenienced; moderate health and habitat issues	Severe health and habitat issues; some mandatory vacation of premises	Large areas vacated and closed to public access; extensive specialized containment cleanup required
Odor	A few complaints adjacent to asset	Some complaints adjacent to asset	Moderate complaints adjacent to asset	Extensive complaints adjacent to asset; lingering area odor	Extensive area-wide complaints	Odor at dangerous level at spill site; evacuation of premises required
Environmental Compliance	Minor consequence	Minor violation - reporting only	Regulatory sanction possible	Regulatory sanction likely; Damage reversible less than one year	Extensive regulatory sanction virtually insured; damage reversible in 1-5 years	Severe sanctions; damage reversible in 5 years or more

How Condition and Criticality Determine Business Strategies



Determine Business Risk ("Criticality")

Water Mains Condition and Criticality

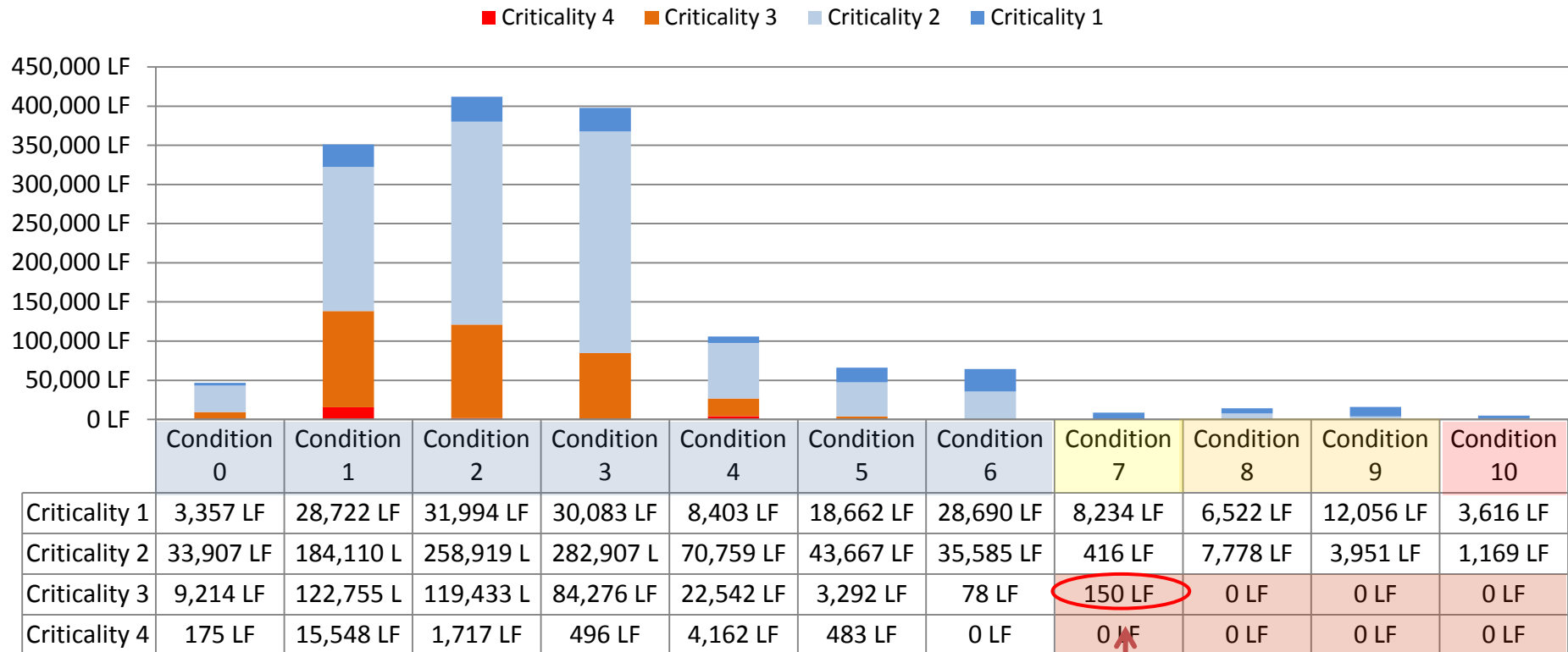


- Criticality ratings are affected by redundancy.

Water Mains Condition and Criticality

Ideal	Current	Water Mains Criticality CAP 1-3:
100%	100%	CAP 1: All assets have a desktop review completed
15-25%	25%	CAP 2: Intermediate assets are those with criticality 3.0 or greater and condition less than 7
5-10%	less than 1%	CAP 3: Advanced assets have criticality rating of 3.0 or greater with condition rating of 7 or greater

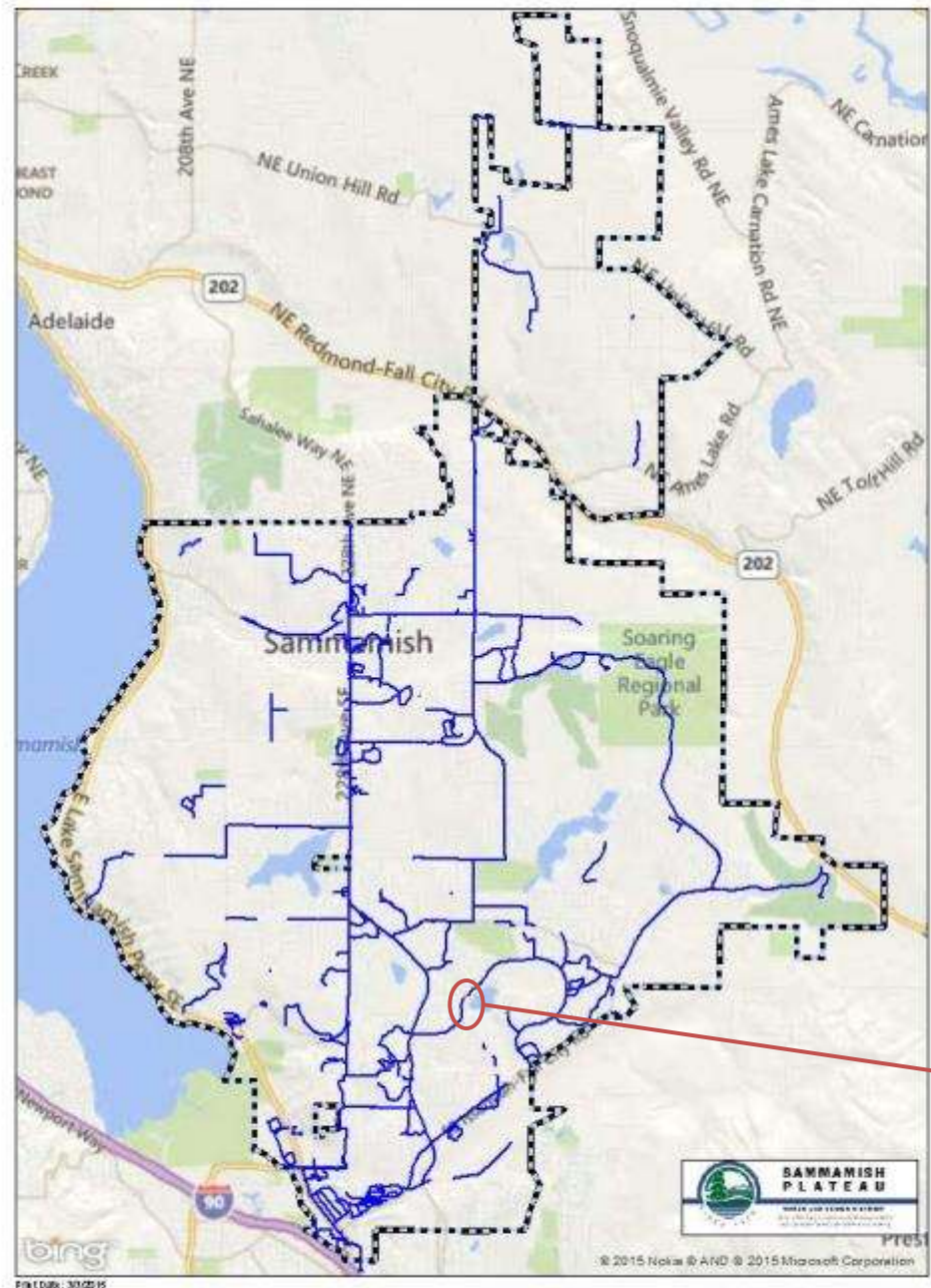
Water Mains Criticality to Condition Rating in Lineal Feet







High Criticality Water Mains

Determine Business Risk ("Criticality")

Condition of Critical Water Mains



Condition Rating Legend:

-  0-6
-  7
-  8-9
-  10+



Determine Business Risk ("Criticality")



"We've considered every potential risk except the risks of avoiding all risks."

Lessons Learned

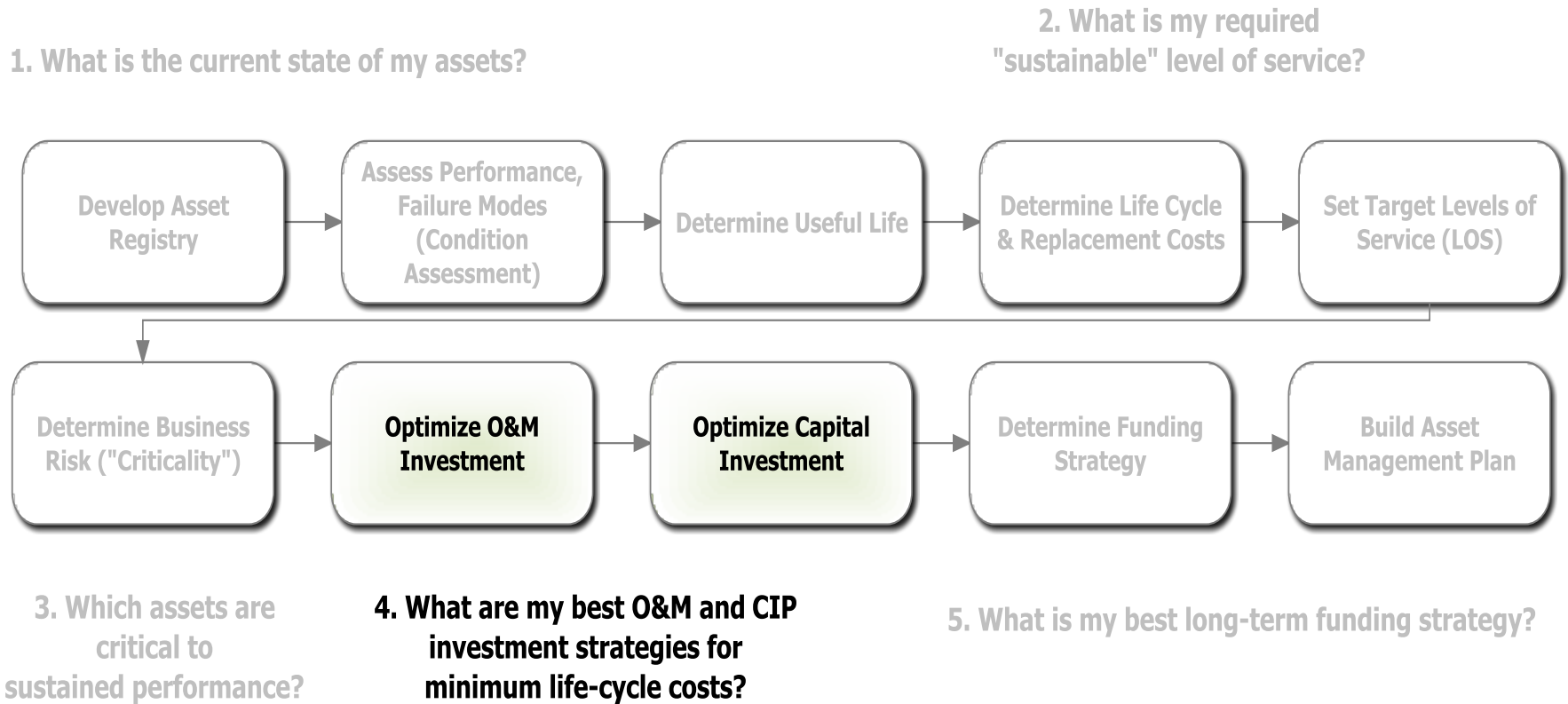
- Used to determine if you can run an asset to failure – not what needs to be done for emergency preparedness
- Start big – global ratings first, then detailed based on certain criteria (facilities, instead of components. Mains – baseline based on size, then detailed based on vulnerability assessments, operations knowledge and other factors such as topography)
- Will need to review and update as systems evolve
- Redundancy in service can reduce criticality



4 of 5 Core Questions

- What are my best O&M and CIP investment strategies to minimize life-cycle costs?
 - Optimize O&M Investment
 - Optimize Capital Investment

Asset Management 10-step process



Optimize O&M and Capital Investments: Definition and Purpose

Definition

- Determine when to invest in capital renewal or replacement based on level of O&M costs, takes into consideration regular preventative maintenance, unplanned repair costs, business rules and criticality

Purpose

- Reduce the life-cycle costs of an asset
- Increase the useful life expectancy
- Spend operating and capital money effectively and efficiently
- Provides time to research options for renewal or replacement

Optimize O&M and Capital Replacement Methods

- As assets deteriorate and the level of preventative maintenance and unplanned repair costs increase, perform cost analysis for replacement, rehabilitation or continued maintenance
- Connect preventative maintenance and unplanned repair costs to asset management data
- Update condition ratings when assets are seen to validate remaining life

O&M and Capital Replacement Optimization Example

Non Critical Watermain Business Rule:

Assets with criticality rating of less than 3.0

- After 3 failures (leak or break) requiring the same customer group to have their water shut-off within a 5 year time period, perform business case analysis for replacement, rehabilitation or continued maintenance.
- Glen Homes East Watermain Replacement Capital Project

Lessons Learned



- Tie preventative maintenance programs to condition, criticality and service levels
- Establish business rules to trigger cost analysis for replacement, rehabilitation or continued maintenance
- CMMS is important to track the maintenance records and life-cycle costs of assets to have the information needed to perform cost analysis and determine which strategy to use: continue maintaining, repair, rehabilitate or replace
 - Attach maintenance records and costs to the asset

Lessons Learned

- Business Case Analysis
- Programmatic capital budgeting
- Identify capital investment reasons: replacement or growth and fund projects accordingly

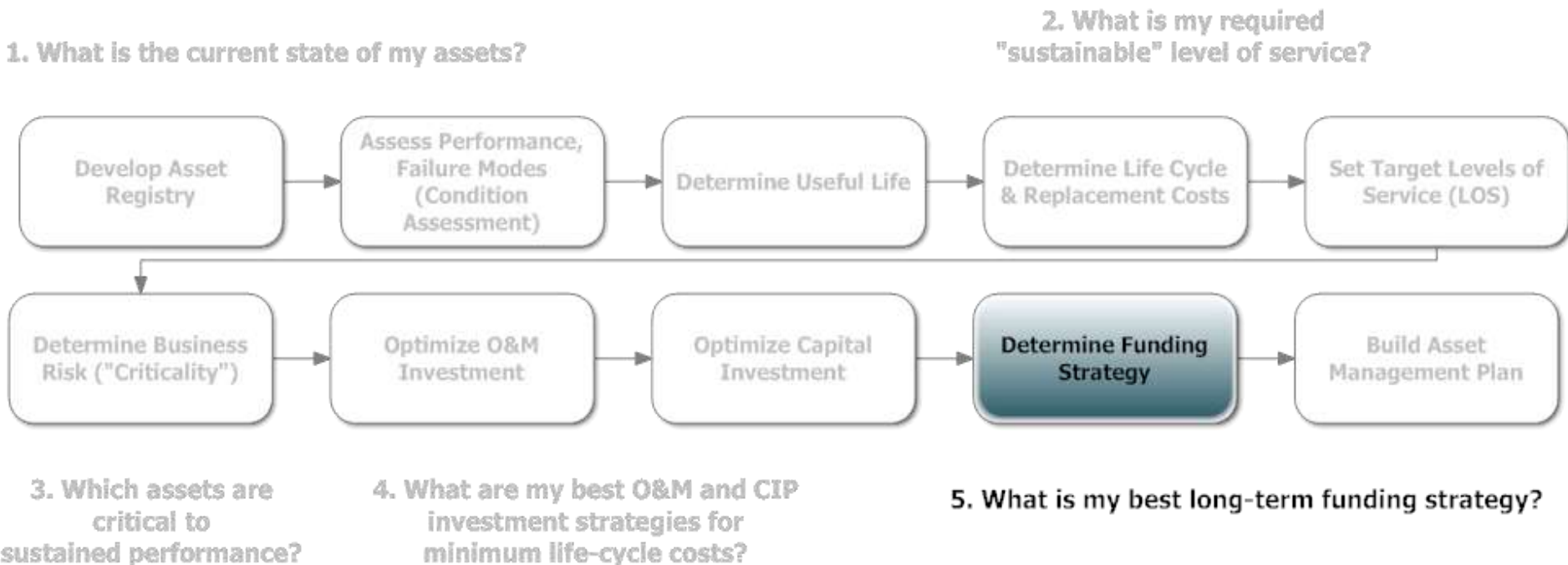




5 of 5 Core Questions

- What is my best long-term funding strategy?
 - Determine Funding Strategy

Asset Management 10-step process



Funding Strategy: Definition and Purpose

Definition:

- Adopt replacement funding philosophies
 - Pay when asset fails
 - Build reserves
 - Debt funding



Purpose:

- Fit community priorities
 - Balance intergenerational equity
 - Project revenue requirements, smooth rates, manage borrowing

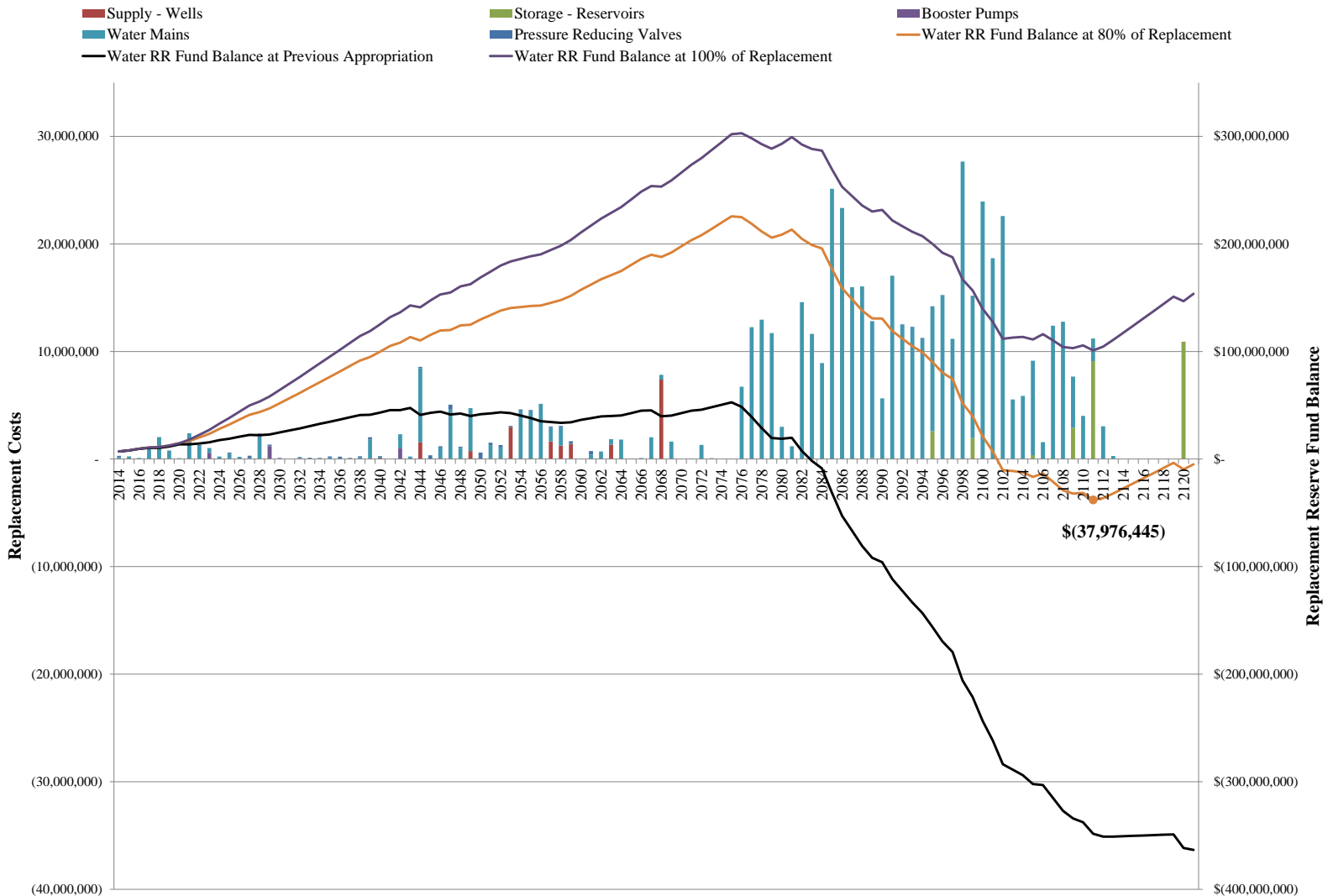
Initial Findings – Our “fiscal cliff”

- Prior reserve funding resulted in deficits in 2085
 - Costs - from 125% of initial install to replacement
 - Useful life – refined
 - Rate model – extended

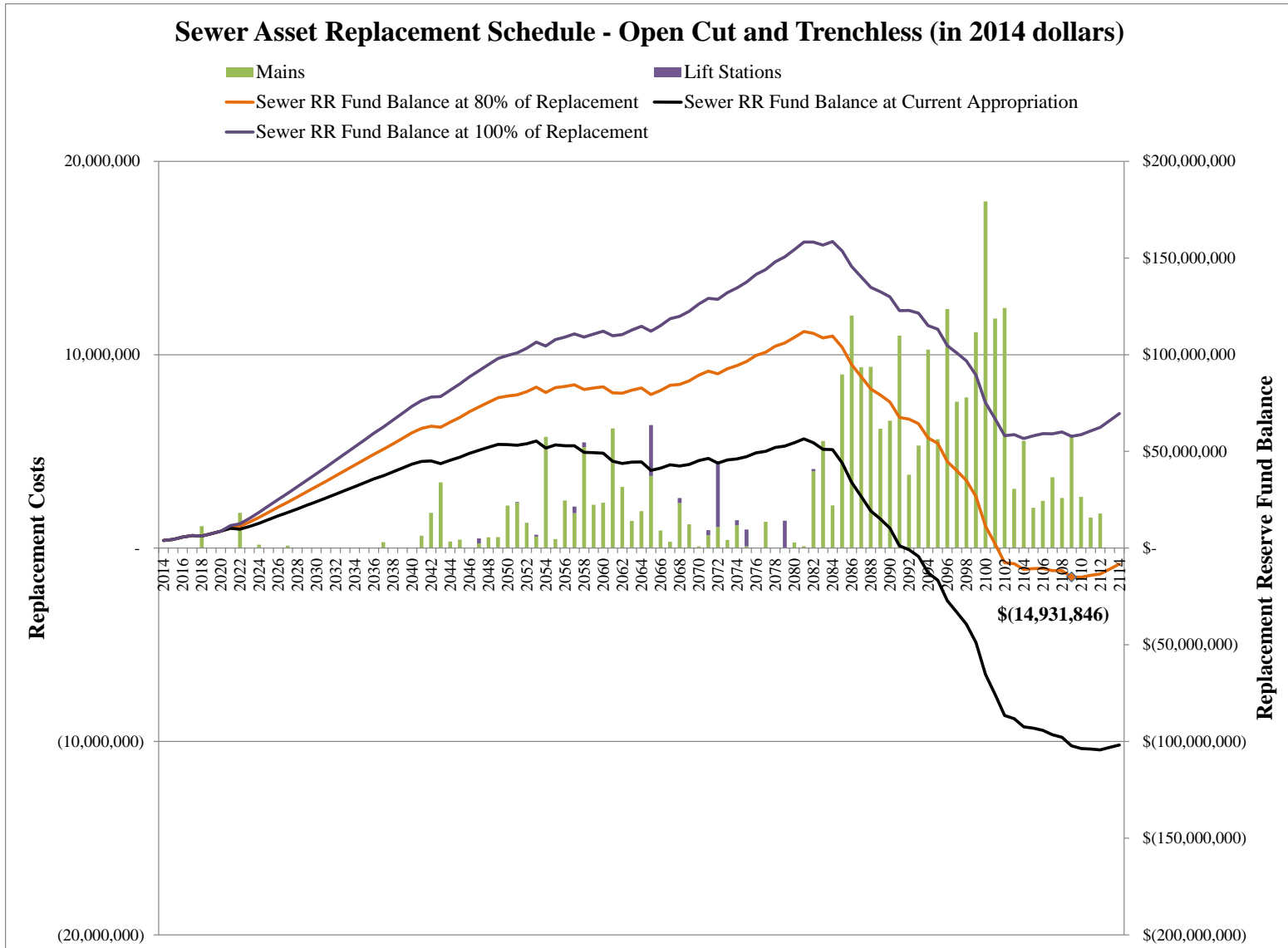


Revised Projection: Open Cut and Trenchless

Water Asset Replacement Schedule - 90% Open Cut, 10% Trenchless (in 2014 dollars)



Revised Projection: Open Cut and Trenchless



Capital Reserve Balances

- Balance of Reserves Compared to New Target

- Water

2014			
2014 Replacement Value	Aggregate Depreciation	Est. Year-End Fund Balance	% of Depreciation
576,950,289	142,305,106	10,243,021	7%

- Sewer

2014			
2014 Replacement Value	Aggregate Depreciation	Est. Year-End Fund Balance	% of Depreciation
292,826,014	64,176,471	4,434,463	7%

- District adjusted rates to address new information

Capital Reserve Funding

- Annual Reserves Contribution Compared to Target

- Water

2015		
Target	Annual Set-Aside	% of Target
5,285,034	2,378,316	45%

- Sewer

2015		
Target	Annual Set-Aside	% of Target
2,814,020	864,952	31%

- **District on track to meet contribution target by 2021**

District Next Steps

- Approved funding assumptions
- Integrated new funding assumptions with rate model
- Identified rates strategy





Wish we would have planned for this like SPWSD, our account is empty.



Lessons Learned

- Use accurate replacement values for projections
 - Prior financial projections based on 125% of original install costs - not sufficient
- Use refined asset lives for projections
- The District is in a good position:
 - **Young System = Time To Plan**
- Replacement reserves = sustainable infrastructure

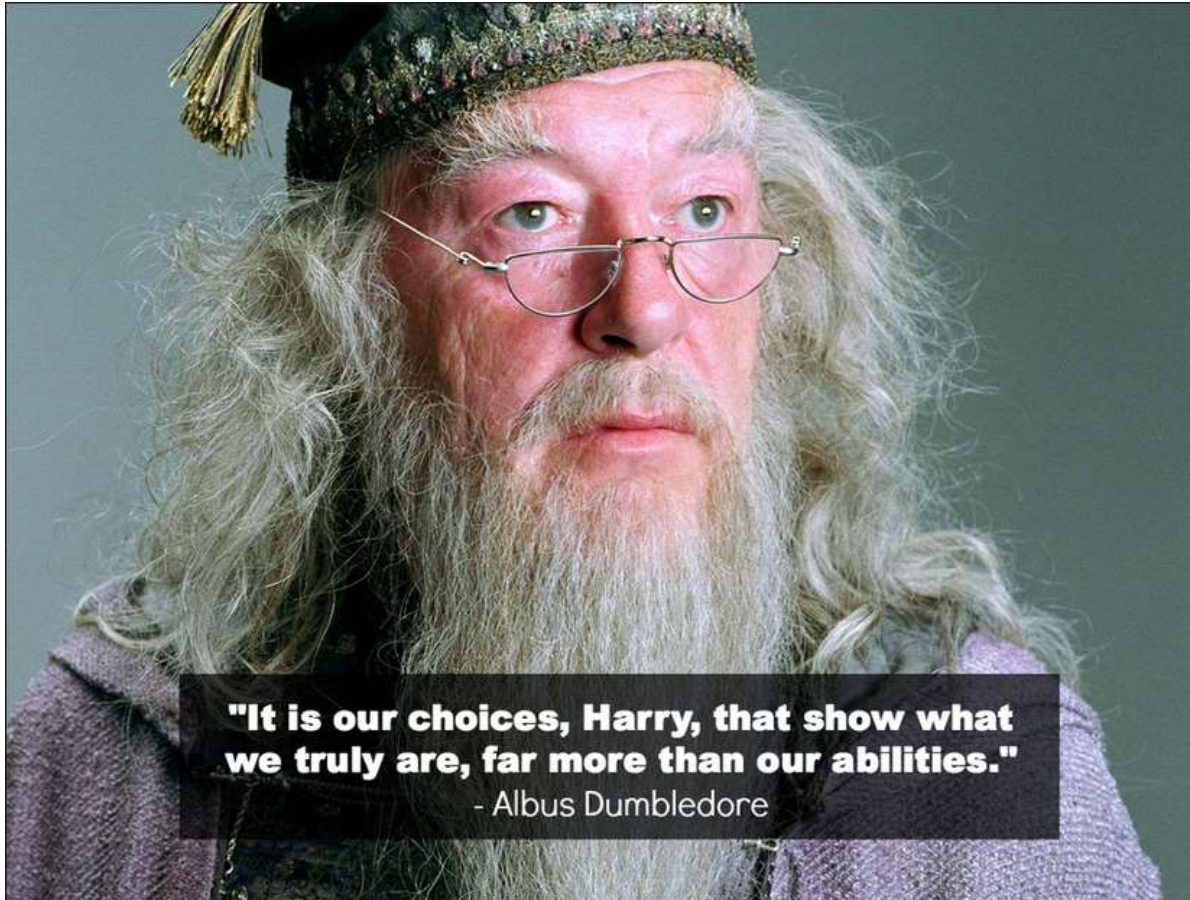
Lessons Learned

- Project replacement until **all** assets will have failed
- Review debt coverage availability over time
- Obtain support of long-term funding strategy
 - It takes courage to grow rates now for future customers



District Next Steps – “It is Our Choices”

~ Albus Dumbledore (Harry Potter)



Asset Management 10-step process

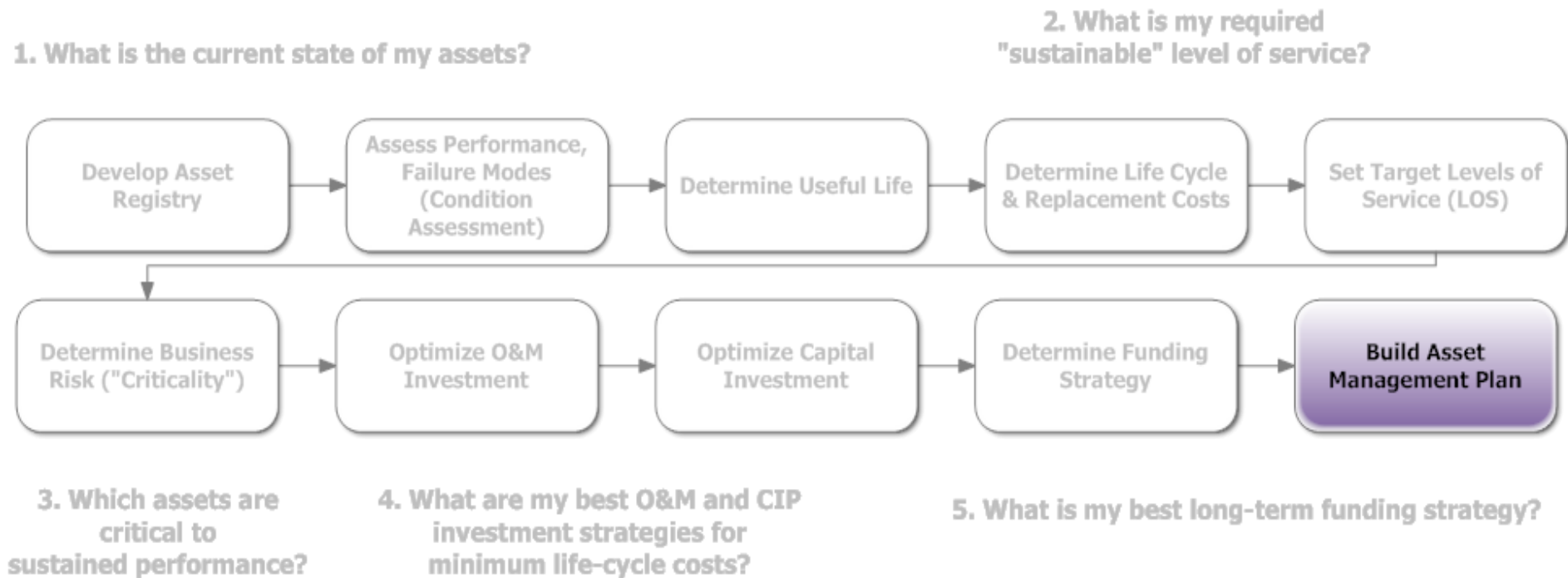
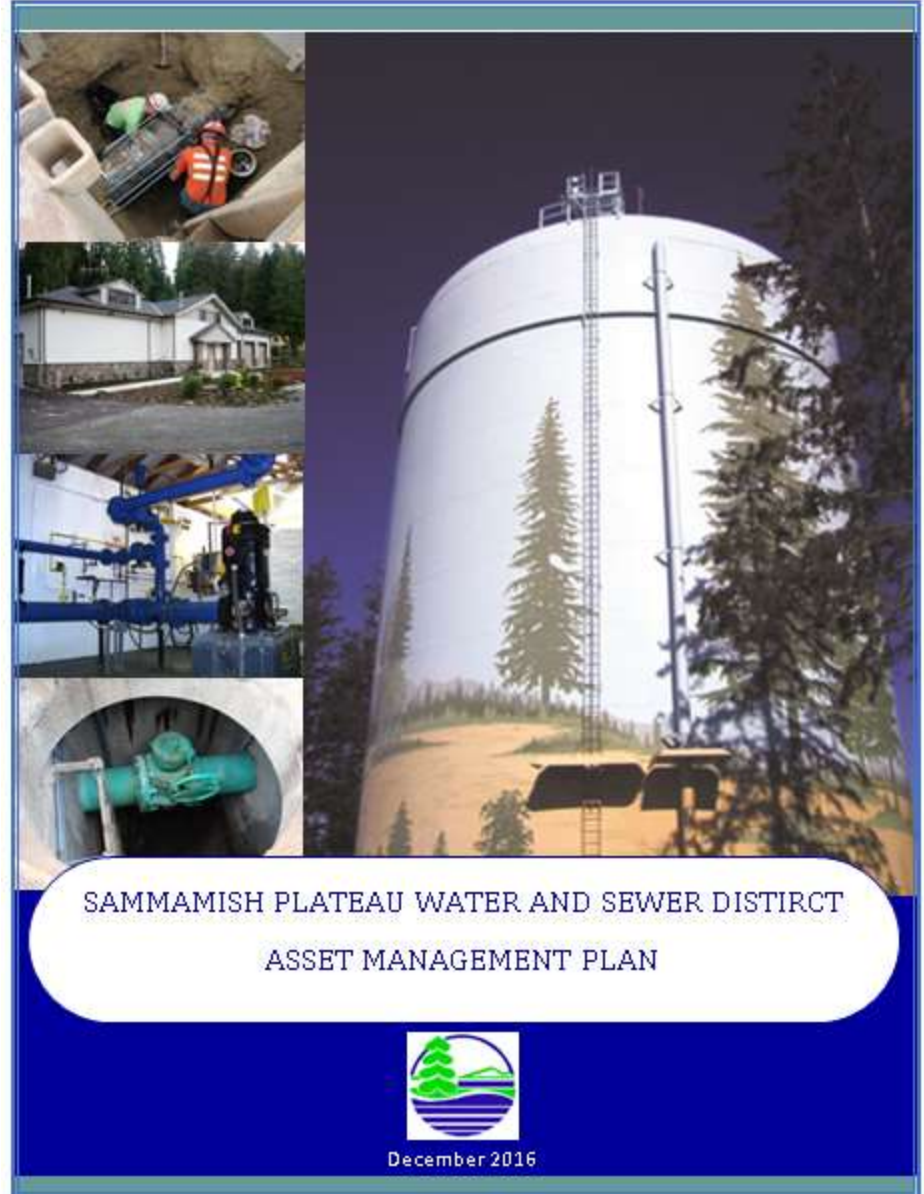


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 - Level of Service
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 - Summary of Water Assets
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Water Mains and Appurtenances

Water Mains and Appurtenances convey water throughout the system for fire protection and potable use. Water mains and appurtenances are required to deliver safe, efficient and reliable water service. This function includes 291 miles of water transmission and distribution pipe lines, more than 17,100 service lines, 2,500 fire hydrants, 5,500 valves, 100 blow off valve assemblies, over 100 air vacuum (air/vac) relief assemblies and approximately 51 control valve stations.



The District's water system is divided in two distinct zones the Plateau Zone and Cascade View Zone. The Plateau Zone has more than 270 miles of transmission and distribution pipelines ranging in size from 1 to 30 inches in diameter. The Cascade View Zone has approximately 23 miles of transmission and distribution pipelines ranging in size from 2 to 12 inches in diameter. The condition of both systems is generally good. The overall condition of the water transmission and distribution system is shown in Figure 1-10 and mapped in figure 12.



Within the Plateau Zone transmission capacity is provided by 12-inch-diameter and larger pipelines from the supply sources to various points in the water system. In most areas the District has combined the transmission mains with the distribution system by oversizing the mains where appropriate. The Plateau Zone distribution system consists of smaller than 12-inch-diameter pipelines that convey water from the transmission grid to the individual service connections.

Within the Cascade View Zone, there is essentially no distinction between the transmission and distribution piping. The largest pipelines within the Cascade View Zone are 8-inch and 12-inch diameter pipelines. The older sections of the Cascade View Zone distribution system consist of mains less than 8 inches in diameter, while newer sections are generally 8-inch and 12-inch diameter pipelines.

The District policy is to loop the system where reasonable and practical to provide redundancy in service during maintenance and repair activities, and better water quality overall by avoiding stagnation in dead-ends. Due to system looping the overall criticality of District water mains is relatively low, on a scale of 1-10 no pipe has reached a 5 criticality rating. The overall criticality of the water transmission and distribution system is shown in Figure 1-10, critical water mains are shown on the map in figure 13.

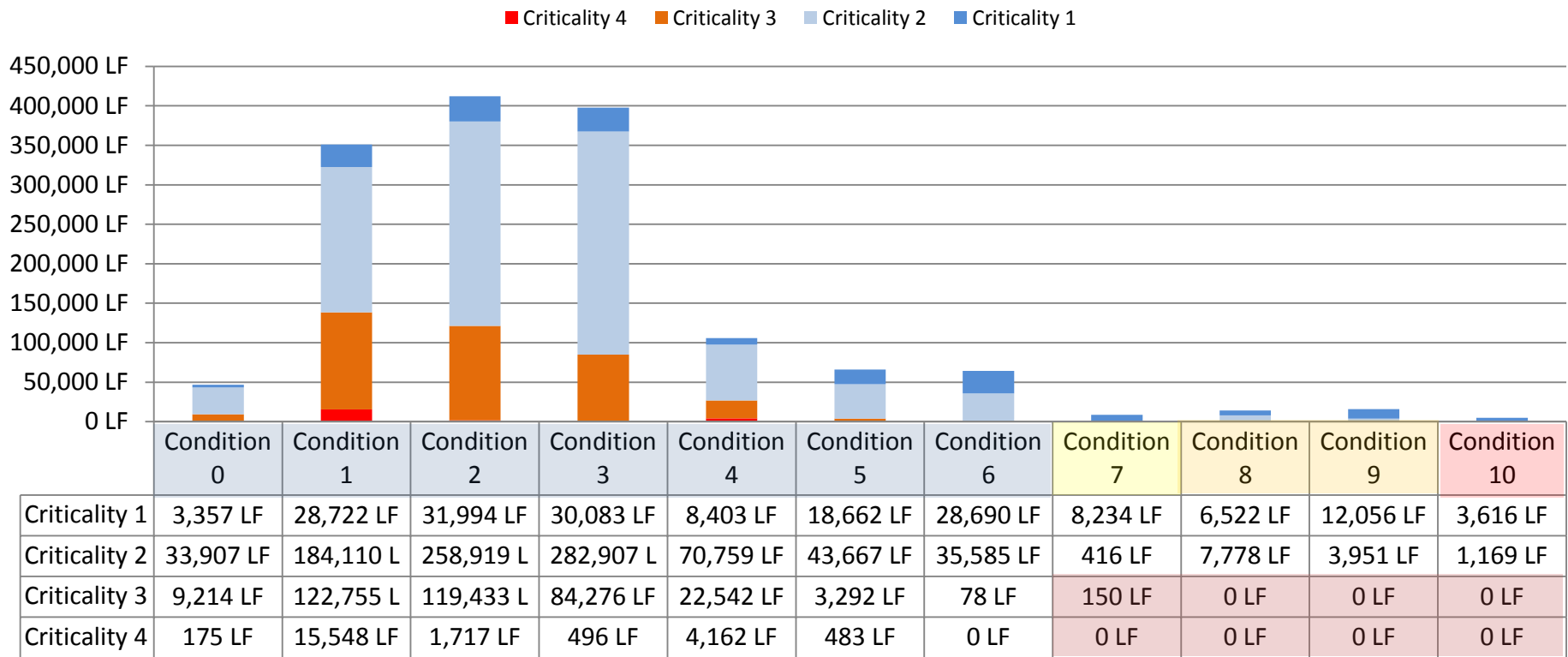
Water Main by Material	Useful
Asbestos Cement	80
Cast Iron	150
Ductile Iron	100
Galvanized	50
High Density Polyethylene (HDPE)	75
Polyvinyl Chloride	40
Steel	40

1st Draft Plan Summary of assets

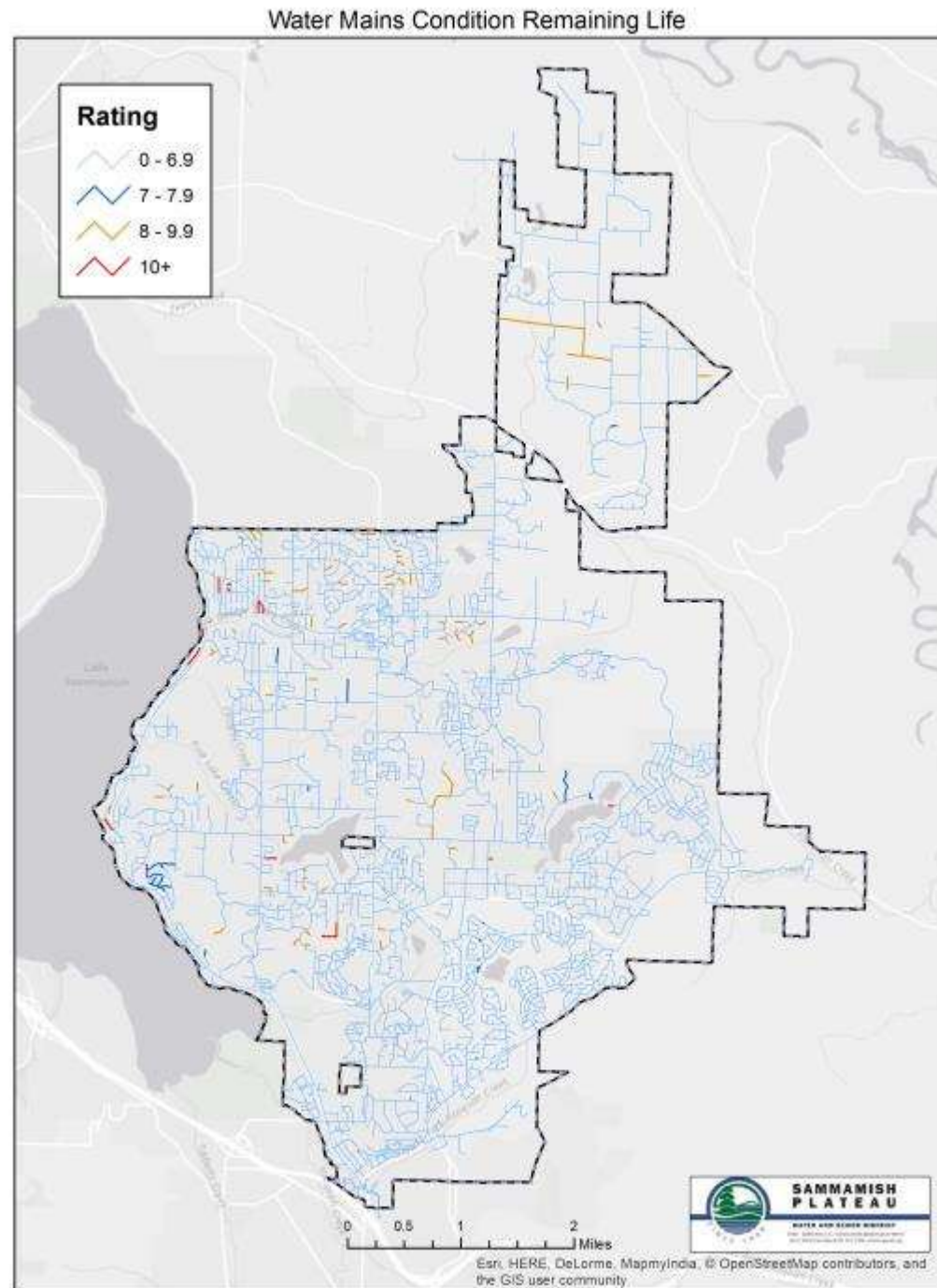
1st Draft Plan – Summary of assets

Ideal	Current	Water Mains Criticality CAP 1-3:
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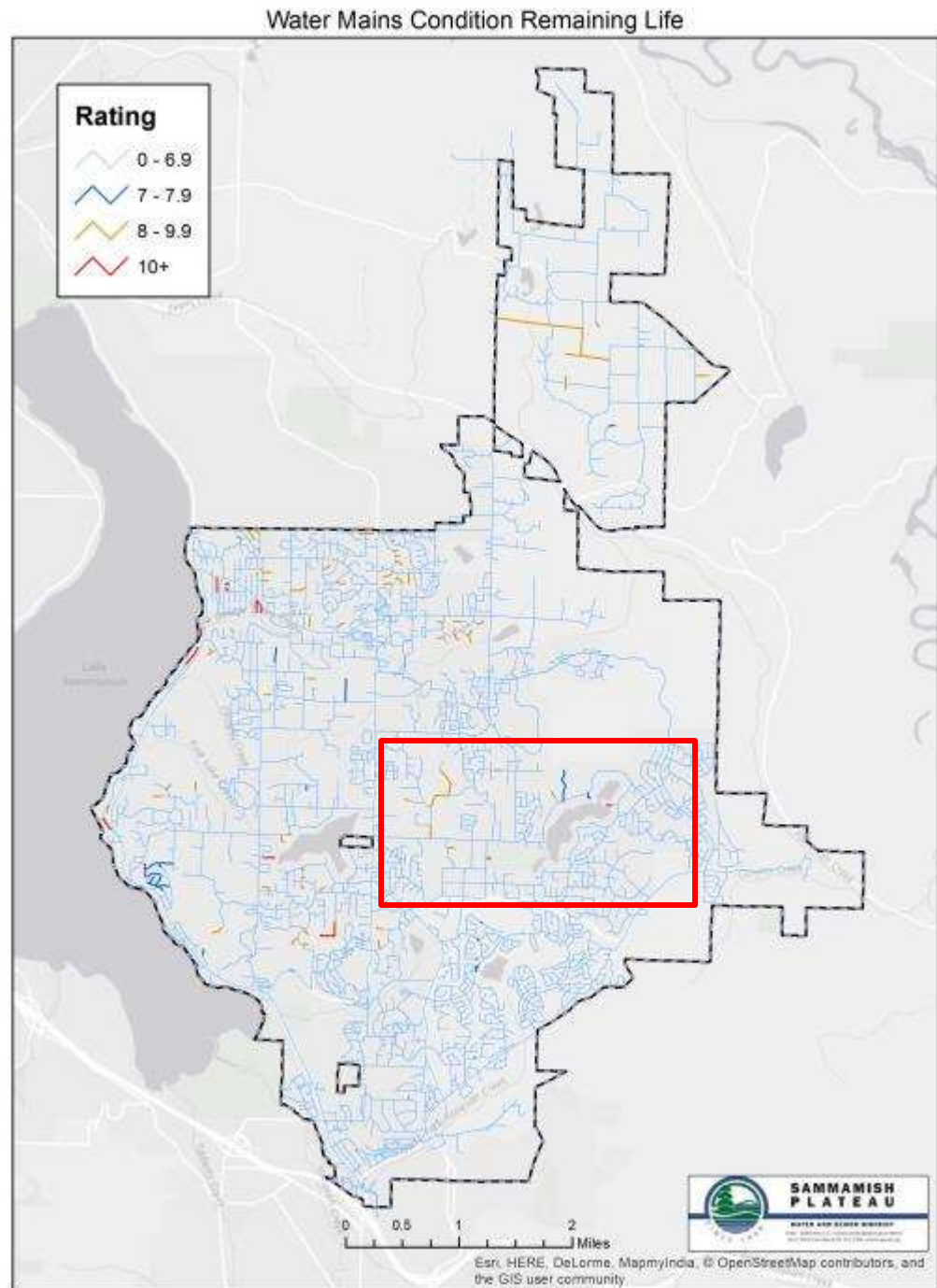
Water Mains Criticality to Condition Rating in Lineal Feet



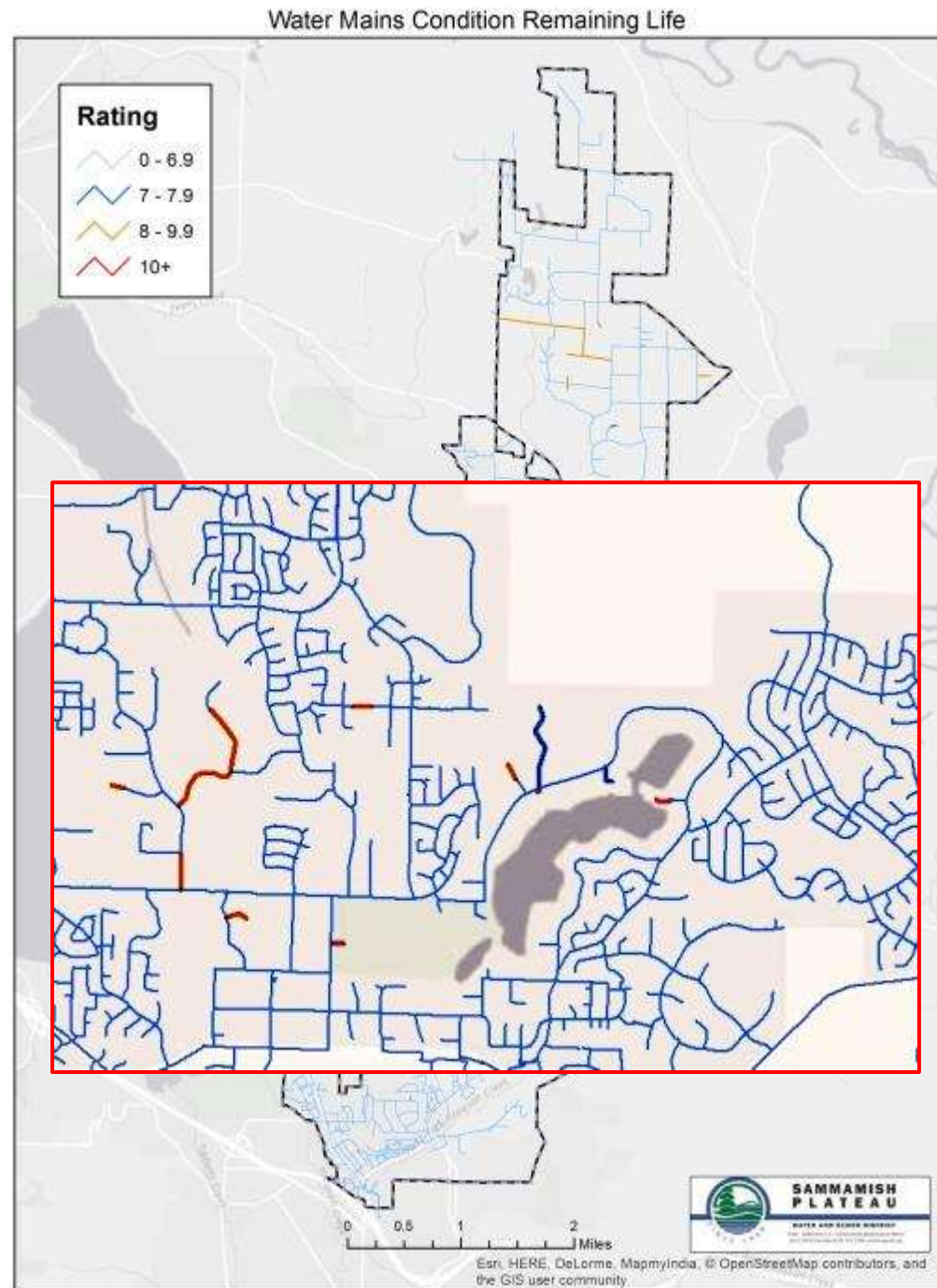
1st Draft Plan Summary of assets



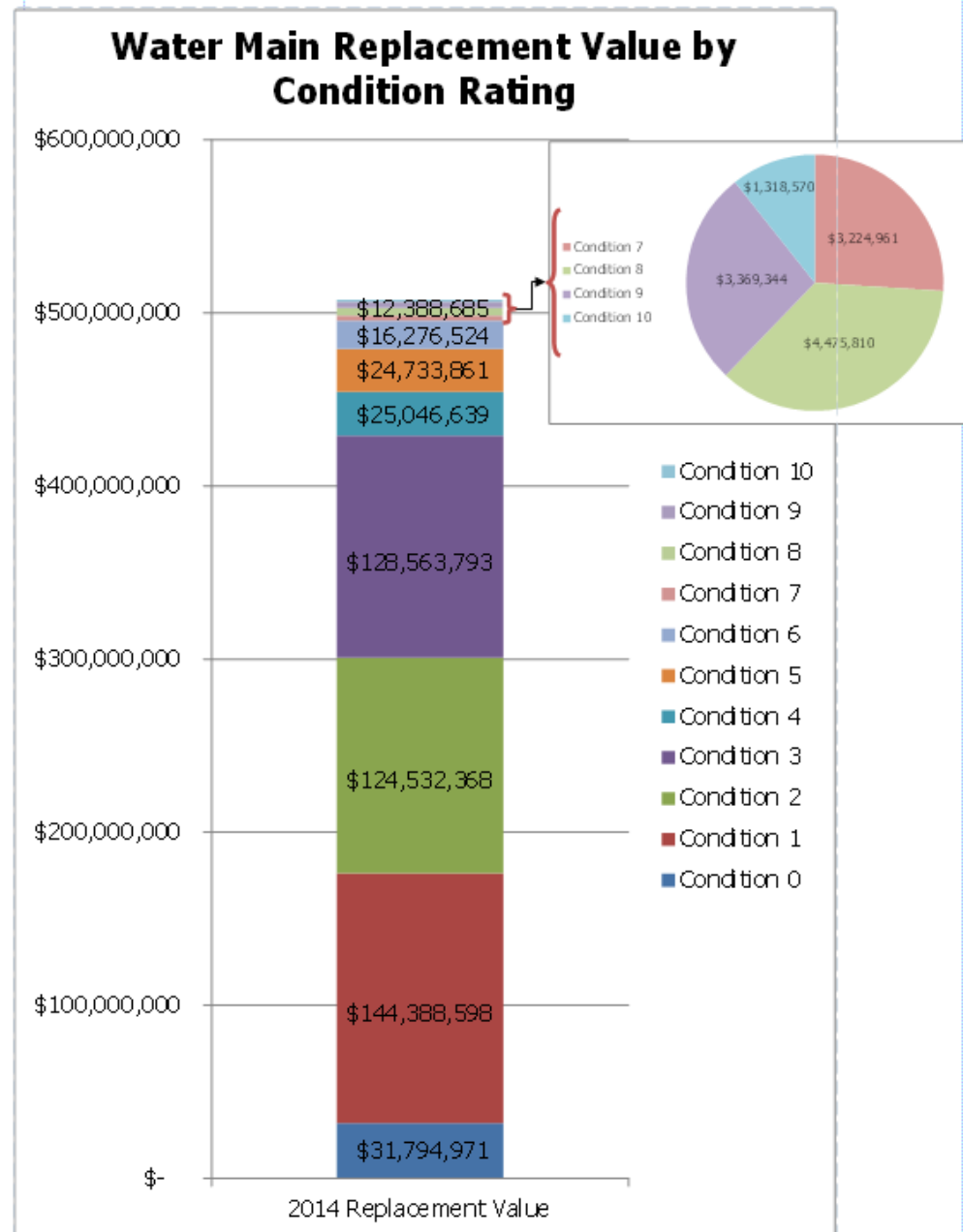
1st Draft Plan Summary of assets



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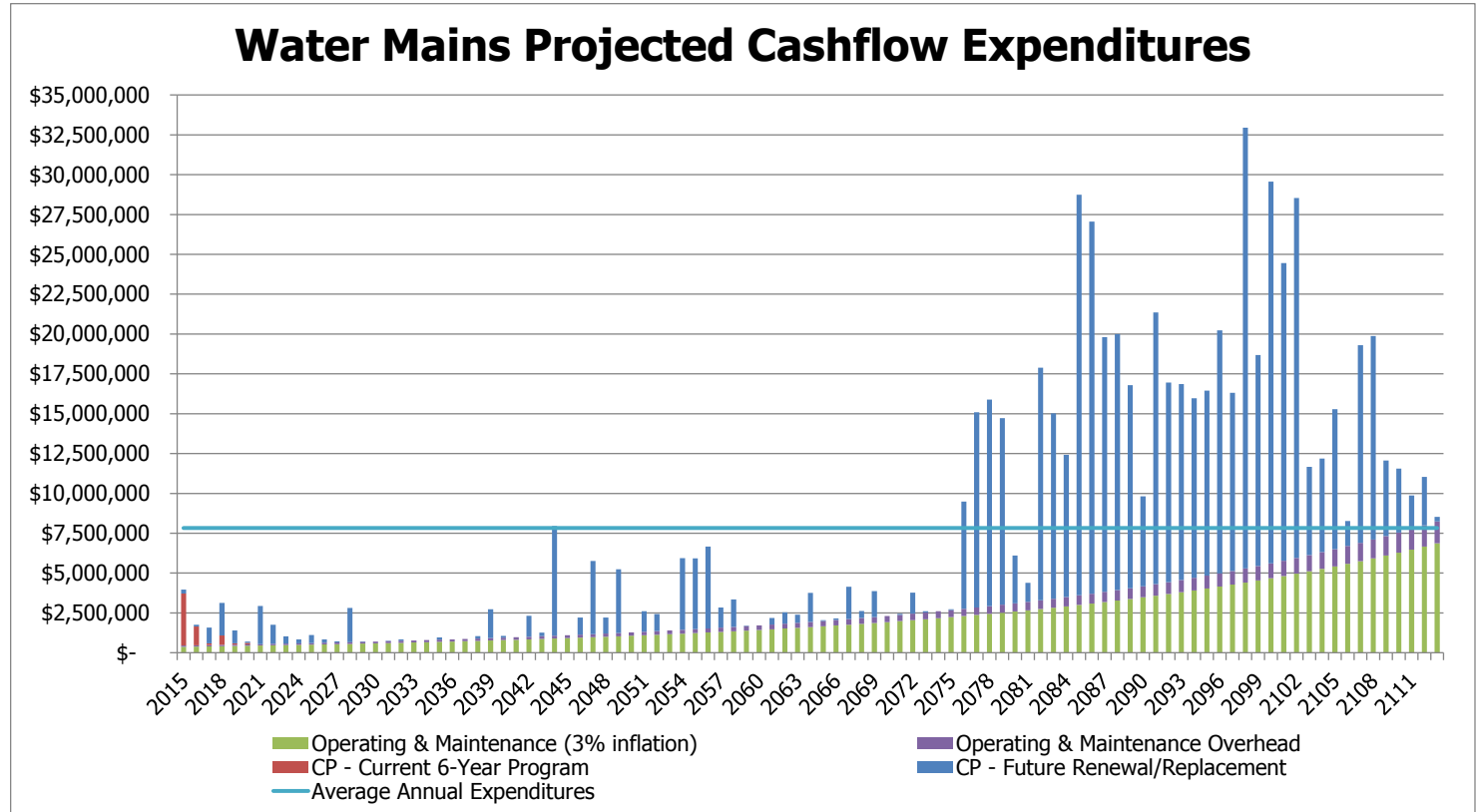
1st Draft Plan Summary of assets

Water Main Operating and Maintenance and Rehabilitation and Replacement Cost Assumptions

- Operating and Maintenance: Current spending plus annual 3% inflation is sufficient to maintain current service level.
- All water main material assumed to be replaced with ductile iron.
- All unknown <8" water main material assumed to be PVC. 8" and greater assumed to be AC.
- All unknown pipe diameter assumed to be 8".
- All assets to be in a condition commensurate with their age profile.
- Water Main rehabilitation and replacement will use a combination of open cut and trenchless – 90% open cut and 10% trenchless.
- Water Mains will be replaced according to current design standards, including the upsizing of main diameter based on the following table:

Current Diameter	Replacement Diameter	LF of Pipe	Cost Per LF
2", 3" & 4"	4"	131,099	\$ 225
6" & 8"	8"	998,210	\$ 319
10" & 12"	12"	297,523	\$ 383
16"	16"	59,348	\$ 447
18"	18"	4,624	\$ 477
20" & 24"	24"	8,440	\$ 591
28"	28"		\$ 652
30"	30"	2,221	\$ 666

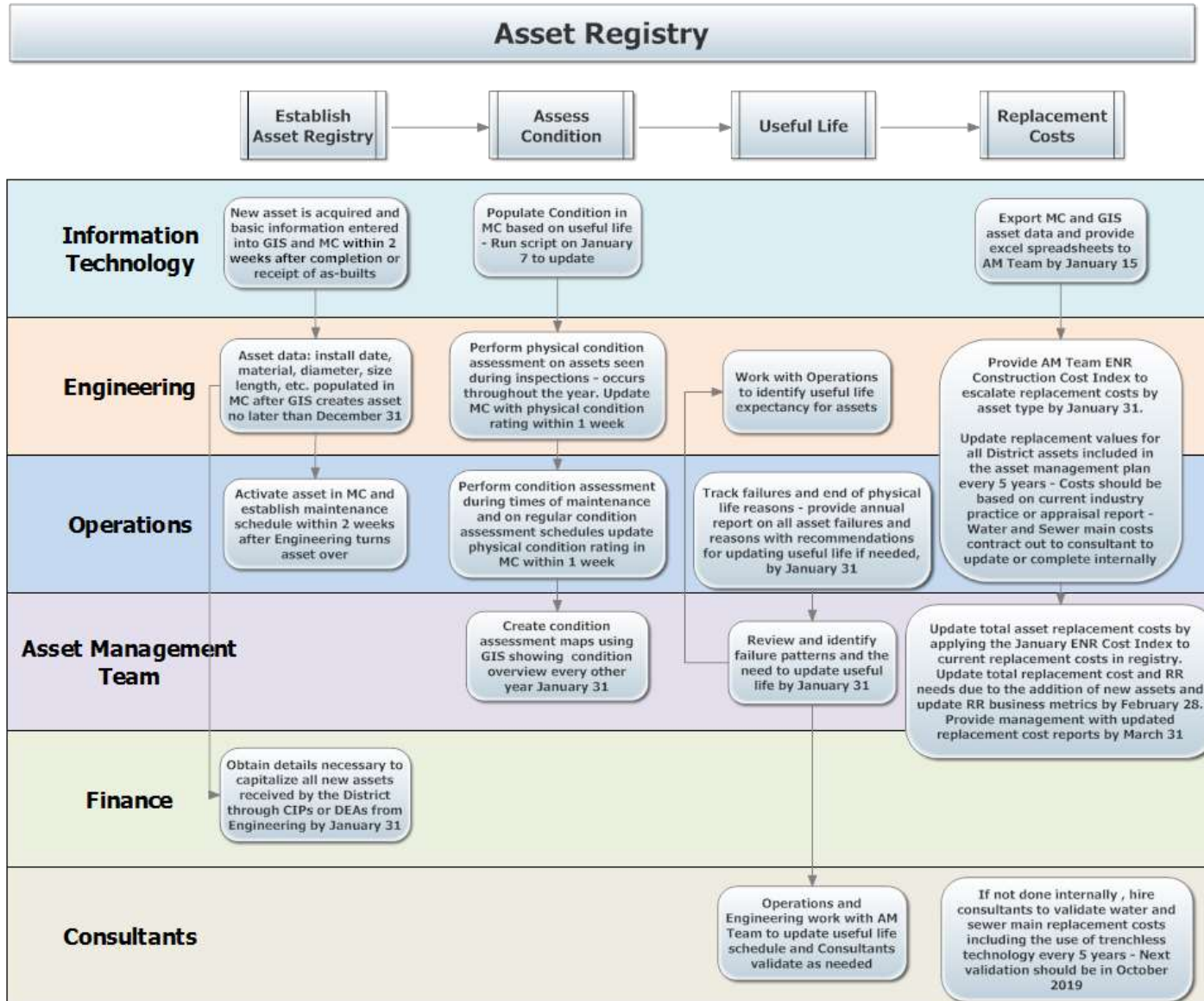
1st Draft
Plan
Summary
of assets



Projected 6-year Operating and Maintenance (O&M) and Capital Plan Expenditures

	2015	2016	2017	2018	2019	2020
Water Mains O&M	\$ 454,848	\$ 468,493	\$ 482,548	\$ 497,025	\$ 511,935	\$ 527,293
Water Mains Capital Plan	\$ 3,259,000	\$ 1,185,500	\$ 115,000	\$ 595,500	\$ 87,500	\$ 87,500
Water Mains Total	\$ 3,713,848	\$ 1,653,993	\$ 597,548	\$ 1,092,525	\$ 599,435	\$ 614,793

Build Asset Management Plan



- Work Flow Mapping for Continual Business Process

Lessons Learned

- Develop plan in alignment with agency systems – budget, capital plans, comprehensive plans, etc.
- Take it one step at a time develop your plan in phases
- Focus on the large, highest value assets first
- Benefit to in-house asset management plan development: Not a document on a shelf – but a continual business process
- Set up process mapping as you go – when, why, how, who will update the plan
- Involve all departments to ensure the asset management plan is integrated in the organization

Phew – On To Final Conclusions

Stress Reduction Kit



Directions:

1. Place kit on FIRM surface.
2. Follow directions in circle of kit.
3. Repeat step 2 as necessary, or until unconscious.
4. If unconscious, cease stress reduction activity.



Final Conclusions

- Align asset management with your organization's mission. Asset management should be one tool to meet your mission.
- Use EPA framework as a guide
- Start with a pilot project – don't eat the elephant all in one bite. Pick a couple of asset classes to go through the asset management process before trying to do all.
- GIS and CMMS are cornerstones to having a good asset management program.

Final Conclusions

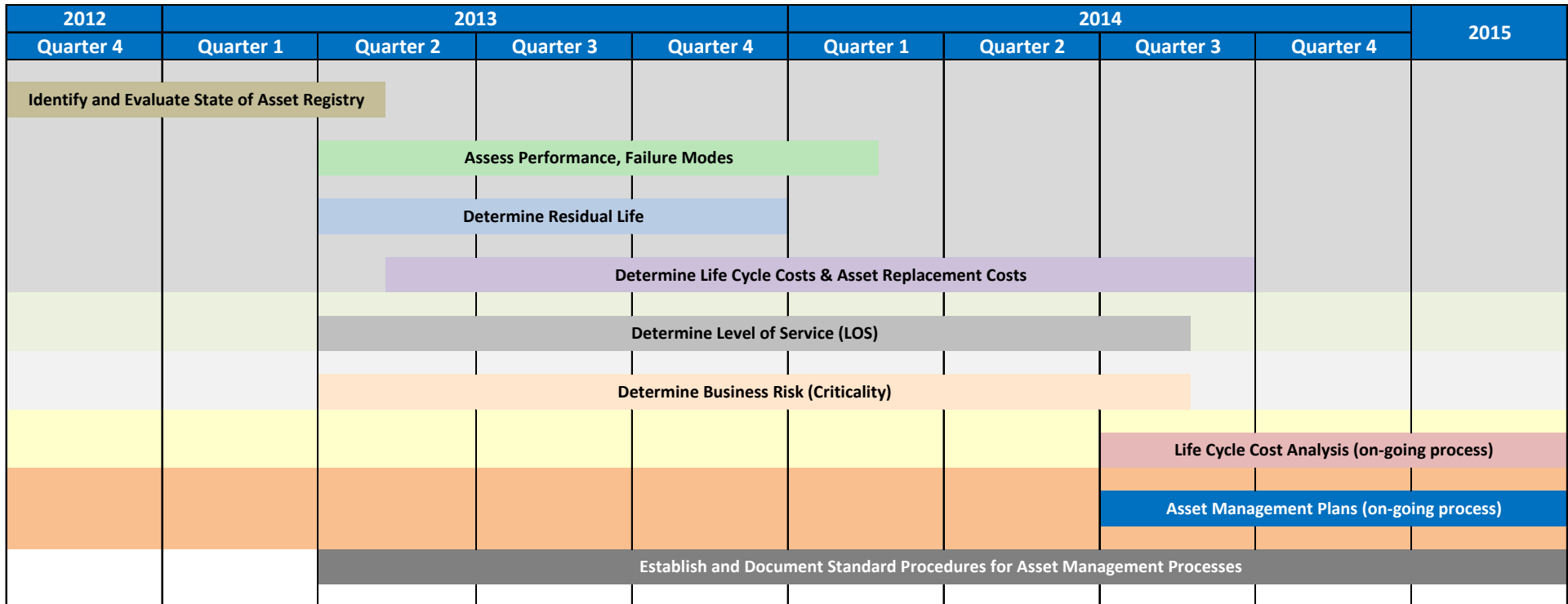
- Staff training and orientation is critical
 - Develop an organizational culture and understanding focused around asset management
 - Expose staff to others experiences with asset management
 - Broaden knowledge through training and technical advancement for asset management
- Staff for success: Asset management is a full-time initiative and additional resources may be needed
- To succeed asset management needs to be interdisciplinary to create shared ownership: Engineering, Operations, Finance, Information Technology and Administration/General Management



Final Conclusions

- Political support goes a long way: willing to fund the initiative and willing to follow the recommendations for rate setting
- It is possible to pursue parallel paths that culminate in asset management, don't need everything in place to begin, just ensure they can integrate
- Develop business processes as you go
- Expect you will make continuous revisions to gain confidence in plan outcomes

Asset Management Takes Time and Resources



Relates to the EPA Asset Management Core Question
1. What is the current state of my assets?

Relates to the EPA Asset Management Core Question
2. What is my required level of service (LOS)?

Relates to the EPA Asset Management Core Question
3. Which assets are critical to sustained performance?

Relates to the EPA Asset Management Core Question
4. What are my best O&M and CIP investment strategies?

Relates to the EPA Asset Management Core Question
5. What is my best long-term funding strategy?

NEVER EVER
EVER
GIVE UP!





Final Conclusions

Things won't be perfect your first go-round:

- Systems and knowledge will continue to grow and improve,
- Have processes in place to revisit and update asset management plans on a schedule,
- Don't sweat the small stuff.
- Pat yourself on the back as progress is made: we are a small agency and have been successful.

Questions??



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