Asset Management “Made Easy”

AWWA-PNWS Section Conference

April 2018

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Agenda

- **Asset Management basics**
- **Asset Management at SPU**
  - A few case studies

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Definitions

- **Asset management**
  - *"A process for maintaining a desired level of customer service at the best appropriate cost" (EPA)*
  - *Managing infrastructure assets over their life cycle to achieve desired service levels with the best combination of life cycle costs and risk*

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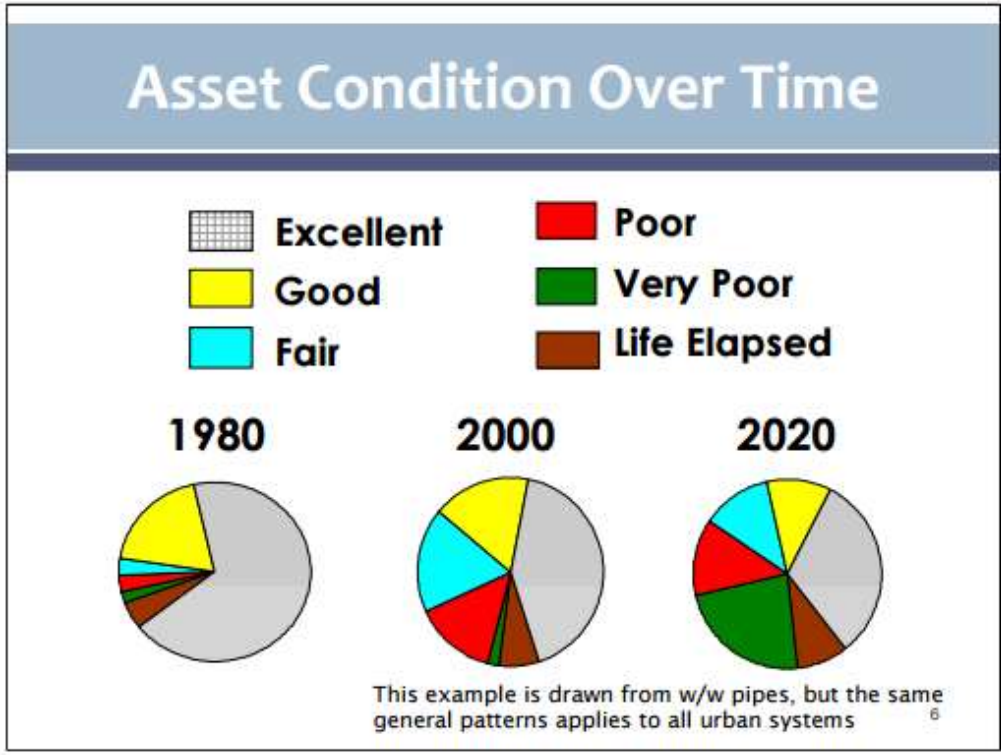
Why Asset Management?

- **Structured and documented framework for planning, design, construction, O&M**
- **Customer centered – focus on levels of service**
- **Business approach – focus on cost-effective service delivery**
- **Strong basis for long-term financial planning (and funding)**
- **Helps improve utility mgmt. and operations**

Source: EPA



Asset Management "Made Easy"

- **Simple concepts…but lots of details!**
- **Advice:**
  - Be methodical
  - Engage all staff who touch the assets
  - Lay out plans, document, and communicate to staff
  - Monitor results
  - Then repeat!

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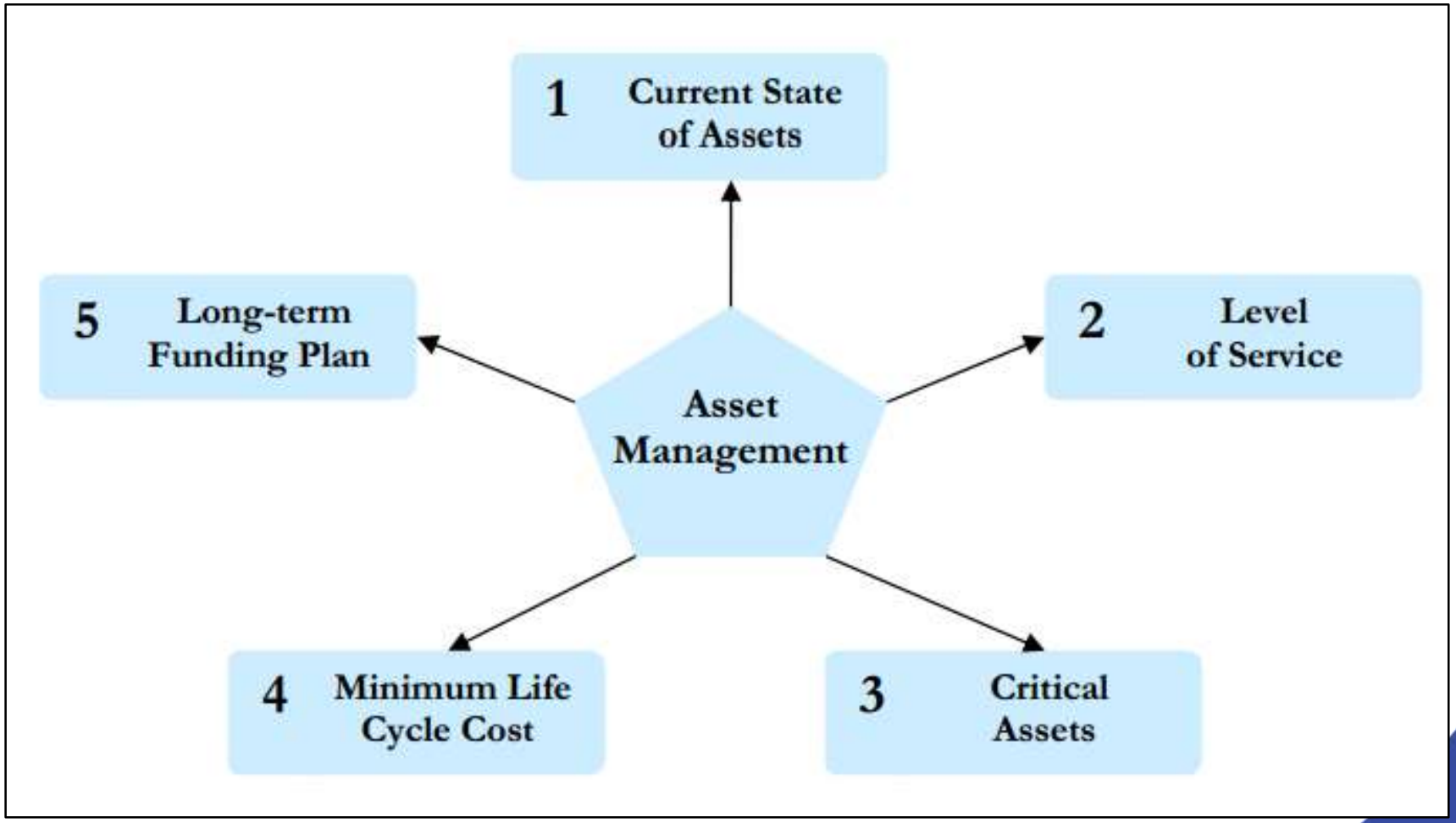
Essential Elements



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1. Current State of Assets

- **Inventory your assets and their condition**
  - Material
  - Age of installation
  - Current condition
  - Inspection results
  - Failure history
  - Major maintenance
  - Many other details…

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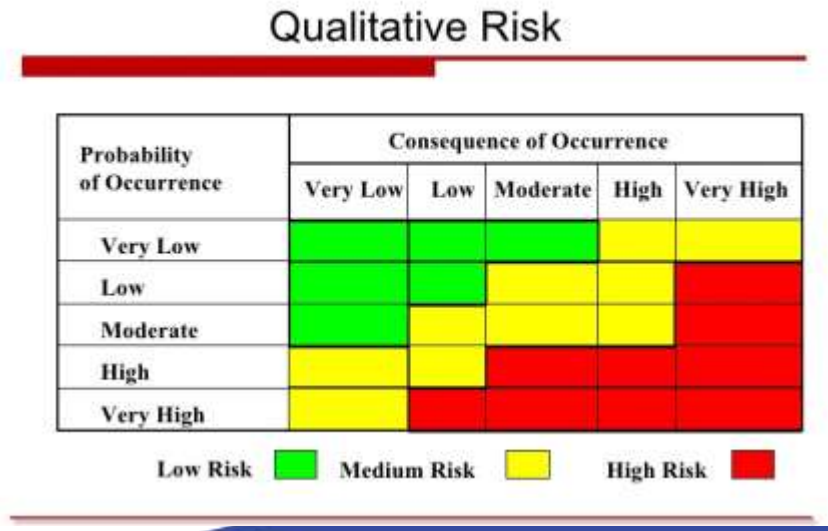
2. Levels of Service

- **Examples:**
  - Meeting regulations for water quality
  - Meeting regulations for water pressure and flow in distribution system
  - Meeting dam safety regulations
  - Meeting instream flow and temperature requirements/commitments
  - Meeting flow and pressure requirements of wholesale customers
  - Meeting distribution leakage and water conservation goals
  - Limiting yearly drinking water outages
  - Limiting transmission system outages
  - Responding to high priority drinking water problems within 1 hour
  - Post-Earthquake water system performance goals (being developed currently)

3. Criticality of Assets

- **Understanding which assets are most critical in meeting service level goals**
  - Risk assessment associated with asset failure
- **Focus more attention on most critical assets**
  - Condition assessment
  - Reliability Centered Maintenance
  - Renewal and replacement

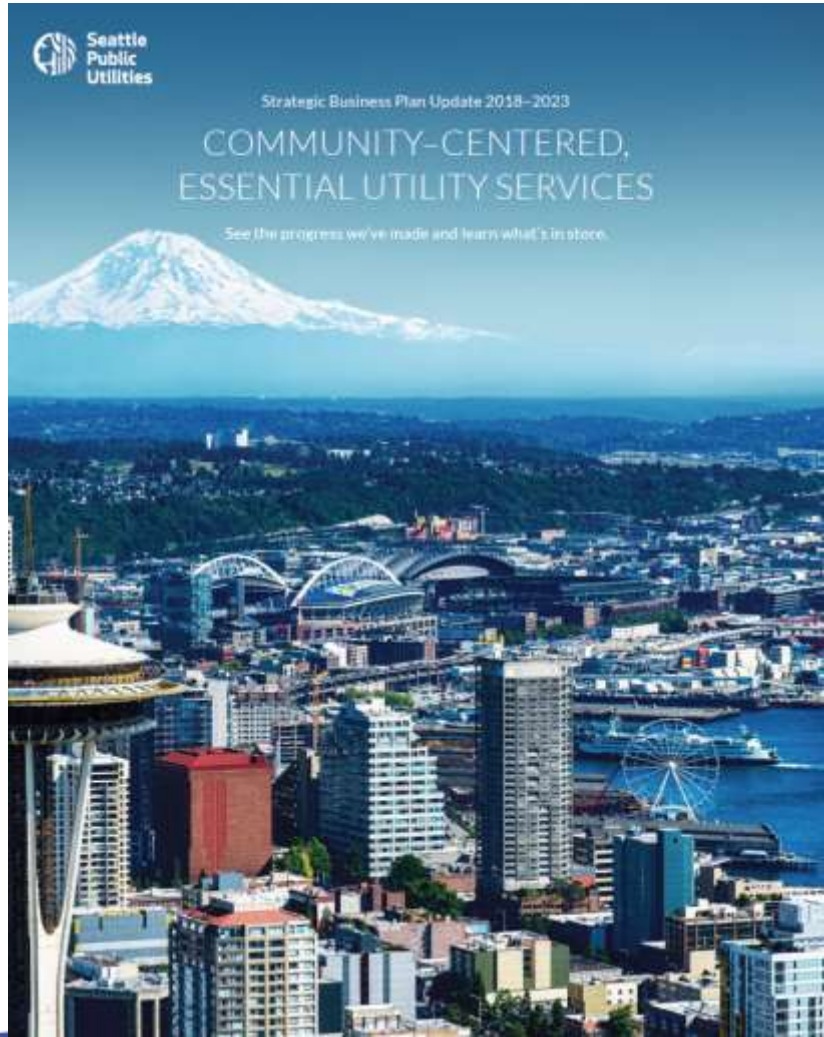


4. Minimize Life Cycle Cost

- **Life cycle cost analysis**
  - Work as a team with planners, engineers, O&M, finance, policy, etc. and external stakeholders as needed
  - Determine optimal blend of CIP and O&M over the long-term
  - Consider non-monetary factors as well – triple bottom line (economic, environmental and social)

5. Long-Term Funding Plans

- **Use recommendations to plan future budgets**
  - O&M
  - CIP
- **Evaluate rate impacts, affordability**



Asset Management at SPU

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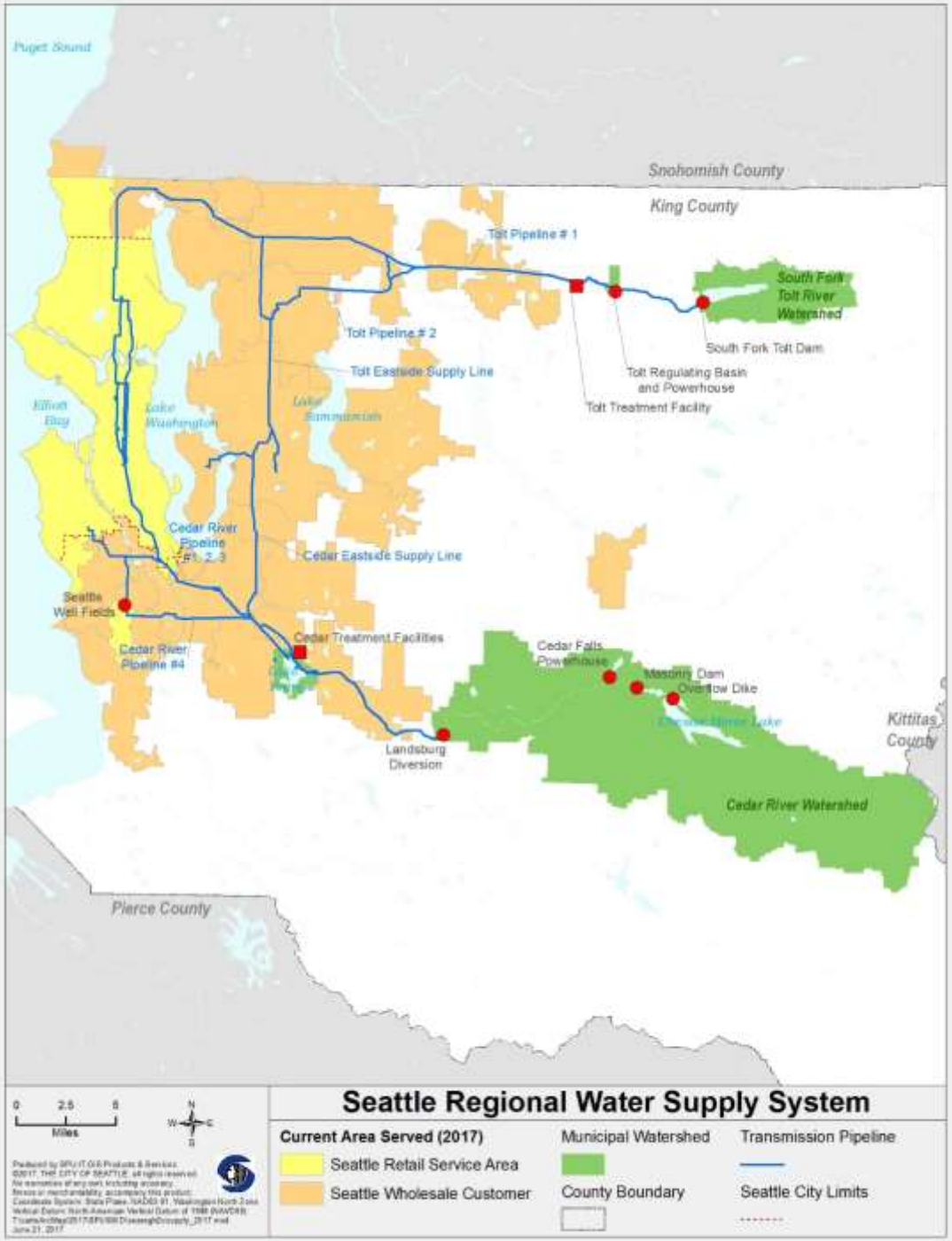

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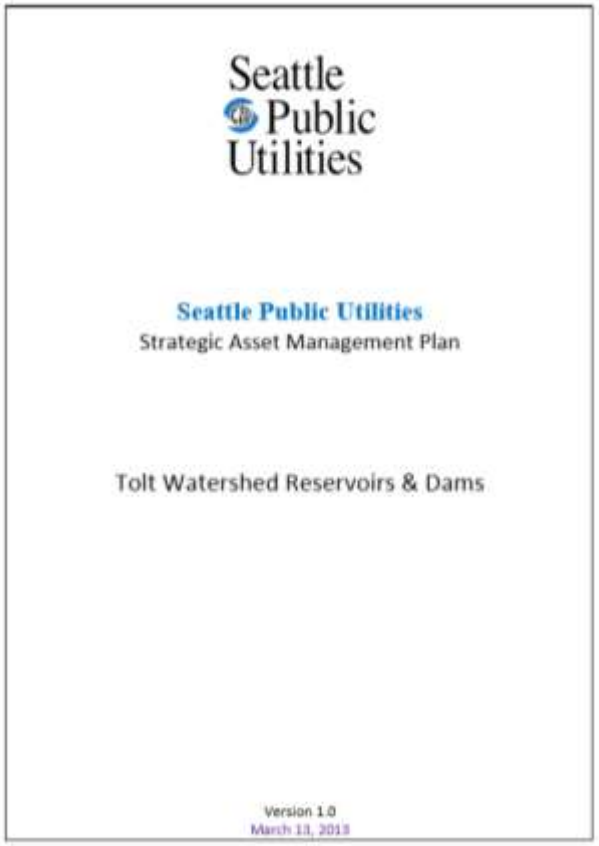
Asset Management Plans

- **AMPs are the "containers" for asset management analysis**
- **One AMP for each major asset class**
- **Renew AMPs on a frequency as needed, based on multiple factors**
  - Projected needs for assets
  - Age of existing AMP
  - Available staff resources



Asset Class	Last Updated	Program Manager	Priority for Updating	Notes
Cedar Watershed Reservoirs and Dams				
Tolt Watershed Reservoirs and Dams				
Lake Youngs Reservoir and Dams				
Cedar Watershed Transportation System				
Tolt Watershed Transportation System				
Transmission Facilities				
In-Town Facilities				
Landsburg Facilities				
Water Treatment Facilities				
Water Transmission Pipes and Appurtenances				
Water Distribution Pipes				
Water Utilidors				
Concrete Reservoirs (Treated Water)				
Steel Water Tanks and Standpipes				
Water Pump Stations				
Water Meters (Wholesale and Retail)				
Water Valves				
Water Hydrants				
Water Services/Taps				

Examples

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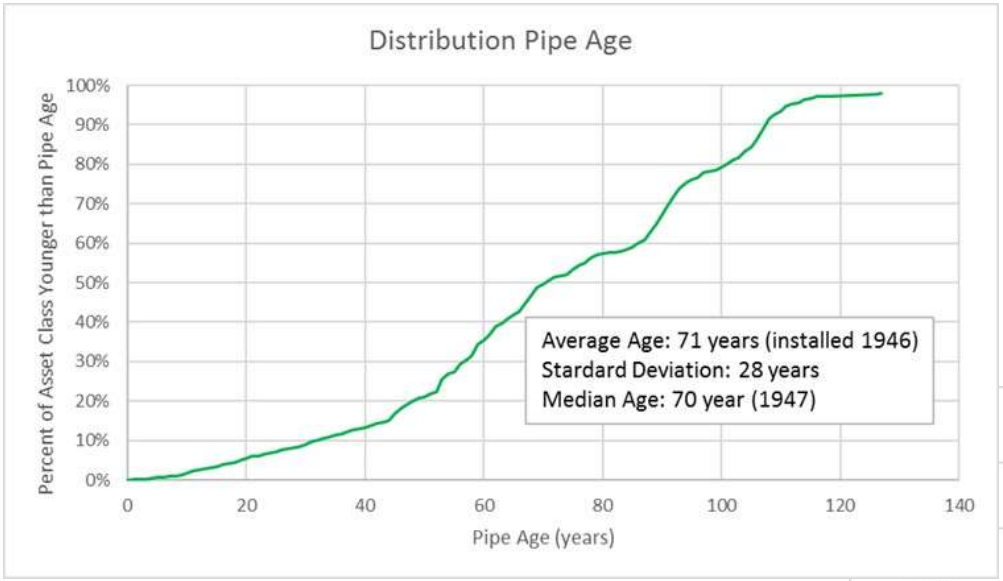
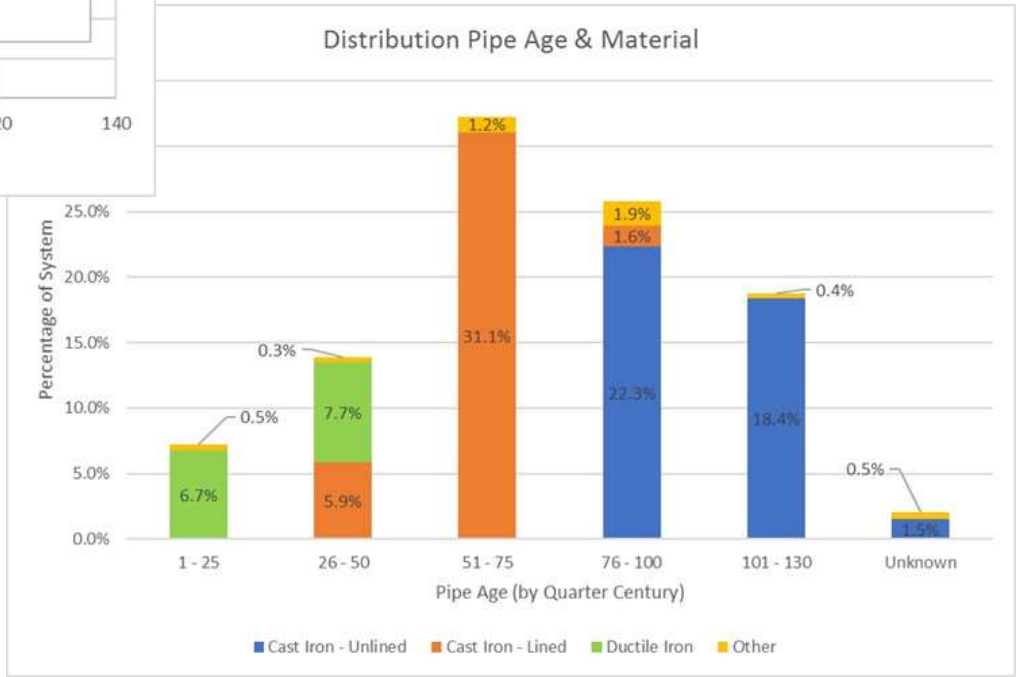
Current State of Assets

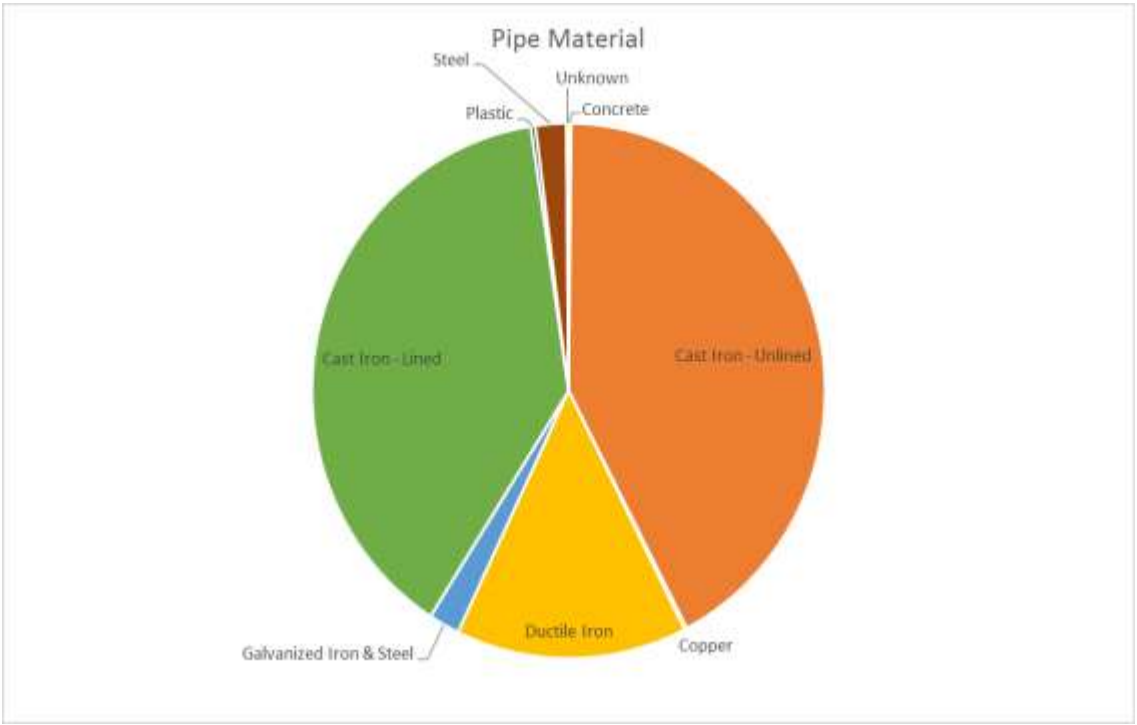
- **Distribution Pipes**





Current State of Assets

- **Distribution Pipes**



Material	Percentage	Miles
Cast Iron - Unlined	42%	690
Cast Iron - Lined	39%	630
Ductile Iron	15%	238
GI/GS	2%	32
Steel	2%	32
Plastic	0.3%	5
Concrete	0.2%	3
Copper	0.2%	2
Unknown	0.1%	2
Total	100%	1634

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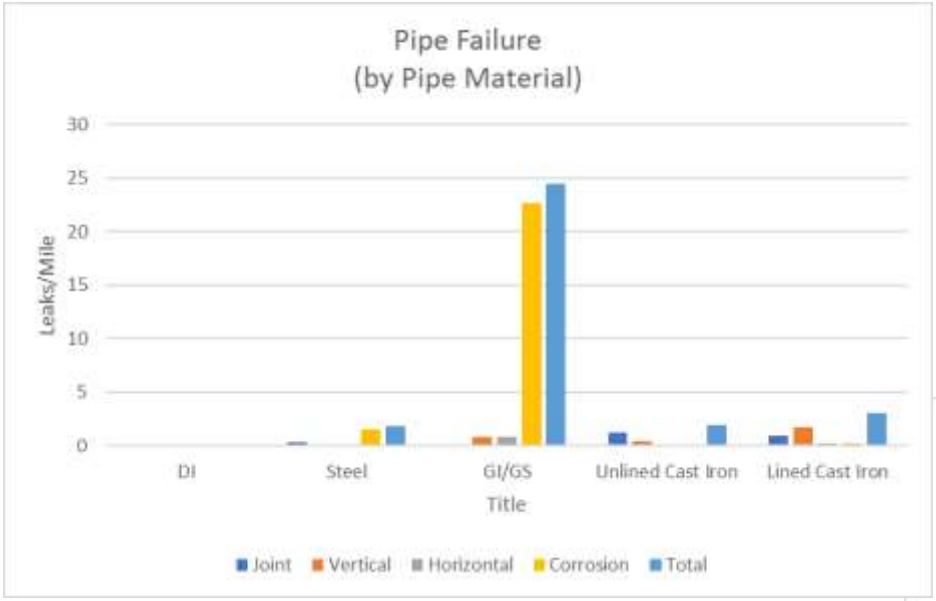
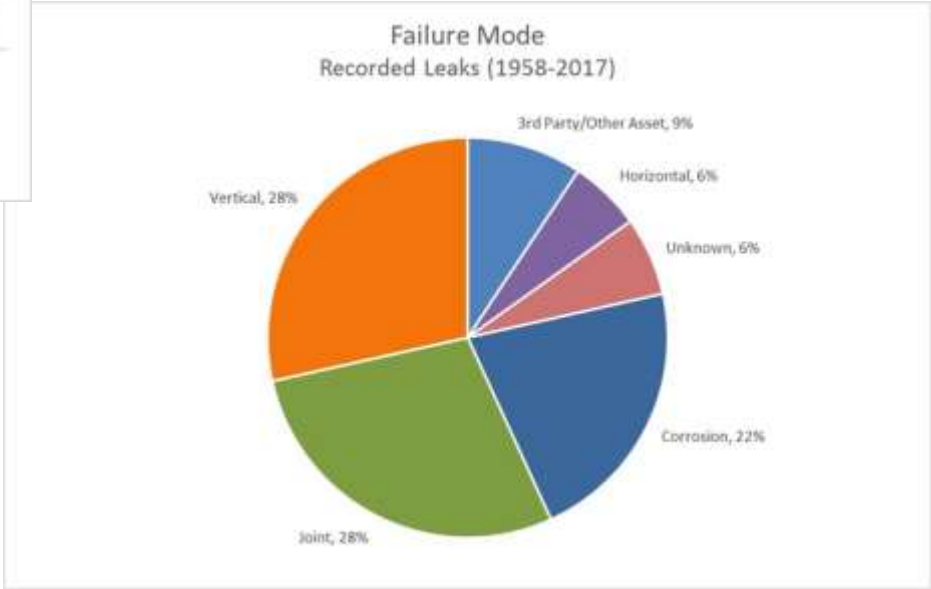
Current State of Assets

- **Distribution Pipes**





Current State of Assets

- **Distribution Valves**

Valve	Use in SPU Water System*	Quantity
Line	Line valves are typically either gate or butterfly valves, depending on pipeline size. Ball and plug valves may be used in the following situations: high pressure (±250 psi), significant throttling under high flow rates, control of pressure surges, or where throttling of high pressure differentials may be required. Distribution line valves should be placed at interties and roadway intersections located at street margins. The valves should be spaced to provide operational flexibility and redundancy to the water	
Gate	Gate valves are preferred where possible. They completely exit the flow path when fully open and allow drained water mains to fill without bypasses. Gate valves require space for a valve bonnet above or to the side (laydown valves) of the pipeline. Cover over water main may be critical. In cases where substandard cover is allowed, the gate valve operating nut must be below the bottom of the paving. This is particularly sensitive for concrete pavement, which tends to be thick. Gate valves are typically more expensive than butterfly valves. Laydown valves must be operable from the street surface and require a sealed right angle gearbox. (See Std Plan 030 for standard cover requirements.)	16,792
Butterfly	Butterfly valves are frequently used on larger pipelines. All valves 16-inches and larger should be full-size inline butterfly valves and be installed in chambers. Valves under 16-inches can be either gate or butterfly valves. Standard practice is to use gate valves. Butterfly valves 16" or larger must be installed with a bypass to allow a drained pipe to fill without throttling the butterfly valve seats. Throttling of large-diameter butterfly valves with pressure differentials of over 50 psi is a primary reason seats have been destroyed after only one or two usages. Make provision for replacement of butterfly valves in the vault design. Include a dismantling joint, or similar, to enable disassembly of the pipe and design chamber to accommodate replacement.	440
Check	Check valve is a special valve that only allows flow in one direction through the valve. Check valves are usually installed in chambers. Several styles are	109

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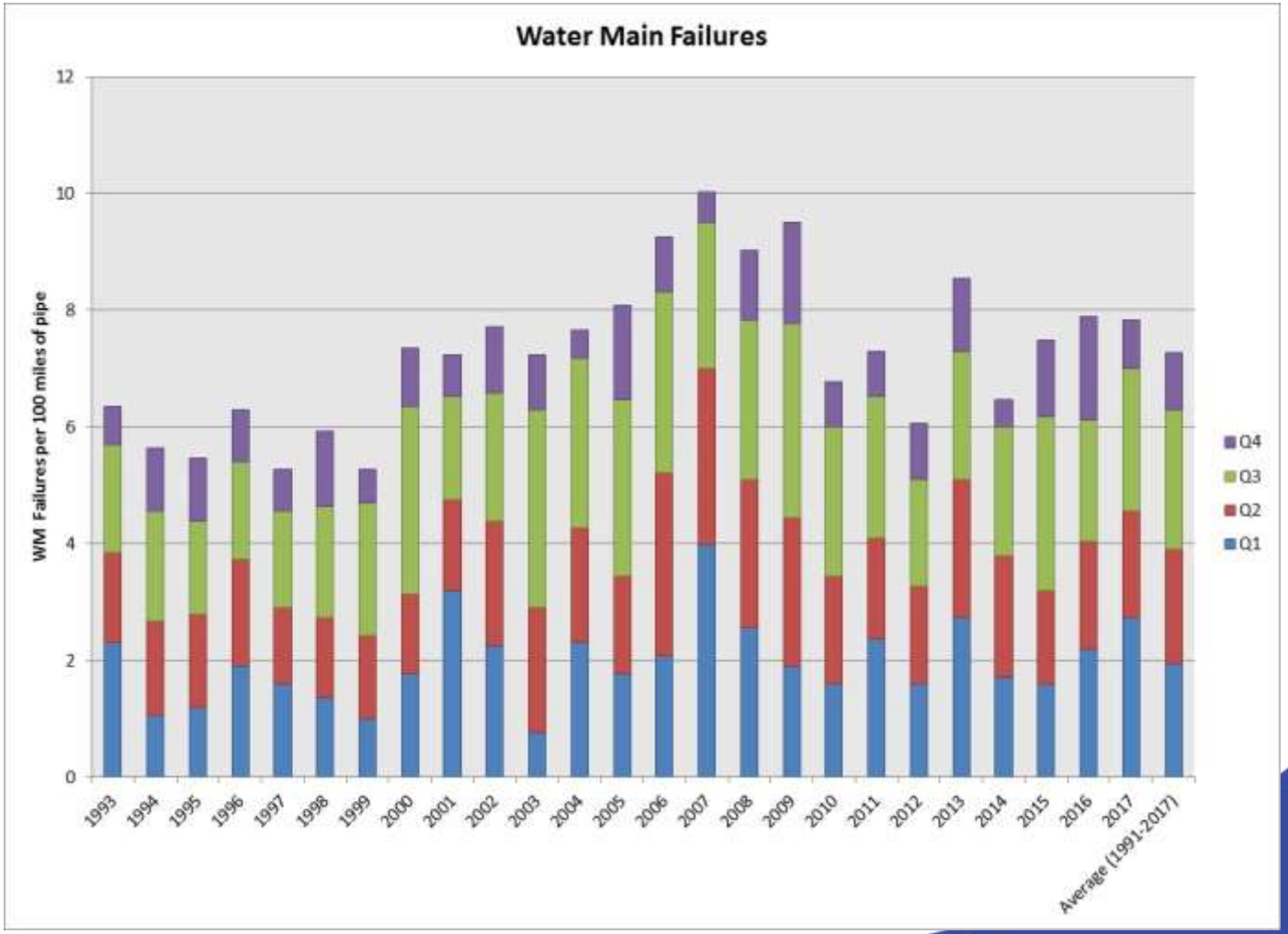
Levels of Service

- **Distribution Pipes**



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Levels of Service

Table 1. Service Level Performance - YTD First Quarter 2017

#	Levels of Service and Performance	Reporting Frequency	Target	Performance
Focus Area: Customer Experience - Making it easier to get help and find answers				
1	Customers rank their satisfaction with SPU services is at least 5 on a scale of 1-7. (Last measured in 2015.)	Every 4 Years	≥5	5.9
2	% of priority drinking water, drainage, and wastewater problems responded to within one hour.	Monthly	≥90%	92%
3	# of households enrolled in the Utility Discount Program. - Increase from January 1 - 2018 year end goal: 34,000	Monthly	 34,000	 2,271 32,414
Focus Area: Health and Environment - Better projecting your health and our environment				
4	% compliance with Department of Health regulations.	Monthly	100%	Yes

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Criticality of Assets

- **Pump Stations – criticality**
  - Size of area served
  - Redundancy in pressure zone
  - Critical customers served
- **Met with planners, engineers, operations and maintenance to determine criticality**
- **Categorized by high, medium, low**

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Criticality of Assets

- **Reliability Centered Maintenance (RCM)**
  - "A process used to determine what must be done to ensure that physical assets continue to do what its users want in its present operating context"
  - Meaning, what's this asset's mission? And how does its parts prevent it from failing the mission?
- **Teams performed detailed RCM analysis on a few of the High Priority pump stations**

Criticality of Assets

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RCM Analysis

Name: Burien Pump Station
Location: 14600 8th Ave So
Analysis Date: Sept. 24th – Sept. 25th

I. Executive Summary

A. Purpose

Reliability Centered Maintenance (RCM) was used to ensure that Seattle Public Utilities (SPU) Burien Pump Station functions reliably and as intended. The objective of the analysis was to determine the specific operating context (functions and requirements) of the pump station, to determine the performance standards associated with these functions and to identify the areas where modifications to the station's operation, maintenance, or design could result in increased reliability.

Burien Pump Station Site Photo

The scope of this analysis includes:

Electrical switchgear	Lighting
Motor Starters	Receptacles (outlets)
Motors	Exhaust fan
Pumps	Heater
Valves	Heater contactor
Piping	Thermostats
SCADA	Sprinkler controller
PLC (Programmable Logic Controller)	Floor drain
I & C (Instrumentation & Control)	Plumbing fixtures (toilet, sink)
Intrusion alarm system	Roof
Flood alarm	Gutters/downspouts
Heat detector	Flow meter (outside of station)
Building interior	Emergency pump connections

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Criticality of Assets

- **Exported RCM "lessons learned" to rest of pump stations and vetted with team**
  - General RCM-based recommendations for High, Medium, Low criticality

Interval		Work Group	Crew Size	Tasks	Measurement	time estimate
1	week	Mech		Check and adjust packing (ignore if mechanical seal); check for any leaks		
		Mech		Inspect sight glass for oil level, check for oil leaks, add oil as necessary (ignore if grease)		
1	month	Mech/Elec		Start diesel pump and/or generator to test		
3	month	Mech		Test flood alarm switch, run sump pumps		
6	month	Mech		Inspect pump room pipes for corrosion. Clean corrosion/rust with a wire brush and paint.		
				Inspect railings, stairs, and stiles		
				Inspect/repair non skid on steps.		
				Lubricate flow meter		
1	year	Mech		Lubricate motor and pump bearings; consider using acoustic device for greasing; change oil every 5000 hours or 2 years, whichever comes first		
		Mech		Exercise isolation valves		
		Mech		Clean inlet strainers, process water filters; flush control valve hydraulics		
				Pump tests: run each pump in turn, coordinating availability with OCC operator.	Pump flow and pressure	
				Vibration monitoring (perform during pump testing)	Vibration data for trending	
				Inspect A/C unit, change filters on any air handling units		
				Inspect belt, lube bearing, blow out debris/replace filter in swamp cooler		
				Inspect couplings on pumps		
				Hydraulic ball valves: Isolate control valve, test emergency solenoid; flush cylinders as needed		
		Elec		Insulation resistance readings; megger readings; inspect starter contacts	Ohms	
				Infrared survey for electrical contacts - may require retrofits at some stations for IR	Photo of IR hot spots	
				Oil starters: Take and analyze sample (City Light Lab). To get a clean sample, starter cabinet must be cleaned first to prevent contamination.		
		Instr tech		Pressure transducers: bleed sensor line to zero, repressurize and compare readout to calibrated gauge.		
				Test and inspect interlocks		
		Grounds		Clean hatch drains and/or roof gutters		
3	years	Mech		Check alignment with laser tool, adjust as needed	Alignment data	
4	year	Instr tech		Replace internal lithium battery in PLC processor.		
5	years	Mech		Pump control valves, surge valves, any other diaphragm valves: Replace valve diaphragm, pilot valve diaphragm, and seat disc.		

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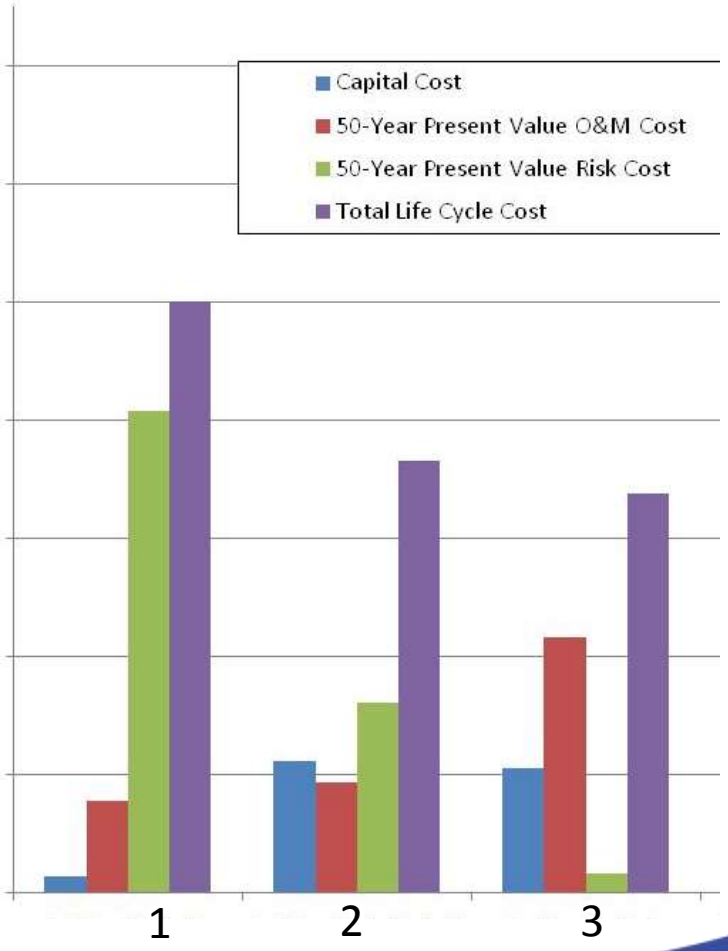
Minimize Life Cycle Cost

- **Life cycle economic analysis including CIP and O&M**



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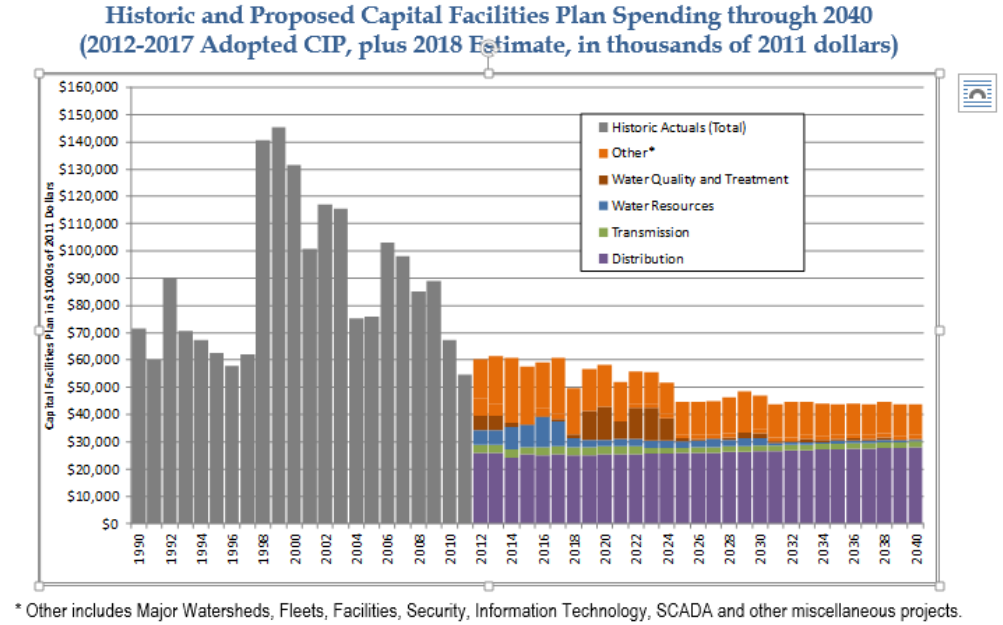
Long Term Funding Plans

- **CIP**
  - Based on asset management plans
- **O&M**
  - Verify existing budget is appropriate based on asset management plans
  - Evaluate future budget needs



* Other includes Major Watersheds, Fleets, Facilities, Security, Information Technology, SCADA and other miscellaneous projects.

What's Next?

- **Continuous improvement**
- **Renew AMPs as needed**
- **Implement and monitor AMP recommendations**

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Questions?

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