



2019 ANNUAL
CONFERENCE & EXHIBIT

LOUDOUN  WATER

 **ARCADIS** | Design & Consultancy
for natural and
built assets

NEWEA
WORKING FOR WATER QUALITY

January 27, 2020

SESSION 1
ASSET MANAGEMENT 1:
CASE STUDIES AND TOOLS

DEVELOPMENT OF AN ASSET MANAGEMENT ROADMAP PROPELLED BY WORK TEAM INITIATIVES

PRESENTER

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Agenda



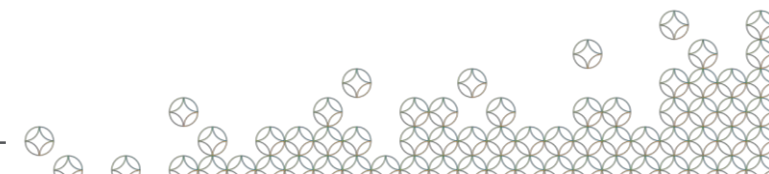
- Loudoun Water Overview
- Asset Management Practices Assessment
- Asset Management Roadmap





Loudoun Water Overview

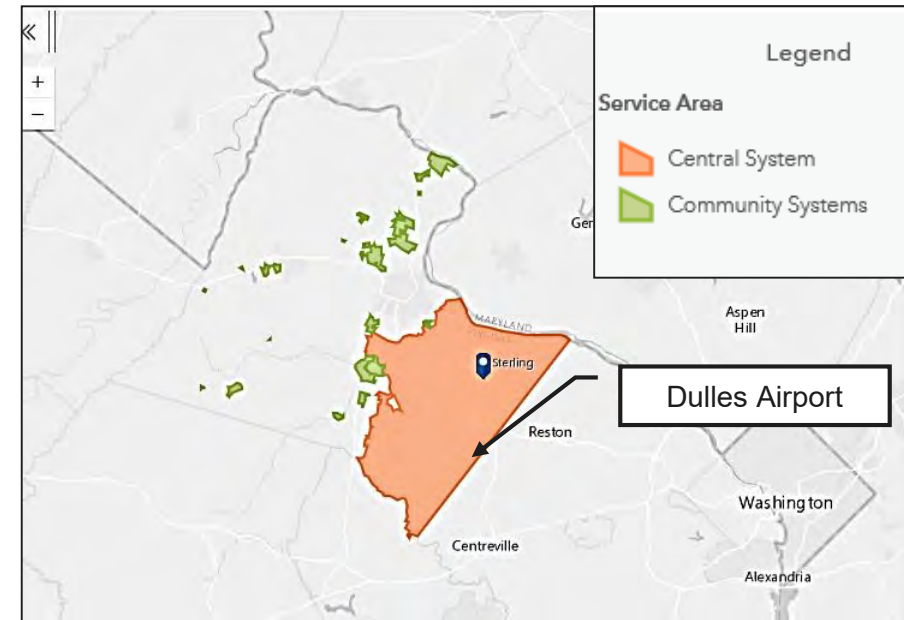
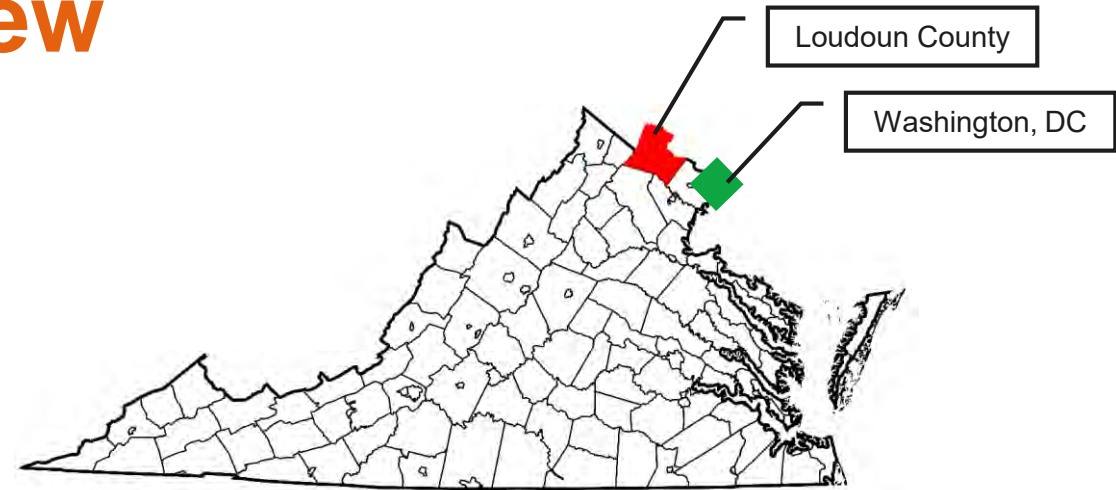
- Political subdivision of the State of Virginia (Est. 1959)
- Provides drinking water and wastewater services to over 260,000 residents in Loudoun County, VA
- Assets include:
 - One central water treatment facility
 - 1,300 miles of water distribution main
 - One central wastewater treatment facility
 - 1,100 miles of wastewater collection system pipeline
 - Many smaller community water and wastewater treatment plants





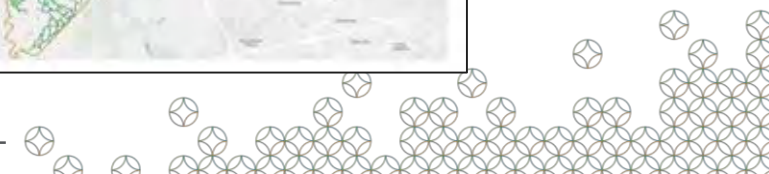
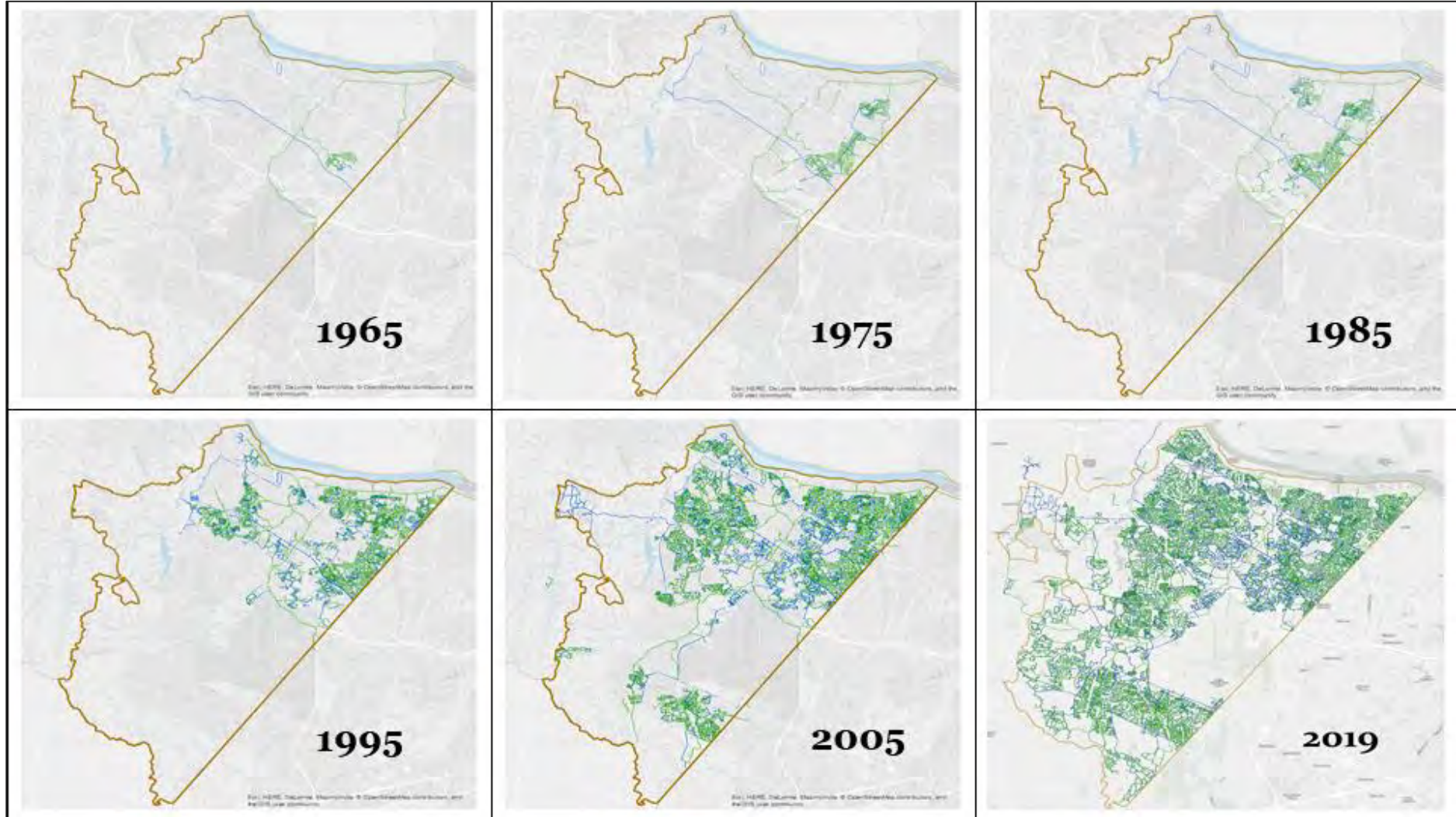
Loudoun Water Overview

- Loudoun County is located 25 miles west of Washington, DC
- One of the fastest growing counties in the US over the past decade





Loudoun Water Infrastructure Growth





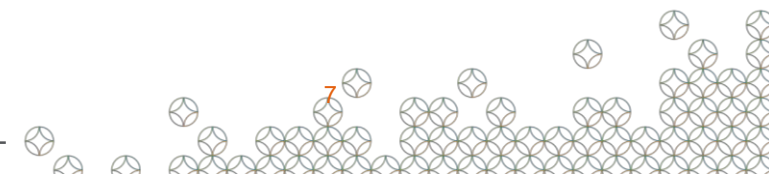
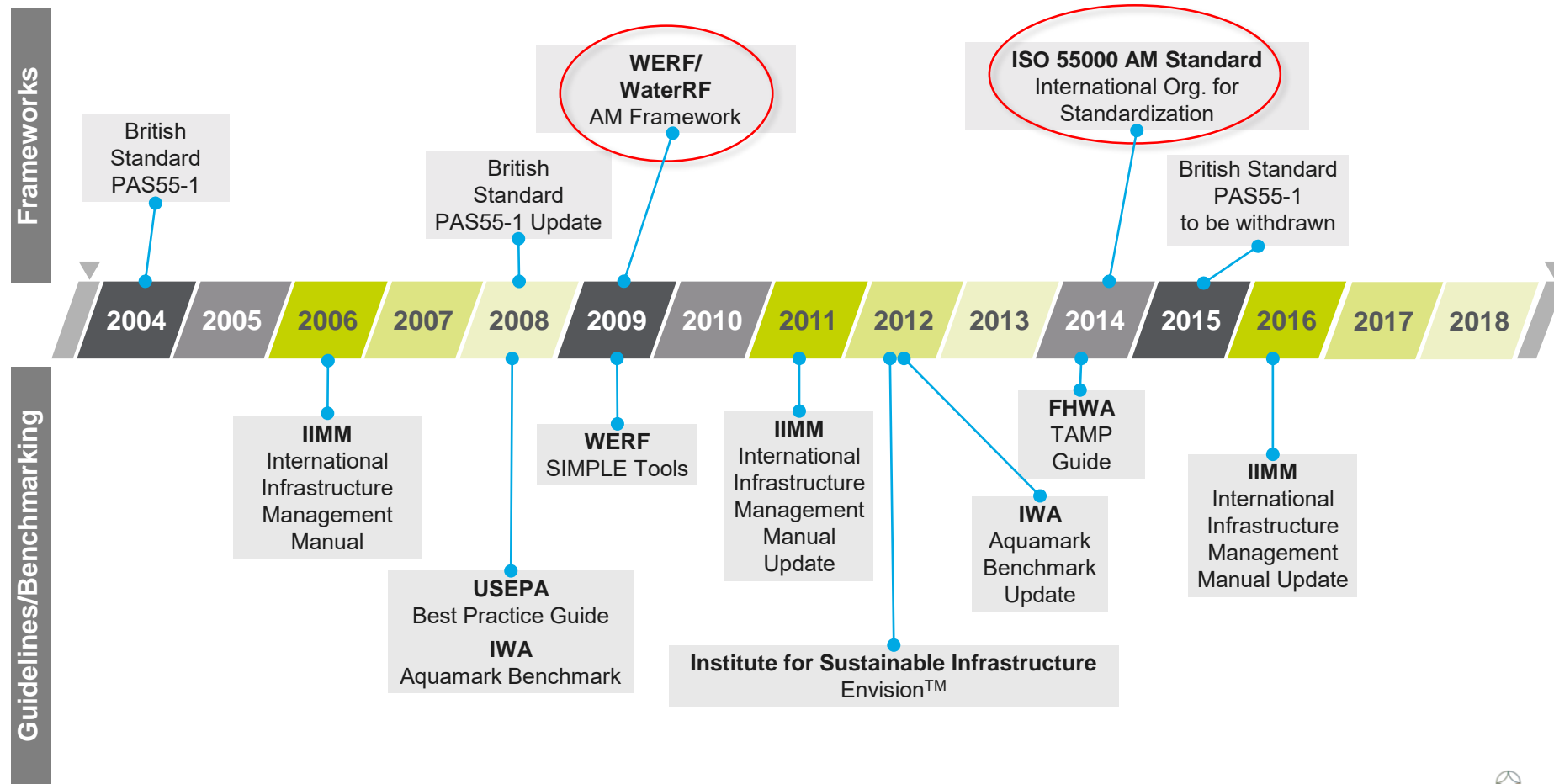
Benefits of Asset Management Practice Assessment

- Identifies strengths and improvement opportunities in AM practices
- Provides ability to prioritize improvement areas and develop a roadmap for implementation
- Provides an opportunity to learn about AM practices occurring in other parts of the utility
- Identifies a utility's AM practices relative to top 10% highest scoring water & wastewater utilities; although some gaps are more important than others
- Guides future action toward a measurable “state of practice” and benchmarks progress along the way toward that goal





Development of an AM Program is Based on Two Widely Recognized Frameworks





SAM-GAP has 150 Statements to Assess Practices and Identify Opportunities for Improvement

The **SAM-GAP** assessment tool takes the form of a detailed and comprehensive multiple-choice questionnaire.

SAM-GAP Examine the situation, Expose the problems, Execute the improvements.

Main Help Change Password Logout

1 Processes and Practices

cost effective to apply at what point in that life cycle. Processes and practices must be in place that supports decision-making throughout all stages of an asset's life.

Processes and Practices Information Systems Data and Knowledge Service Delivery Organizational Issues People Issues Asset Management Plans

1.10 Maintenance

The asset maintenance approach is to establish the right balance of preventive, predictive, and reactive maintenance, implement improved maintenance and operational procedures and improve work planning and scheduling. The aim of maintaining assets are to meet service delivery performance requirements, control fixed plant, equipment and component aging and optimize the entire asset life cycle costs

1.01 1.02 1.03 1.04 1.05 1.06 1.07 1.08 1.09 **1.10** 1.11 1.12

Legend: ■ Current Item ■ Uncompleted Item ■ Completed Item ■ Unanswered Question

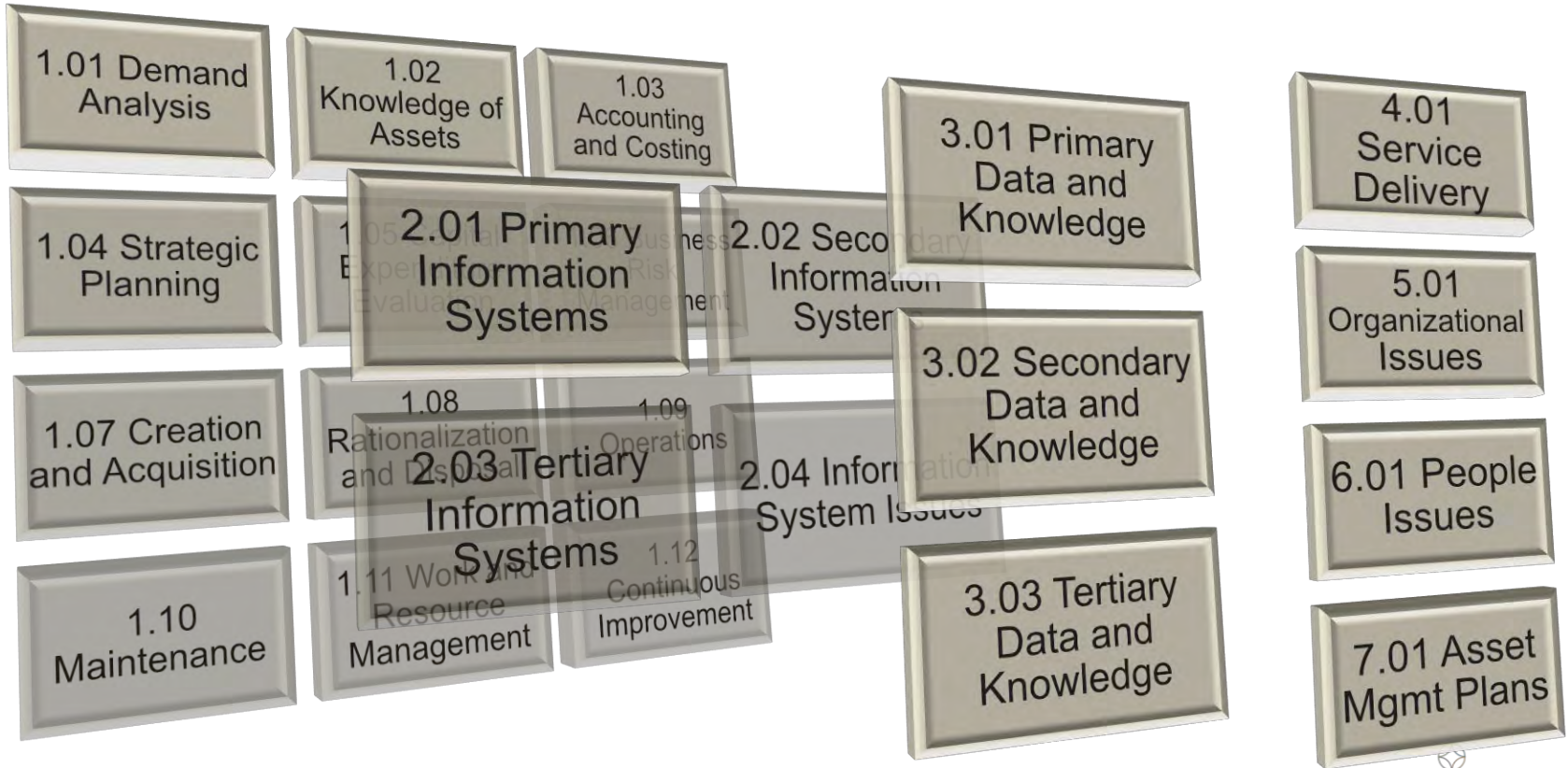
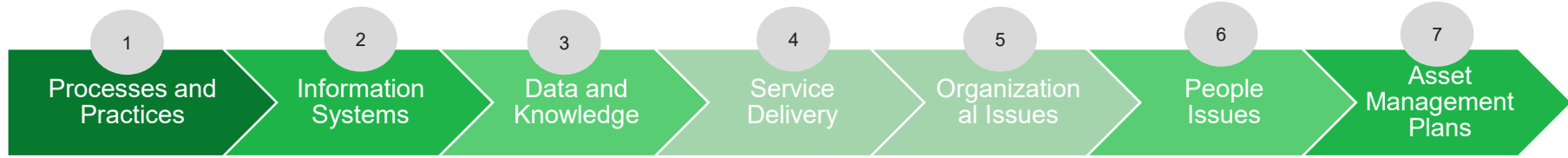
To what extent and at what level do processes exist for: Save and Next >

1.10.01 Processes for setting a strategic level maintenance framework (such as Reliability Centered Maintenance, Zero Breakdown Maintenance, Six Sigma, etc.) that defines how the organization undertakes maintenance of its assets.(eg. Does such a corporate wide policy exist and is it tied to business goals and cost analysis?)

<p>Level of practice</p> <p>○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p>	<p>Extent of practice</p> <p>○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5</p> <p>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</p>
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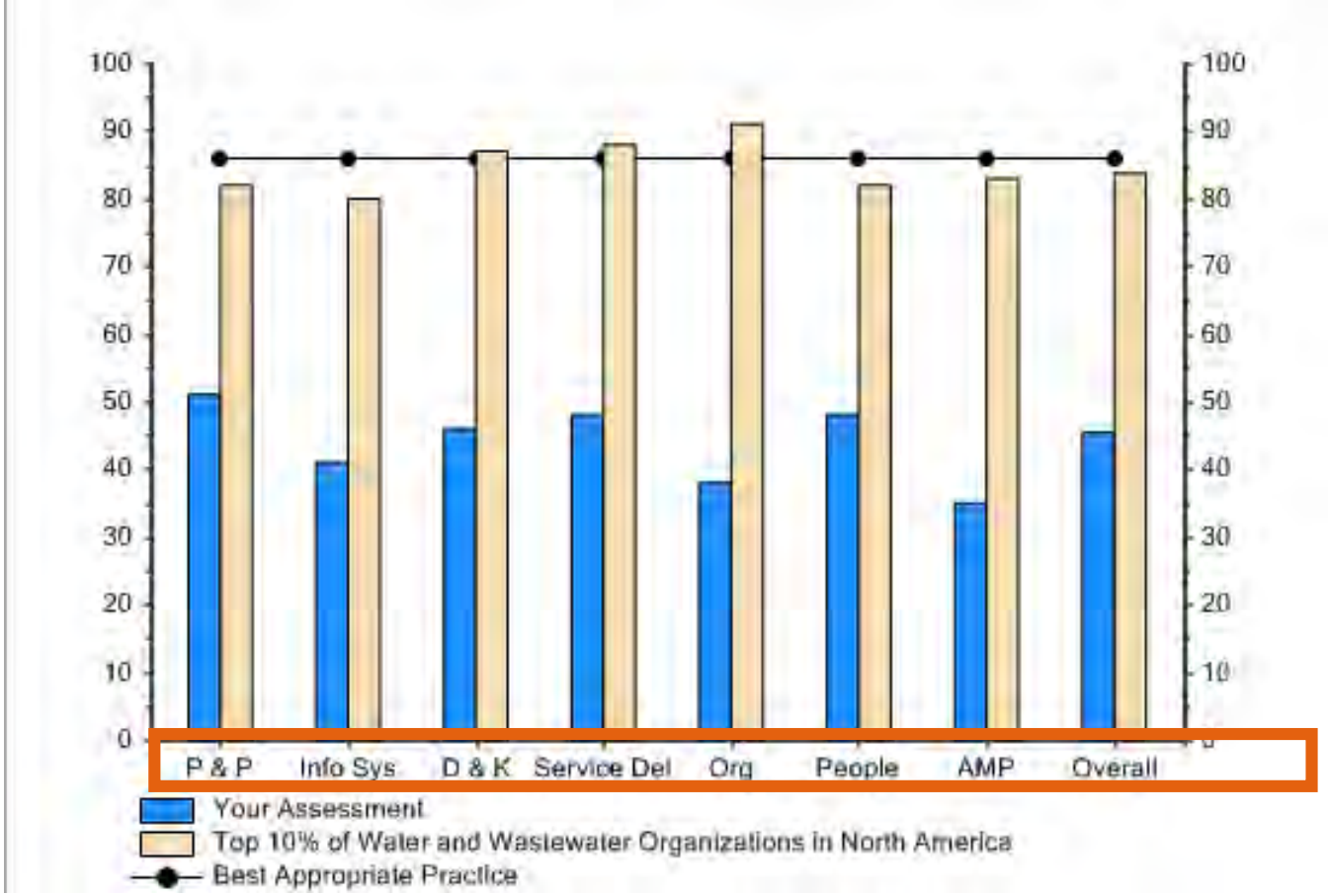


There are 7 SAM-GAP Elements





SAM-GAP Scores Helping Prioritize Areas to Improve

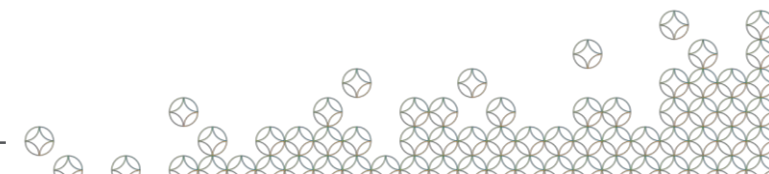




Scoring Discussion is an Efficient Way to Discuss Practices and Improvement Opportunities

Processes and Practices, etc.

Level of Practice	Extent of Practice
0 = "Innocence"	0 = Never done
1 = Aware but no practice	1 = Ad hoc process rarely executed
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3 = Modest practice level	3 = Mixture of ad hoc and systematic process, partially documented
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Scoring Discussion is an Efficient Way to Discuss Practices and Improvement Opportunities

IT Systems

Level of Practice	Extent of Practice
0 = No relevant information systems in place	0 = No systems in place, hence no use
1 = Very few automated systems / application in place	1 = For the most part, the systems are archaic and outdated; poorly used
2 = Some automated systems in place, most manual	2 = A few systems are well used, most are not
3 = Mix of automated and manual systems	3 = Mix of well used and not used
4 = Most work processes are automated	4 = Most are well used
5 = All work processes automated	5 = All are well used





Scoring Discussion is an Efficient Way to Discuss Practices and Improvement Opportunities

Data and Knowledge

Level of Practice	Extent of Practice
0 = 0% complete (no data)	0 = Mostly inaccurate/ out of date
1 = 35% complete	1 = 35% accurate / up to date
2 = 50% complete	2 = 50% accurate / up to date
3 = 65% complete	3 = 65% accurate / up to date
4 = 80% complete	4 = 80% accurate / up to date
5 = 95% complete	5 = 95% accurate / up to date





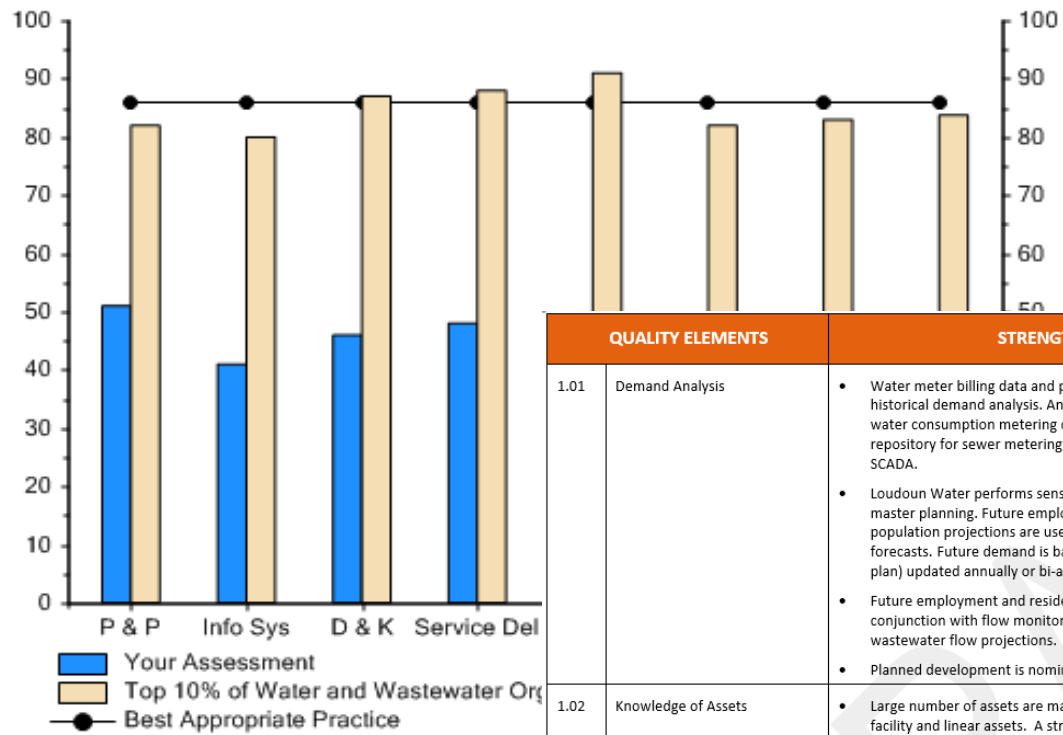
AM Practices Assessment Steps

1. Review Requested Organization Information
2. Convene multi-department group(s) from O&M, Capital planning, IT, etc.
3. Discuss Questions with Groups to Review Current State
4. Develop Initial Assessment & Summarize Improvement Opportunities
5. Organization Provides Feedback
6. Develop AM Initiatives & Roadmap with Organization

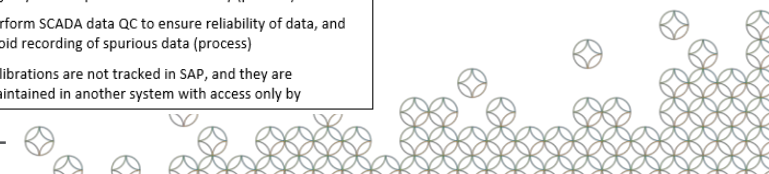




Gap Analysis Identified Strengths and Opportunities

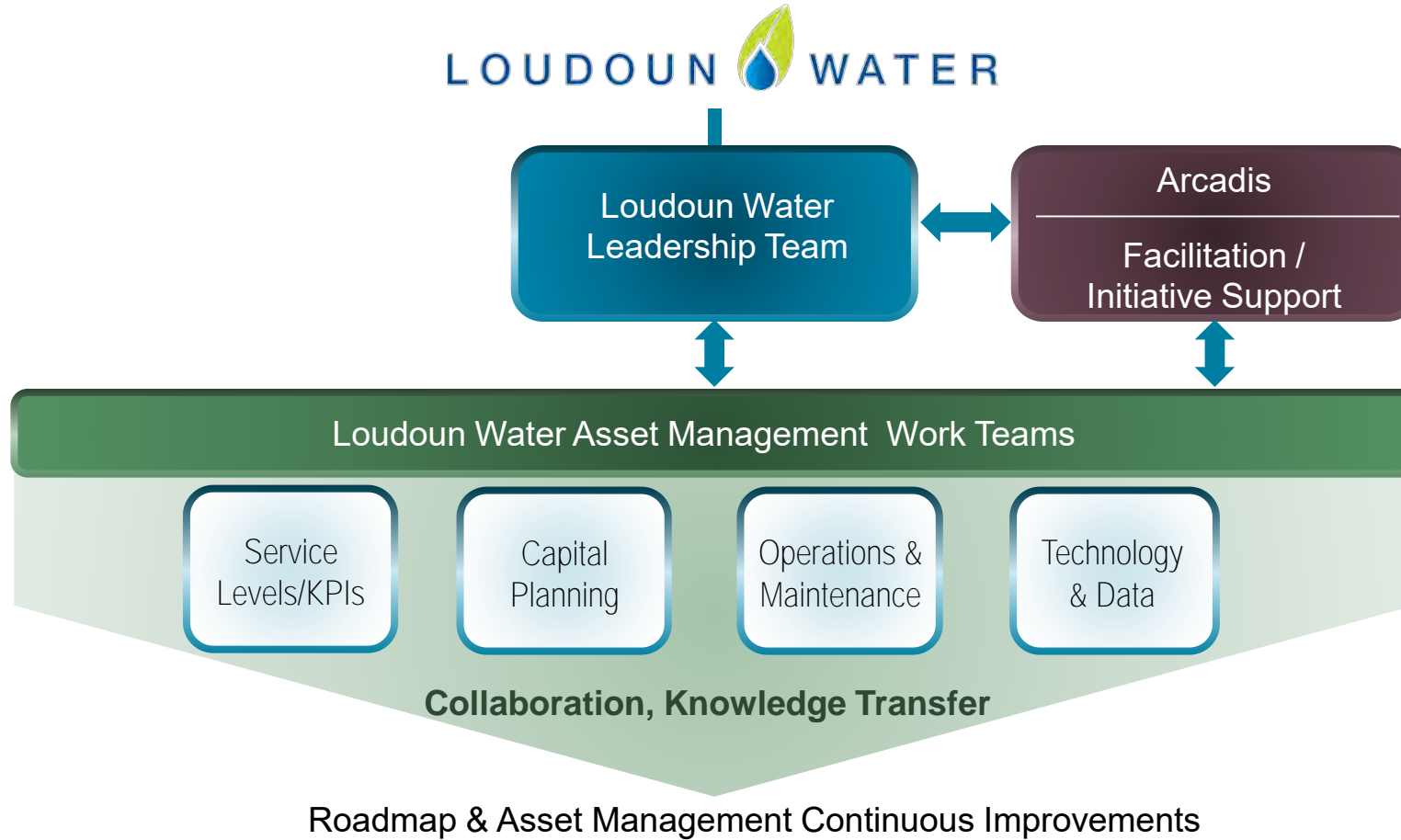


QUALITY ELEMENTS		STRENGTHS	IMPROVEMENT OPPORTUNITIES
1.01	Demand Analysis	<ul style="list-style-type: none"> Water meter billing data and production data is used for historical demand analysis. An AMI system is used for water consumption metering data. Each WIMS is the repository for sewer metering data, which pulls data from SCADA. Loudoun Water performs sensitivity analysis in water master planning. Future employment and residential population projections are used for water demand forecasts. Future demand is based on County plan (5-year plan) updated annually or bi-annually. Future employment and residential population (+/- 5 %) in conjunction with flow monitoring data are used for future wastewater flow projections. Planned development is nominally tracked on GIS 	<ul style="list-style-type: none"> Conduct AWWA water loss audit as a best practice method to identify real (leakage) losses and apparent losses. Identify any data availability deficiencies and address gaps to complete the audit. (data) Expand use of dashboards for analysis of historical data beyond Broad Run to support decision-making and data QC (data, technology) Conduct customer/stakeholder surveys to enhance understanding of future demands and forecasts (data)
1.02	Knowledge of Assets	<ul style="list-style-type: none"> Large number of assets are managed in SAP, including facility and linear assets. A structured hierarchy is in place. Asset information is collected and managed down to Maintenance Managed Item (MMI). Large number of linear assets, including pipes, valves, manholes, are effectively managed in GIS. GIS attributes are generally consistent. Integration exists between GIS and SAP Some equipment utilization is tracked in SCADA The water and sewer hydraulic models provide information on asset performance from a capacity perspective. As part of condition assessment work, LW is currently performing field verifications and updating asset registry for facilities 	<ul style="list-style-type: none"> Develop master data standards for equipment registry, including: <ul style="list-style-type: none"> SOP for what should be tracked as an equipment SOP for what equipment attributes and equipment class attributes should be tracked (policy) Develop master data standards for CCTV inspections (see Sewer Pipeline Condition and Remediation Planning Business Needs Assessment Implementation Plan) (policy) Perform periodic reviews and updates to the SAP asset registry for completeness and accuracy (process) Perform SCADA data QC to ensure reliability of data, and avoid recording of spurious data (process) Calibrations are not tracked in SAP, and they are maintained in another system with access only by








Work Team Approach





Draft Work Team Initiatives & Prioritization

Change Description	Benefits	Value / Benefit Rating	Ease of Implementation	Overall Priority
1A. Determine the priority service level and corresponding KPIs for each asset management work team that is critical in communicating the success of the asset management framework. (e.g., leaks/breaks, water loss, sewer backups, customer response, service interruptions)	<ul style="list-style-type: none"> Provides focus to organization efforts. Provides ability to refine performance management process and service levels/KPIs. Provides alignment of leading and lagging KPIs with overarching service levels that support Loudoun Water's strategic objectives. 	High	Easy	1
1B. Develop definition sheets to define priority (1A) service levels with supporting KPIs as leading/lagging indicators for each asset management work team (e.g., system-wide asset condition and risk, AM program progress).	<ul style="list-style-type: none"> Provides clarity and uniformity across organization for computations of service levels and KPI metrics. Provides ability to compare LW performance with industry benchmarks and set reasonable targets. Provides ability to confirm data collection feasibility with work teams. Provides ability to assign data and reporting ownership. 	High	Easy	1
1C. Initiate data collection of priority service levels with supporting KPIs.	<ul style="list-style-type: none"> Provides ability to determine feasibility of data collection. Provides ability to determine data location. Provides ability to identify new data requirements. Provides ability to determine process for data extraction and computation. Provides ability to determine data accuracy. 	High	Medium	2
1D. Begin development of reporting process and asset management performance dashboards. Expand use of dashboards for analysis of historical data beyond Broad Run to support decision-making and data QC	<ul style="list-style-type: none"> Provides ability to develop dashboards to trend performance and set targets. Provides uniform reporting process. Provides clear communication of asset management performance metrics. 	High	Medium	2
1E. Launch full roll-out of performance measures across all asset types and divisions with the development of definition sheets, data collection, and final reporting process and dashboards established.	<ul style="list-style-type: none"> Provides comprehensive performance management across all asset classes and divisions. Provides a comprehensive dashboard to trend performance and set targets. 	High	Medium	2

	Value / Benefit Rating	Ease of Implementation Rating
	High	Easy
	Medium	Medium
	Low	Difficult





Initial Prioritization

Value / Benefit	High	3	2	1
	Medium	4	3	2
	Low	5	4	3
		Difficult	Medium	Easy

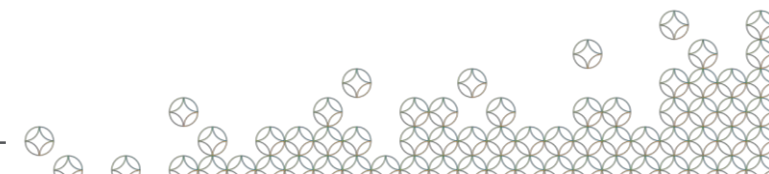
Ease of Implementation





Initiatives Summary

Work Team	No. of Initiatives	No. of Elements
Leadership	4	10
Service Levels / KPIs	1	3
Capital Planning	4	7
O&M	4	17
Technology and Data	2	13
Total	15	50





Roadmap Workshop Objectives

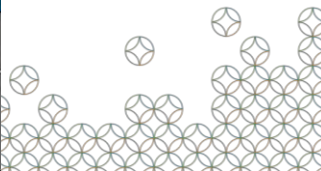
- Confirmed initiatives were appropriate
- Priorities/Phases were correct
- Confirmed which initiatives had been started
- Discussed appropriate duration of phases





Work Team Roadmaps

LOUDOUN WATER		Asset Management Leadership Team Roadmap						ARCADIS
Project	Value/Benefit Rating	Ease of Implementation Rating	Final Priority	Phase 1	Phase 2	Phase 3	Phase 4	
Improvement Initiative 1: Organizational and Communication Improvements								
1A	Charter Leadership Team and Asset Management Program Manager to facilitate decision-making and direction for the AM program. Hold kickoff meeting, visioning and develop governance SOP; develop charter with goals, objectives, meeting schedules, deliverables and initiative schedules.	5.0	4.7	1	Charter & Develop governance	Continue as program is developed & Implemented		
1B	Charter and establish Asset Management Work Teams to work on tasks and initiatives. Hold kickoff workshops with each Team to develop its charter with goals, objectives, meeting schedules, deliverables and initiative schedules.	4.9	3.2	1	Kickoff, Charter & Begin Initiatives	Continue as program is developed & Implemented		
1C	Maintain SOP Library and develop governance	4.4	2.9	2		Develop SOP governance	Continue as program is developed & Implemented	
1D	Update the strategic plan to reflect Loudoun Water's commitment and focus on Asset Management; Update the AM Roadmap to ensure alignment with LW's strategic plan	3.1	4.4	1	Develop strategic plan	Implement strategy & measure progress		
1E	Develop a Communications Plan including a plan to improve the Asset Management culture and implement change throughout the organization.	4.3	2.7	1	Begin	Continue as program is developed & Implemented		
Improvement Initiative 2: Enhance Project Delivery								
2A	Develop guidance for project management to ensure consistent project delivery and enhanced project management culture	4.9	2.0	1	Develop guidance	Implement for future capital projects		
2B	Develop methodology to enable Loudoun Water to predict future personnel needs for capital projects	4.0	1.8	1	Develop methodology	Implement, predict needs and continue into the future		
Improvement Initiative 3: Enhance and Improve Accessibility to Training								
3A	Identify Asset Management program training needs and implement a focused training program	4.8	2.3	3		Identify & Prioritize training needs	Implement training programs Prioritize needs annually Update people skills matrix	
3B	Develop a process for succession planning especially concentrating on employees retiring in the next five years	4.0	2.6	2		Begin	Implement Continue as program is developed & Implemented	
Improvement Initiative 4: Develop Standards for Records Management								
4A	Establish governance structure for records management. Standardize and centralize where possible the knowledge management system across all departments and create SOPs to formalize the standardized processes for unstructured data, documents, procedures, naming conventions, system storage and periodically updating of documents. Implement new processes and train staff.	4.3	2.0	3		Establish governance and Develop SOPs	Implement, Train staff, and Monitor performance	





Work Team Initiatives and Phases

LOUDOUN WATER		Phase 1 (2019)	Phase 2	Phase 3	Phase 4
Asset Management Program	Leadership Team	<ol style="list-style-type: none"> 1. Charter Directors Team and Asset Program Manager to Facilitate Decision-making and Direction of AM program 2. Charter AM Work Teams and Hold Kick Off Meetings 3. Update Strategic Plan 4. Develop AM Communications Plan 5. Develop Guidance for Project Management 	<ol style="list-style-type: none"> 1. Implement Updated Strategy and Begin to Measure Progress 2. Implement AM Communications Plan 3. Implement Guidance for Project Management 4. Develop Process for Workforce Succession Planning 5. Develop Standard Operating Procedure (SOP) Library and Governance 	<ol style="list-style-type: none"> 1. Identify and Prioritize Training Needs 2. Establish Governance and SOPs for Records Management 3. Develop Methodology to Predict Future Personnel Needs for Capital Projects 	<ol style="list-style-type: none"> 1. Re-evaluate and Prioritize Training Needs 2. Implement Records Management SOPs and Provide Training
	Service Levels/KPI Team	<ol style="list-style-type: none"> 1. Determine priority Level of Service (LOS) and Key Performance Indices (KPI) and Develop Definition Sheets 	<ol style="list-style-type: none"> 1. Begin tracking service levels and KPI metrics; Address data needs 	<ol style="list-style-type: none"> 1. Develop AM Performance Dashboards 	<ol style="list-style-type: none"> 1. Monitor and Revise Dashboards as Needed 2. Launch Full Roll-out of Performance Measures Across All Asset Types & Divisions 3. Conduct AWWA Water Loss Audit using AMI Data; Address Any Data Gaps
	Capital Planning Work Team	<ol style="list-style-type: none"> 1. Gravity Sewer Lateral Policies; Update Cleaning vs. CCTV Strategies; Develop Risk Ranking Methodology for Sewer Assets 2. Develop a Structured Condition Categorization Process for Gravity Sewers; Develop Long-Term Lateral Operations and Maintenance (O&M) and Renewal Cost Impacts; Evaluate the Cost Effectiveness of Inflow and Infiltration (I&I) reduction projects 3. Vertical Assets: Utilize Risk Scores for CIP Planning 4. Develop SOP for Business Case Guidelines for R&R Projects to support Capital Improvement Planning (CIP) 5. Central System: Complete Risk and Resilience Assessment Study and ERP 	<ol style="list-style-type: none"> 1. Identify High I&I Areas via Flow Data; Develop Long-Term Gravity Sewer Inspection Plan; Develop Long-Term Inspection Workload & Strategy for Staffing/Contractor 2. Develop Alternatives Analysis Guidelines for Remediation Monitoring and Maintenance of Poor Condition Pipes 3. Vertical Assets: Develop Equipment R&R Costs for CIP Planning 4. Vertical Assets Develop AMPs with Forecasts 5. Central System: Implement Improvements from Risk and Resilience Study 4. Community System: Complete Risk and Resilience Assessment Study and ERP 5. Maintain High Level Project Cost Data 6. Update BCE form to Incorporate Risk and Cost Analyses 	<ol style="list-style-type: none"> 1. Develop Long-Term Strategy for Force Main Condition Assessment and Corrosion Control; Develop Manhole Structural Inspection & Data Management Strategies; Formulate Low Pressure System Maintenance and Renewal Strategies 2. Coordinate Growth Projects with Condition Remediation Projects; Develop Long-Term Sewer Asset Renewal Cost Forecasting; Develop I&I Reduction Cost Forecasting 3. Update Linear Asset Risk Assessment Guidelines 4. Community System: Implement Improvements from Risk and Resilience Study 5. Sewer & Reclaim System: Complete Risk and Resilience Assessment Study and ERP 6. Maintain Asset Level Valuation Cost Data 	<ol style="list-style-type: none"> 1. Develop Equipment R&R Costs for Linear Asset CIP Planning 2. Develop AMPs with Forecasts for Linear Assets 3. Sewer & Reclaim System: Implement Improvements from Risk and Resilience Study
	Operations and Maintenance Work Team	<ol style="list-style-type: none"> 1. Develop Current Process Maps and Perform Training; Identify Desired Optimizations 2. Develop SOP and Training on Adjustments Needed to Preventive Maintenance (PMs) 3. Utilize Capacity Planning for Work Centers; Regularly Forecast Hours to Evaluate Resources and Timing of PMs 4. Enable Calibration Histories to be More Widely Available. Expand Calibration Program to Include Other Equipment 5. Implement a Water Valve Exercising Program in PM Program 6. Develop Maintenance Plans for Equipment Spares 7. Pilot Use of MRP (Material Requirements Planning) to Determine if its Beneficial 	<ol style="list-style-type: none"> 1. Implement Desired Optimizations in Process Maps and Perform Training 2. Select Standard Scheduling Tool; Roll-out and Training 3. Develop and Implement SOP to Follow Up with Customers Confirming Resolved Issues 4. Review and Tailor Failure Codes for Tracking of Maintenance Issues, and Provide Training. 5. Track Warranties in SAP for New Equipment Across Dptmts 6. Develop SOP to Track P-card Purchases to Work Orders; Create SOP and Perform Analytics to Review P-card Purchases for Additions to Inventory Stock Items 7. Expand Use of MRP as Required 	<ol style="list-style-type: none"> 1. Perform Data Analytics on Failure Codes. 2. Develop a Risk-based, More Efficient PM and Predictive Maintenance (PdM) Program Across Departments. 3. Assign Bill of Materials for Critical Equipment to Facilitate Material Reservation Process 	<ol style="list-style-type: none"> 1. Establish SOP for a Feedback Process on Slow Moving Inventory Reports for PMs and Inventory Optimization 2. Revise Process & Provide for Assigning Tools/Equipment 3. Create SOP to Establish a Quality Standard & Review Process for Operating Procedures. Update Operations Procedures and Make More Readily Available
	Technology and Data Work Team	<ol style="list-style-type: none"> 1. Develop SOPs for SAP Master and Transaction Data and Training 2. Develop SOPs to Ensure Data Quality and Completeness on Master & Transactional Data 3. Develop CCTV Defect Codes; CCTV Video and Database Format Standards; Develop Enterprise Data Model for AM; Develop Workflows on New, Expired and Split Assets 4. Update CCTV Data Collection Software 5. Map Process to Add Refurbishment Values Back into Asset 6. Make Improvements Outlined in GIS Data Assessment Report 7. Pilot Use of an Enhanced Reporting and Data Analytics Environment (Tableau/PowerBI) to Support KPIs 	<ol style="list-style-type: none"> 1. Conduct Training on SAP Master & Transaction Data Processes 2. Develop QC Reports on Master Data and Transactional Data 3. Optimize Reporting for CCTV Crews; Improve Management of In-progress Assets; Improve Tracking and Data Retention Standards for New Construction CCTV Inspections; Tracking Gravity Sewer R&R Projects in a Database of Record; Implement a CCTV Data QA/QC Process 4. Update CCTV Hardware Standby Equip & Maint Strategies 5. Implement New Process & Training to Add Refurbishment Values Back into Asset 6. Evaluate and Implement Sending and Receiving Cost Center Model with Cost Center Hierarchies 7. Develop Alternatives to Address Hierarchy when a Community System Becomes Part of Central & Implement Preferred 8. Pilot Ability to Link Fixed Assets and Equipment Assets in SAP, and Leverage Workflows 9. Automate Material Avail Check When Work Order is Released 10. Expand Enhanced Reporting Program 	<ol style="list-style-type: none"> 1. Address Data Quality and Completeness Issues on Master Data and Transactional Data 2. Improve Point Repair Tracking & Prioritization and Backlog Management 3. Develop Asset Warehouse for Linear Asset Condition Data 4. Expand Linking Fixed Assets and Equipment Assets in SAP, and Implement Workflows & Training 5. Integrate Equipment Run Hours from SCADA with SAP for PMs; Develop/Modify PMs 	<ol style="list-style-type: none"> 1. Continue Addressing Data Quality and Completeness Issues on Master Data and Transactional Data 2. Enhance Tracking of Customer Complaints in SAP Using Compliant Categories or Notification Types



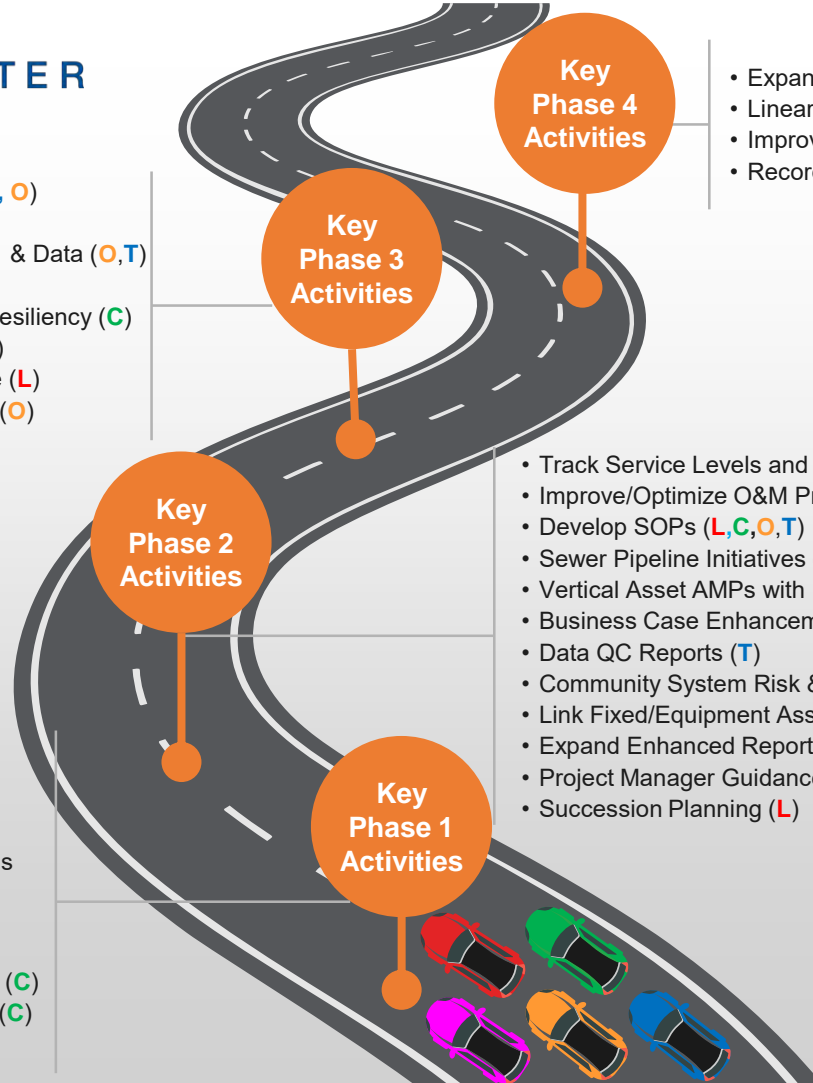


Asset Management Roadmap

LOUDOUN  WATER

- AM Performance Dashboards (S,T, O)
- Sewer Pipeline Initiatives (C)
- Improve/Optimize O&M Processes & Data (O,T)
- Run Hours SAP Integration (T)
- Sewer & Reclaim System Risk & Resiliency (C)
- Maintain Asset Level Cost Data (C)
- Records Management Governance (L)
- Critical Equipment Bill of Materials (O)

- Charter Work Teams (L)
- Updated Strategic Plan (L)
- Develop SOPs (O,T,C)
- Determine Service Levels and KPIs (S)
- Standardize O&M Processes (O)
- Sewer Pipeline Initiatives (C,T)
- Risk Scores for Vertical Asset CIP (C)
- Central System Risk & Resiliency (C)
- Pilot Enhanced Reporting (T)
- AM Communications Plan (L)



- Expand KPIs & Dashboards (S,O,T)
- Linear Asset AMPs with Forecasts (C)
- Improve/Optimize O&M Processes (O,T)
- Records Management Standardization (L)

- Track Service Levels and KPIs (S)
- Improve/Optimize O&M Processes (O,T)
- Develop SOPs (L,C,O,T)
- Sewer Pipeline Initiatives (C,T)
- Vertical Asset AMPs with Forecasts (C)
- Business Case Enhancements (C)
- Data QC Reports (T)
- Community System Risk & Resiliency (C)
- Link Fixed/Equipment Assets & Leverage Workflows (T)
- Expand Enhanced Reporting (T)
- Project Manager Guidance (L)
- Succession Planning (L)

**ASSET
MANAGEMENT
ROADMAP
PROPELLED BY
WORK TEAM
INITIATIVES**

- L Leadership Team**
- S Service Levels/KPI Team**
- C Capital Planning**
- O O&M**
- T Technology & Data**





Practice Assessment & AM Roadmap Summary

- Identified strengths and improvement opportunities in AM practices
- Prioritized improvement areas
- Developed a roadmap for implementation propelled by work team initiatives



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