Complying with the Latest Updates to Ohio EPA Asset Management Requirements

Practical Water Utility Asset Management Plans

Kevin Campanella, Utility Planning Leader, Burgess & Niple

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Ohio Section
American Water Works Association

Agenda

- Who Are You?
- Why Me?
- What are Your Intentions?
- The AM Story - Backwards


WHO ARE YOU
WHO ARE YOU
EDITED FOR AIRPLAY
NOT TO BE
TAKEN AWAY
KEEP

What are Your Intentions?
AM as a One Hit Wonder?

Why Asset Management Plans and Why Now?

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Ideas in motion.

Flint, MI

Gallipolis, OH

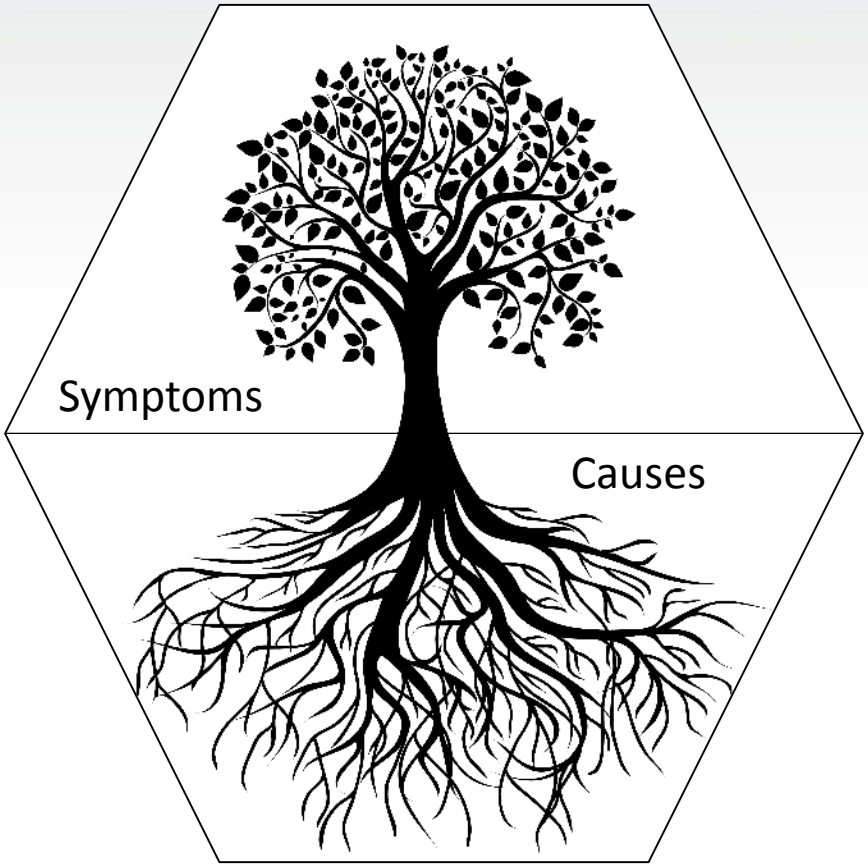
Toledo, OH

Harmful Algal Bloom (HAB)

Sebring, OH

The Columbus Dispatch

Root Cause



Senate Bill 2

- Section 6109.24 (B): “A public water system shall demonstrate the technical, managerial, and financial capability of the system to comply with this chapter and rules adopted under it by implementing an asset management program” by October 1, 2018.

- This applies to all public water systems

There's Gold in Them Thar Hills

The AM Story - Backwards

him to halt. He couldn't tell what it was, the wailing call of a bugle from the prison yard or a ray of the setting sun, much too bright and gay for October, which fell on Dorfrichter's petition. Hastily, he picked up the pen, dipped it into the dark-blue depths of the inkwell, and scribbled three crisp words beneath the bottom line of the petition:

"Rejected. Major Kunze."

Results from AM Programs

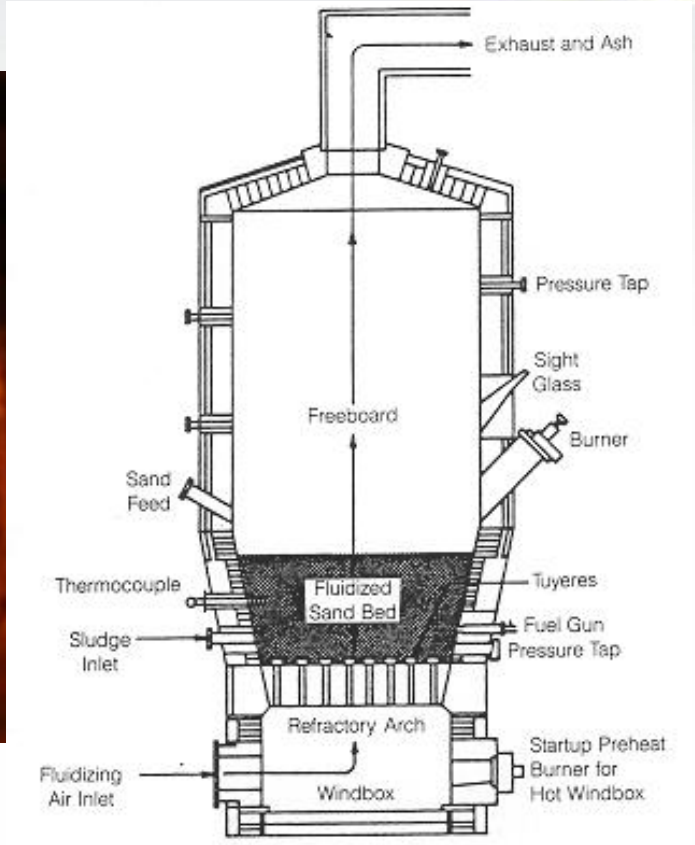
- Assets missing from register → WWTP bypasses
- CIP → 5-15% reduction from CIP evaluation
- Operations → 5-10% reduction
- Maintenance →
  - $250k / year in savings at two WWTPs
  - Safety improvements
  - Benefits in more reliable service

Savings were achieved…

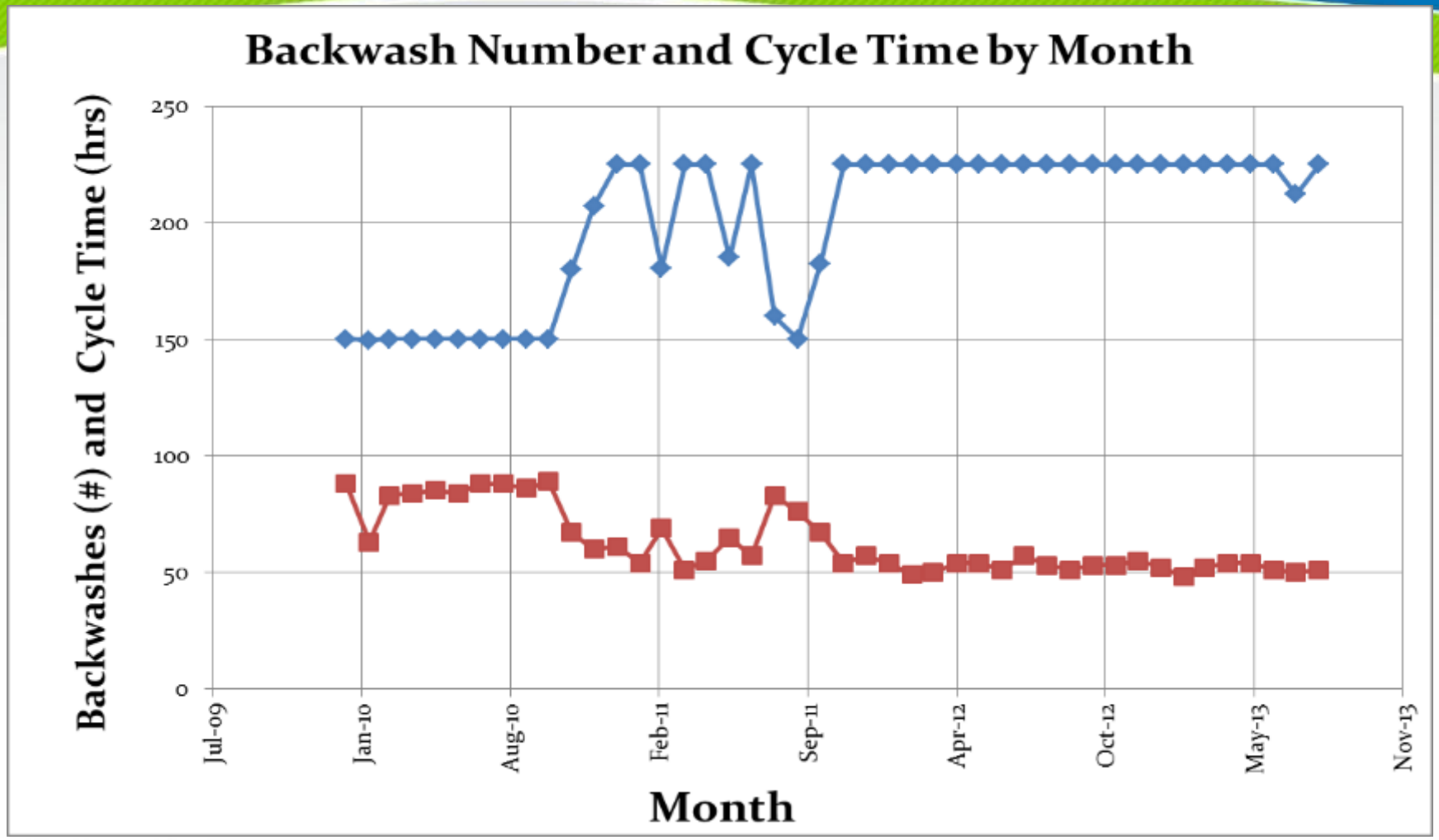
…because there was an asset management process in place (or not).

The Last Pages in the Asset Register

The Last Pages in the CIP

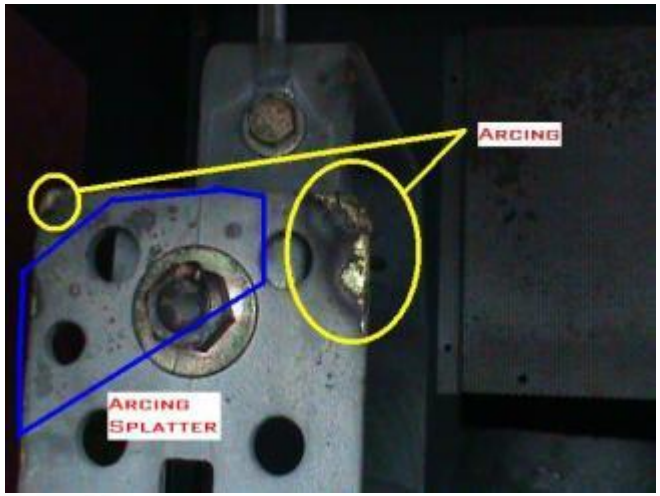


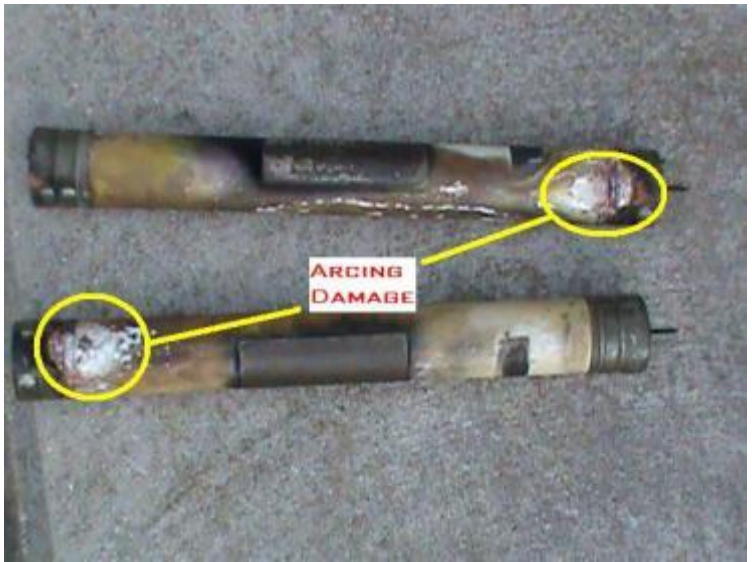
The Last Pages on Operations



The Last Pages in Maintenance

$110k saved…and maybe a life





Elements of an Asset Management Program

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SB2 AM Program Requirements

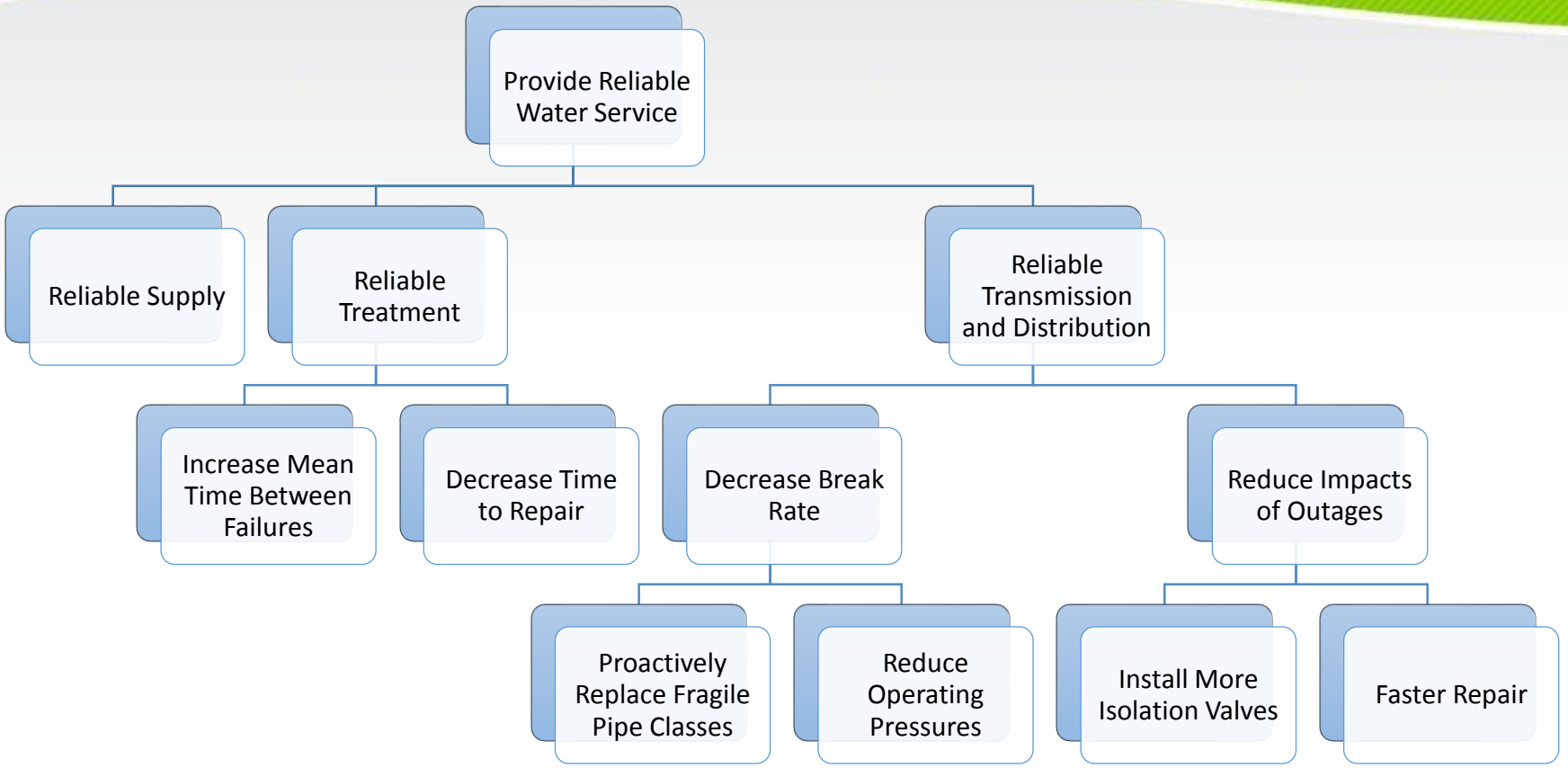
Section 6109.24 (B)(3) Asset Management Program shall include:

- Inventory and evaluation of all (physical) assets — Current State of Assets
- Approved capacity projections — Levels of Service: Growth
- Emergency preparedness and contingency planning programs — Risk
- A capital improvements plan (CIP) — Long Term Funding
- Asset rehabilitation and replacement ("R&R") program
  - Criteria and Timeline — Levels of Service: Aging Infrastructure
- Operations and maintenance programs — Life-Cycle Costs and Risk
- Long-term funding strategy — Long Term Funding

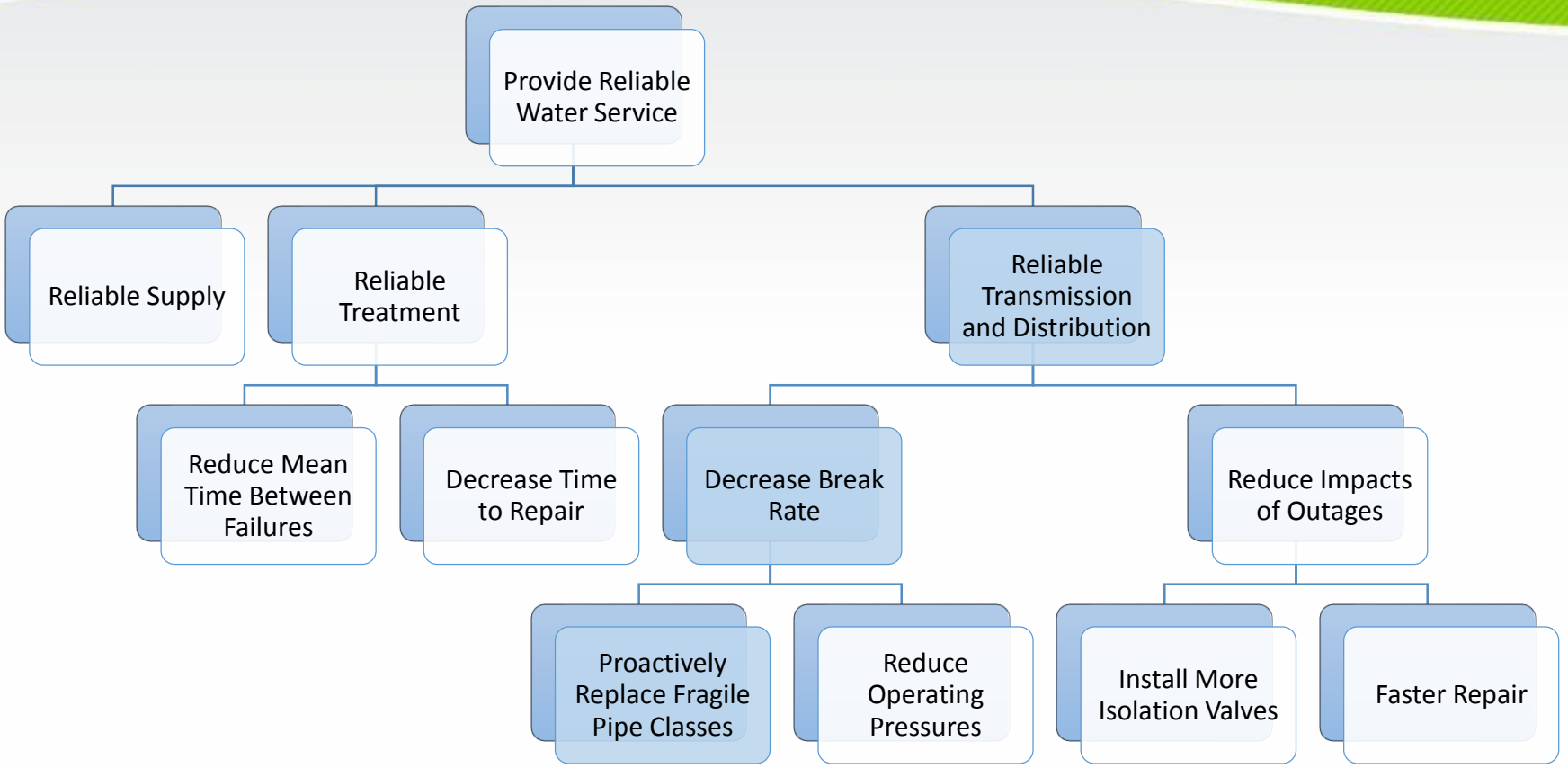
The 5 Chapters of the Typical AMP

Levels of Service

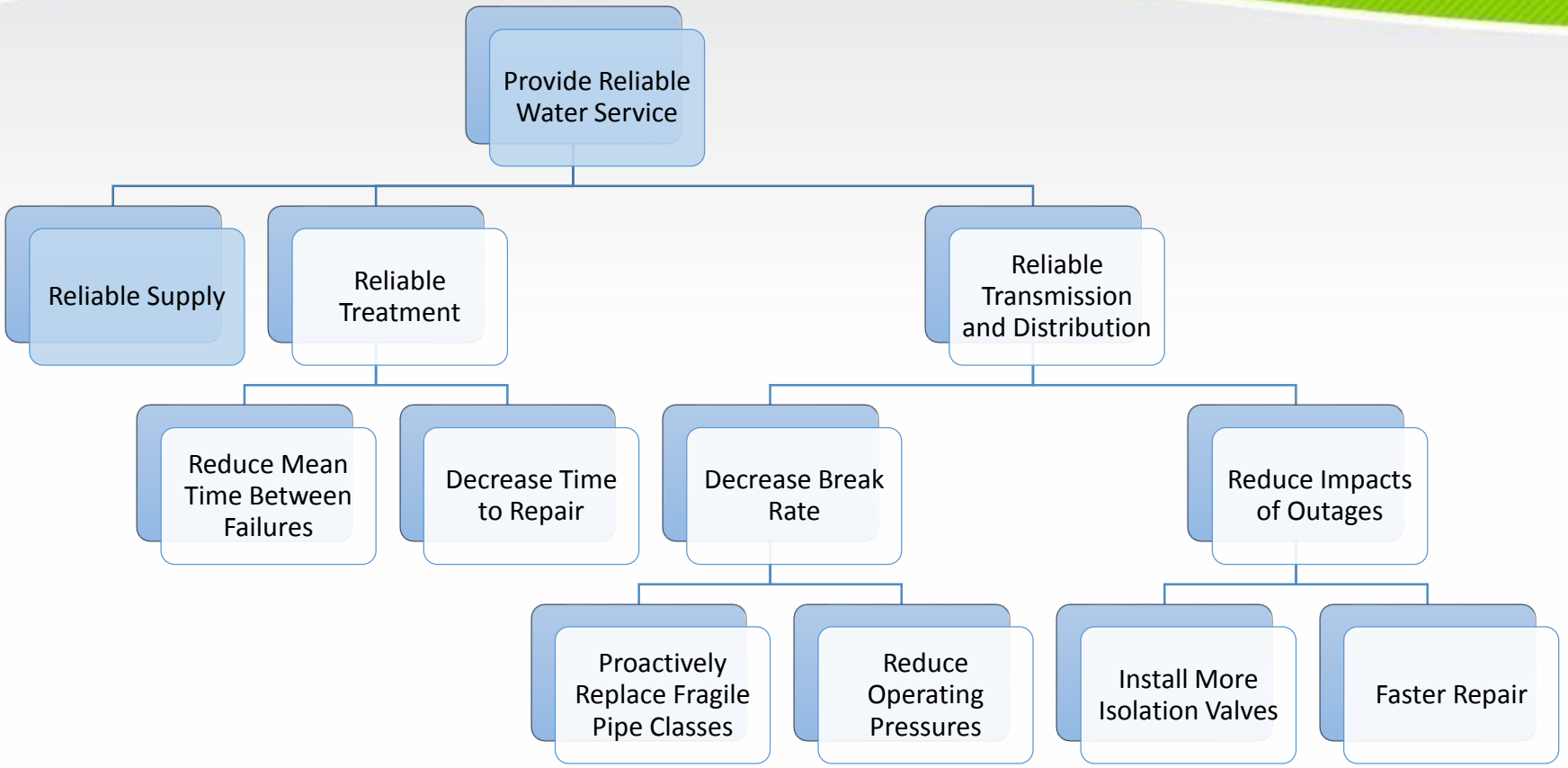
Performance Management Framework – Water Utility



Performance Management Framework – Columbus

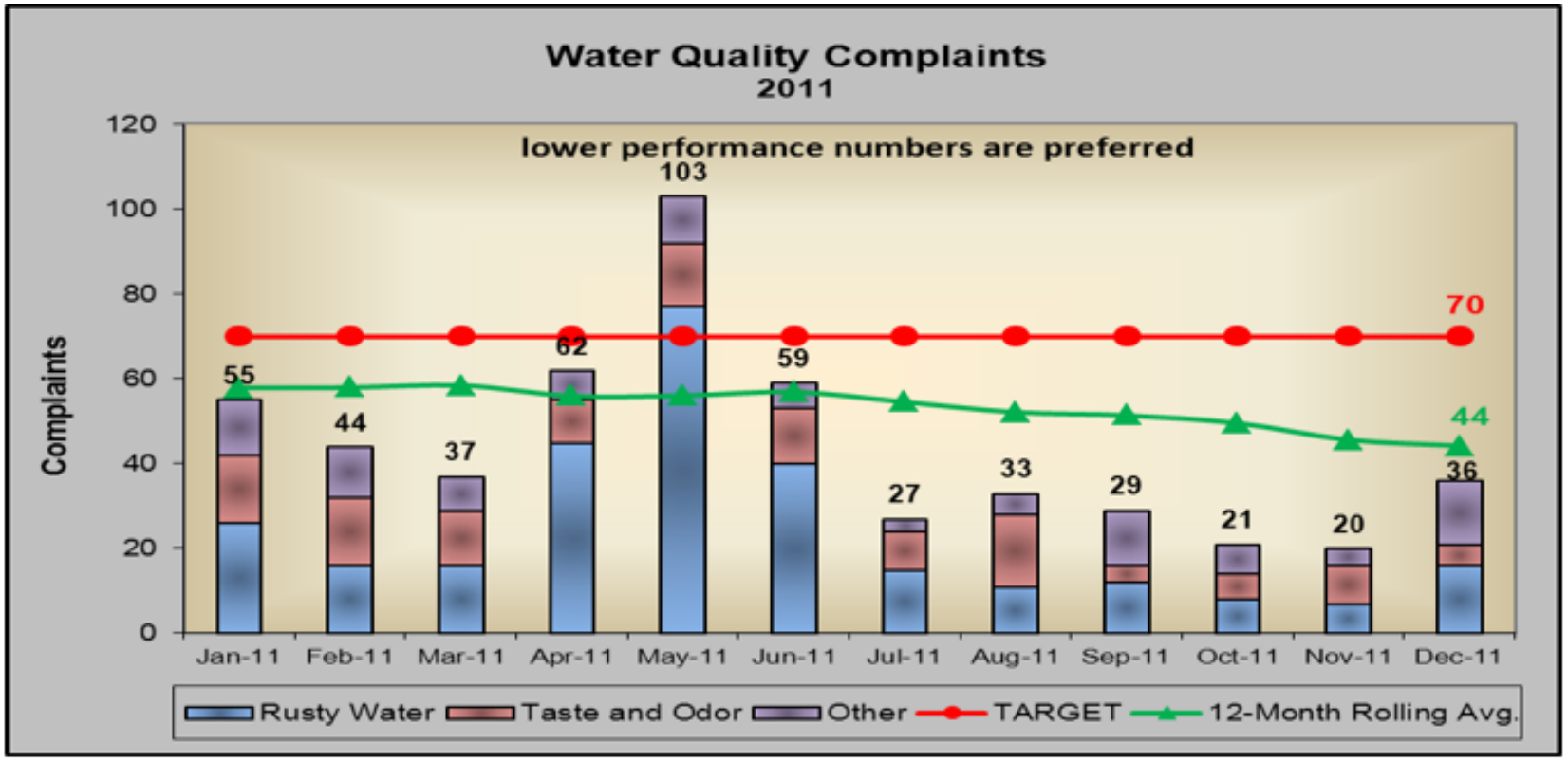


Performance Management Framework – Lake Erie Supply



What Levels of Service to Track

- Drinking Water Utility
  - Finished Water Quality (# of permit violations)
  - Availability (number and duration of outages)
  - Pressure (number of pressure complaints)
  - Complaints (taste, color, odor, etc.)

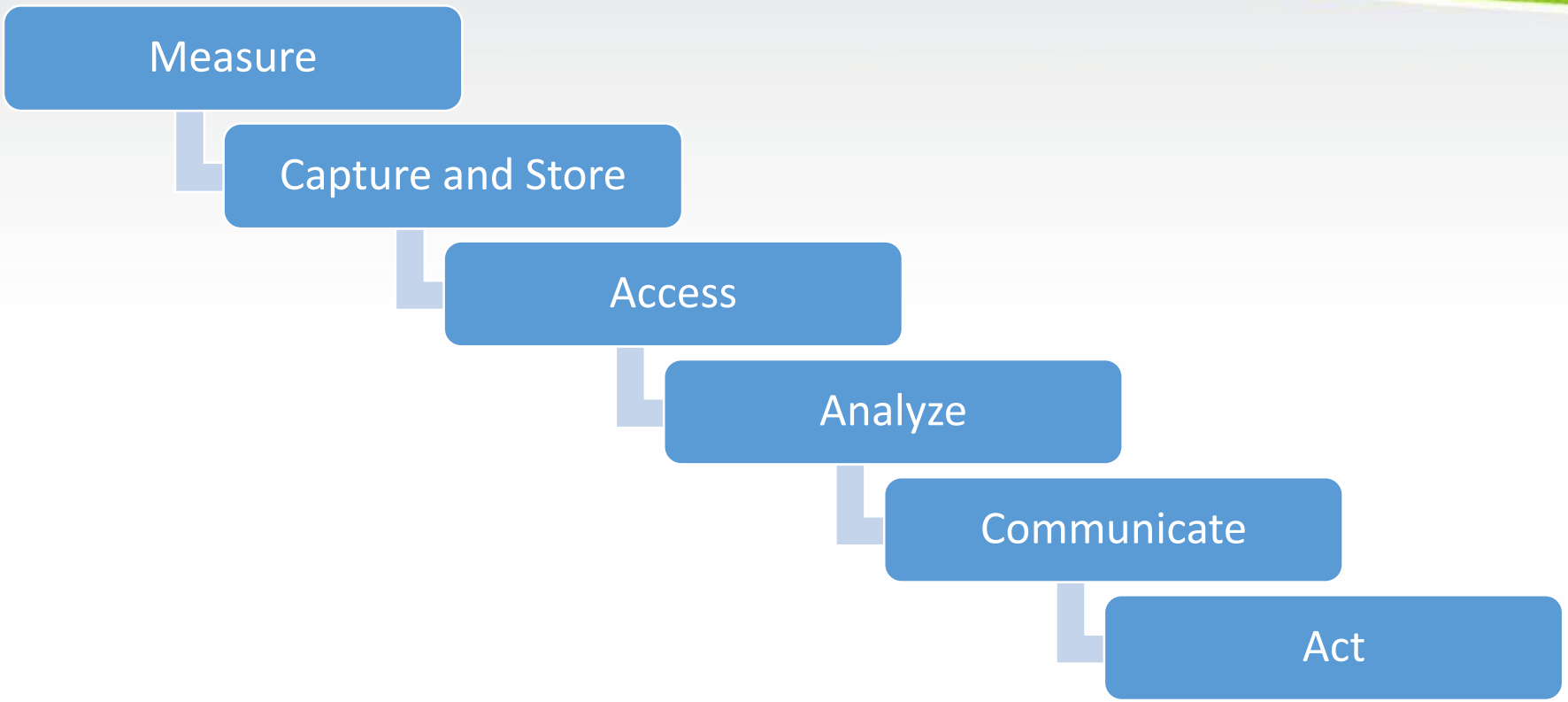


Definition: Total number of water quality complaints received by DPU and deemed to be valid. Distribution system reliability and drinking water quality have important implications for customer service and Operations & Maintenance, especially if ongoing complaints and issues impact the same customers on a repeat basis. Issues can be indicative of poor asset condition, restricted flows, low residual chlorine, and/or poor turnover of water in the distribution system. Complaints are tracked by type in order to track root cause of the problem and determine the most appropriate and effective method of resolution. This measure should be monitored for discernable trends over time. **Current target is at or below 70 complaints per month.**

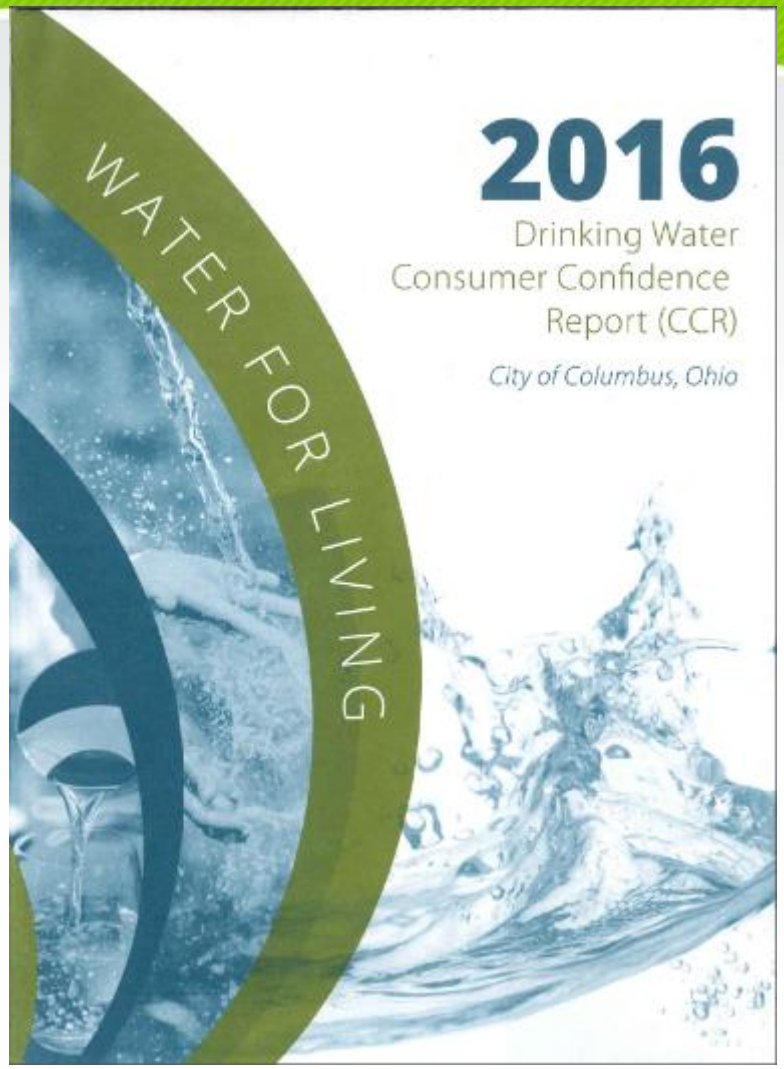
Notes on Performance: On average, performance was better than target for 11 of the 12 months in 2011. In May 2011, there was a significant spike in the number of complaints due to the Division of Fire's seasonal hydrant flushing program. Subsequently, the long term trend has showed steady improvement as represented by the declining 12 month rolling average.

Your Assets are Talking. Are You Listening?

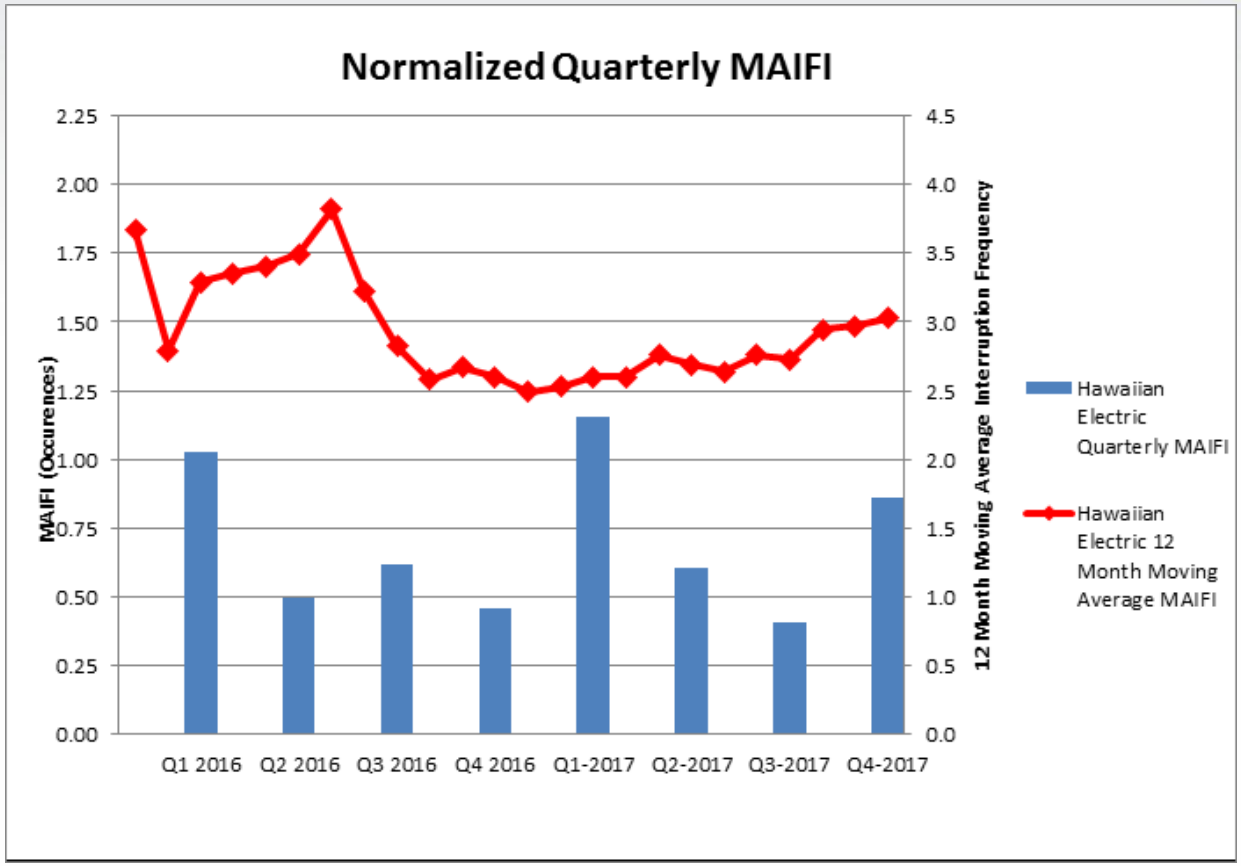
Performance Management: It's a Process



You're already tracking Quality



So is the power industry…



Current State of Assets

2. CURRENT STATE OF ASSETS

Know What you Own

- Asset Register (GIS, CMMS, Excel)
- Asset Characteristics
  - * Location
  - * Size
  - * Faceplate #
  - * Age
  - * Material
  - * Failure History
  - * Replacement $
  - * Depth
- Asset Hierarchy
- List of Spares

If you're not sure…

- Asset Walk Downs for Existing Assets
  - Two-way check between asset on the floor and in the system of record (asset register)
- O&M Ready for New Assets
  - Get assets and PM's into the maintenance cycle before assets go live

Condition of Assets

- Assess condition based on understanding of failure modes (1-5 scoring system)
  - Physical condition (i.e. PACP for pipes)
  - Performance (cost to maintain)
  - Capacity (can it perform its intended function?)
  - Obsolescence (Can I get replacement parts?)

Physical Condition

Pump

Condition	1	2	3	4	5
Vibration	None	Minor	Moderate	Considerable	Major
Temperature	Normal	Minimal heat from casing	Heat detected by hand	Heat uncomfortable to the touch	Excessive
Noise	Normal/None	Slight whine/rattle detected	Moderate whine/rattle detected, easily heard over pump noise	Loud whine/rattle	Disturbingly loud vibrations during operation
Leaking	None visible	Minor	Moderate	Considerable	Major

Condition Assessment – Performance Based

Water Main

1	2	3	4	5
0 Leaks/year	1-2 leaks/year	3-5 leaks/year	> 5 and < 10 leaks/ year	> 10 leaks/year

Risk Exposure

3. RISK EXPOSURE

Risk


Risk
=
Likelihood of Failure
X
Consequence of Failure

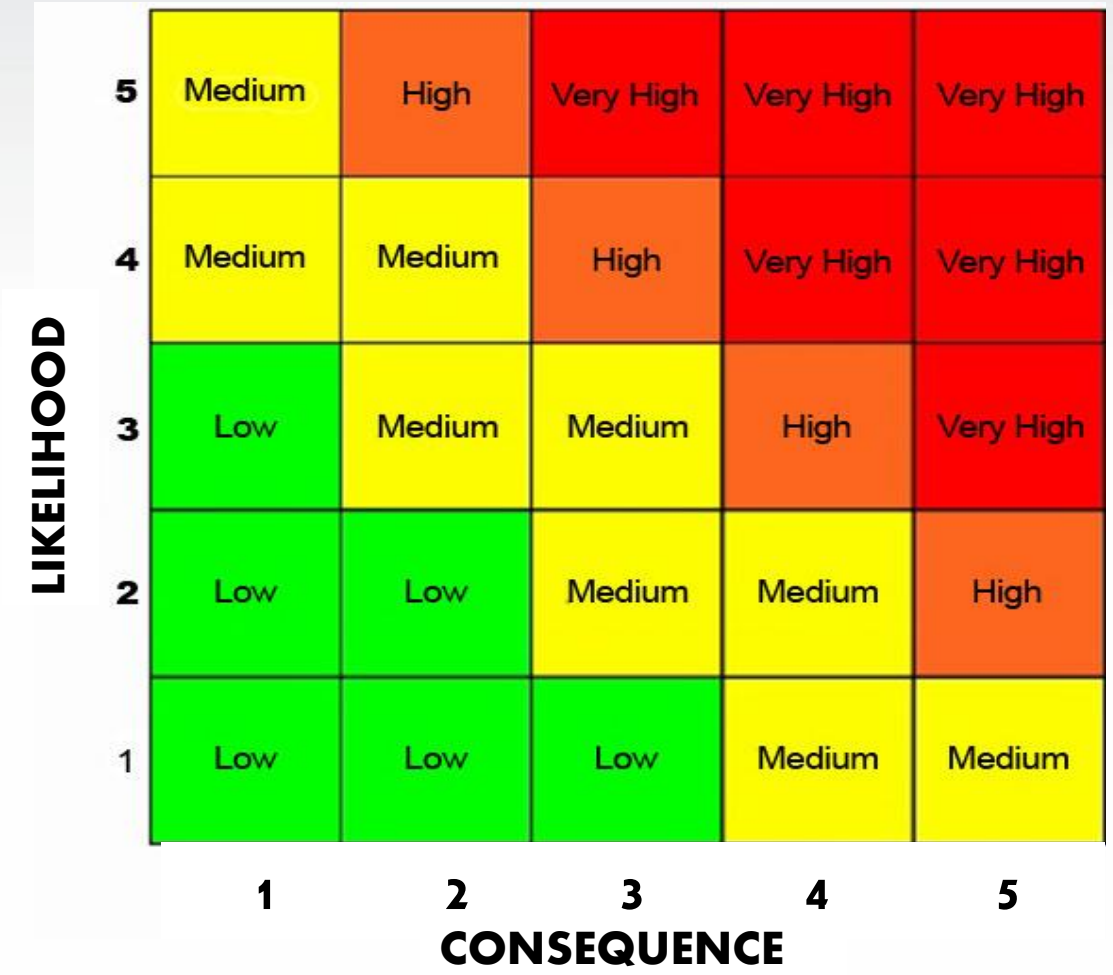
Consequence = Criticality

- Consequences can include:
  - Financial – direct cost to the utility
  - Social – property damage, traffic, noise, service interruption
  - Environmental – overflows, spills
- Can be assessed on a 1-5 scale
- Consequences can be assessed in $$

Example Consequence of Failure Matrix

5 (or >5)	4	3	2	1
Deaths as a result of incident.	Extensive injuries requiring major medical treatment but not life threatening	Follow up medical treatment required	First aid treatment necessary but no follow up medical treatment	No injuries as a result of incident
Major unplanned outage	Minor unplanned outage to customers	Moderate planned service interuption to customers	Minor planned interuption to customers	No interruption to customer
Significant irreplaceable loss of data	Significant but replaceable loss of data	Loss of minor data	No data loss, but data not accessible for short period	No impact to function
Hazardous material release - immediately life threatening	Hazardous material release - not immediately life threatening	Hazardous material release requiring external assistance to make safe	Hazardous material release contained safely	No hazardous material release
Financial loss (greater than 1% AOB Annual Operating Budget)	Financial loss (0.5% to 1% AOB)	Financial loss (0.25% to 0.5% AOB)	Financial loss (0.1% to 0.25% AOB)	Negligible financial loss (0 to 0.1% AOB)
Disruption to routine operation which may extend beyond 2 weeks	Disruption to routine operation which may extend for 1 to 2 weeks	Disruption to routine operation which may extend for up to 1 week	Disruption to routine which can be managed immediately	Observation only

Illustrating Risk



Concentrate your efforts on highest risk assets

Emergency Preparedness and Contingency Planning

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Minimize Life-Cycle Costs

4. MINIMIZE LIFE-CYCLE COSTS

Minimizing Life-Cycle Costs

An Asset Management Plan should include strategies for minimizing costs and risks while maintaining service levels:

- Capital Costs
- Operating Costs
- Maintenance and Reliability

Only one strategy above may be necessary – depends on the context of the utilities anticipated needs.

Optimize Capital Spending

- Justify projects using more data and with more rigor in the preliminary design stage

- The Asset Management Plan may state something like this:
  - Project justification review will be conducted on all projects with a budget over $50,000

- Summary Info.
- Problem Statement
- Alternatives Evaluation
- Benefit/Cost Analysis

Anchorage Water and Wastewater Utility	Project Justification Report

Summary Information:			
Project Number:		*Project Name:*	
Utility:	Water / Wastewater / Both (split costs)	*Project Location:*	
Department:		*Division:*	
Estimated Total Cost:		*CIB Years:*	
Project Manager/Lead:		*Phone#:*	

Project Origin:

☐ Master Plan ☐ O&M / Efficiency ☐ Regulatory ☐ Strategic Initiative or Strategic Plan Project
☐ Programmatic ☐ Capacity / Growth ☐ ADOT MOA Emergency Fund
☐ Risk Related (asset deterioration or consequence mitigation) ☐ Other: _____

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

Define the Problem to be Solved & Project Scope/ Description:

Justification for the Project (include Levels of Service affected, alignment with Strategic Plans, & associated risks):

Expected Costs and Benefits of the Proposed Project:*

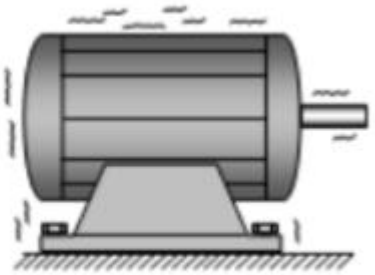
Optimize Maintenance Strategies

- Increased capacity = More assets to maintain
- Advanced equipment technology = Maintenance is complex
- More stringent standards = Less downtime
- Existing assets are aging; reactionary maintenance and replacements alone are too costly
- Proactive maintenance is safer!
- Maintenance tools are more sophisticated

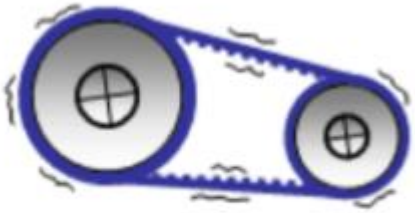
Vibration Analysis

Rotating Equipment

Vibrating Pumps



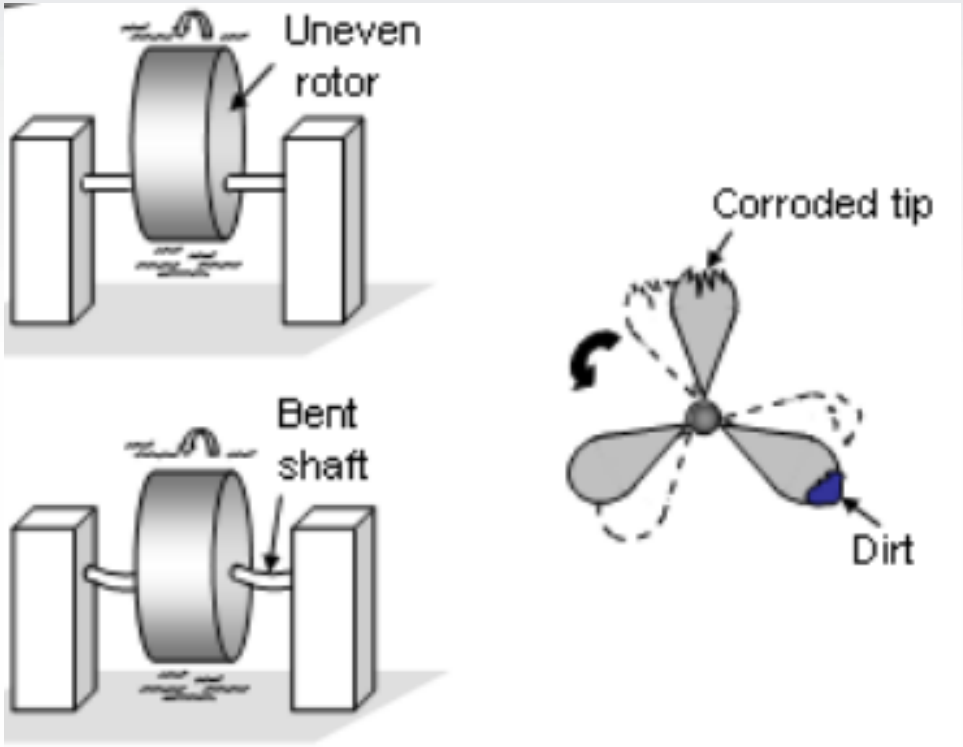
Vibrating Motors



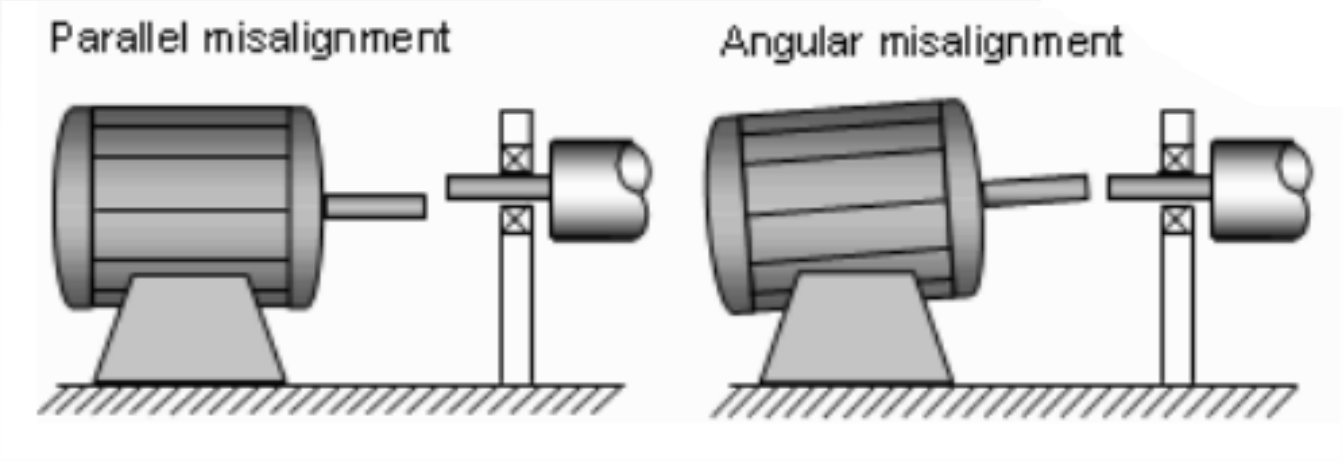
Vibrating Belts

Vibrating Fans

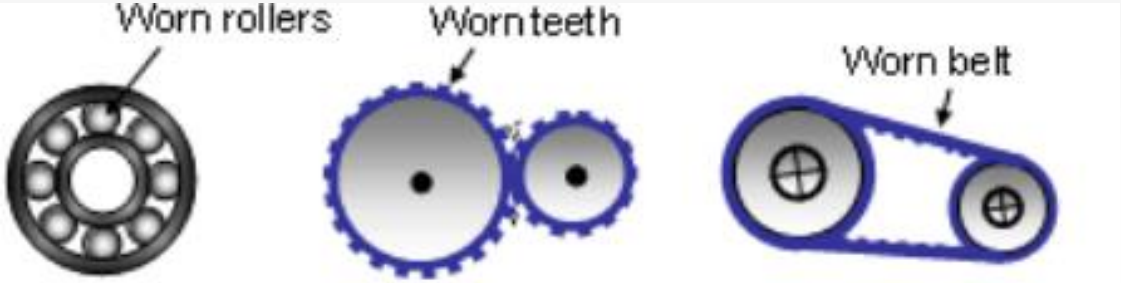
Imbalances



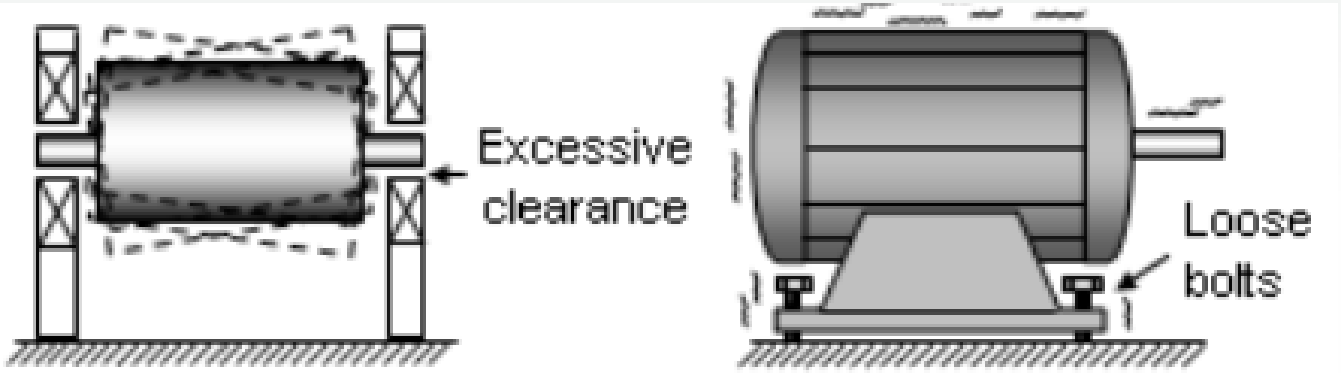
Misalignments



Wear



Looseness / Soft Foot



Vibration

- Very good at diagnosing specific issues
- Not as sensitive in many applications as ultrasound
- Inexpensive
- Can be used to verify repairs

Oil Analysis

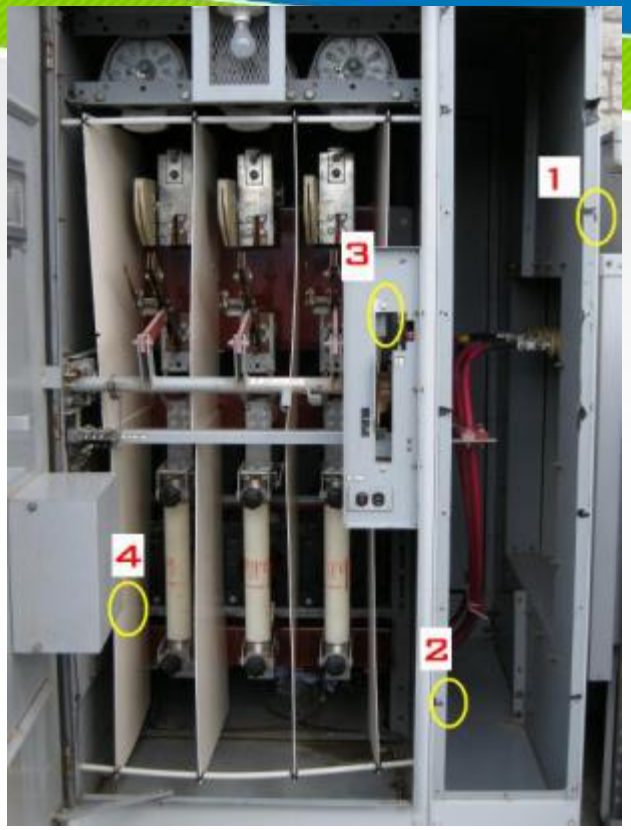
Possible Tests	Fluid Properties *Physical and Chemical Properties (Aging Process)*	Contamination *Fluid and Machine Destructive Contaminants*	Wear Debris *Presence and Identification of Wear Particles*
Viscosity Analysis	++	+	–
TAN or TBN	++	+	+
Moisture Analysis	–	++	+
Particle Counting	–	++	+
Oxidation and Nitration (FTIR)	++	+	–
Flash Point	+	+	–
Elemental Analysis	++	+	++
Glycol	–	++	+

LEGEND: ++ = *Primary Benefit* + = *Minor Benefit* – = *No Benefit*

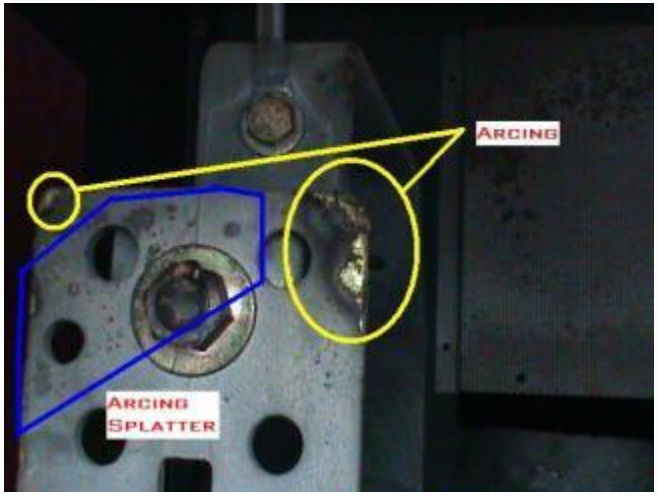
Analysis can help determine root cause of failure

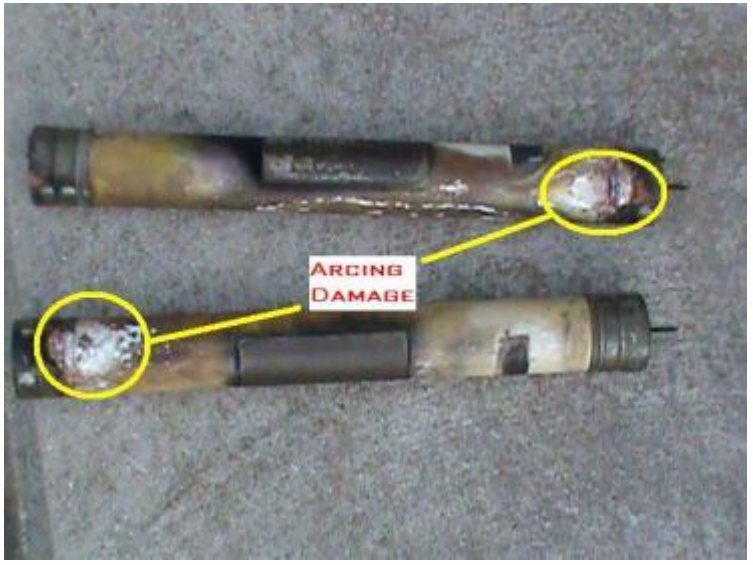
Ultrasound (Vibration and Lube)

Ultrasound for Electrical: Transformer

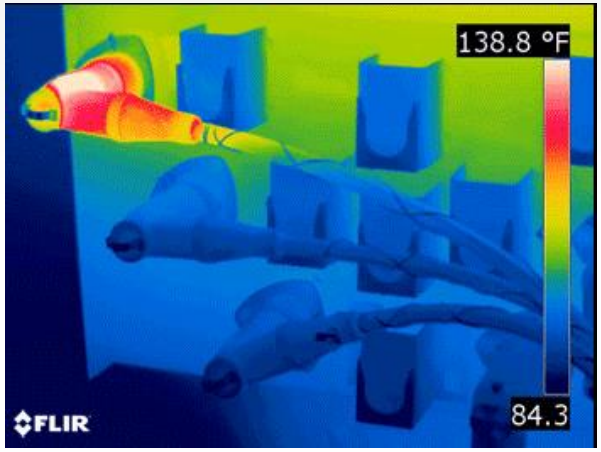


Ultrasound for Electrical





Thermography



Electrical Panel

Motor

Examples of Maintenance Strategy

- Train staff in use of ultrasound for use in detecting when and how much to lube
- Measure ratio of (PdM+PM) / CM
- Capture all failure data in a CMMS by 2020
- Increase population of asset replacement data
- Increase wrench time through better maintenance planning by 5% by 2019

Long-Term Funding Strategy

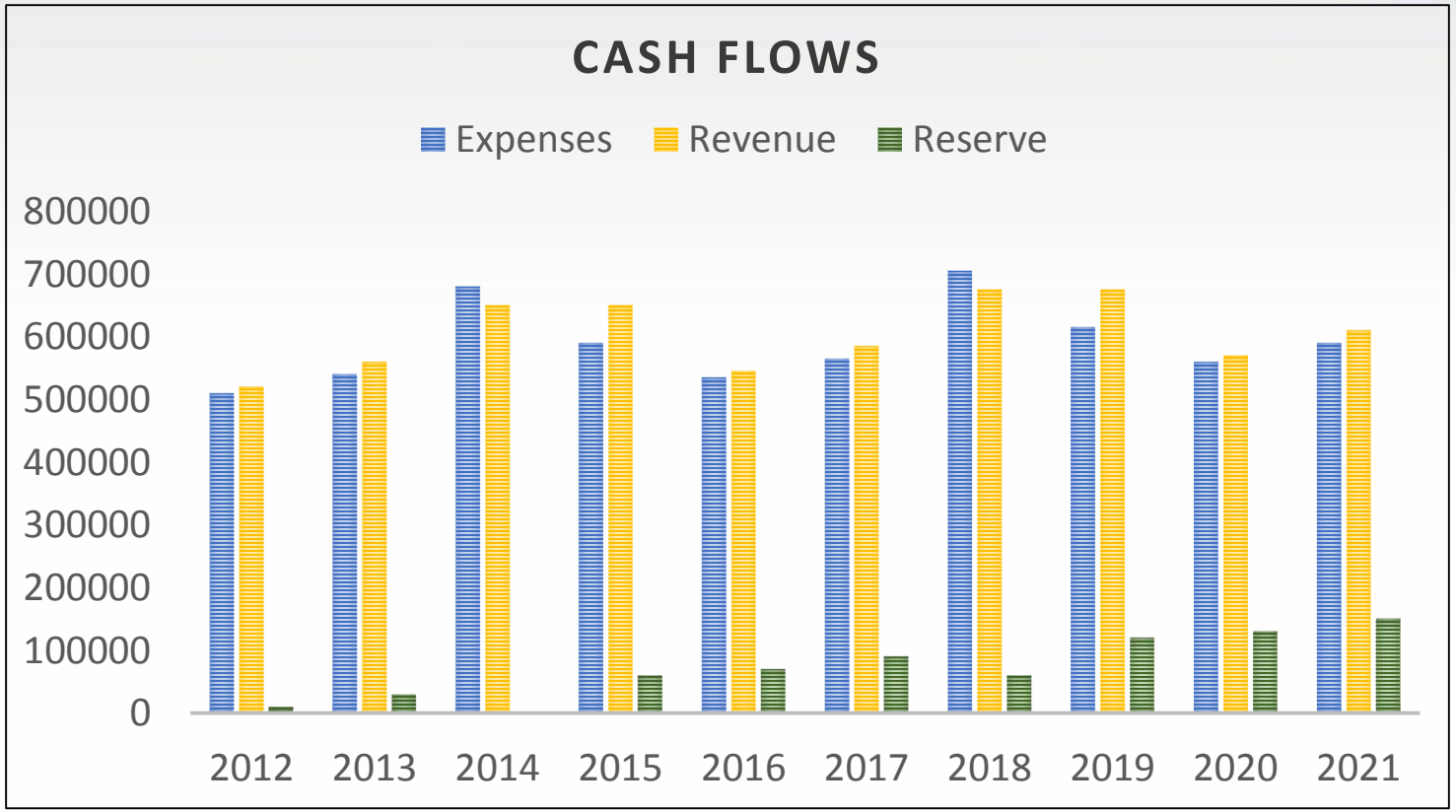
5. LONG-TERM FUNDING STRATEGY

Building a Plan – Work on Priorities

For 5 years prior and into the future, does the utility have:

- CIP to address future service needs
- Replacement plan for existing, aging assets
- Operations and maintenance budget
- Funding sources and estimated levels

Expenses, Revenue, Reserves



Sample SAMP

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Ideas in motion.

Sample SAMP (cont'd)

3.1 Initiative Identification and Prioritization

As outlined in the Introduction, the vision and goals presented in the *Philosophy and Framework* report, coupled with the findings in the *Performance Self-Assessment* report, clearly indicate that all areas of asset management practice need to be either improved or introduced for DPU to be a leading utility. Some of these areas are already on that improvement path, notably CMMS enhancements, Business Case Evaluations (BCEs), and Levels of Service (LOS).

TABLE 3-1
Recommended Improvement Initiatives

No.	Priority	Initiative	Tangible Benefits	Phase(s)
1	Urgent	Develop a Risk-based Decision Approach to Assets	- Life-cycle cost savings - Improved rate predictability	All
2	Urgent	Enhance LOS Measures and Targets	-Life-cycle cost savings - Service level improvements	All
3	High	Provide Organizational Development to Support AM	- Productivity improvements	All
4	High	Incorporate AM into DPU's Strategic Plan	- Life-cycle cost savings	All
5	High	Develop Project Delivery and Project Management Guidelines	- Productivity improvements - Life-cycle cost savings - Service level improvements	All
6	High	Develop and Implement Strategic Asset Management Plans (SAMPs) by Major Asset Class	- Life-cycle cost savings - Service level improvements	2
7	High	Establish Asset Management Procedures/Standards	- Life-cycle cost savings - Productivity improvements	2 and 3
8	High	Improve the Procurement Process	- Cost savings - Productivity improvements	2 and 3
9	High	Develop and Implement an Operations Optimization Program	- Life-cycle cost savings - Service level improvements - Productivity improvements	2 and 3
10	High	Develop and Implement a Strategic Maintenance Management Program	- Life-cycle cost savings - Service level improvements - Productivity improvements	2 and 3
11	High	Develop and Implement a Performance Management Program	- Life-cycle cost savings - Service level improvements - Productivity improvements	2 and 3
12	High	Select and Implement Core Technology Systems	- Productivity improvements - Service level improvements	All

Sample AMP

DRAFT

Strategic Asset Management Plan
Water Distribution Valves

Prepared for
City of Columbus
Columbus, Ohio
Version 2015

Table of Contents

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Scope of Work

- Data Gathering
  - Data Request
  - Interviews
- Prepare Draft AMP (existing conditions)
- Workshop Potential Recommended Action Items for the Plan
- Prepare AMP
  - Public Use Document
  - Internal Use Document

Sample Data Request

Western Water Asset Management Plan
Data Request

List of Documents for Review: Please collect readily accessible documents from list below. B&N can pick these up or these can be sent digitally. We do not need all the documents to start the Asset Management Plan evaluation. If documents are not available, that is fine. If you have existing documents that address multiple area, please indicate which items are covered by your document.

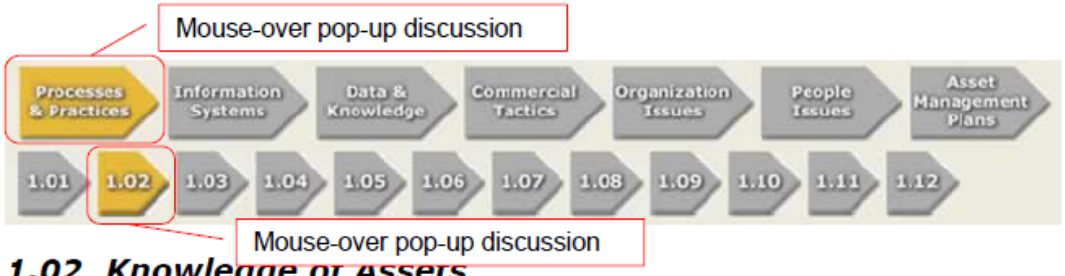
Levels of Service and Performance Management Data

1) Performance measures:
    a. Levels of Service
        i. Service interruptions
        ii. Regulatory compliance data (could review CCR)
        iii. Low Pressure events Number of connections
    b. Number of customers (by type, if tracked)
        i. Including a list of critical customers with continuous supply needs
    c. Number and description of interconnections in the event emergency supply is needed (and if they are treated / disinfected)
    d. Miles of pipe
    e. Debt to revenue ratio
    f. Reserve funds, and for contingency planning:
        ii. Any amounts budgeted specifically for emergency purposes
        iii. Statement of who can authorize emergency expenditures and under what conditions
    g. Non-revenue water
    h. Transmission and distribution pipe break rate \ break database
    i. Complaints (by category if available) over time
    j. Rehabilitation and Replacement data (e.g. percent of asset value replaced / year)

Current State of Assets and Risk Exposure

2) Water System Map (if not shown in GIS) showing
    a. Booster stations
    b. Treatment plant(s)
    c. Transmission and Distribution Piping
    d. Well Fields and Surface Water Intakes
    e. Force mains
    f. Valves (need to know that a map with detailed location of valves exists for contingency planning, but it should not be provided as part of this request)
3) Detailed maps/schematics or "As-Built" plans of distribution system & booster stations (just need to know if these are available: do not need copies)

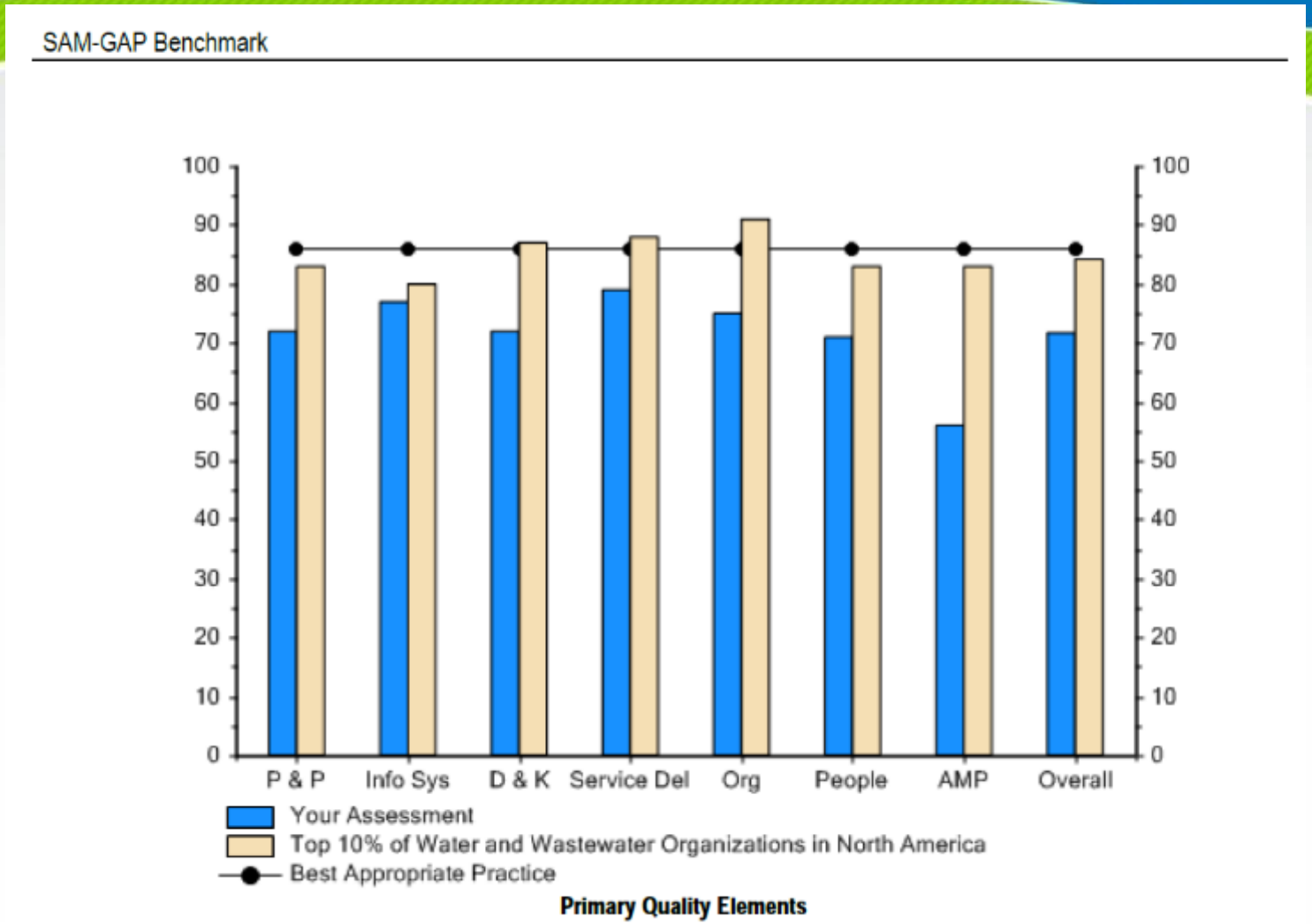
SAM-GAP



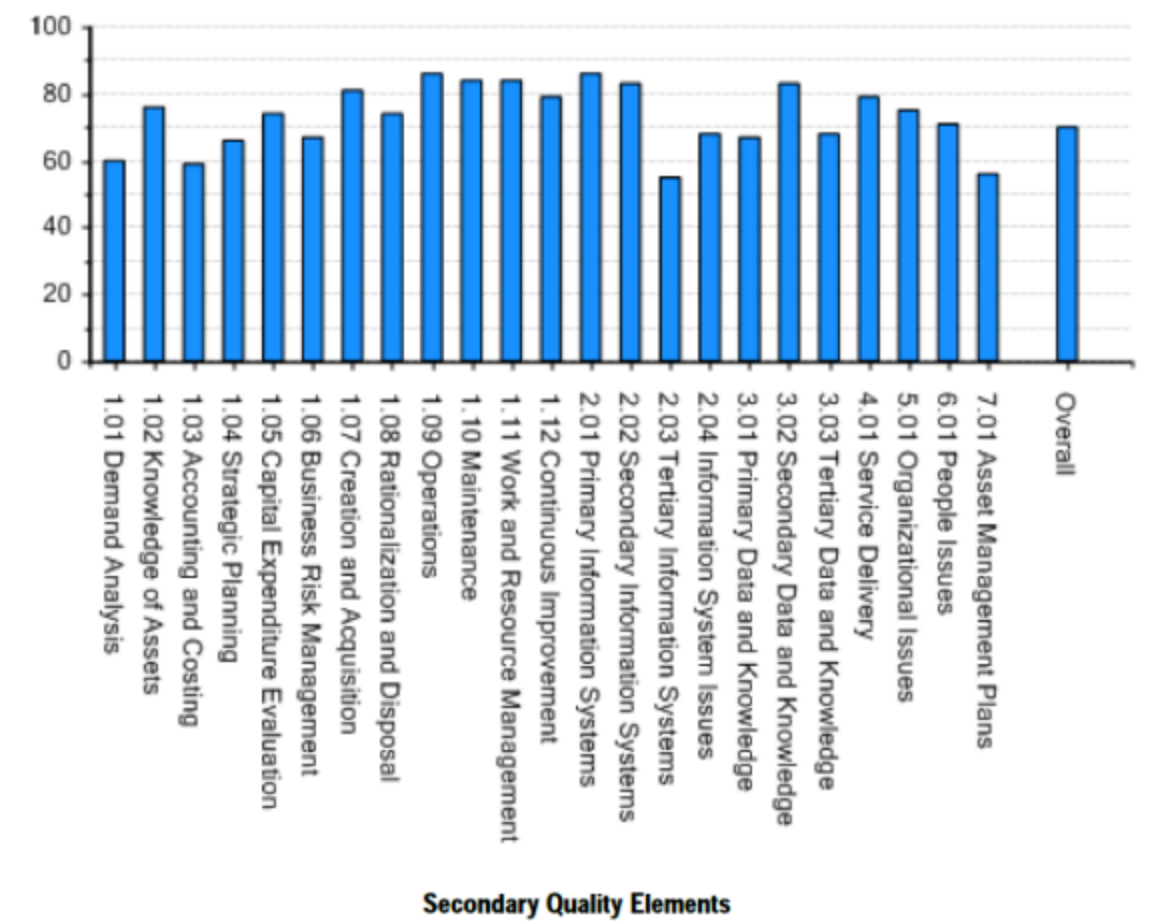
1.02 Knowledge of Assets

To what extent and at what level do processes exist:	(Level of practice)	(Extent of practice)
1.02.01 For defining the structure of the asset register and the level of detail of asset information that is collected and managed down to the maintenance managed item (MMI). (eg. Is there a defined hierarchical registry structure that is followed consistently? Is the structure and level of detail regularly reviewed?)	0 ="Innocence" 1 = Aware but no practice 2 = Low practice level 3 = Modest practice level 4 = Substantial practice level 5 = "World class" practice level	0 = Never done 1 = ad hoc process rarely executed 2 = ad hoc process occasionally executed 3 = mixture of ad hoc and systematic process, partially documented 4 = Mostly systematic process, pretty well documented, and regularly executed 5 = Systematic, fully documented process, always executed
1.02.02 For defining the collection and management of asset attribute information. (eg. Is there a data standard defining this and how is the standard maintained? Is it clear what information is required to be collected on assets?)	0 ="Innocence" 1 = Aware but no practice 2 = Low practice level 3 = Modest practice level 4 = Substantial practice level 5 = "World class" practice level	0 = Never done 1 = ad hoc process rarely executed 2 = ad hoc process occasionally executed 3 = mixture of ad hoc and systematic process, partially documented 4 = Mostly systematic process, pretty well documented, and regularly executed 5 = Systematic, fully documented process, always executed
1.02.03 For determining what assets to collect condition data on, when these assessments should be undertaken, and for determining the potential remaining useful lives of the assets. (eg. Are there written protocols defining how these are to be done? How are these protocols maintained? Is accurate data regularly and systematically gathered?)	0 ="Innocence" 1 = Aware but no practice 2 = Low practice level 3 = Modest practice level 4 = Substantial practice level 5 = "World class" practice level	0 = Never done 1 = ad hoc process rarely executed 2 = ad hoc process occasionally executed 3 = mixture of ad hoc and systematic process, partially documented 4 = Mostly systematic process, pretty well documented, and regularly executed 5 = Systematic, fully documented process, always executed
1.02.04 For determining what assets to collect performance and reliability data on and for	0 ="Innocence" 1 = Aware but no practice	0 = Never done 1 = ad hoc process rarely executed

SAMP output


SAM-GAP Benchmark
100
90
80
70
60
50
40
30
20
10
0
P & P
Info Sys
D & K
Service Del
Org
People
AMP
Overall
Your Assessment
Top 10% of Water and Wastewater Organizations in North America
Best Appropriate Practice
Primary Quality Elements

SAMP Output


100
80
60
40
20
0
1.01 Demand Analysis
1.02 Knowledge of Assets
1.03 Accounting and Costing
1.04 Strategic Planning
1.05 Capital Expenditure Evaluation
1.06 Business Risk Management
1.07 Creation and Acquisition
1.08 Rationalization and Disposal
1.09 Operations
1.10 Maintenance
1.11 Work and Resource Management
1.12 Continuous Improvement
2.01 Primary Information Systems
2.02 Secondary Information Systems
2.03 Tertiary Information Systems
2.04 Information System Issues
3.01 Primary Data and Knowledge
3.02 Secondary Data and Knowledge
3.03 Tertiary Data and Knowledge
4.01 Service Delivery
5.01 Organizational Issues
6.01 People Issues
7.01 Asset Management Plans
Overall
Secondary Quality Elements

Drivers Exercise

	Business Drivers for Change Over the Next 5 Years	Total Points	Number of Responses	Definition
A	Increasing Demands	8	2	Significant increase is expected in demand (quantity) for services, or water resources are limited, driving a need for attention to demand growth planning, demand management, or considerations of new or more reliable resources.
B	Decreasing Demands	0	0	Change is required as a result of a reduction in demand for services (such as through population decline), necessitating focus on service levels, asset rationalization and disposal, new technologies.
C	Regulations and standards	19	5	Utility change is required as a result of new or changing service standards and levels of operational performance being approved and monitored by an external regulatory body in areas such as water / effluent quality, service reliability, customer response, or asset performance.
D	Regulatory Requirements for Asset Management	6	2	Utility change is required to respond to a requirement for long-term asset management plans to be submitted and approved by an external regulatory body (Ohio EPA).
E	Financial - Affordability	29	7	Costs are or will be constrained as a result of customer requirements or affordability commitments, and/or willingness to pay for services provided.

Types of Follow-Up Work

- Asset management training
- Asset walk downs
- “O&M Ready”
- Assess asset data in GIS (structure, population)
- Assess CMMS technology for purchase or rework
- Develop condition assessment processes (i.e. scoring systems)
- Conduct condition assessment

Types of Follow-Up Work

- Develop Levels of Service (metrics, targets, reporting process)
- Prepare replacement plans
- Conduct operations optimization studies
  - Chemicals
  - Energy
- Develop a CIP prioritization methodology
- Develop a CIP evaluation process (i.e. BCE)

Types of Follow-Up Work

- Develop a process for conducting more proactive maintenance
  - Develop maintenance metrics
    - PM/CM ratio
    - Backlog
    - CM resulting from PdM
  - Introduce PdM technologies (ultrasound, vibrations)
  - Assist in optimizing timing of PM
    - Run-time PM
    - Calendar-based
    - Run-to-failure
    - Condition-based

Types of Follow-Up Work

- Develop a risk-register
- Develop a list of critical assets (consequence of failure methodology)
- Prepare Contingency Plan
- Develop KPI's for any line of business
  - Inventory
  - Project delivery
- Projects on the CIP
- AMPs for Asset Classes
- Negotiate with Ohio EPA

Prologue

- Asset Management Plans (AMPs) can be simple
- Show a plan to improve your AM practices
- AMPs are living documents
- AMPs assist with communication on many levels
- AMPs bring structure to how you manage assets
- AMPs help you focus resources to minimize cost
- AM is a journey – enjoy the ride
- AM is not a separate “thing”

Questions and Comments

Thank you!

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