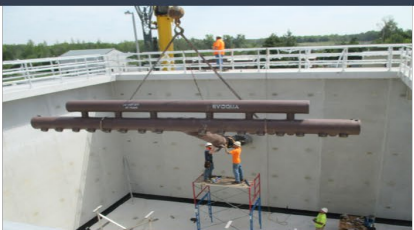


Thank you to our Patrons



We will begin our presentation in a few minutes...



Leadership and Excellence in Environmental Engineering and Science

June 25, 2025

San Antonio Water System

Non-Revenue Water Program (Update)

Jeff Haby, P.E.

Senor Vice President / Production Operations

Richard Donat, PMP

Director / Non-Revenue Water

Hunter Nolen, P.E., BCEE

Hunter Nolen Consulting, LLC. / President and CEO

AAEES – Webinar Series



SAWS Infrastructure by the Numbers

One of Nation's Largest Municipally Owned Utilities

- 2.1 million customers in 4 counties
- Projected 5-year Capital Program
 - ~\$3 Billion
- ~7,900 miles of water pipelines
- 2 major water plants
- 73 pump stations
- 191 wells
- 117 storage tanks
- 59 pressure zones





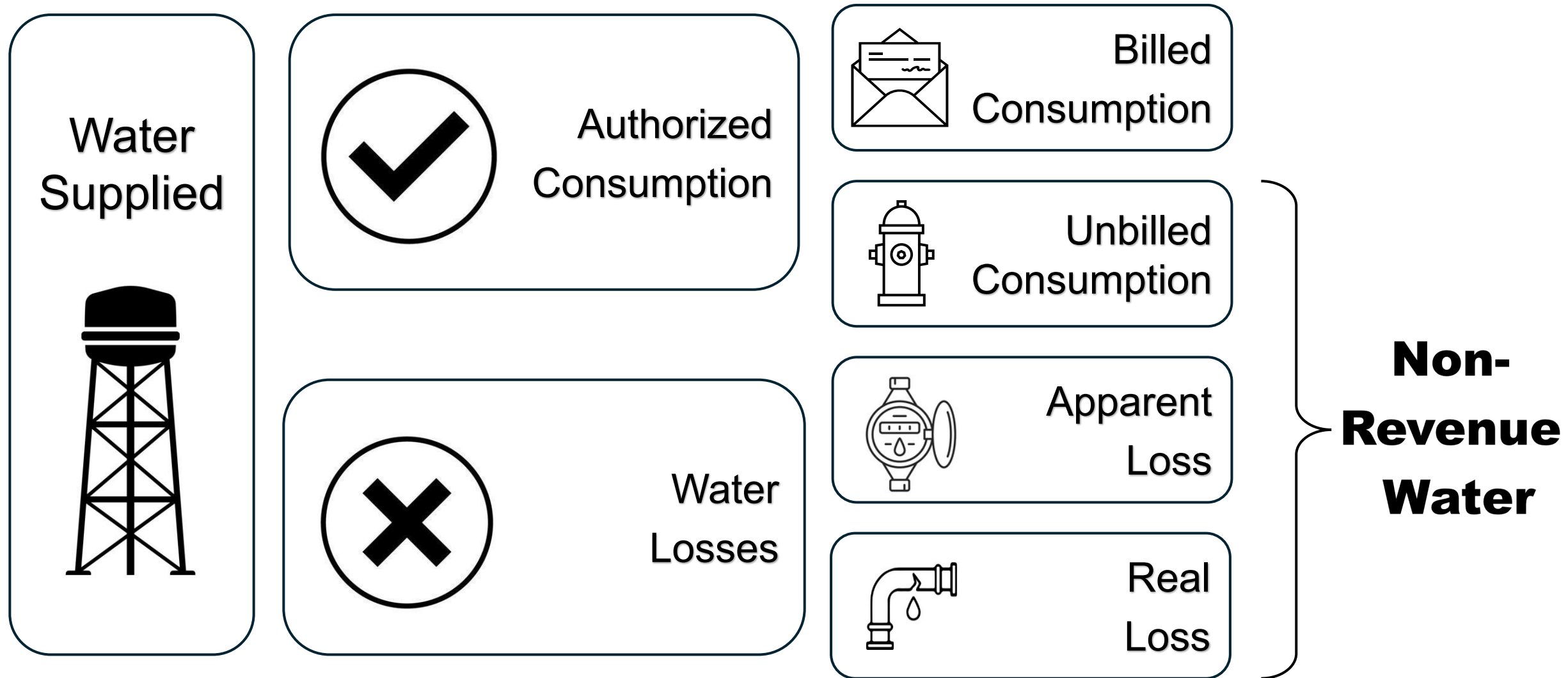
History

Water Loss

- SAWS has been working on this challenge for many years
- Increased water loss brought on by drought
- Refocus and centralizing the Non-Revenue Water Program
- Organizational support



What is Non-Revenue Water (NRW)?





Old pipes cause Texas cities to lose tens of billions of gallons of water each year

The lost water costs the cities millions and heightens the state's water supply challenges.



NEWS

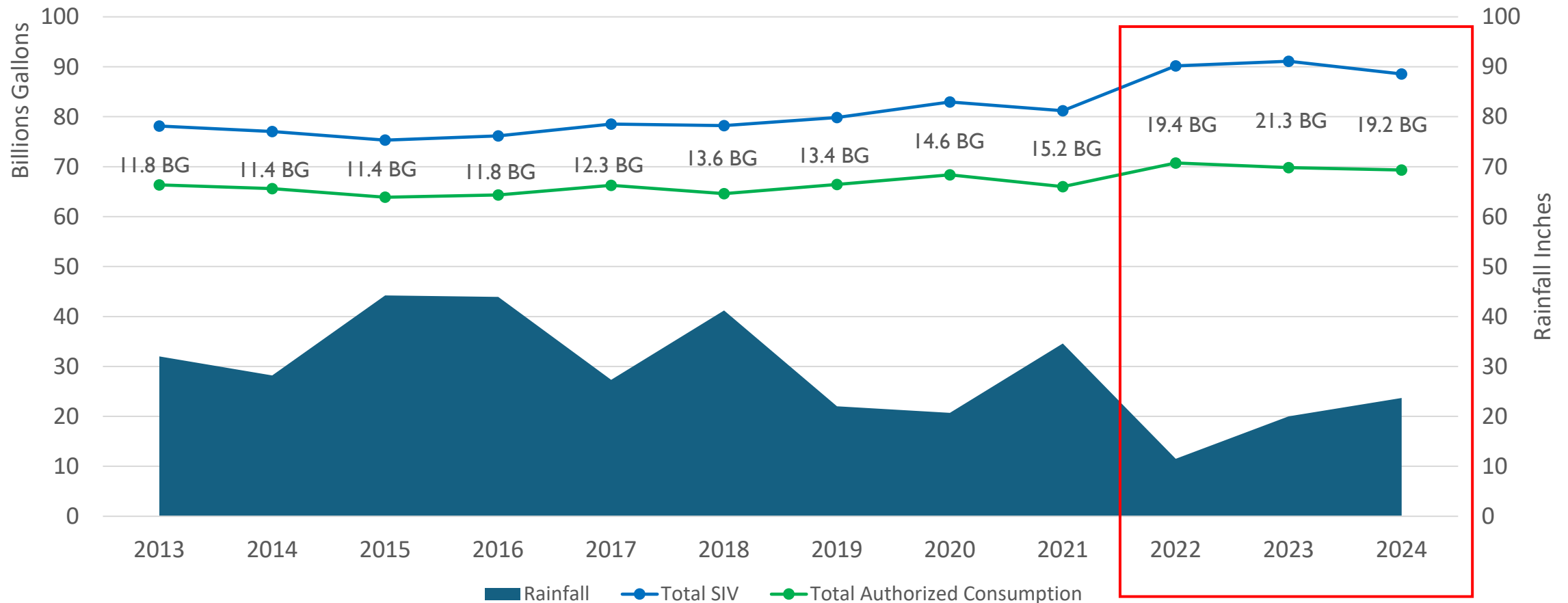
How SAWS is working to fix its 21 billion-gallon water loss problem

As it pushes its customers to conserve, the utility's water loss has jumped in recent years, in part due to drought and aging infrastructure.



Apparent and Real Water Loss

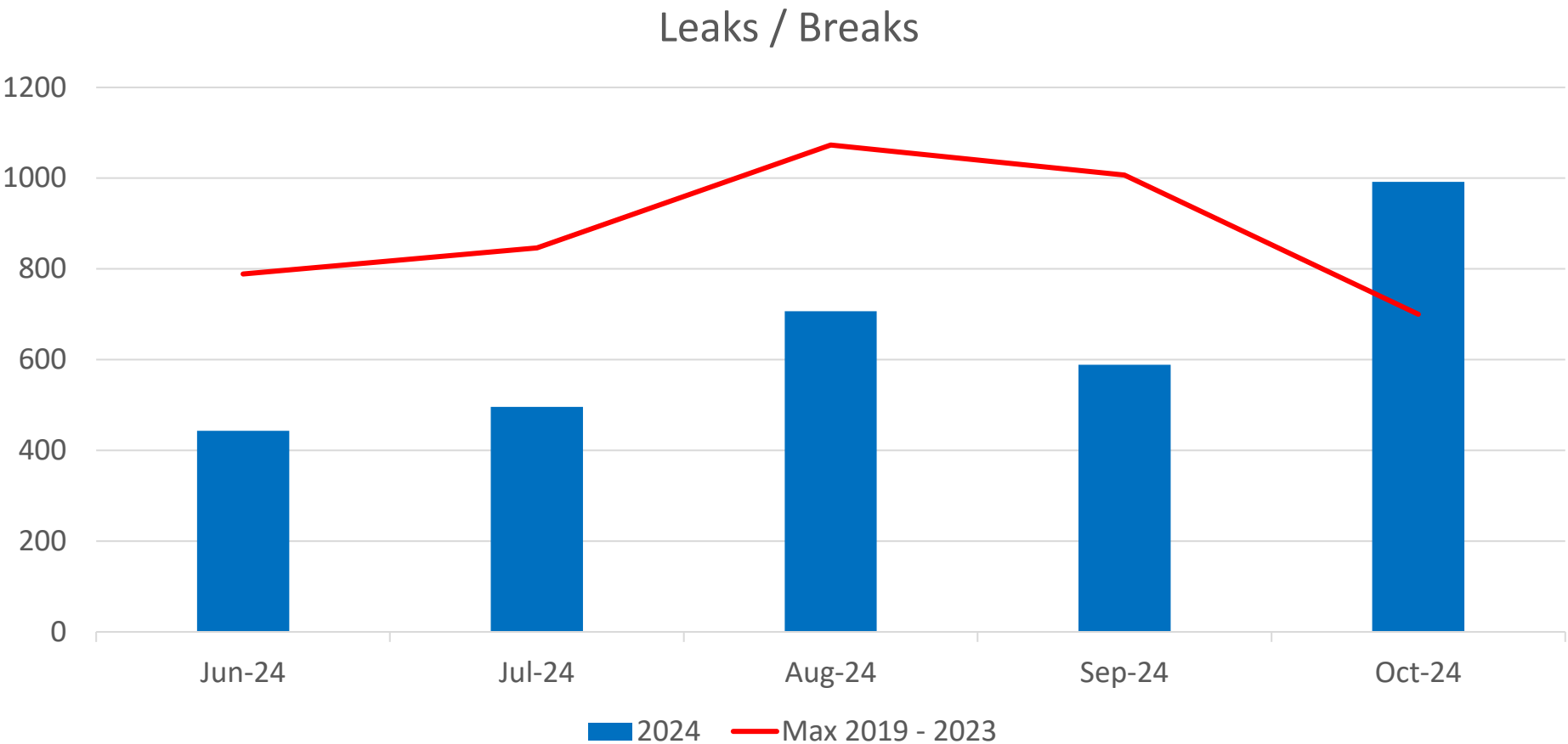
Total System Input Volume vs. Total Authorized Consumption





Water Loss

Weather / Geology

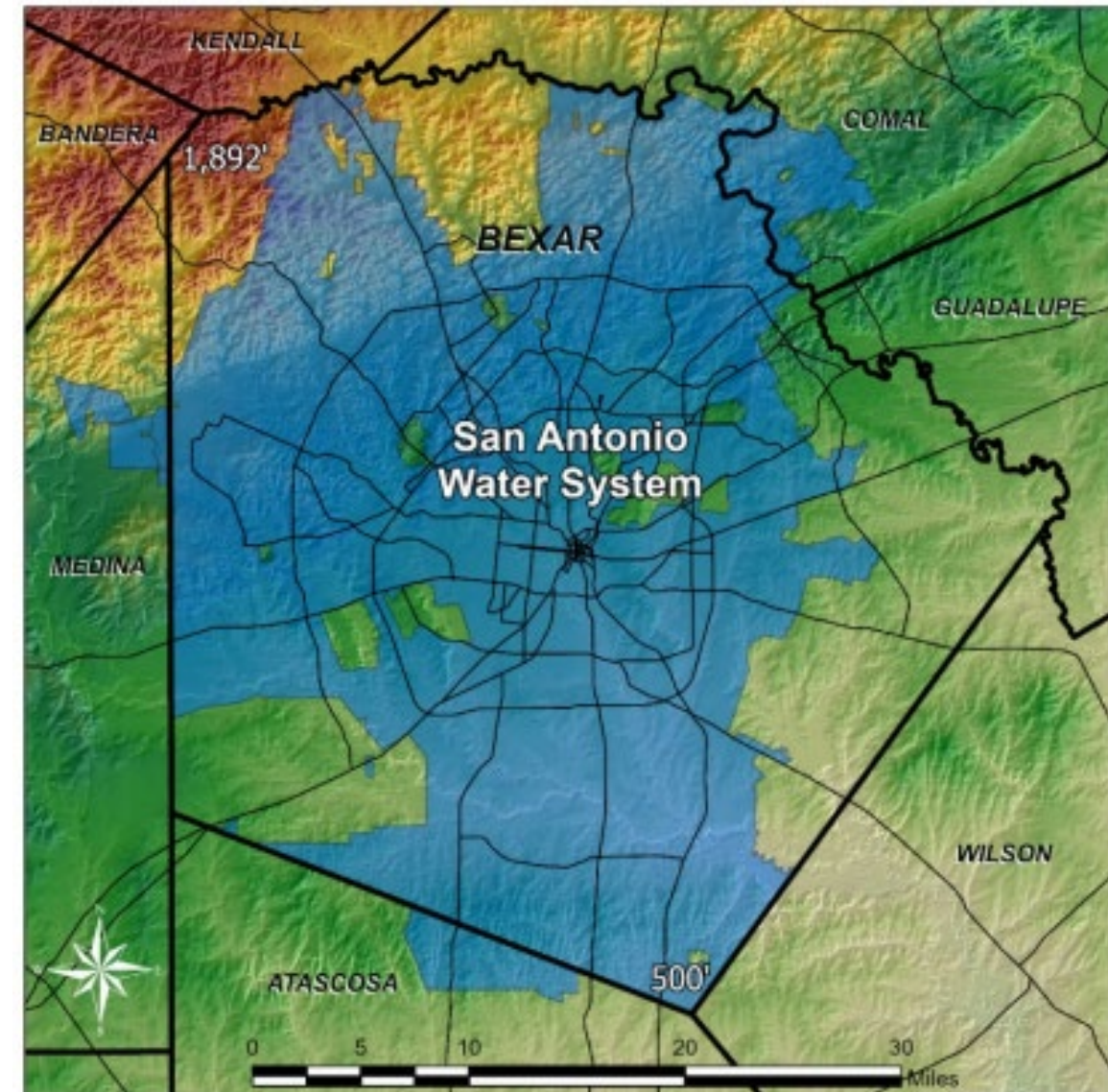




Water Loss

Challenges

- Weather
- Geology
- System Size
- Growth
- Pressure/Elevation
- Budgets
- Pipe Material
- Workforce
- 3rd Party Line Strikes





Measurement Improvements

System Input Volume



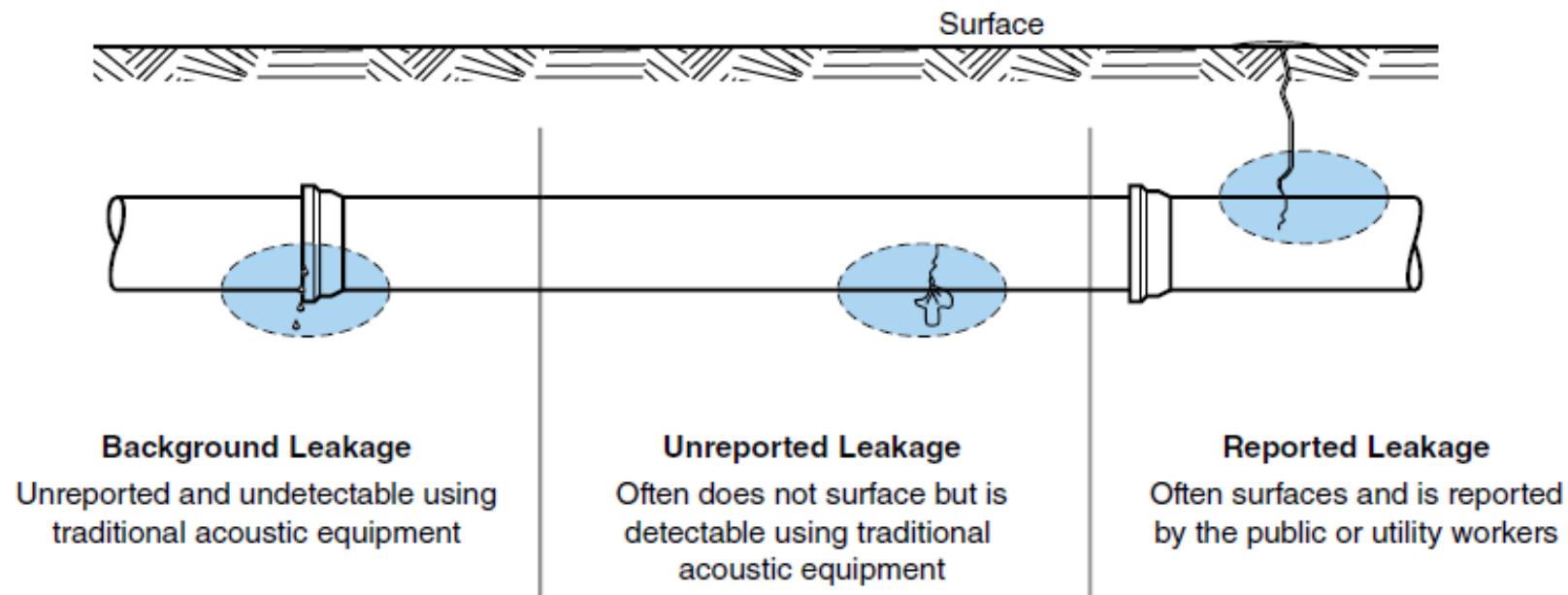
Customer Metering (Connect H2O)





Interventions

Real Losses





Business Practices

Review/Update

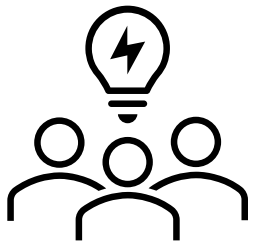
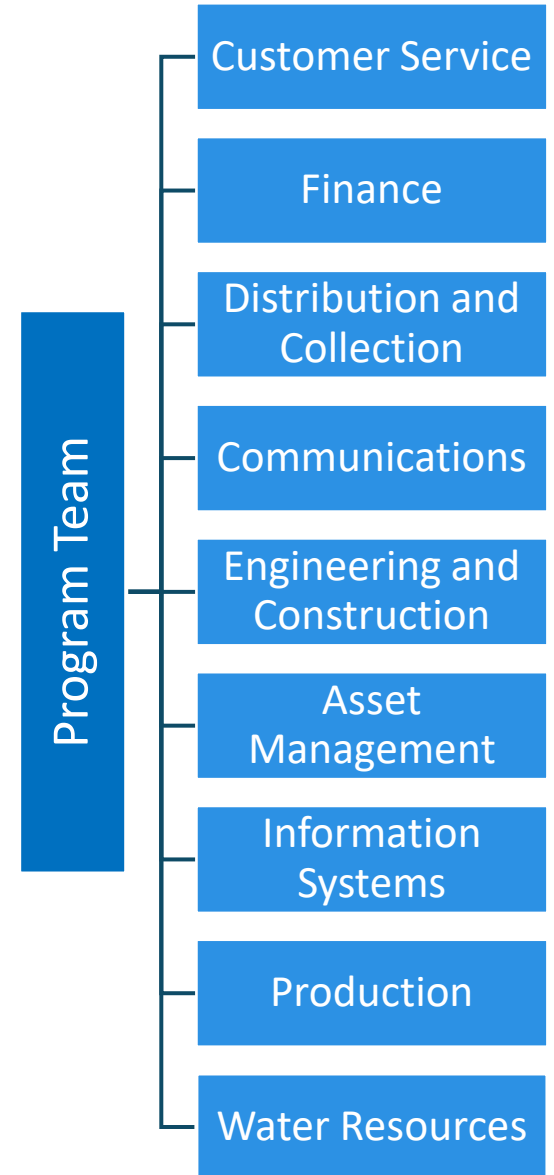
- Review current business practices
- Implement best practices
- Document practices

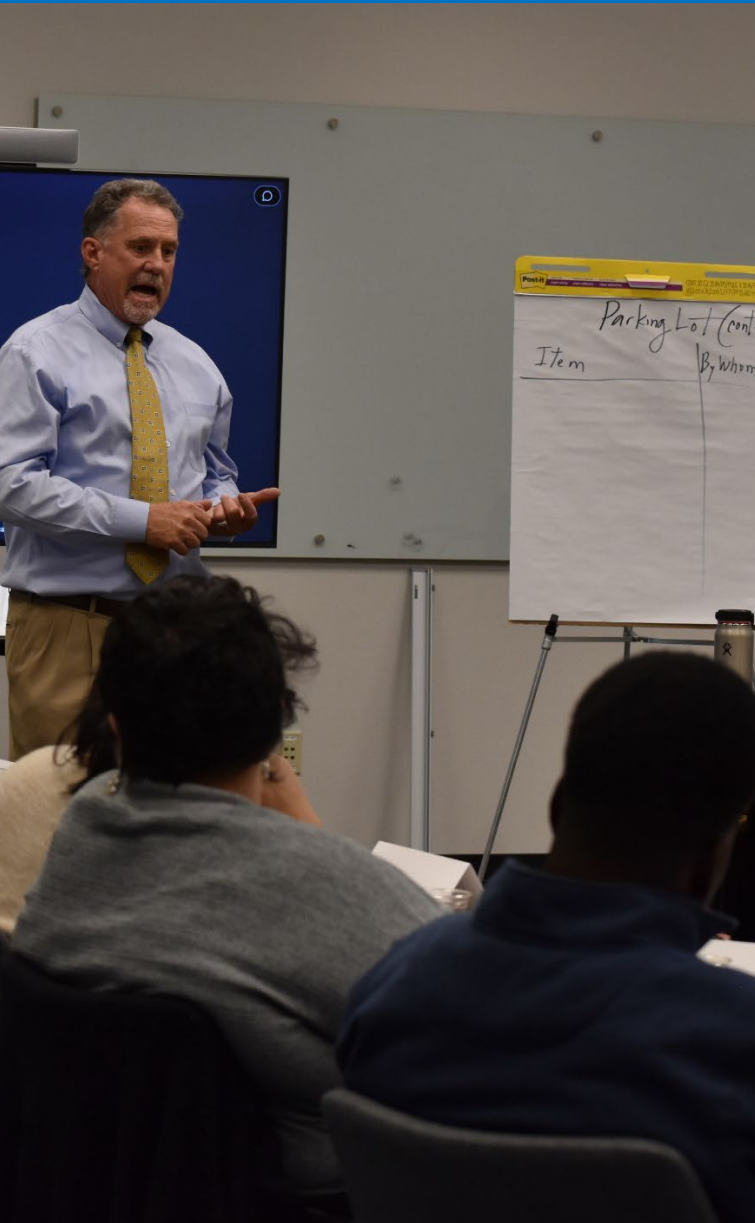


Program Kickoff

Workshop

- Stakeholders from across the organization
- Define and kickoff the Program
- Stakeholder Teaming and Executing Planning (STEP) Workshop - (December 2024)





Program Kickoff

STEP Workshop

HNC Hunter Nolen Consulting, LLC

C. Hunter Nolen, P.E., BCEE

nolench@hunternolenconsulting.com

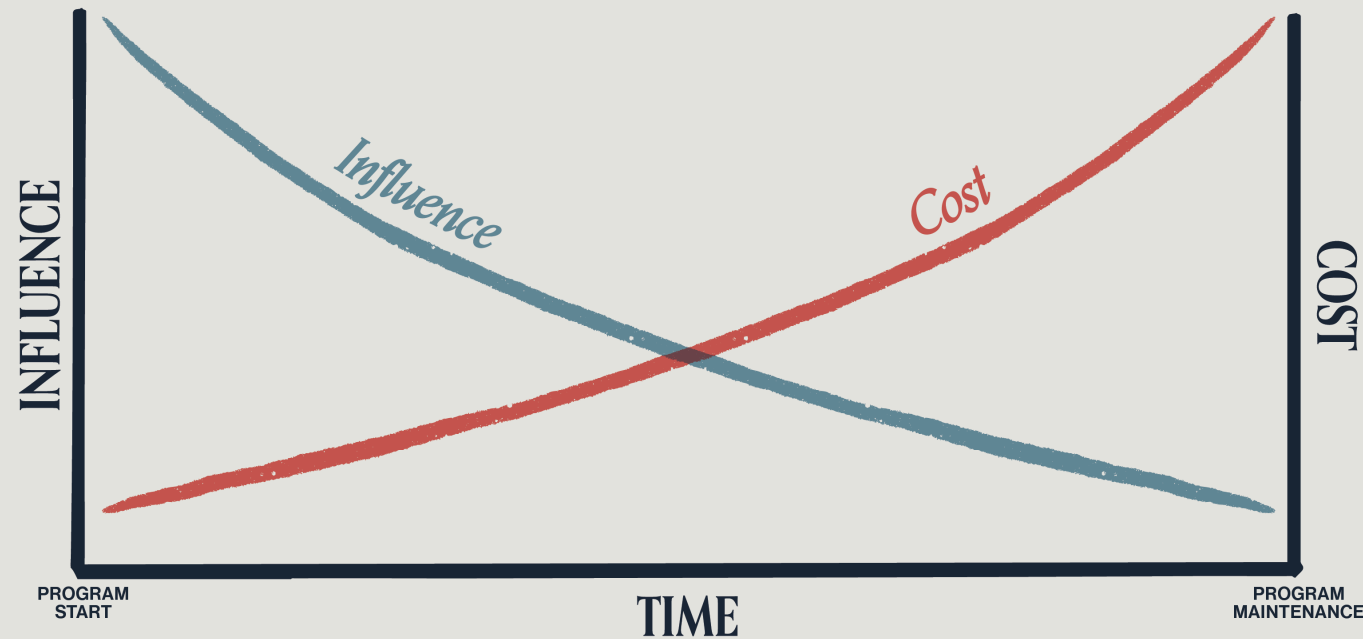
<https://www.hunternolenconsulting.com>

+1 (713) 858-2372

- **40 years** engineering consulting and business management
- **Executive Leadership** – President, multiple organizations (HNC, Wood Group, AAES, CDM Smith)
- **Management Consulting** – management solutions across the business of engineering and science
- **Water/Wastewater Experience** – Board Certified Environmental Engineer, Former President American Academy of Environmental Engineers & Scientists (AAES), direct water/wastewater experience
- **STEP Facilitator** – Independent facilitator of STEP process for wide array of complex endeavors

COOL CONCEPT

INFLUENCE/COST/TIME RELATIONSHIP



Right now is the moment to maximize influence at the least cost.

COOL CONCEPT

THE PARETO PRINCIPLE

The Pareto Principle (The 80/20 Rule) states that 80% of outcomes come from 20% of causes. This means that a small percentage of causes have a disproportionate effect.

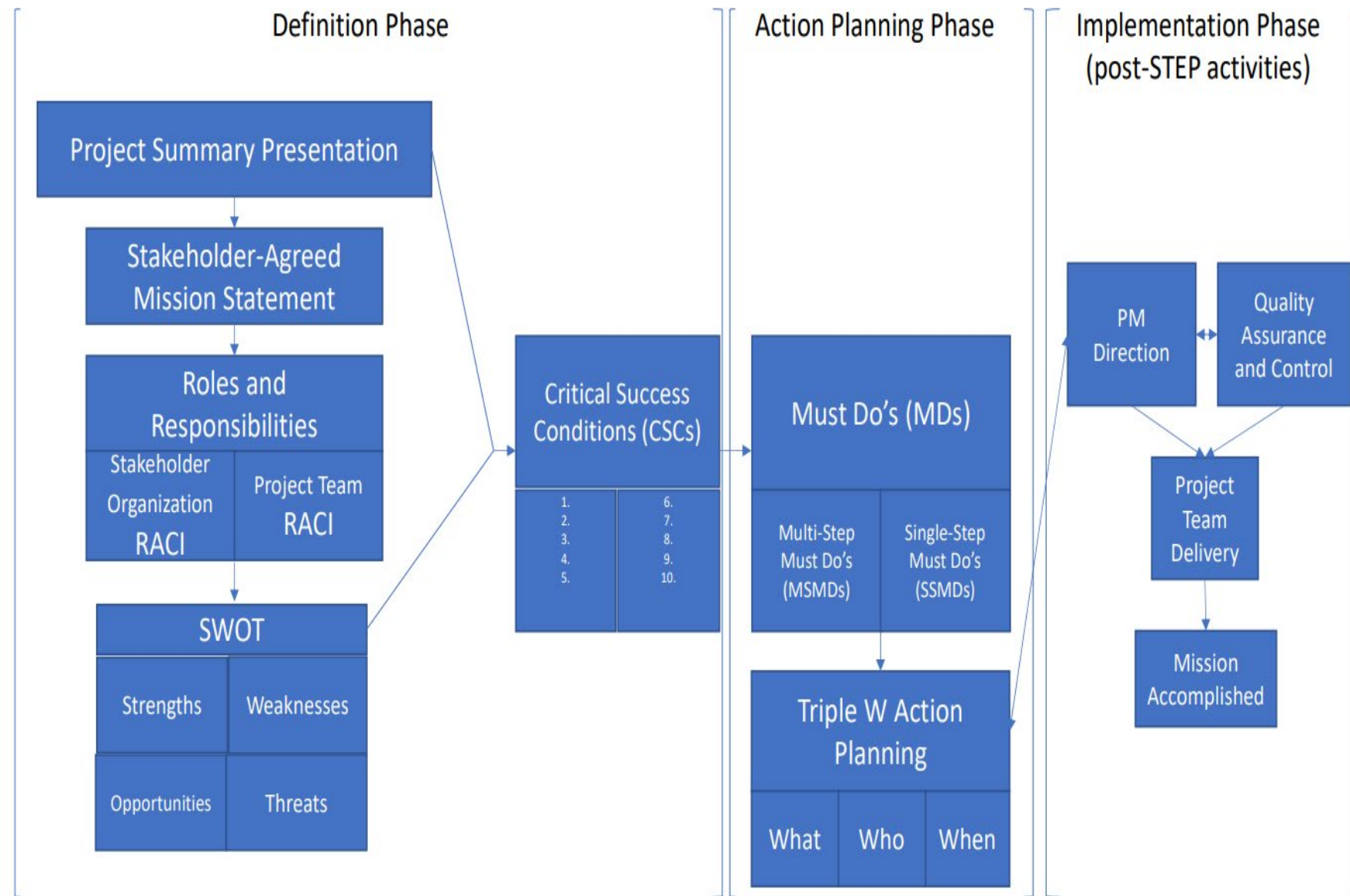
Our opportunity today is to have a huge effect from a small percentage of overall program effort.

STEP Purpose

- **STEP** is a workshop method for understanding and aligning stakeholder expectations and establishing a blueprint for implementation success.



STEP PROCESS OVERVIEW

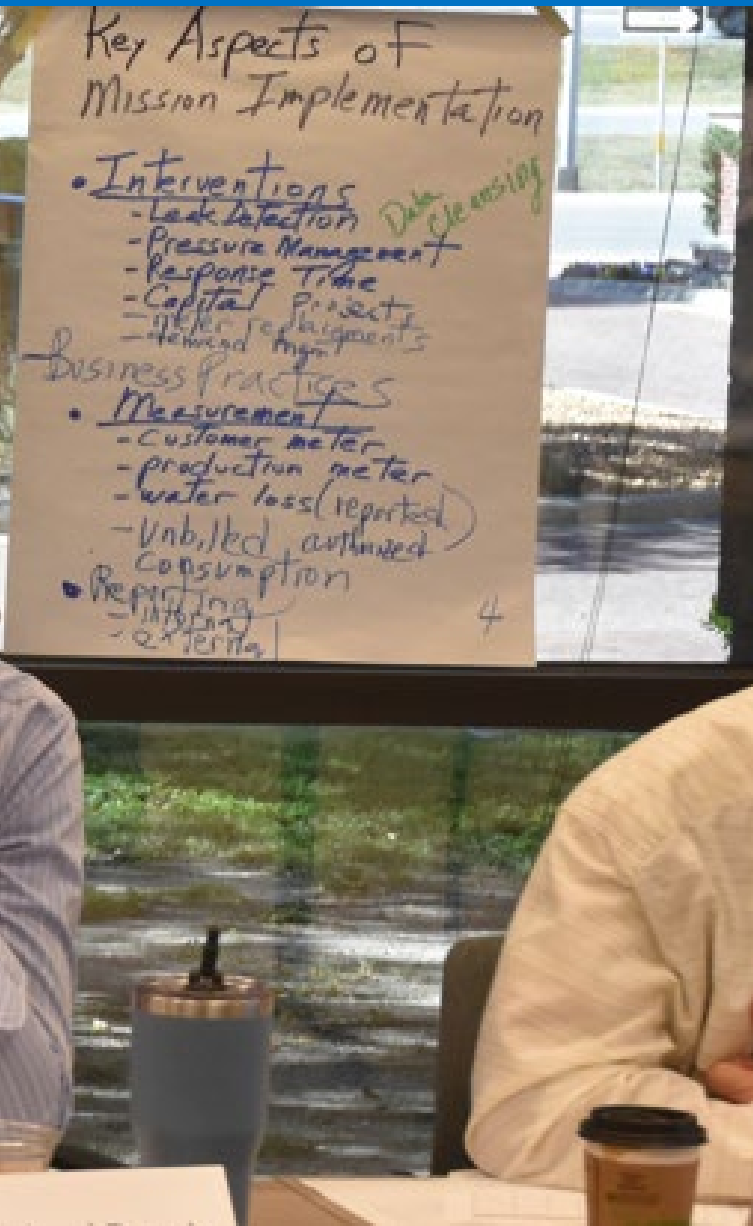


Stakeholder Introduction and Key Program Expectations

Define Stakeholder Expectations



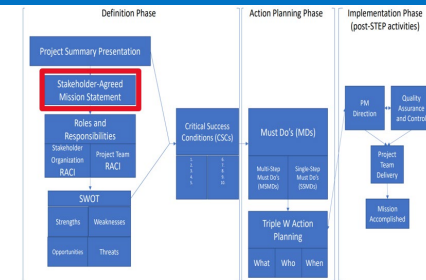
- Establish trust
- Clear goals
- Clear communication
- Best practices
- Data accuracy
- Leverage technology
- Balance financial priorities

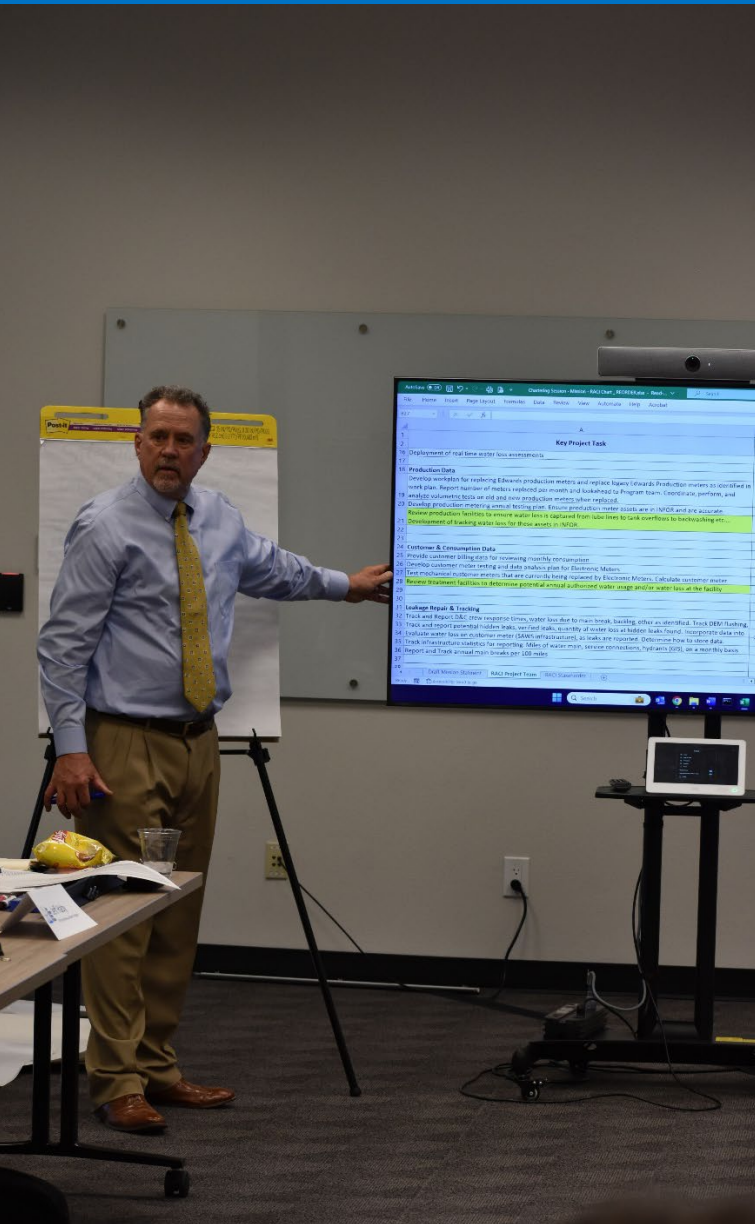


Mission Statement

Discussion

- Present **Draft** Mission Statement to Team
- Capture Stakeholder comments to the Mission Statement (for **later finalization** by SAWS)
- Define **Key Aspects** of Mission Statement for detailed implementation planning





Roles and Responsibilities

- Responsible

- The entity that is responsible for doing a stated aspect of work.

- Accountable

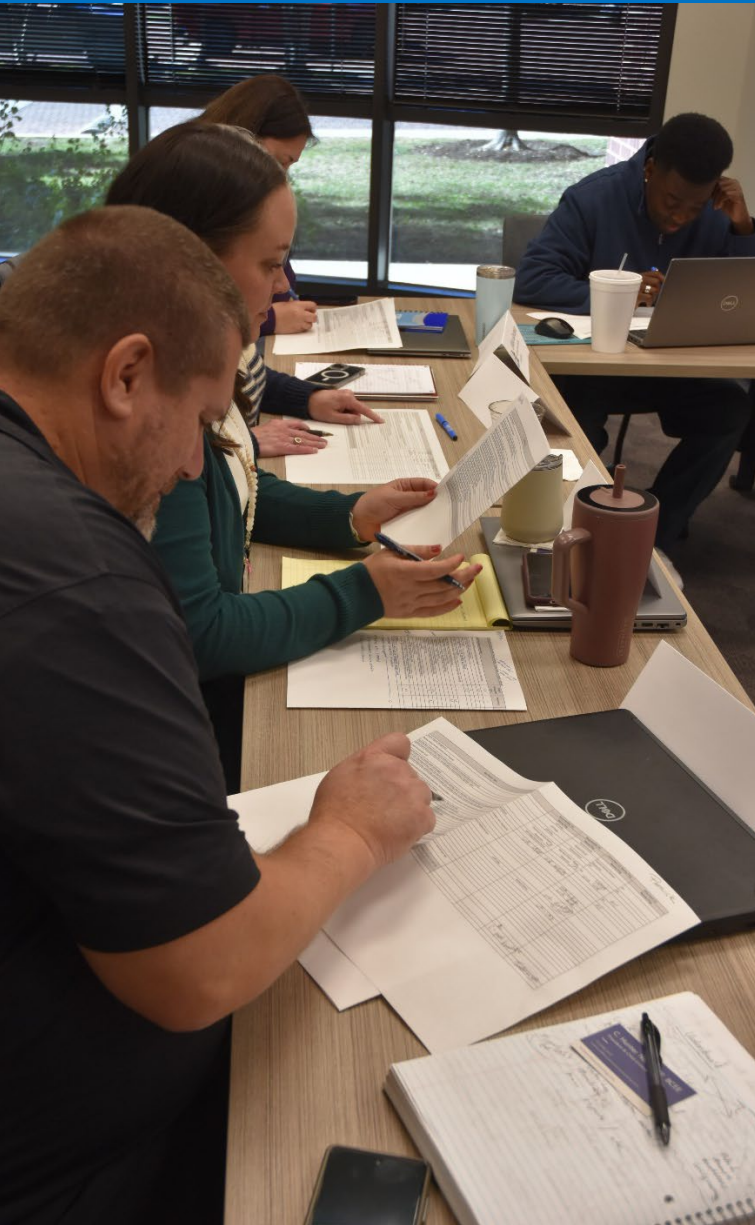
- The entity that has ultimate accountability for ensuring a stated aspect is successful. Where the “buck stops”.

- Consulted

- The entity or entities that need to be consulted at appropriate frequency by R as a stated aspect progresses.

- Informed

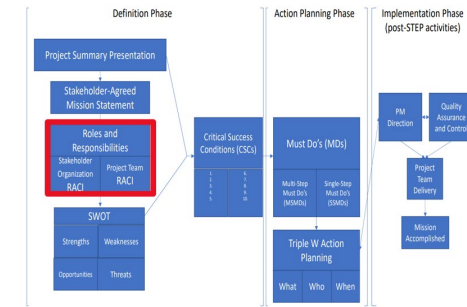
- The entity or entities that need to be informed at appropriate frequency by R as a stated aspect progresses.



Roles and Responsibilities

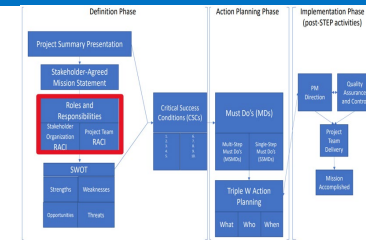
Two-Tier RACI

- RACI - Major Program Activities
 - Big Picture Items
 - Identify **business units**
- RACI - Key Program Tasks
 - More detailed
 - Identify **individuals**



Major Program Activities or Deliverables

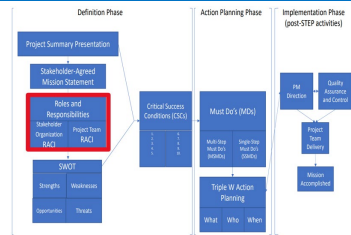
RACI Chart for Business Units



Major Activity or Deliverable	Production	Customer Service	Water Resources	Distribution and Collection	Engineering and Construction	Information Systems	Finance	Communications	Conservation
Overall Program Management (Water loss program monitoring and coordination and simplifying messaging)	I	I	I	I	I	I	I	I	
Develop metrics/key performance indicators	R	R	R	R	R	R	R		R
Monthly/Quarterly/Annual Reporting	C	C	C	C	C	C	C	C	C
Compiling annual water loss audit	C		A, R	C	C		C		
Technology Review (whitepaper) & pilot promising technologies	R	R	R	R	R	R			
Update Water Loss Control Plan			R						
Main Leaks/Breaks Repair + Dead end main flushing + hydrant flushing + sewer line cleaning (etc...)- Data, Tracking, Reporting (Daily/Monthly/Annually)			I	A, R	I				
Production meter upgrades and volumetric tests	A, R								
Production meter inventory and annual testing/verification plan	A, R								
Customer meter testing		A, R							
Leak Detection - Data, Tracking, Reporting (Daily/Monthly/Annually)			A, R						
Virtual District Metering Area	C	C	C			R			
Pressure Management	R			C	C				
Prioritization and execution of capital water main replacement program				R	A, R				
Ongoing communication for public, elected officials, and key stakeholders								A, R	
Data validation/cleanup	R	R	R	R	R	R			
Connect H2O: installation		A, R		C					
Connect H2O: tracking and analysis of data		A, R							R
Management of Billing and Consumption Data		A, R				C	C		
Develop O&M and Capital costs tracking for Non-revenue water program				C	C		A, R		
Determine future budgets needed and associated with the Non-revenue water program.	C	C	C	C	C	C	C	C	C
Demand Management	C	C	C	C	C				A, R
IS Enhancements for Data Collection	C	C	C	C	C	A, R			

Key Program Tasks

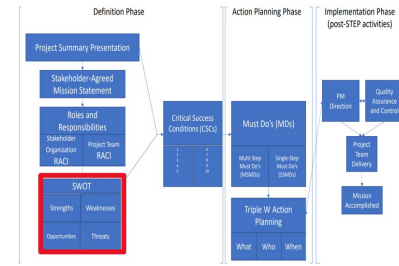
RACI Chart for Individuals



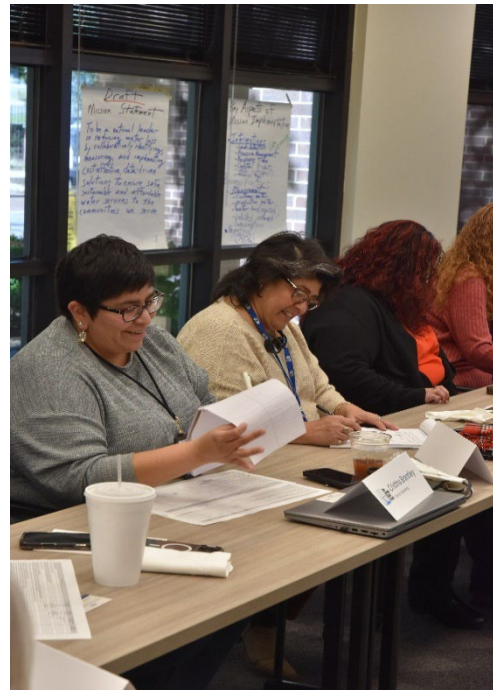
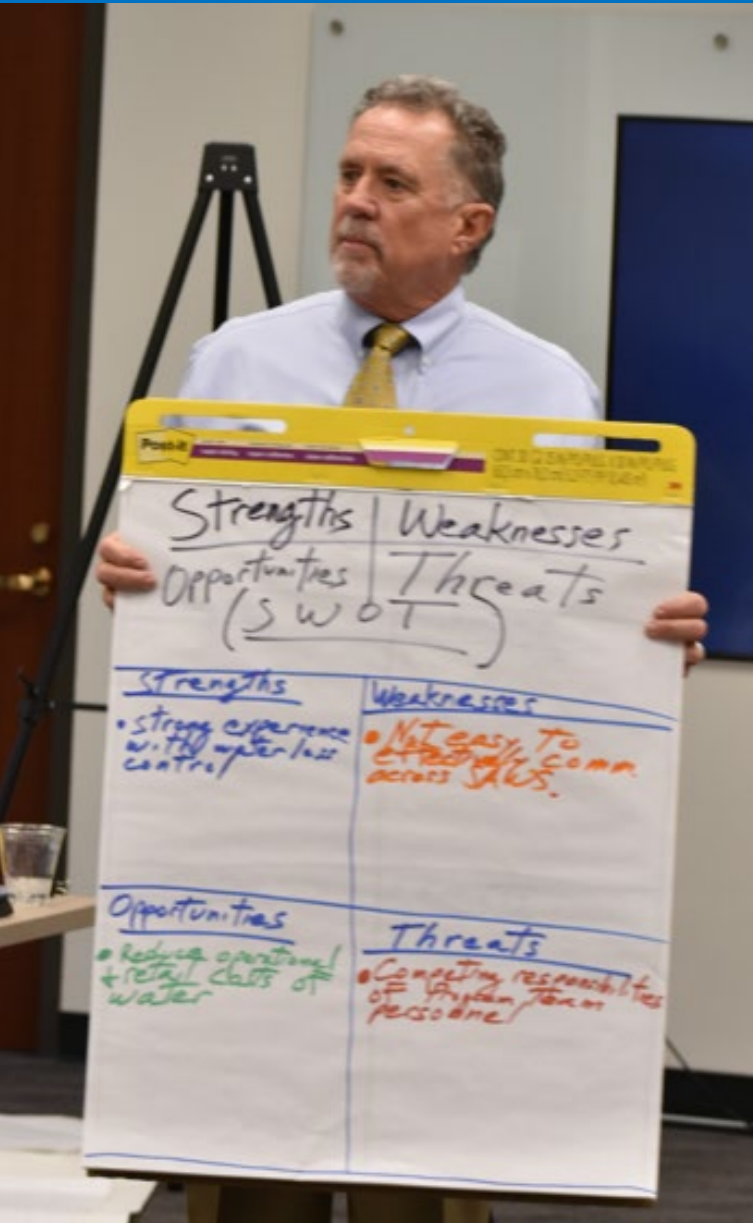
Key Program Task	Accountable (A)	Responsible (R)	Consulted (C)	Informed (I)
Water Loss Control Center				
Overall Program Management	XX	XX		
Develop metrics for Non-revenue water Program	XX	XX	All	All
Reporting Non-revenue water program metrics, goals, activities on Monthly/Quarterly/Annually	XX	XX	All	All
Update/Amend Water Loss Control Plan - include Metrics, Responsibilities, Org Chart, other	XX	XX		
Develop white paper on Non-revenue water technologies	XX	XX	All	All
Internal and External outreach and communication on NRW program.	XX	XX	XX	
Develop overall costs for Non-revenue water program by O&M and Capital on annual basis. Be able to quantify how much we are spending and what additional spend are we doing. (Show how we are increasing funding on an annual basis to address)	XX	XX	All	
Determine future budgets needed for Non-revenue water program.	XX	XX	All	
Water Audit Reporting				
Compile annual water audit	XX	XX	All	
SOPs for Data Collection	XX	XX		
Deployment of real time water loss assessments	XX	XX		
Production Data				
Develop workplan for replacing Edwards production meters and replace legacy Edwards Production meters as identified in work plan. Report number of meters replaced per month and lookahead to Program team.	XX	XX	XX	
Coordinate, perform, and analyze volumetric tests on old and new production meters when replaced.				
Develop production metering annual testing plan. Ensure production meter assets are in INFOR and are accurate.	XX	XX		
Review production facilities to ensure water loss is captured from lube lines to tank overflows to backwashing etc.... Development of tracking water loss for these assets in INFOR.	XX			
Customer & Consumption Data				
Provide customer billing data for reviewing monthly consumption	XX	XX		

SWOT Analysis

Strength, Weaknesses, Opportunities, Threats

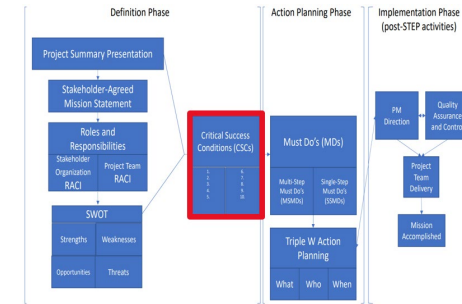


Facilitation of the SWOT analysis with all stakeholders



Critical Success Conditions

- **CSCs** are conditions that must be in place for the team to address stakeholder expectations, achieve the mission, and address the SWOT.
- Compile list of CSCs and then stakeholders rank them



Critical Success Conditions



- ❖ Effective leak detection program
- ❖ Accurate data and analytics
- ❖ Right resources in place
- ❖ Documented and substantiated plans, data, progress, reports, goals, KPI's
- ❖ Continued support from the Board and Stakeholders
- ❖ Continuous momentum/sense of urgency
- ❖ Consistent application of business practices
- ❖ Accurate customer and production metering
- ❖ Collaboration and partnership across departments
- ❖ Adequate funding

Must Do's

Definition and Process

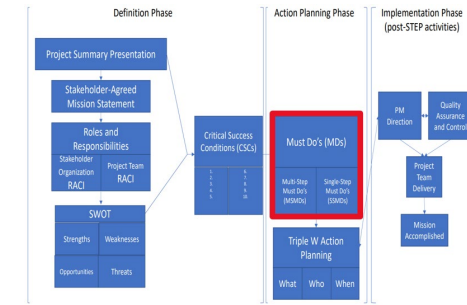
Most critical actions identified to address the highest ranked CSCs

Compile list of MDs and then stakeholders rank them

Top MD's Identified

Execute 2025 Key milestones

- Implement proactive leak detection
- Optimize leak response time
- Replace production meters
- Award design contracts to address poor condition mains
- Explore and implement NRW technologies

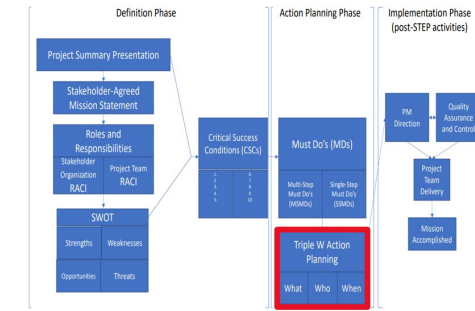


Triple-W

Action, Planning, and Tracking

- What, Who, and When
- The devil is in the details
- Example – Procurement and Installation of Production Meters (2025)

Draft – Example Only



Action #	What	Who	When	Comments
1	Develop list of initial meters for initial procurement (41 meters)	XX	Complete	Initial well sites have been identified. Total of 41 wells
2	Field verification of 41 meters and apparatuses to include Wurzbach 1 – 4 & 6	XX	01/31/25	Verify: existing flow meter specs
3	Preliminary Assessment for Well site assessment	XX	Ongoing	Exercise mainline valves, confirm & test equipment for well isolation instrument verification
4	Prepare documents to advertise with Purchasing	XX	02/15/25	Work with Purchasing on timeline & options: Bid process or contract or sole source
5	Review and approve Vendor	XX	03/31/25	
6	Execute contract with Vendor (Board Approval?)	XX	05/06/25	Will this need to go to the Board?
7	Initial meter delivery to SAWS	XX	08/1/25	Requesting staggered delivery based on well site
8	SAWS initial meter installation complete (41 Meters)	Flow XX Team	12/19/25	Goal to have >20 meters installed by 12/31/2025.

STEP Adjournment

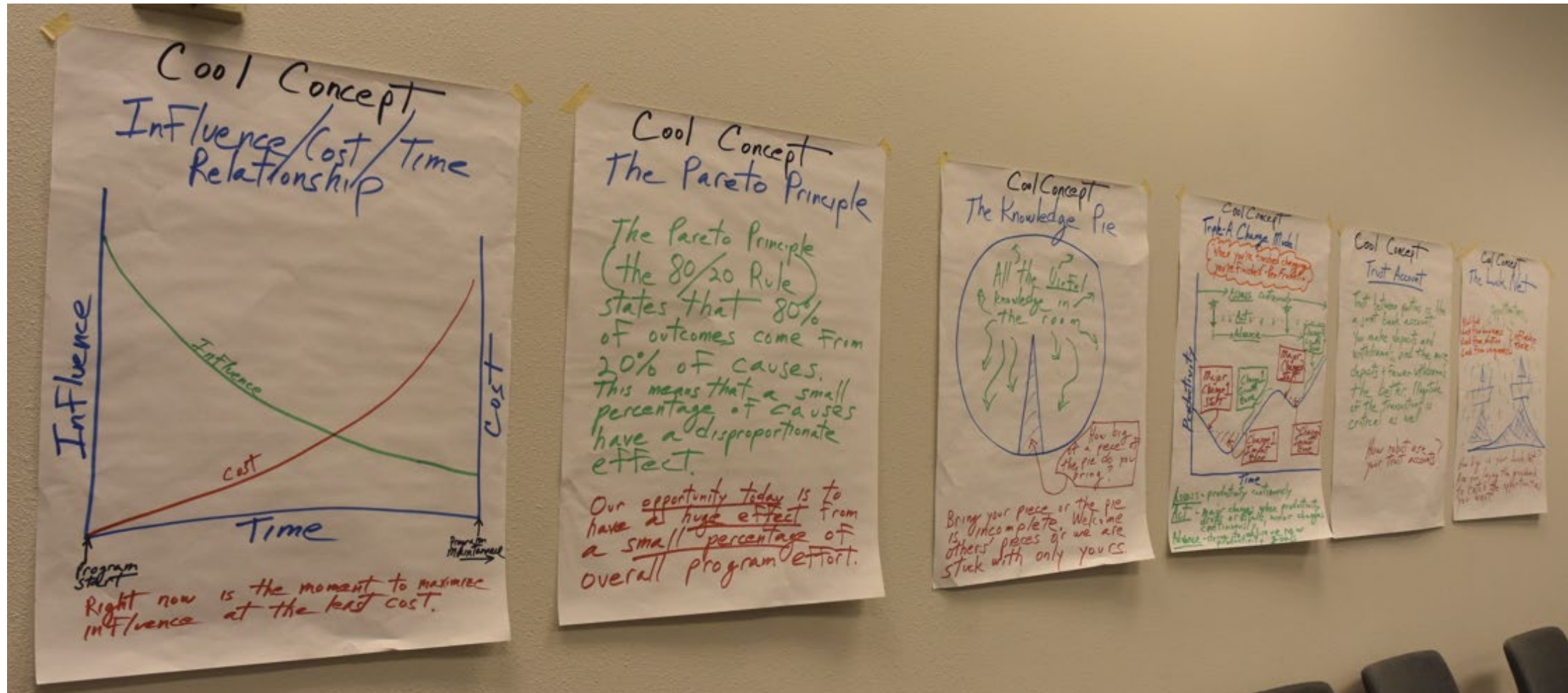
Meeting Closeout Discussion

Verify that:

- Stakeholders' all "had their say"
- Triple-W Action Planning will be completed soon
- Short-term communication and reporting is defined

Introduction of Cool Concepts

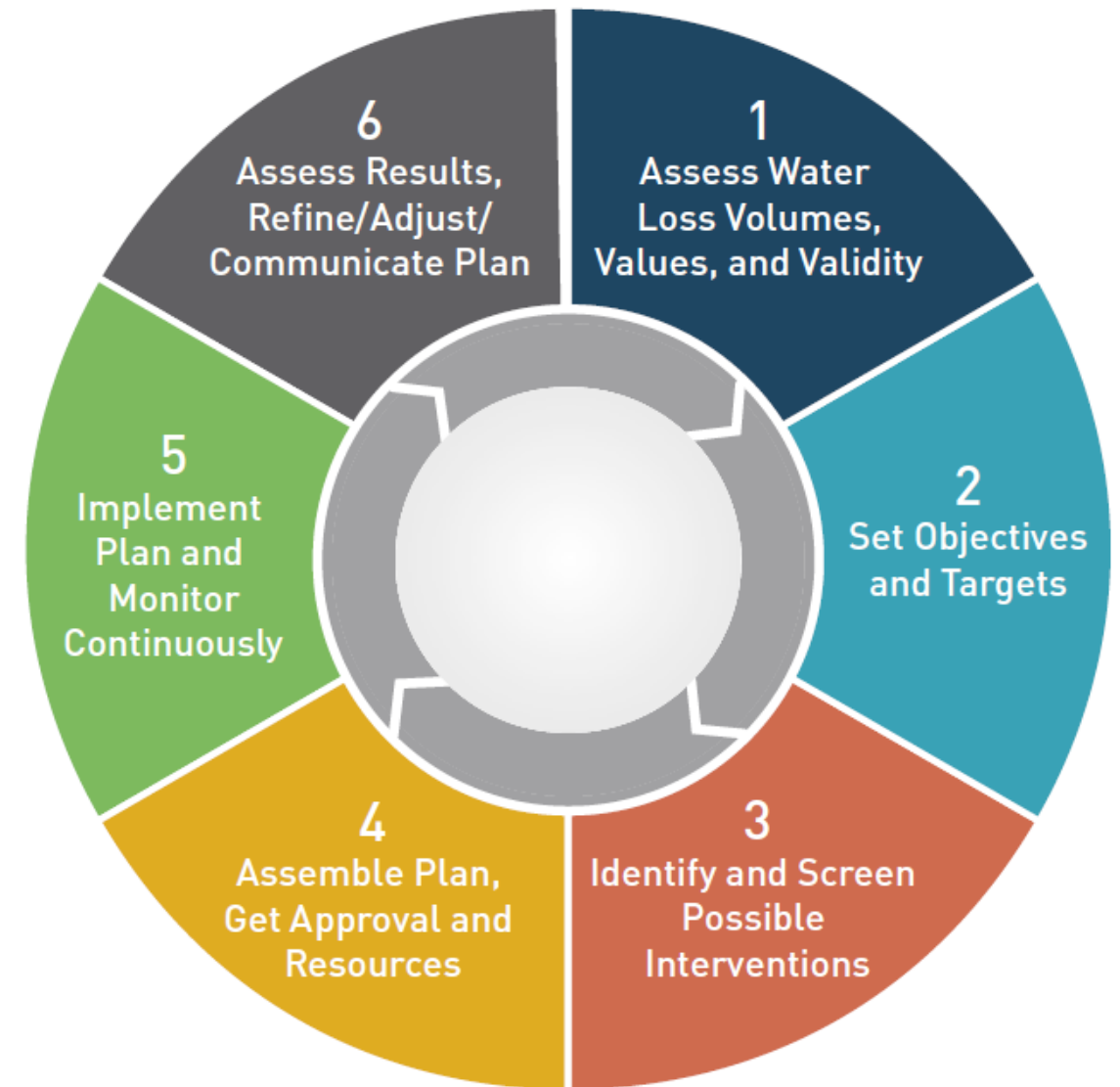
To Refresh the Minds Before Breaks





Next Steps

Non-Revenue Water Program



Source: WRF Project #4695



Thank you!



Thank you for attending our event today.

Would you like to attend our next event?

We have several webinars happening in the near future. Go to <https://www.aaees.org/events> to reserve your spot.

Would you like to watch this event again?

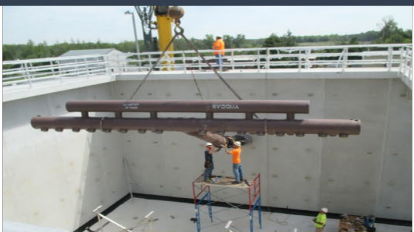
A recording of today's event will be available on our website in a few weeks.

Need a PDH Certificate?

Board Certified Individuals will be emailed a PDH Certificate for attending this event within the next week.

Questions?

Email Marisa Waterman at mwaterman@aaees.org with any questions you may have.



June 25, 2025

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