

# All in One: The Benefits of Integrating Comprehensive Long-term Water Supply, Treatment, and Distribution Planning

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OUR BUSINESS  
OUR PASSION

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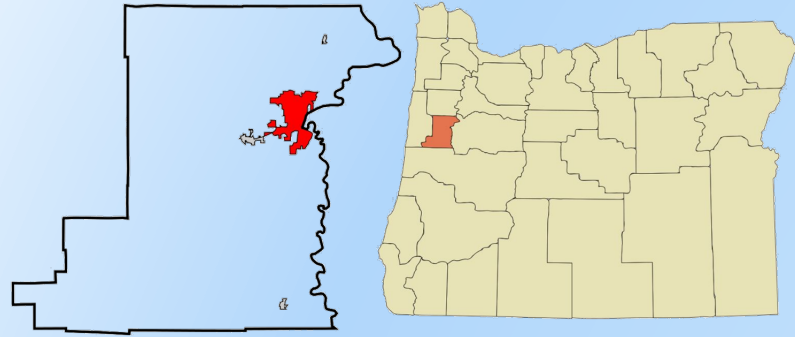
# Agenda

- Overview of Corvallis System
- Overview of Master Planning Process
- Benefits of Integrating Supply, Treatment, and Distribution Planning
  - Optimized Stakeholder Involvement
  - Holistic Long-term Resilience Planning
  - Comprehensive Capital Improvement Plan



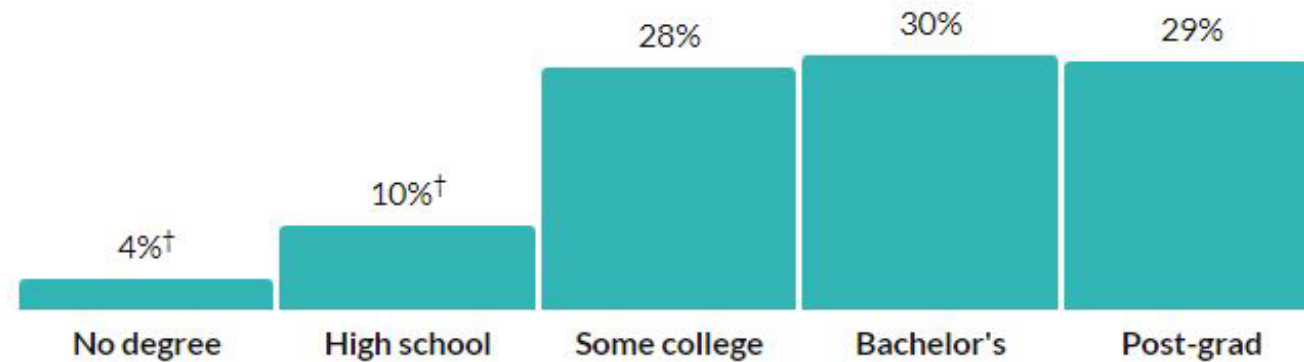
# Corvallis Water System Overview

# Corvallis, Oregon



**Land Area:** 14.23 sq mi  
**Population:** 60,000

Population by highest level of education



\* Universe: Population 25 years and over

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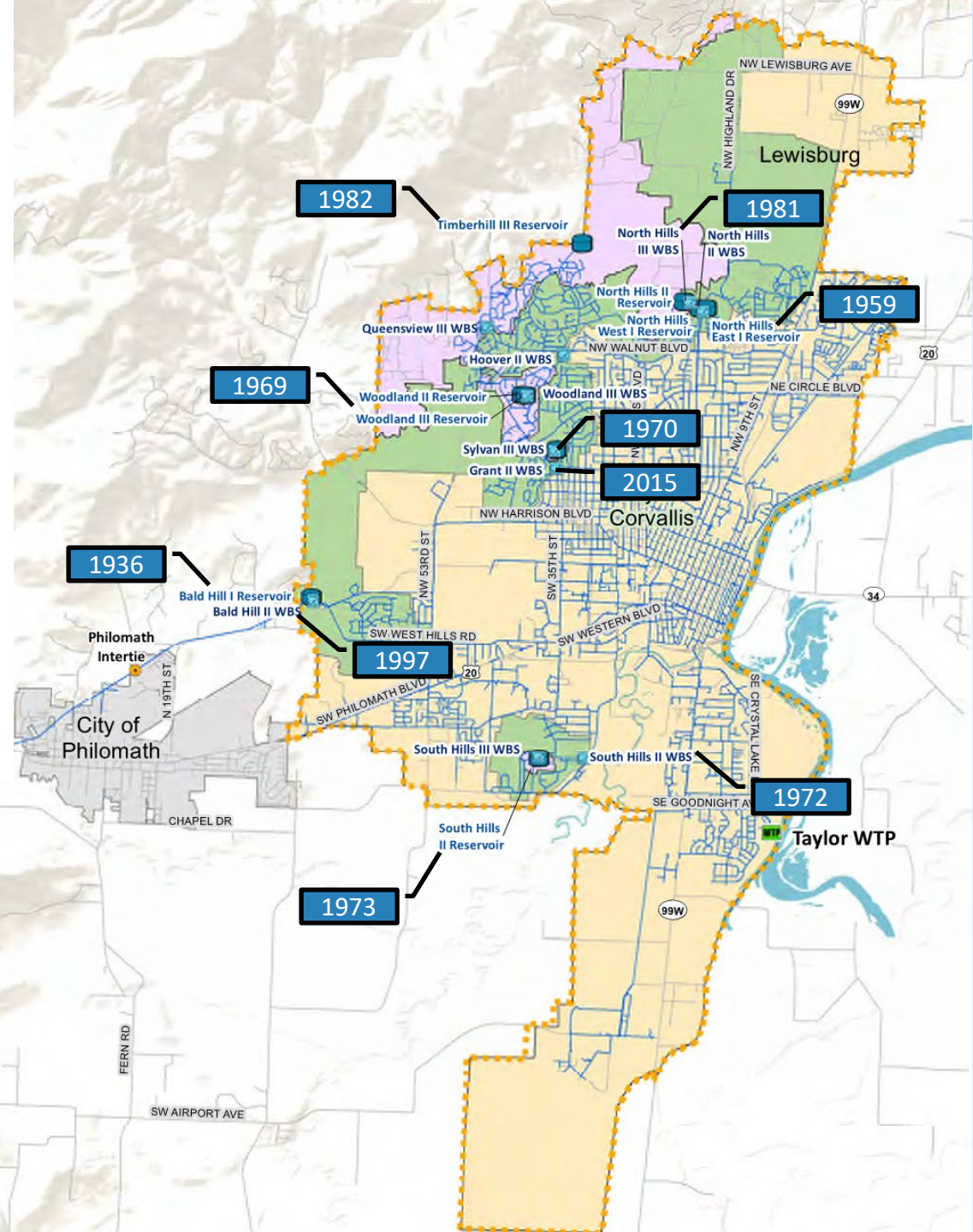
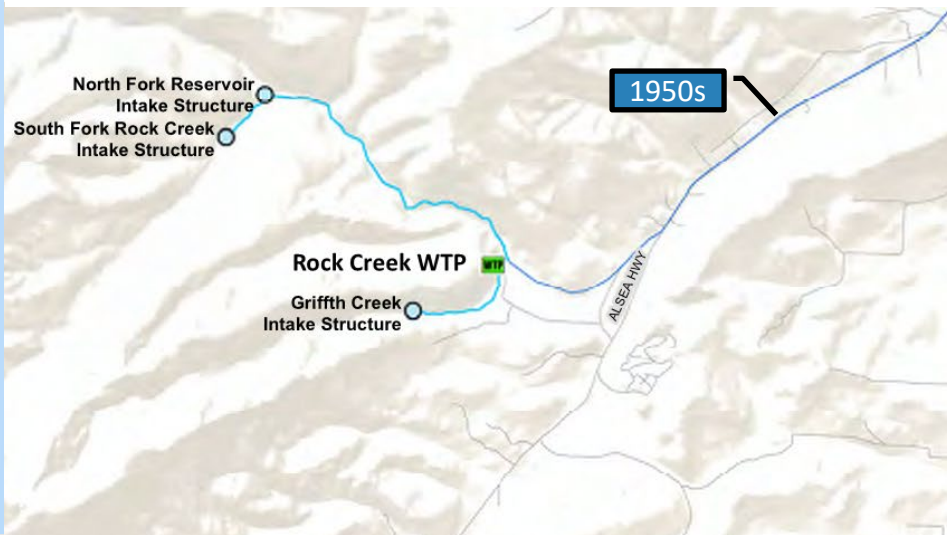
# Water System Overview

- 2 Water Treatment Plants (WTP)
- 255 miles of water mains
  - 4-inch to 36-inch diameter
- 10 Water Booster Stations (WBS)
- 8 Reservoirs
  - Store 22 MG of water
- 3 Water Service Levels



# Water System Age

- Water Mains
  - 71 miles (30%) are 50+ years old
  - 90 miles (35%) 40-50 years old
- Water Booster Stations (WBS)
  - 7 constructed between 1968 and 1981
  - Newest constructed in 2015
  - 8 upgraded since 2000
- Reservoirs
  - Oldest (Bald Hill I) constructed in 1936
  - Newest (Timberhill III) constructed in 1982



# Rock Creek Water Treatment Plant (WTP)

- Located in 10,000-acre Rock Creek Watershed
- Supplied by North Fork Rock Creek, South Fork Rock Creek, and Griffith Creek
- Operates by gravity
- Average annual production: 2.4 million gallons per day (MGD)
- Maximum Capacity: 3 MGD





# Taylor Water Treatment Plant

- Built in 1949
- Upgrades: 1960, 1968, 1971, 1980, and 1995
- Supplied by Willamette River
- Average annual production: 4.9 million gallons per day (MGD)
- Maximum daily capacity: 22 MGD





# Planning Process Overview

# Master Plan Objectives

## Objective #1



Establish a **public outreach** process that establishes and maintains key stakeholder support throughout the planning project.

## Objective #2



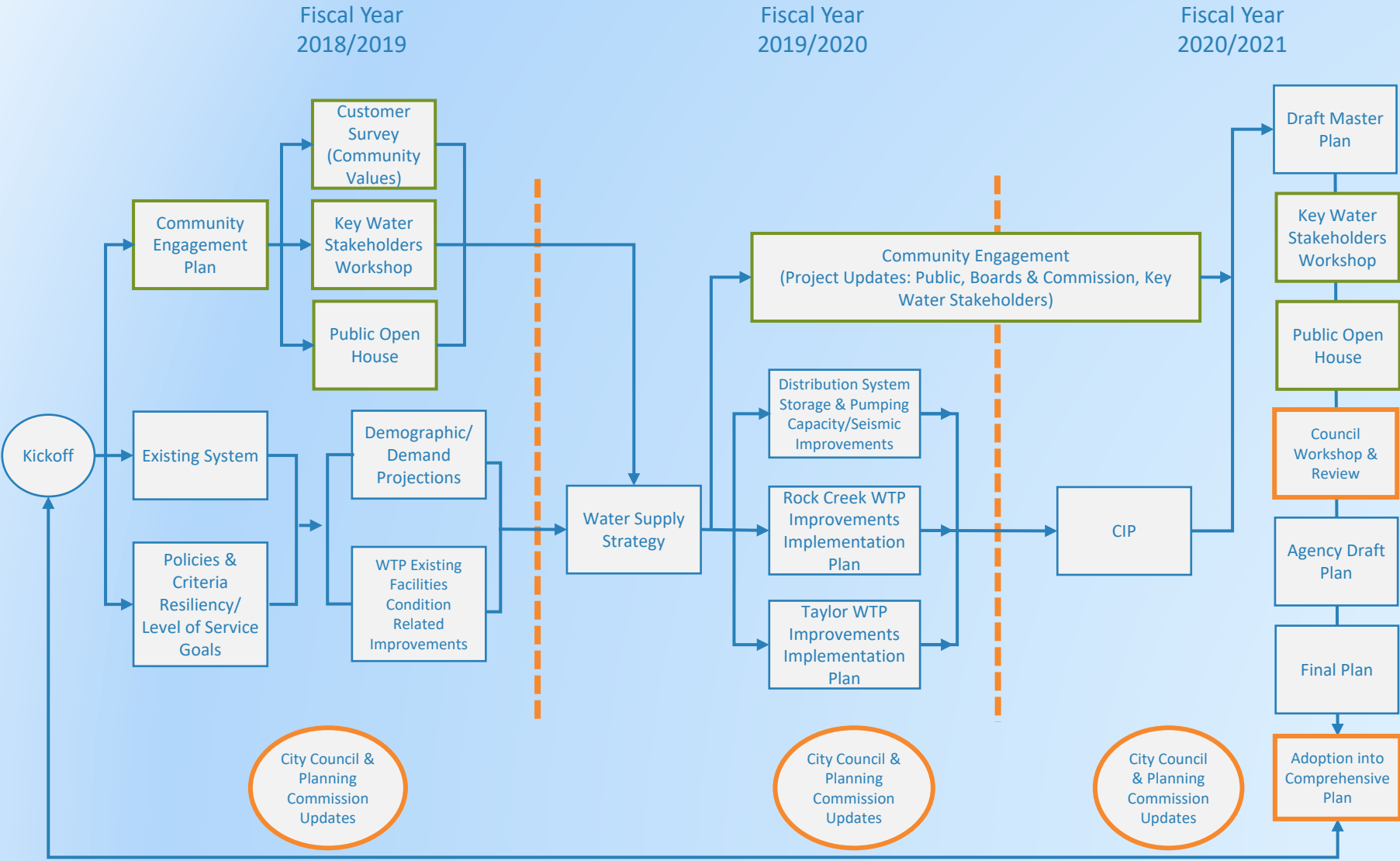
Establish the foundation for a long-term, **seismically resilient** water system for the City.

## Objective #3



**Planning for the future.** Develop a water supply strategy and address finished water demand and quality goals.

# Water Master Plan Project Process



# Master Plan End Product



2 Volumes

9 Chapters –  
360 Pages

22 Appendices –  
2,700 Pages



## Benefits of Integrated Planning

# Benefits of Integrated Planning

## Benefit #1



Establish a **public outreach** process that establishes and maintains key stakeholder support throughout the planning project.

## Benefit #2



Establish the foundation for a **seismically resilient** water system for the City.

## Benefit #3



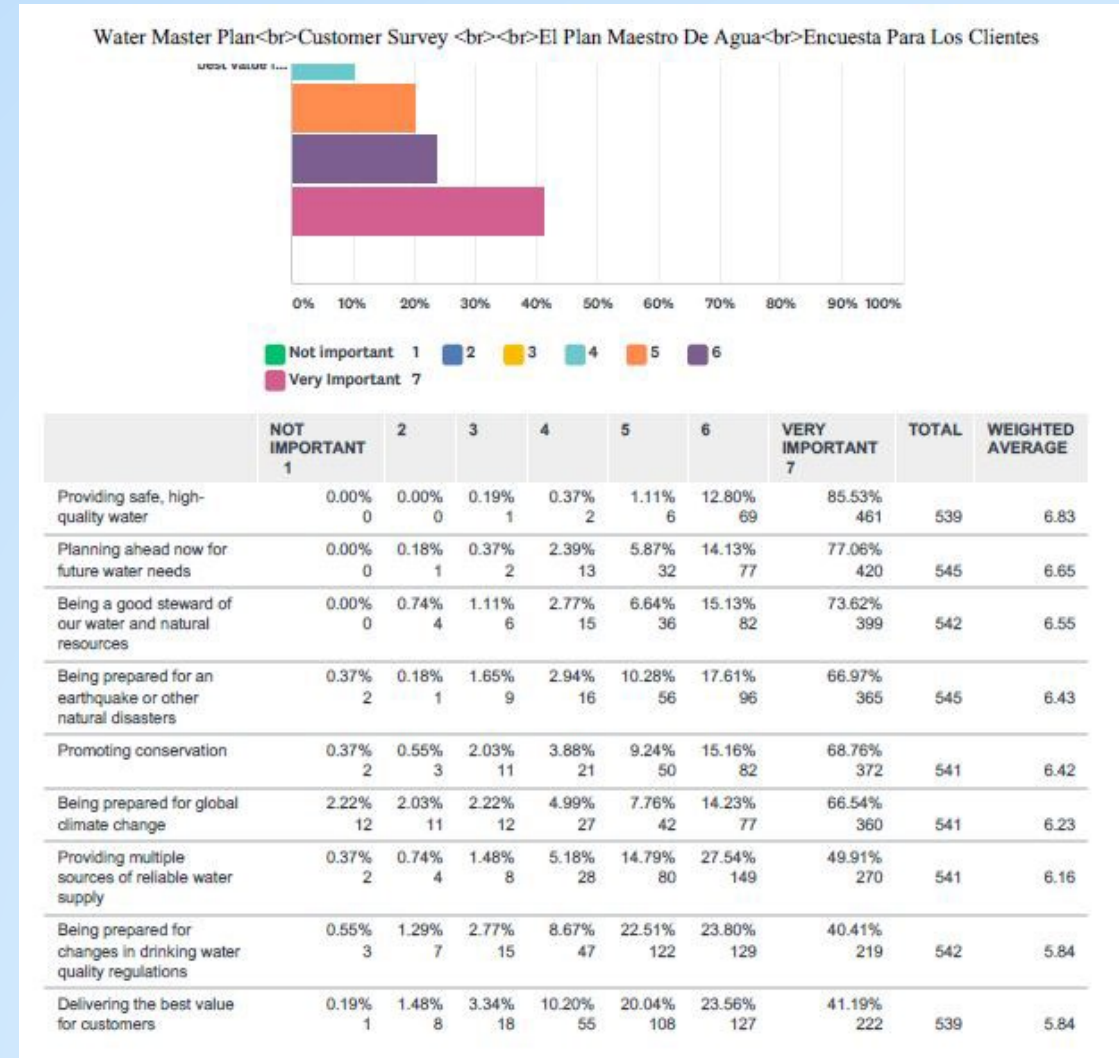
**Planning for the future.** Develop a water supply strategy and address finished water demand and quality goals.



# Optimized Stakeholder Involvement

# Continuity of Project Stakeholders Is Critical

- Public and elected officials
- City staff and community stakeholders
- Consultant team and City staff





# Effective Public Engagement Requires Significant Resources

Date	Activity
<b>2019</b>	
Feb 2	Launched project website
March	Develop materials outreach materials:
March 4	Draft customer survey
March 6	WMP CIDAB presentation
March 18	Launch customer survey
April 3	Key Water Stakeholders Workshop #1
April 8 & 9	OSU Water Symposium
April 25	Public Open House #1
April 29	Customer survey summary
May 4	Close customer survey
May	Share customer survey results: website, Corvallis e-News, Facebook, Twitter, Nextdoor.
June 5	WMP CIDAB presentation
June 20	City Council Update
August 8	City Council Update
October 11	City Council Update
December 18	Planning Commission Update
<b>2020</b>	
January 28	Key Water Stakeholders Workshop #2
August 6	City Council Update
<b>2021</b>	
March 3	Key Water Stakeholders Workshop #3
March 18	City Council Update
May	Draft Master Plan: City Review Complete
July	Online Open House (website live through adoption)
July 19	Infoshare provided to Planning Commission
August 4	Key Water Stakeholders Workshop #4
August 10	Live Open House Q&A (via Zoom)
<b>2022</b>	
Spring	Presentation to Planning Commission
Spring	Final Master Plan to City Council for adoption

Community Outreach and Education

Outreach to Key Stakeholders

Outreach to Elected Officials and Community Boards

Single Comprehensive Plan Effort = Single Public Outreach Effort for City Staff

# Numerous Synergies for City Staff and Consultant Team

## Consultant / Staff Collaboration

- 8 Consultant Teams
- 32 City Staff from six City Departments
- Over 15 Project Meetings/Workshops
- Over 75 Consultant / City Project Manager coordination / information calls



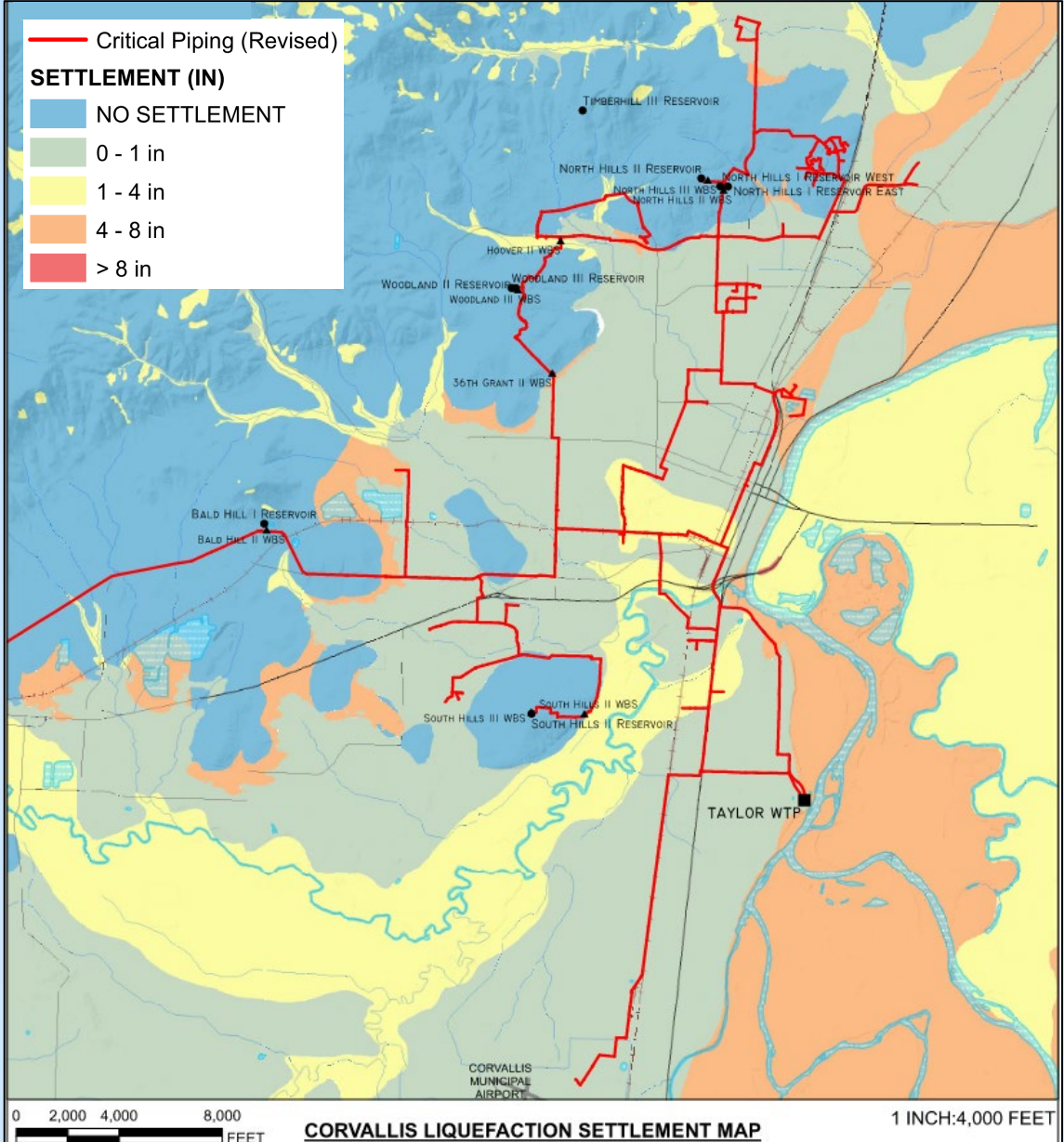
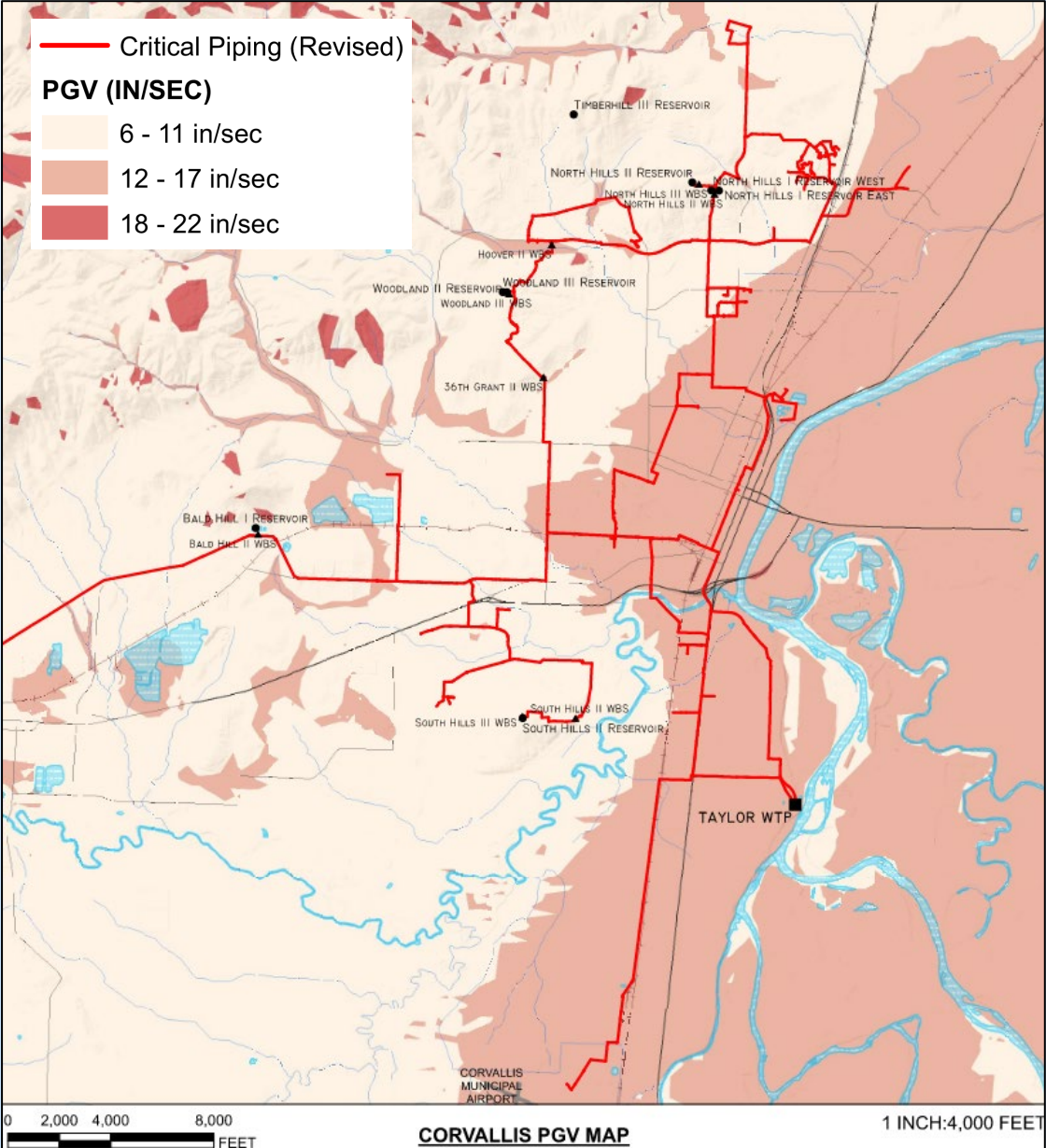
# Biggest benefit = TRUST

- City staff in consultant
- Consultant in City staff
- Elected officials in City staff and consultant team
- Community members in Elected officials and City staff
- Regulatory agencies



# Holistic Long-term Resilience Planning

# A seismic event will affect the entire water system



# Developed a resilient backbone from supply sources to critical customers.

## Legend

### Critical Customers:

- Tier 1 = Short-term (No Disruption)
- Tier 2 = Short-term (1-3 Days)

### Backbone Water Facilities:

- Water Booster Station
- Reservoir
- WTP Water Treatment Plant
- Backbone Water Main

### Existing Water Main (Diameter):

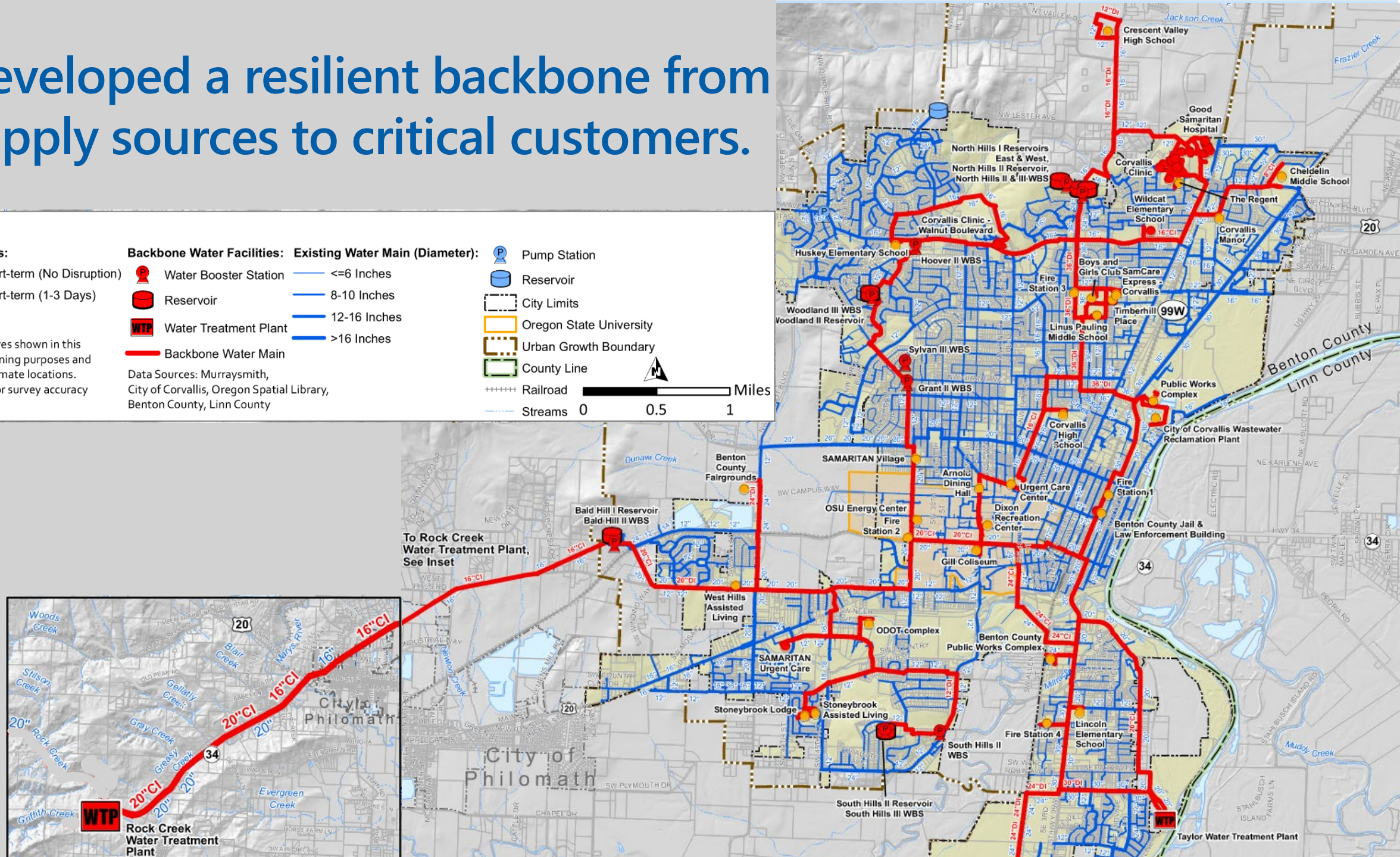
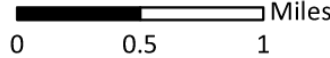
- <=6 Inches
- 8-10 Inches
- 12-16 Inches
- >16 Inches

### Other Features:

- Pump Station
- Reservoir
- City Limits
- Oregon State University
- Urban Growth Boundary
- County Line
- ++++ Railroad
- Streams

Data Sources: Murraysmith, City of Corvallis, Oregon Spatial Library, Benton County, Linn County

Disclaimer: Features shown in this figure are for planning purposes and represent approximate locations. Engineering and/or survey accuracy is not implied.



# The vulnerability of each backbone facility was evaluated using a consistent methodology.



## Structural Performance

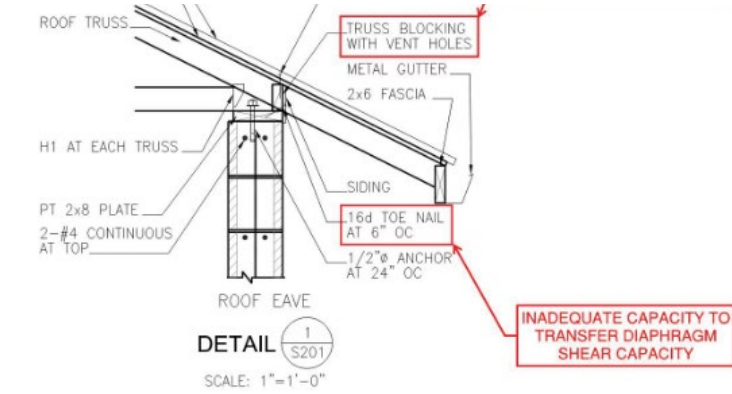


Figure 8 Roof Truss to Masonry Wall Connection – North and South Walls

## Non-structural Performance



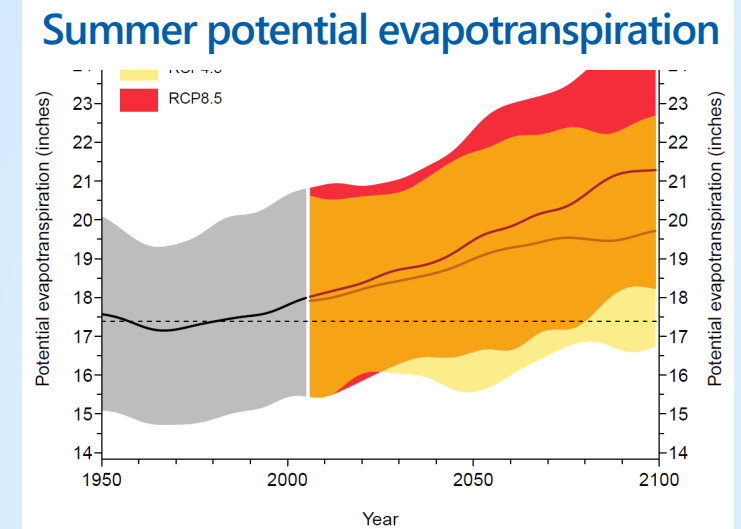
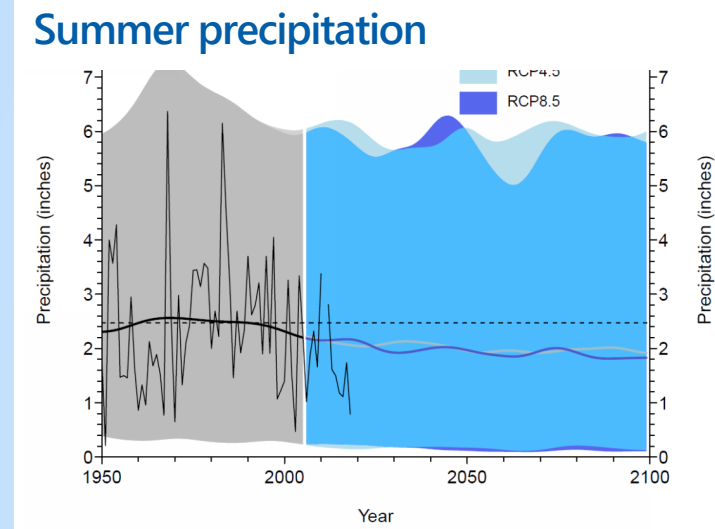
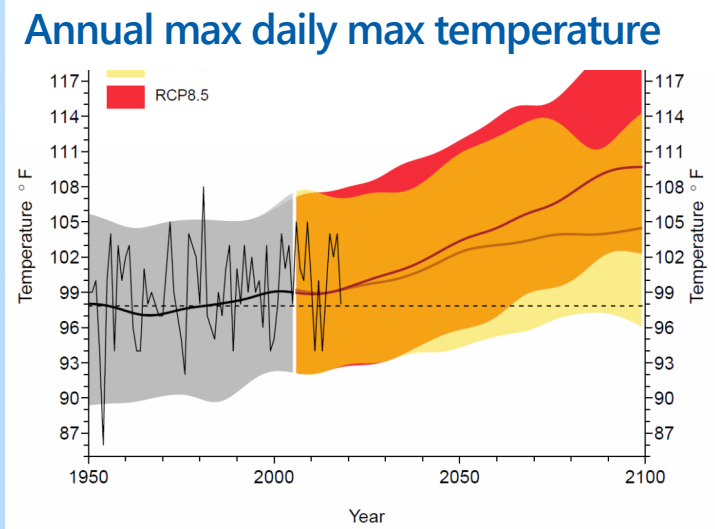
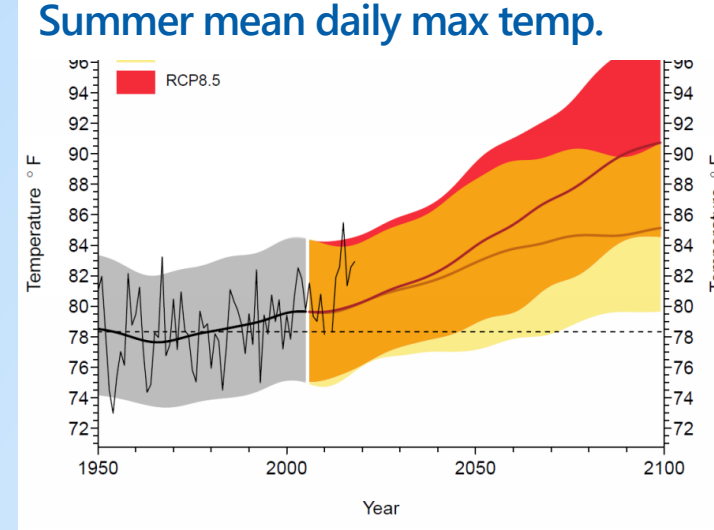
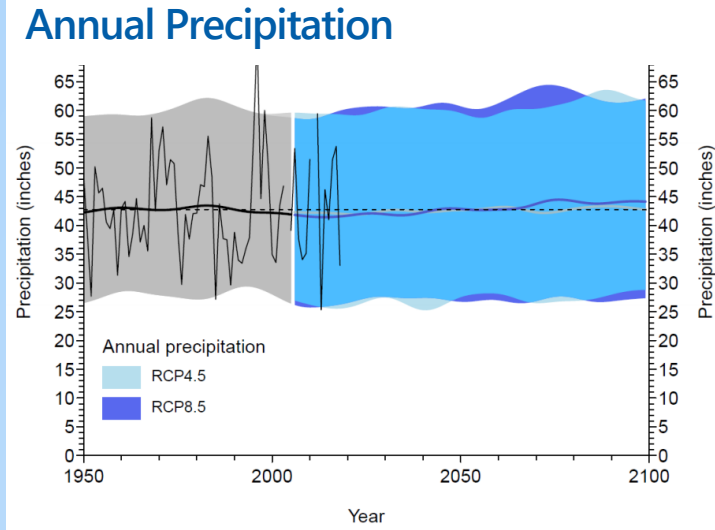
Figure 14 Battery in SCADA Cabinet

# Holistic Look at Interdependencies

<div style="display: flex; justify-content: space-between;"> <span style="font-size: 2em;">Dependent</span> <span style="font-size: 2em;">Dependee</span> </div>			Dependee																							
			Water System Employees					Water System Infrastructure					Redundancy				Transportation			Energy			Other			
			Employee & Family Well Being	Shelter	Food & Water	Commuting to Work	Workload	Structural Inspection	Pipe Assessment/Repair	MEP Equip. Assessment/Repair	Data	Chemical Consumables	Backup Data	Spare Parts	Spare Consumable Supplies	Spare Equipment	City/Regional Roads	Airports	Delivery Services	Electricity	Liquid Fuel	Natural Gas	Contractors & Consultants	ORWARN	Banking/Financial	Wastewater
Dependent	Water System Employees	Employee & Family Well Being	4	4		2									4			2	2	2			2.5	2	2.5	
		Shelter					2																			
		Food & Water													3		2	2		2				3		2
		Commuting to Work	4			1									4			2	4							
		Workload					3	3	3	2		1	1	1				2	2							1
	Water System Infrastructure	Structural Inspection				3	2			3	1				4			2	3		3			3		2
		Pipe Assessment/Repair				3	2			3	1	4		2	4		g3		3.5		3	2	3			2
		MEP Equip. Assessment/Repair				3	2	4		3	1	4		2	4		2		3		3	2	3			2
		Data					4				1.5							3	2		1					3
		Chemical Consumables					4			3		1.5			4		2	3	2		3		3			3.5
	Redundancy	Backup Data					4											3	2		3					3
		Spare Parts					4			1.5	1															
		Spare Consumable Supplies					4					1														
		Spare Equipment					4																			
	Transportation	City/Regional Roads																								
		Airports																								
		Delivery Services																4	3					3		3
	Energy	Electricity																								
		Liquid Fuel																4	4	1				3		3
		Natural Gas																						3		3
Other	Contractors & Consultants								3	1							3						3.5		4	
	ORWARN																								4	
	Banking/Financial																	3							3.5	
	Wastewater																	3	2.5						2	
	Telecommunications																	3	2		3					
Total		4	4	4	9	9	33	9	3	18.5	1	8	9	1	5	38	3	10	29	39.5	4	30	4	32.5	2	40.5



# Partnered with OCCRI to predict Corvallis seasonal climate conditions for the planning period

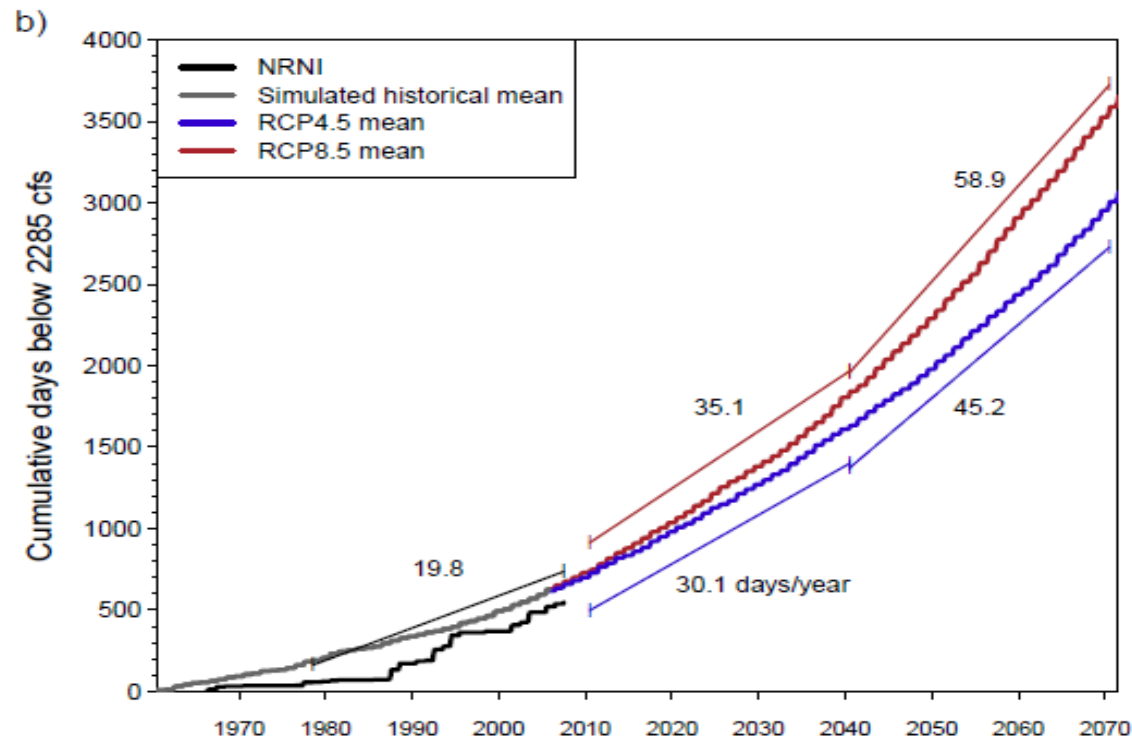


# Also looked at how climate change may impact Corvallis' supply quantity

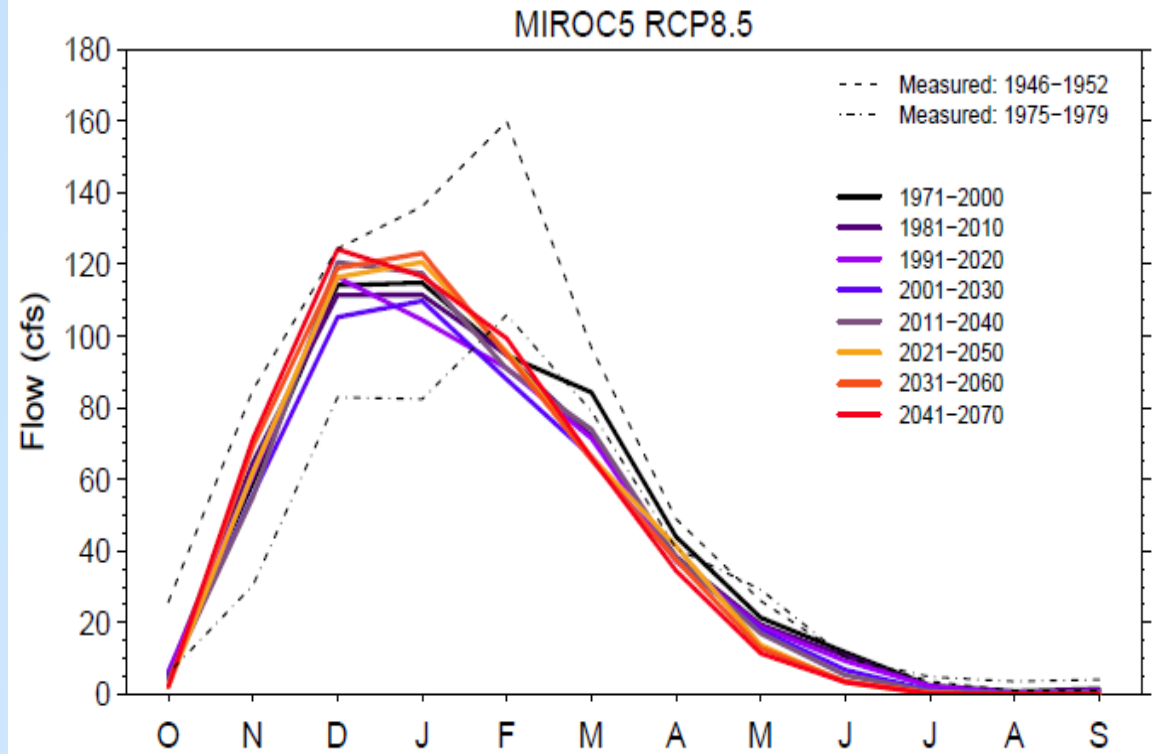
- Some of the City's water rights are junior to minimum perennial stream flows and fish persistence conditions

- Rock Creek flow is very low in late summer.

## Willamette Flow at Albany



## Mean monthly streamflow at Rock Creek



Incorporated water treatment enhancements into CIP to mitigate harmful algal blooms





# Comprehensive Capital Improvement Planning

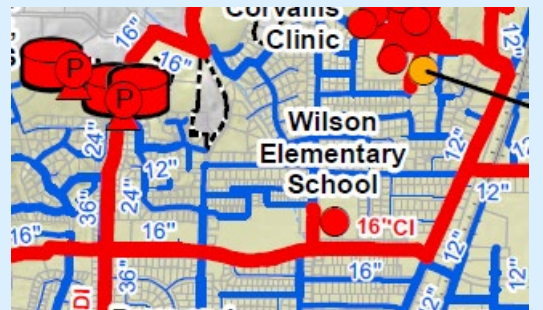
# Started with a Long-Term Water Supply Strategy to Establish Vision for the Future

## Objective

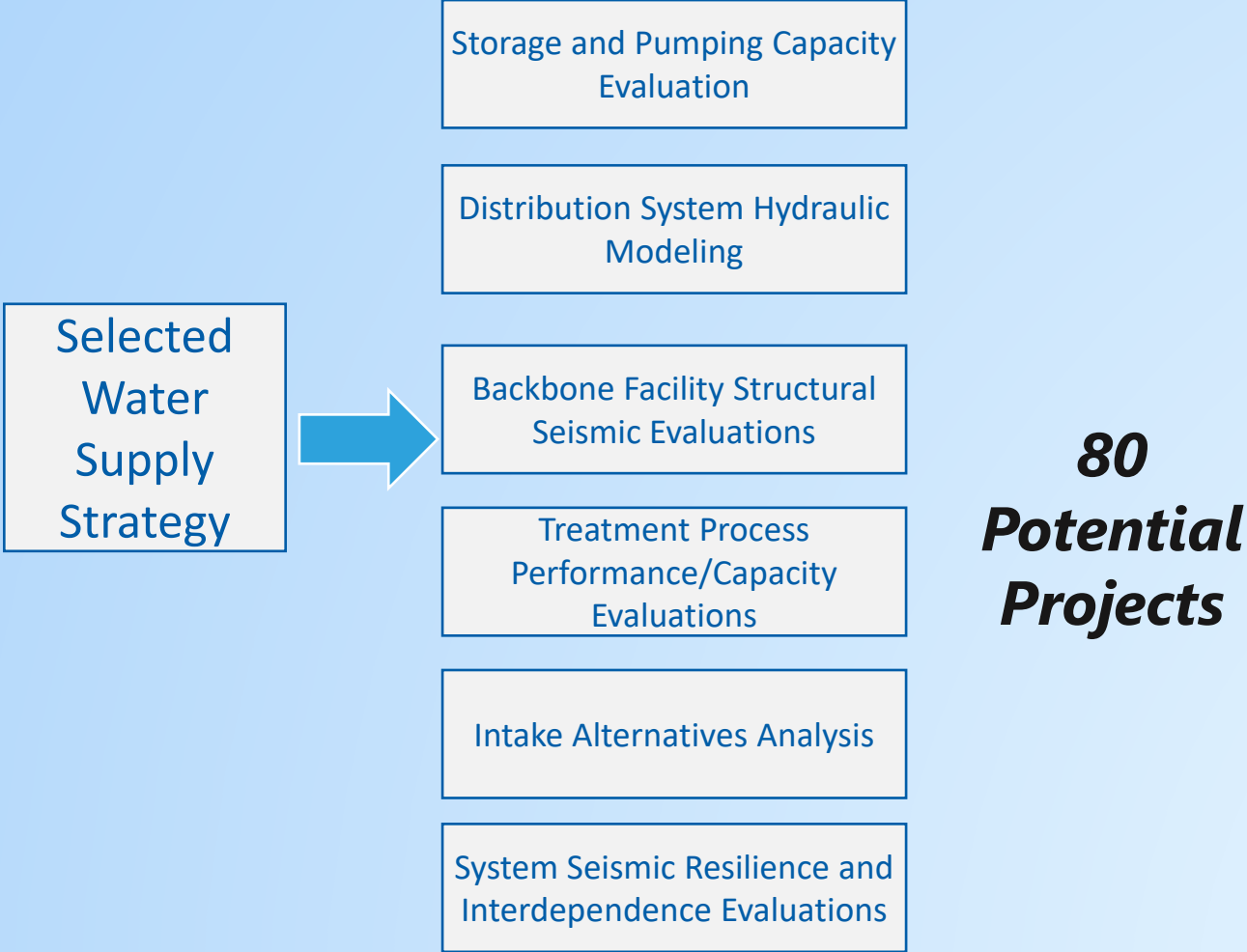
- Capacity: 30 mgd
- Redundancy
- Resiliency

## Solution/Supply Strategy Component

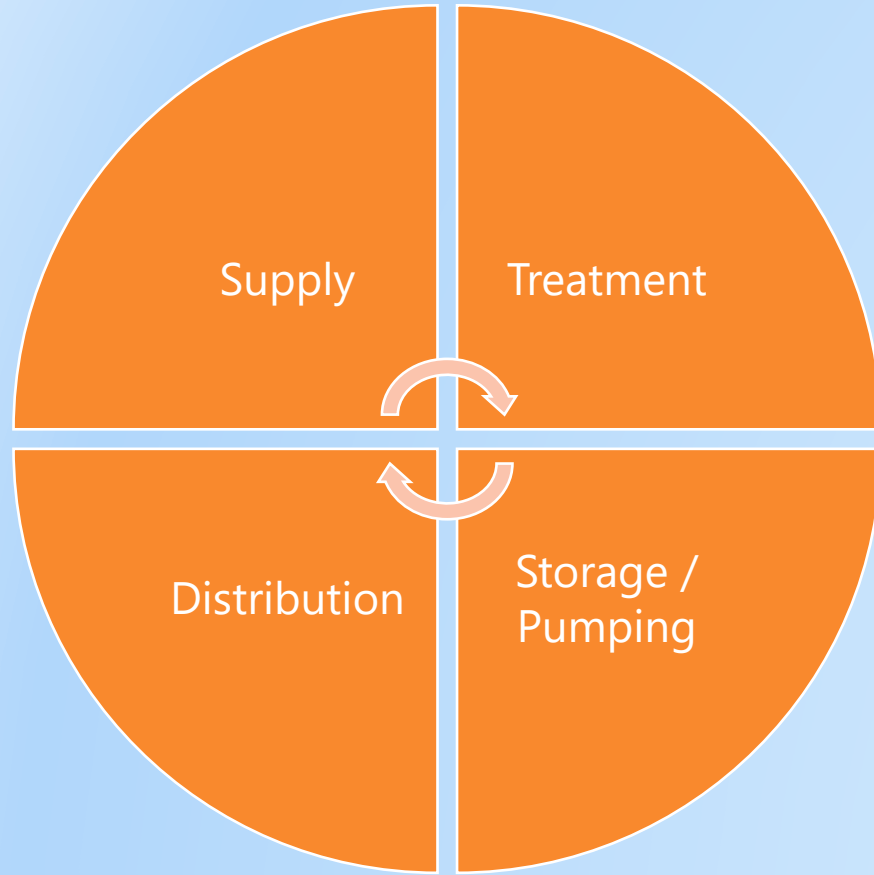
- 25 mgd expanded Taylor WTP
- 5 mgd new Rock Creek WTP
- Two water sources and treatment plants with enhanced treatment capabilities
- Seismically hardened backbone and treatment infrastructure



# Comprehensive Evaluation Identified Improvements for All Components of System



# How to Prioritize Projects When All Components are Interconnected?



## Benefits of Comprehensive Planning Effort

- Identify needs versus wants
- Understand what is the major driver for improvements
  - Capacity
  - Aging Infrastructure
  - Resilience
  - Operations and Maintenance
  - Water Quality
- Capture system-wide benefits as opposed individual improvements

# Prioritization Process

## PROJECT PRIORITIZATION

<b>T-21</b> <b>R/C</b> New Back-up Generator	<b>T-4</b> <b>A</b> Filters 5-8 Influent Valve Actuator Replacement	<b>T-5</b> <b>R</b> Seismic Vulnerability Mitigation (Bulk Chemical Building)	<b>T-18</b> <b>O/R</b> Raw Water Isolation Valves	<b>T-5</b> <b>R</b> Seismic Vulnerability Mitigation (Clearwell 2 Building)	<b>T-5</b> <b>R</b> Seismic Vulnerability Mitigation (Floc/Sed Basins 1-3)	<b>T-14</b> <b>C</b> Redundant Backwash Feed	<b>T-2</b> <b>A</b> Clearwell 1 Concrete Repairs	<b>T-15</b> <b>W</b> Pre-Ozone
	<b>T-6</b> <b>O</b> Filters 5-8 Drain Piping Modifications	<b>T-5</b> <b>R</b> Seismic Vulnerability Mitigation (Ops. Bldg. - Dry Chemical Storage)			<b>T-X</b> <b>A</b> Concrete Repairs on Walkway Spalling Concrete Floc/Sed 1-3	<b>T-7</b> <b>O</b> Backwash System Pressure Relief		<b>T-19</b> <b>O</b> Operator Workspace Optimization/Addition
	<b>T-22</b> <b>W</b> Overflow Piping Modifications	<b>T-5</b> <b>R</b> Seismic Vulnerability Mitigation (Floc/Sed Basin 4)		<b>T-5</b> <b>R</b> Seismic Vulnerability Mitigation (Ops. Bldg. - Filters 1-4)		<b>T-8</b> <b>O</b> Backwash System Study		
	<b>T-23C</b> <b>O</b> Automation Improvements (New Lagoon Chemical Feed)	<b>T-5</b> <b>R</b> Seismic Vulnerability Mitigation (Ops. Bldg. - High Service Pumps)				<b>T-13</b> <b>C</b> Redundant Backwash Pump		
		<b>T-5</b> <b>R</b> Seismic Vulnerability Mitigation (Ops. Bldg.)						
		<b>T-5</b> <b>R</b> Seismic Vulnerability Mitigation (Filters 5-8)						

## ANNUAL PROGRAMS

<b>T-1</b> <b>A</b> Annual Repair and Replacement Program	<b>T-3</b> <b>A</b> Annual GAC Filter Media Replacement
--	--

## CAPACITY DRIVEN PROJECTS

<b>T-9</b> <b>O/C</b> Floc/Sed Basins 1-3 Sludge Removal Improvements	<b>T-11</b> <b>O/C</b> Additional Solids Handling Lagoon	<b>T-10</b> <b>C</b> Additional Alum Tank	<b>T-12</b> <b>C</b> Additional Raw Water Full Lift Pump
<b>T-16</b> <b>O</b> Tube Settler Replacement	<b>T-17</b> <b>O/C</b> Solids Handling Study		

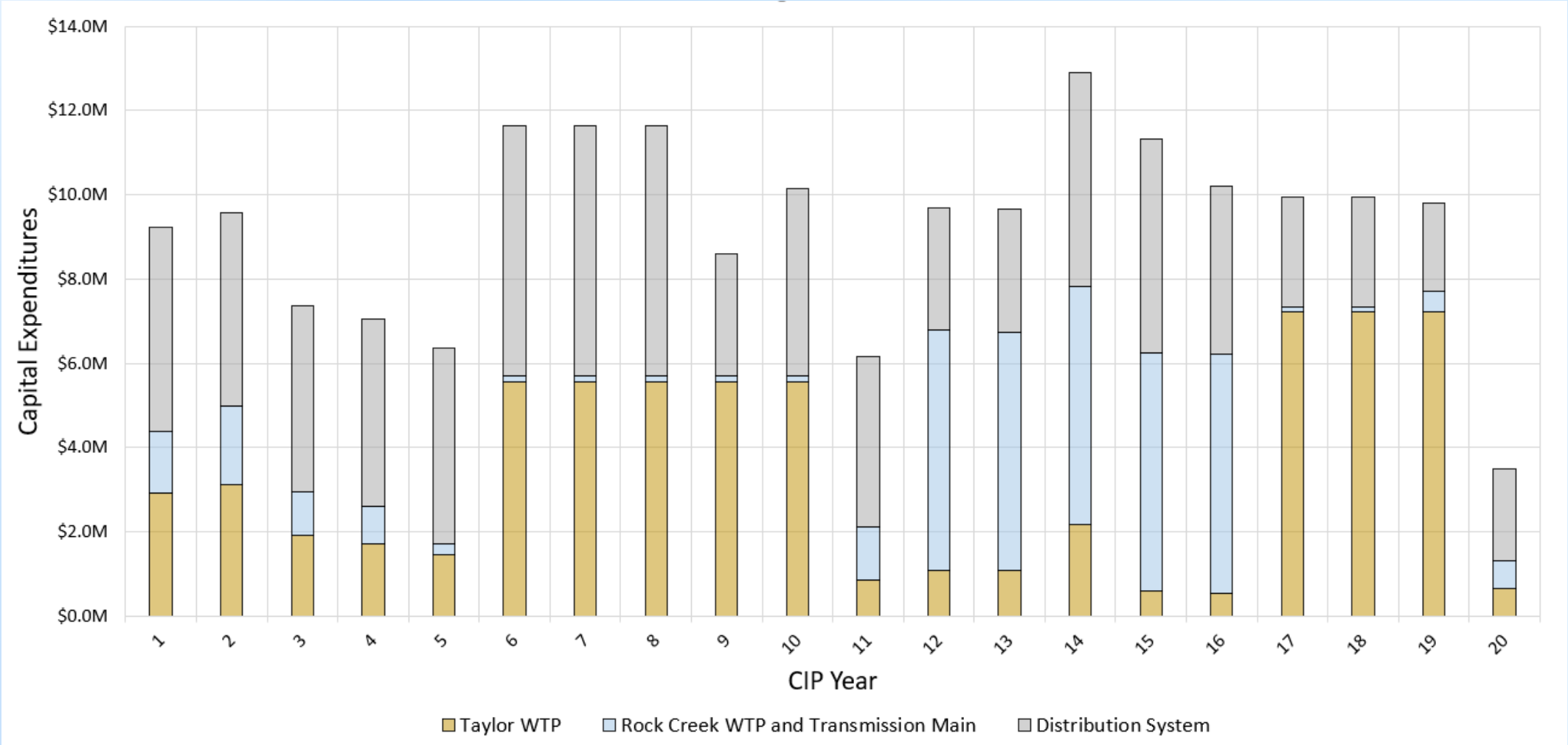
## HOLDING PEN

<b>T-20</b> <b>O</b> HVAC Control System Replacement	<b>T-23A</b> <b>O</b> Automation Improvements (Filter Backwash)
	<b>T-23B</b> <b>O</b> Automation Improvements (Lagoon Decant Monitoring)
	<b>T-23D</b> <b>O</b> Automation Improvements (Chemical System Programming)

**A** AGING INFRASTRUCTURE    **R** RESILIENCE    **O** OPERATIONS AND MAINTENANCE    **C** CAPACITY    **W** WATER QUALITY



# Additional Re-prioritization Occurs When Translating Into 20-Year Plan



# Additional Benefits

- System Development Charge Updates
- Regulatory Review

# Benefits of Integrated Planning

## Benefit #1



Optimized Stakeholder  
Involvement

## Benefit #2



Holistic Long-term  
Resilience Planning

## Benefit #3



Comprehensive Capital  
Improvement Plan

# Questions?

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- Carollo Engineers, Inc.
  - Alena Thurman
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  - Connor Mancosky
    - [cmancosky@carollo.com](mailto:cmancosky@carollo.com)