

PROJECT 2030

WATER MAIN REPLACEMENT



CITRUS
HEIGHTS
WATER
DISTRICT

PROJECT 2030
WATER MAIN REPLACEMENT



Customer Advisory Committee Meeting 3

DECEMBER 11, 2018



PLEDGE OF ALLEGIANCE

MEETING AGENDA

Public Comment

Approve Meeting #2 Summary

Infrastructure Challenges

Water Main Replacement Findings

Water Main Replacement Costs

Basic Financial Considerations

Q&A

Public Comment

Preview of CAC Meeting 4 on February 5, 2019

Meeting Take Away's



PUBLIC COMMENT



PUBLIC COMMENT





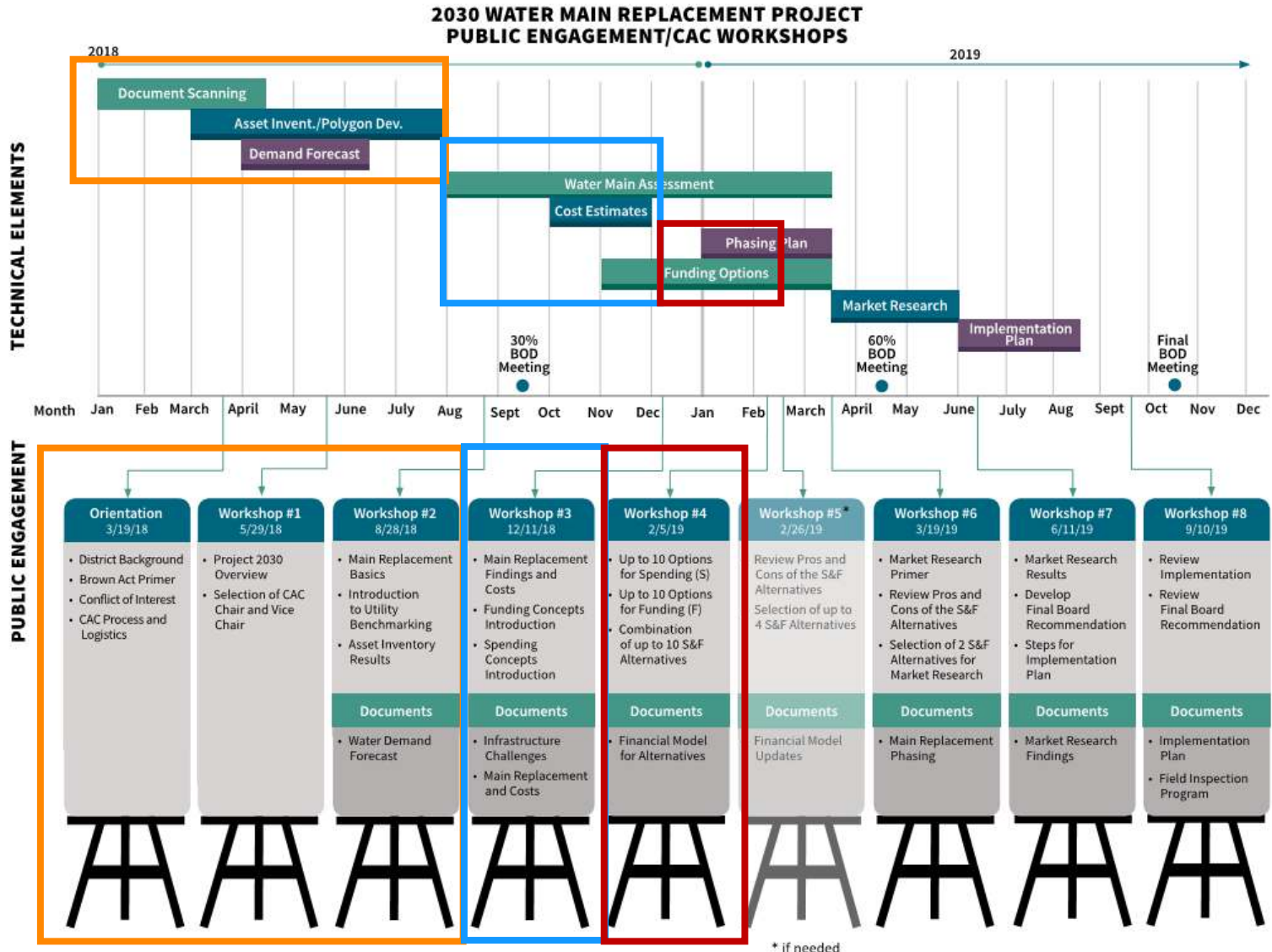
APPROVE MEETING #2 SUMMARY – AUGUST 28, 2018



WHERE WE ARE & WHERE WE ARE GOING



PROJECT OVERVIEW

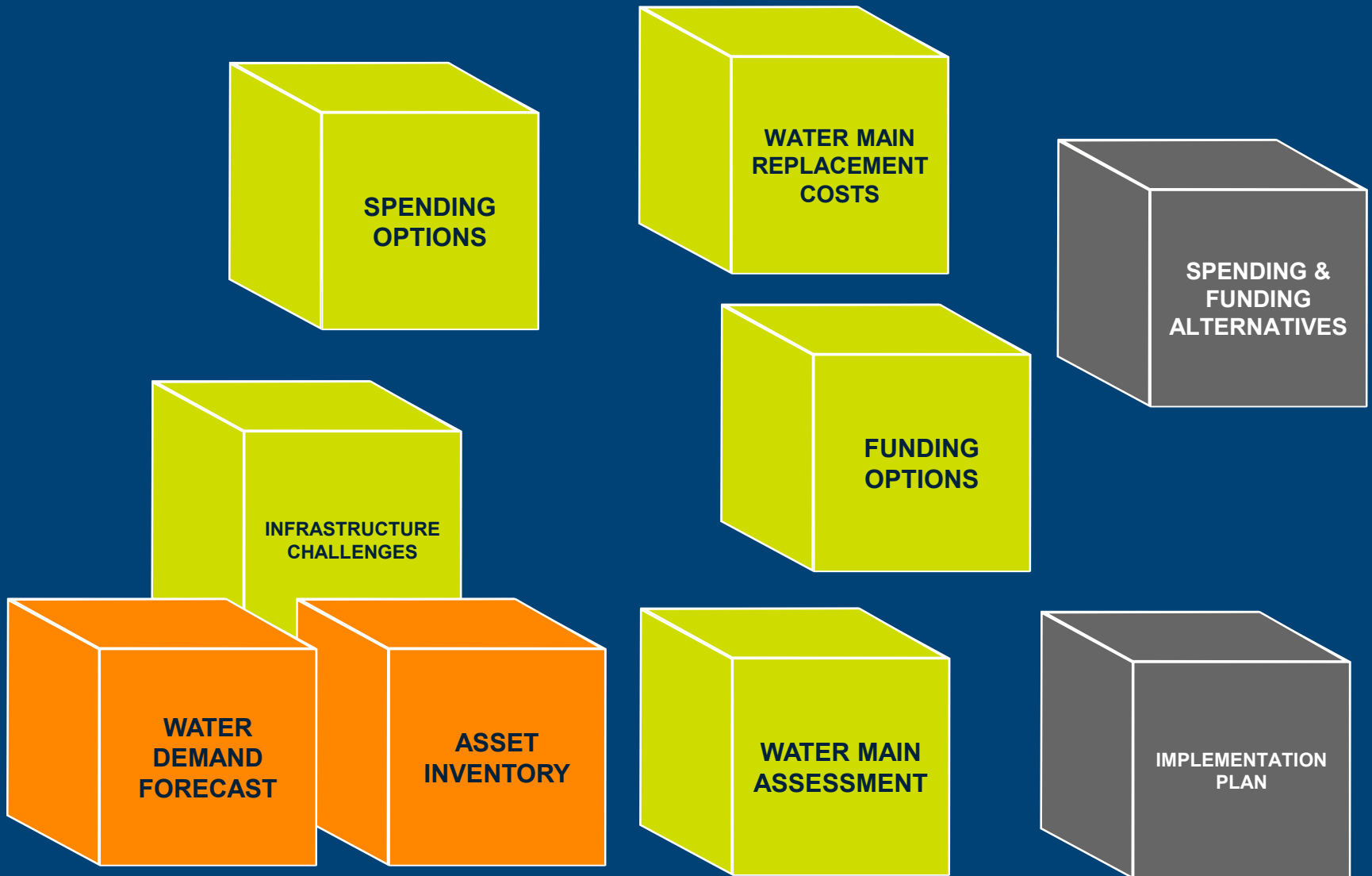


PROJECT 2030 SCOPE





PROJECT 2030 BUILDING BLOCKS





TECHNICAL MEMO #2 - INFRASTRUCTURE CHALLENGES

OVERVIEW OF TECH MEMO #2

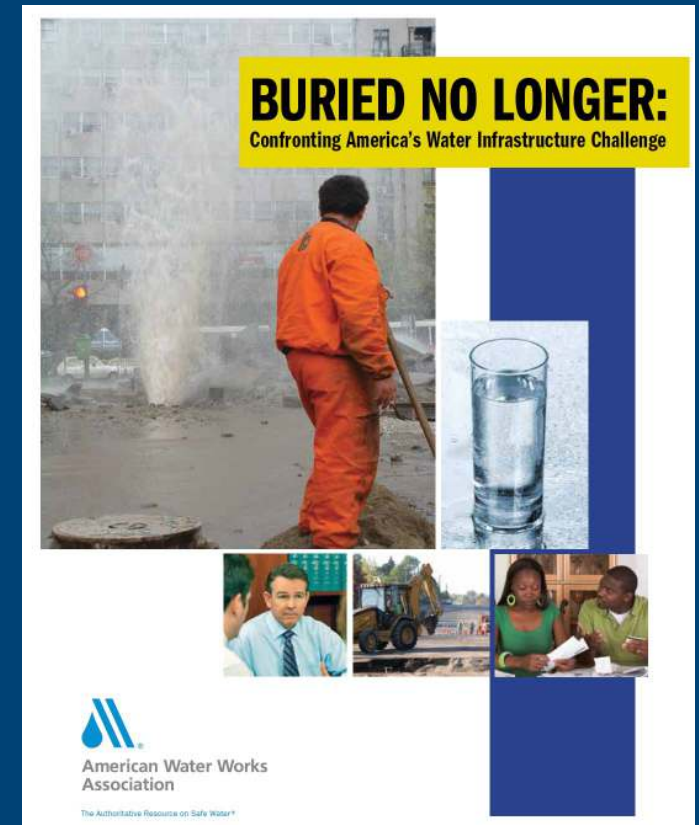
- Infrastructure Challenges
 - What makes water main replacement challenging?
- Supply Challenges
- Regulatory Challenges





INFRASTRUCTURE CHALLENGES

- The American Water Works Association (AWWA) has identified aging infrastructure as a nation-wide challenge
- Key Findings by AWWA
 - The Needs are Large
 - Household Water Bills Will Go Up
 - There are Important Regional Differences
 - There are Important Differences Based on System Size
 - The Costs Keep Coming
 - Postponing Investment Only Makes the Problem Worse



SUPPLY CHALLENGES

- *Availability* – Water Rights and Contracts
- *Reliability* – Infrastructure and Operations
- *Sustainability* – Planning for the Future
- The District must continue to manage and invest in supply availability, reliability and sustainability



REGULATORY CHALLENGES

- Compliance with current regulations is built into the District systems and operations
- Upcoming State mandated water conservation regulations may pose a challenge for the District and its customers
- Other factors CAC should consider:
 - Continue current water efficiency efforts
 - Additional water efficiency efforts as needed to achieve long-term State policy objectives



MAKING WATER CONSERVATION A CALIFORNIA WAY OF LIFE

Primer of 2018 Legislation on Water Conservation and Drought Planning
Senate Bill 606 (Hertzberg) and Assembly Bill 1668 (Friedman)



TECHNICAL MEMO #3 - MAIN REPLACEMENT RISK ANALYSIS FINDINGS



HOW WILL RISK-BASED APPROACH BE USED?

- Using sophisticated risk assessment software
 - Evaluate multiple LOF and COF risk factors
 - Develop prioritized main replacement list
- Short-Term Planning (by CHWD staff)
 - Develop and update capital improvement plan (annually and 5-year intervals)
 - Revisit LOF and COF factors and weighting
- Long-Term Planning (by CHWD staff and CAC)
 - Understand key risk factors
 - Develop multi-decade spending and funding strategy



SUMMARY OF RISK ANALYSIS FOR MAIN REPLACEMENTS

High			
3	3	6	9
2	2	4	6
1	1	2	3
Low			
	1	2	3
	Low		High
	Consequence of Failure		

- Risk Analysis – Computer Software
 - Likelihood of Failure (LOF)
 - Consequence of Failure (COF)
- LOF and COF comprised of multiple factors
- Each LOF and COF factor also gets a weighting factor (% LOF or COF)

Total Risk Score =

$$(\%_{\text{LOF}_1} \times \text{LOF}_1) + (\%_{\text{LOF}_2} \times \text{LOF}_2) + \dots$$

multiplied by

$$(\%_{\text{COF}_1} \times \text{COF}_1) + (\%_{\text{COF}_2} \times \text{COF}_2) + \dots$$



RISK FACTORS AND INITIAL RELATIVE WEIGHTING

Likelihood of Failure (LOF)		Consequence of Failure (COF)	
LOF #1: Pipe Age / Survival Probability	50%	COF #1: Pipe Diameter	20%
LOF #2: Pipe Material	25%	COF #2: Pipe Flow	20%
LOF #3: Historical Main Breaks	15%	COF #3: Transmission Pipelines	25%
LOF #4: Creek Crossings (Vulnerability)	10%	COF #4: Critical Facilities	10%
		COF #5: Creek Crossing (Environmental Impact)	10%
		COF #6: High Traffic Areas	10%
		COF #7: Difficult Access Areas (Backyard Mains)	5%
LOF Total	100%	COF Total	100%



LIKELIHOOD OF FAILURE (LOF) FACTORS

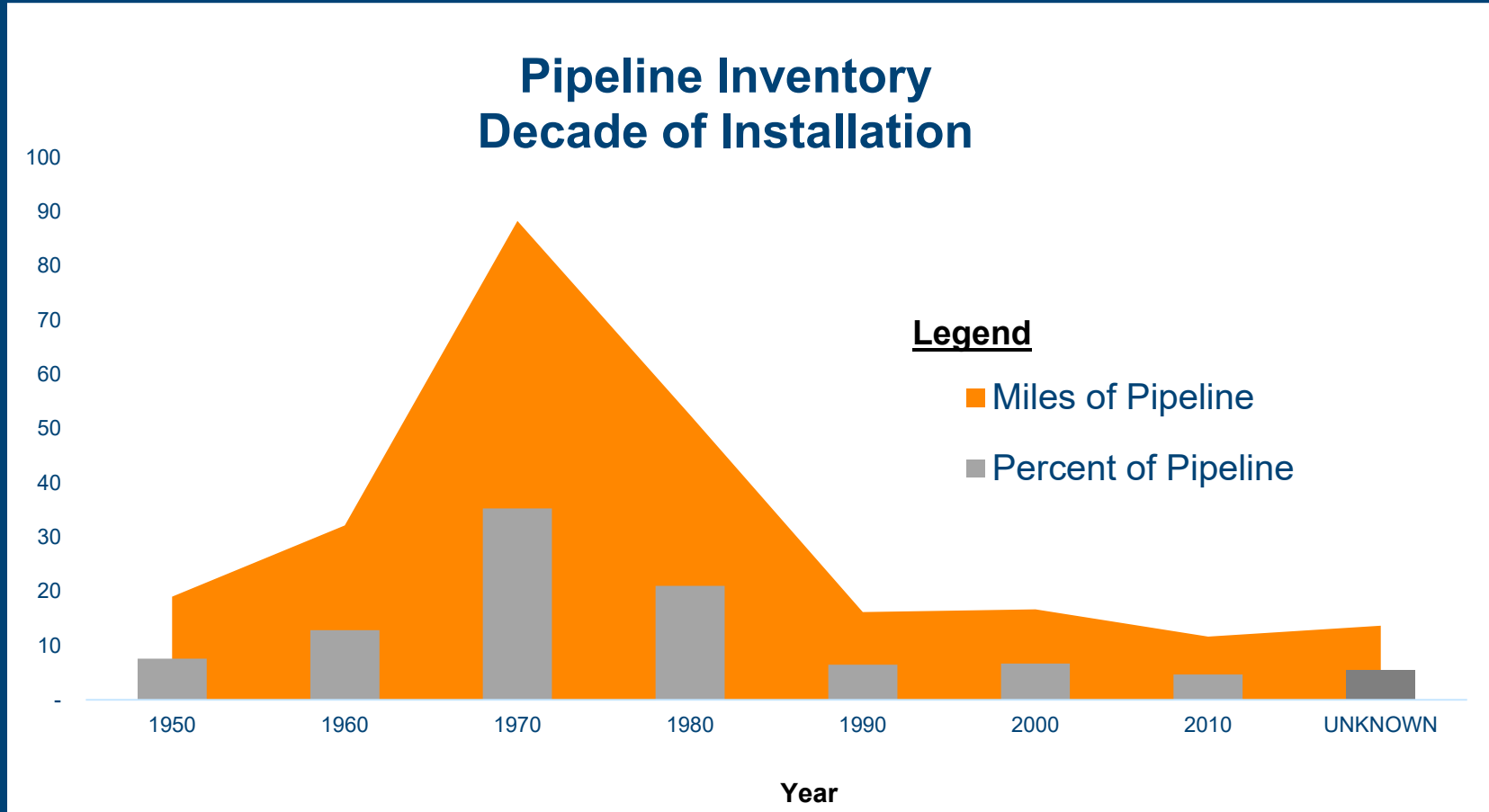


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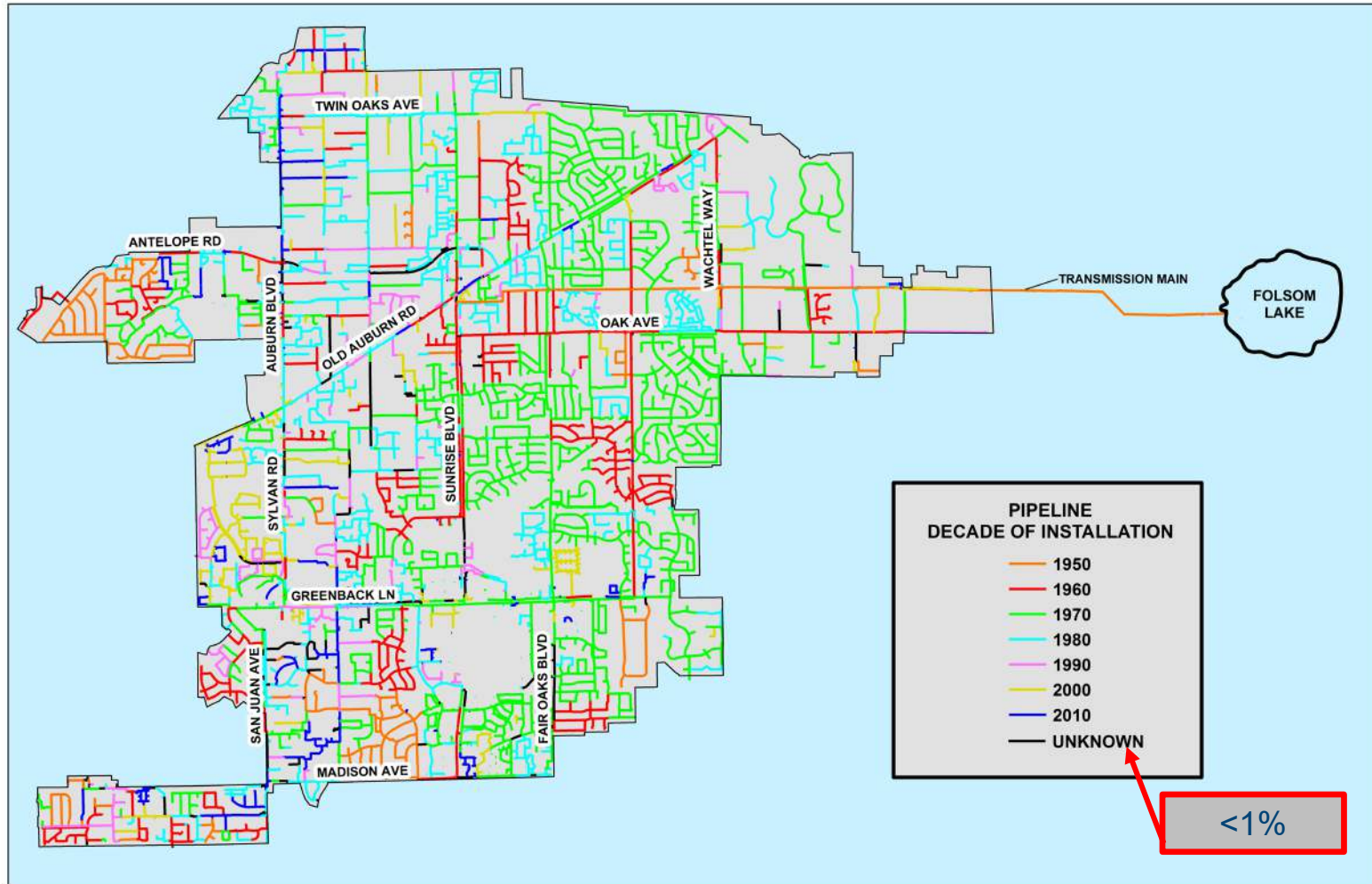
LOF #1: PIPE AGE / SURVIVAL PROBABILITY (50% WEIGHTING FACTOR)





LOF #1

DECADE OF INSTALLATION





LOF #1

WHAT DOES “SURVIVAL PROBABILITY” MEAN?

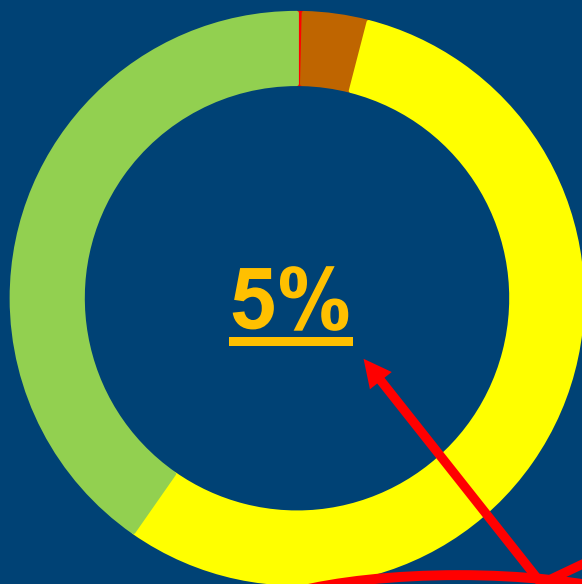
- Likelihood that a pipe won't experience a “failure”.
- “Failures” can be repaired and returned to service.
- Everyday examples: car repairs/replacement
 1. *How do you decide when to replace with new?*



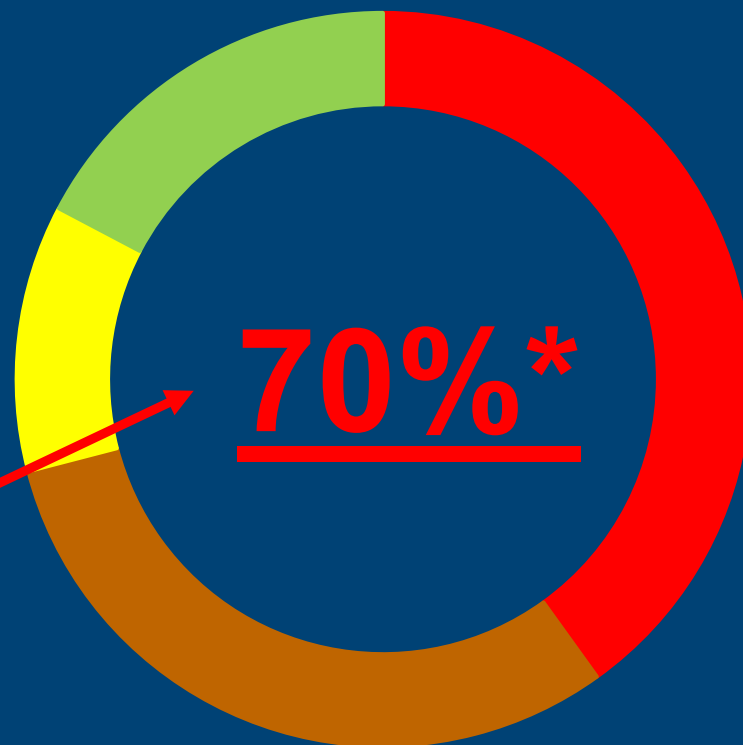


LOF #1: WATER MAIN SURVIVAL PROBABILITY 2030-2065

2030



2065



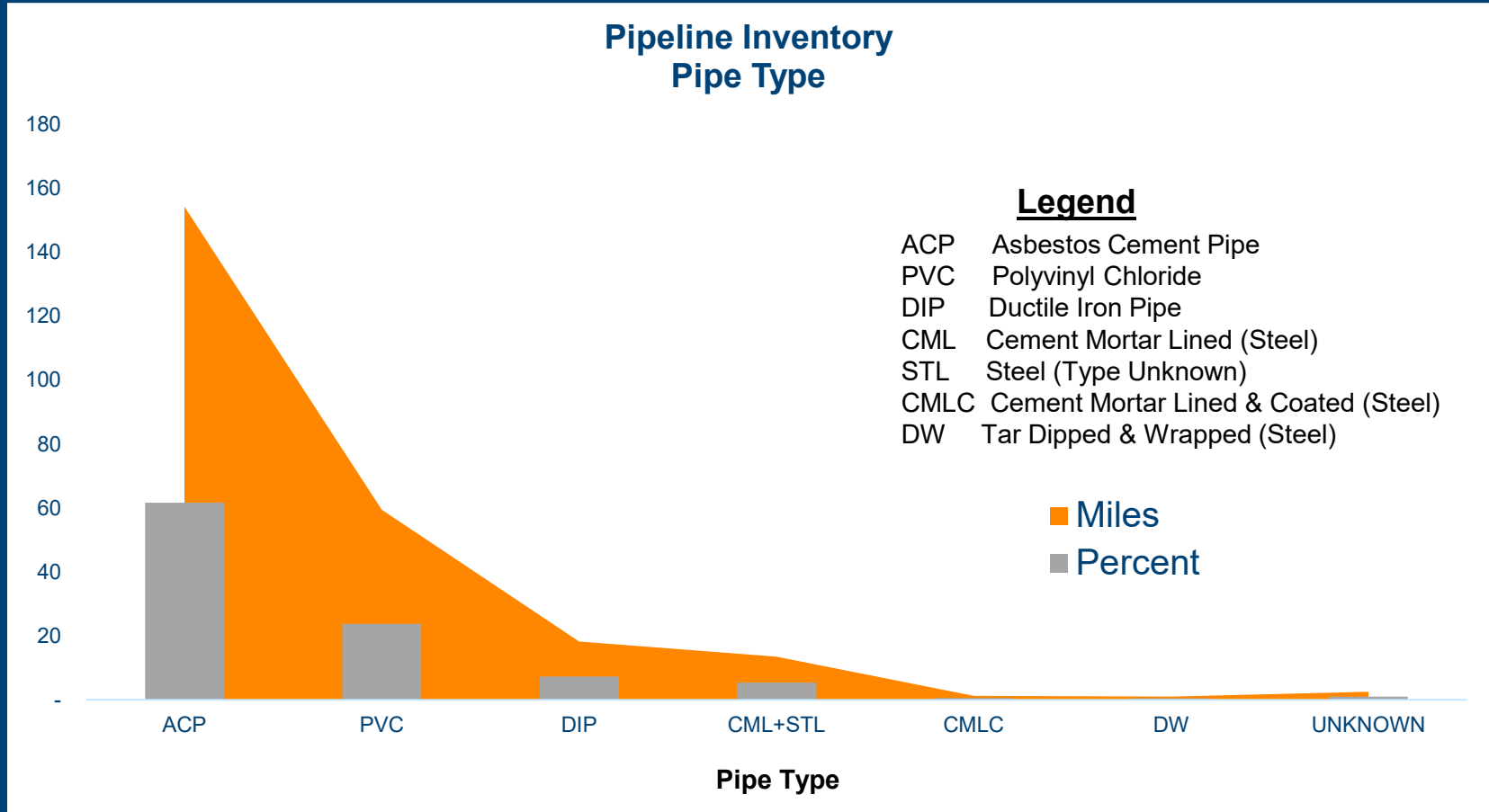
Survival Probability
Benchmarks

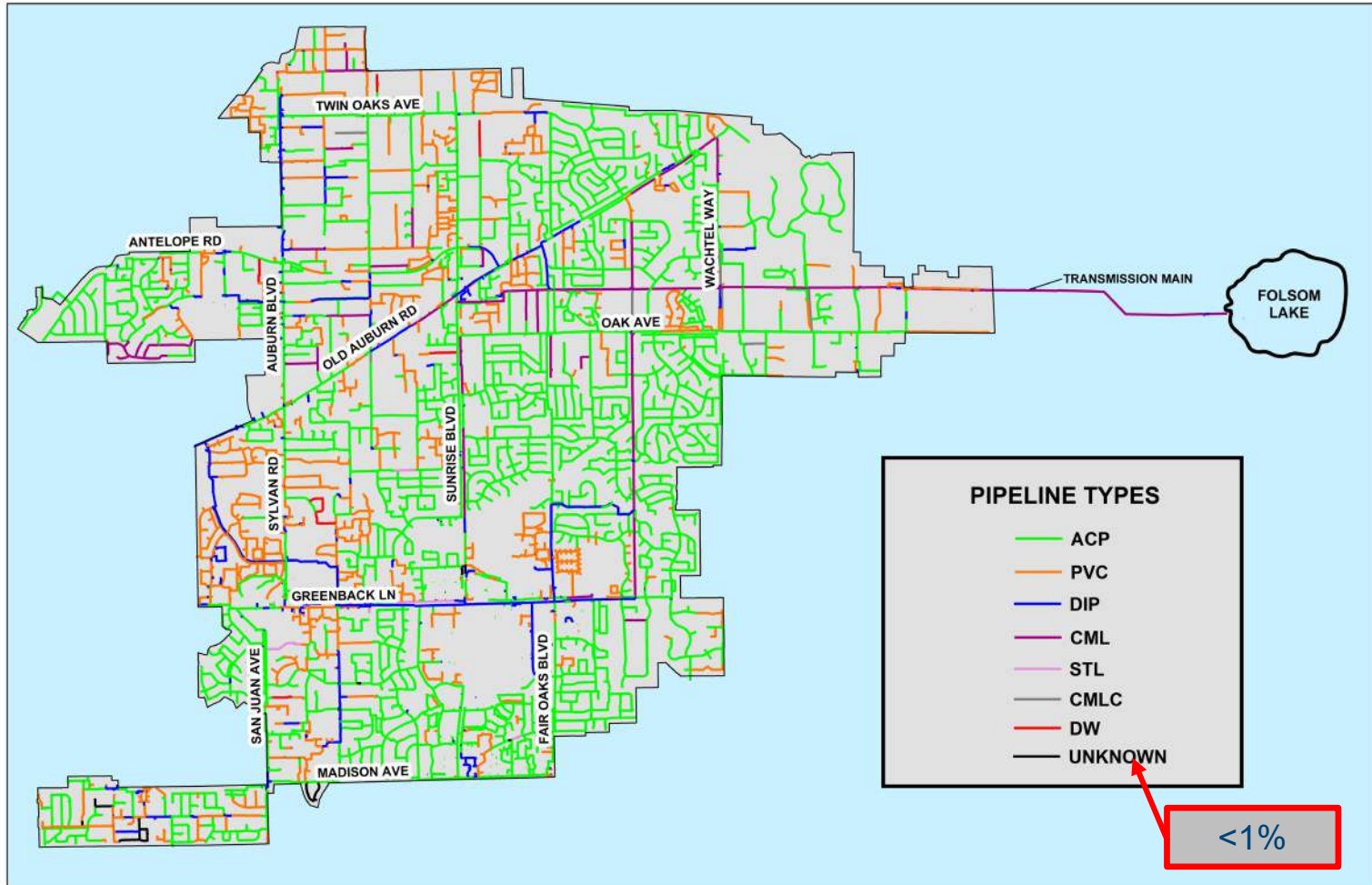
■ <u><15%</u>	■ <u><25%</u>
■ <u><50%</u>	■ <u>>50%</u>

* Assumes CHWD continues at current rate of replacement.



LOF #2: PIPE MATERIAL (25% WEIGHTING FACTOR)







LOF #2

LIFE EXPECTANCY FOR VARIOUS PIPE MATERIALS

<u>Pipe Material</u>	<u>Life Expectancy (Years)*</u>
Ductile Iron Pipe (DIP)	60-110
Asbestos Cement Pipe (ACP)	75-105
Steel	95
Polyvinyl Chloride (PVC)	70

** Buried No Longer. Confronting America's
Water Infrastructure Challenge, AWWA, 2012*

Life Expectancy is NOT the same as Survival Probability!



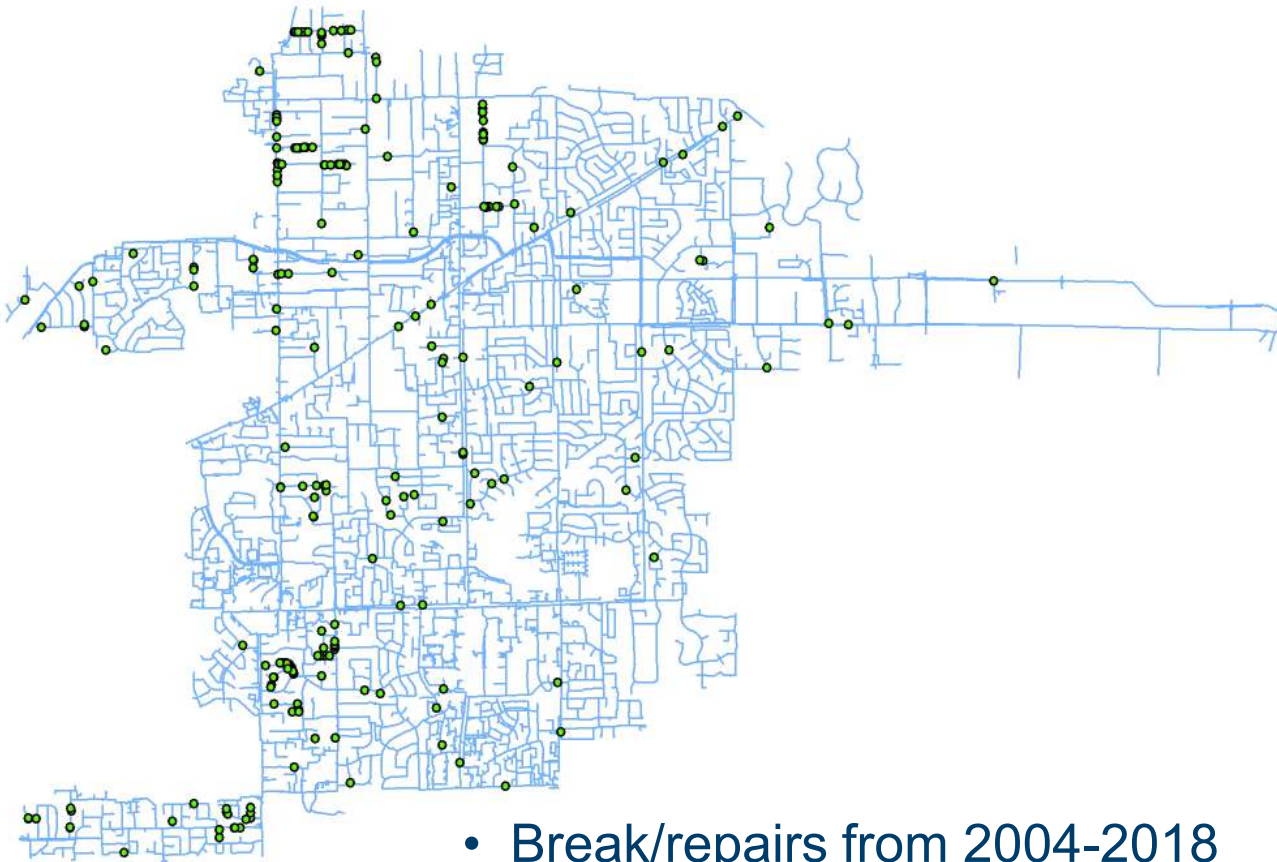
LOF #3: PIPELINE VULNERABILITY (15% WEIGHTING FACTOR)

- 17 creek crossings (8 free standing, 9 bridge supported)
- Vulnerable to flood stage creek flows and debris, pipes are exposed.





LOF #4: HISTORICAL WATER MAIN BREAKS (10% WEIGHTING FACTOR)



- Break/repairs from 2004-2018
- Predictor of future trouble spots



CONSEQUENCE OF FAILURE (COF) FACTORS



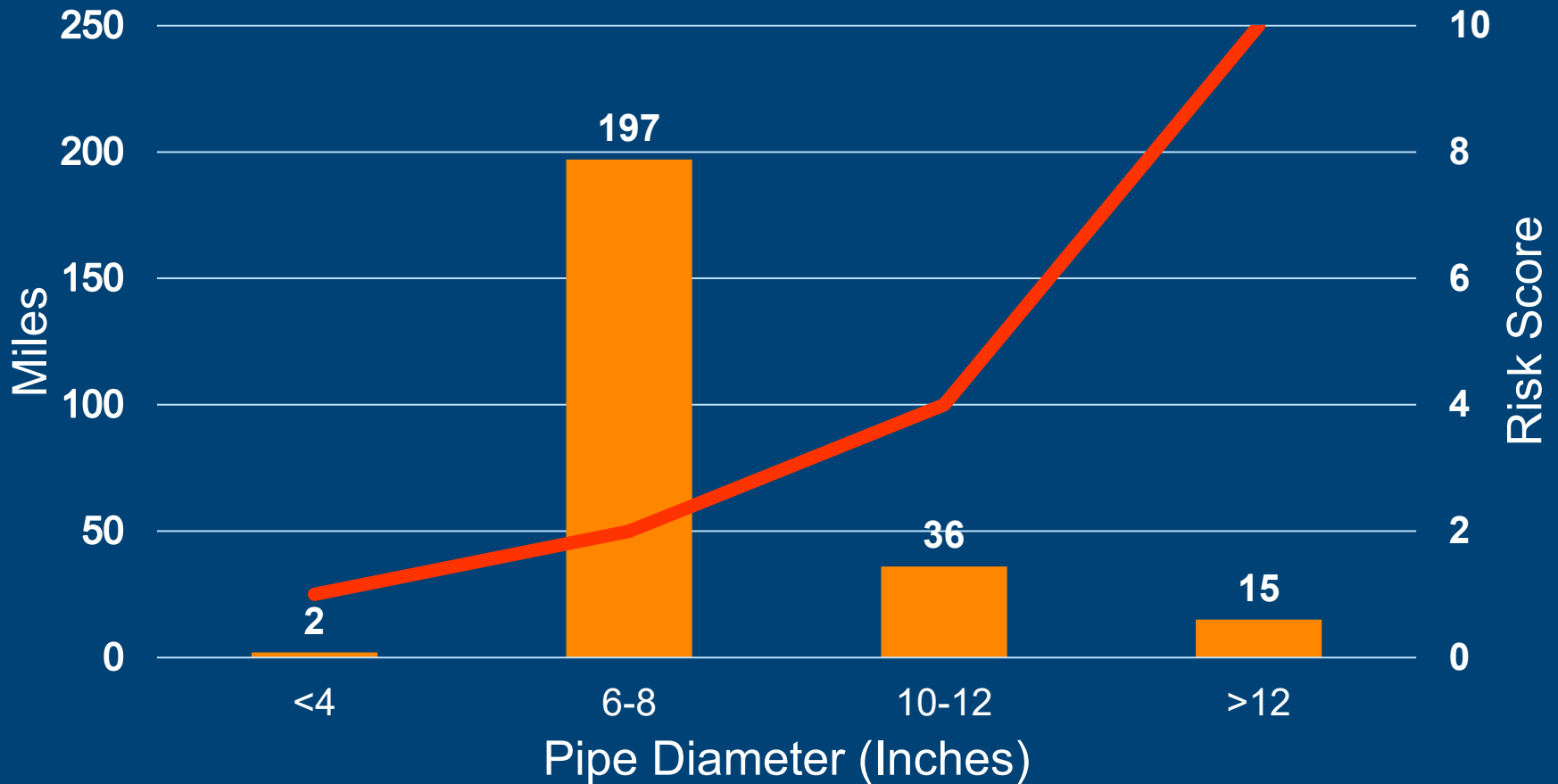
CONSEQUENCE OF FAILURE (COF) FACTORS

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LOF Total	100%	COF Total	100%



COF #1: PIPE DIAMETER (20% WEIGHTING FACTOR)

Miles and Risk Score of Pipes by Size

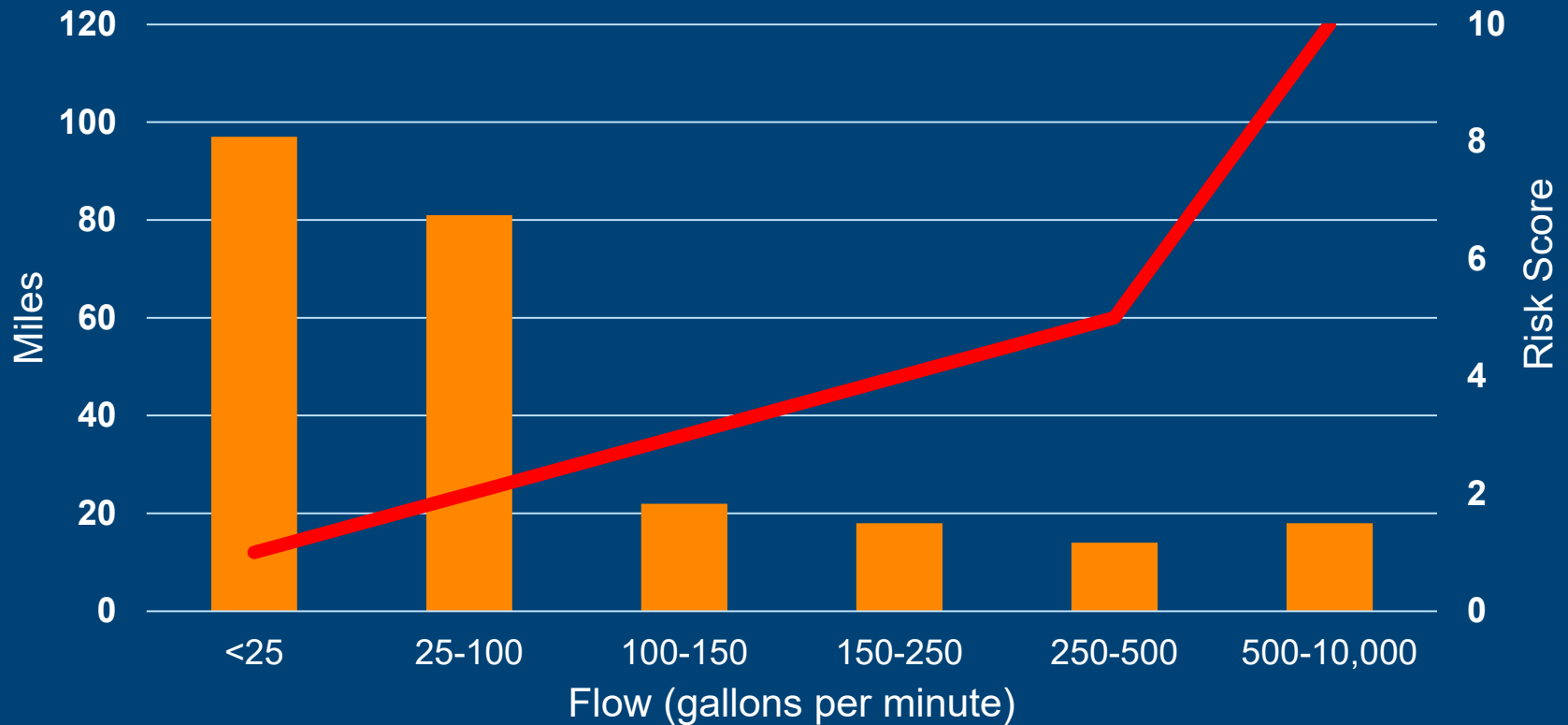


Total amount of all pipes = 250 miles



COF #2: PIPE FLOW (20% WEIGHTING FACTOR)

Miles and Risk Score of Pipes by Flow





COF #3: TRANSMISSION PIPELINES (25% WEIGHTING FACTOR)

- **Distribution Mains** (\leq 12 inch Diameter)

- Deliver water to customers and businesses
- Mostly 6-8 inch diameter
- Also provide neighborhood fire protection



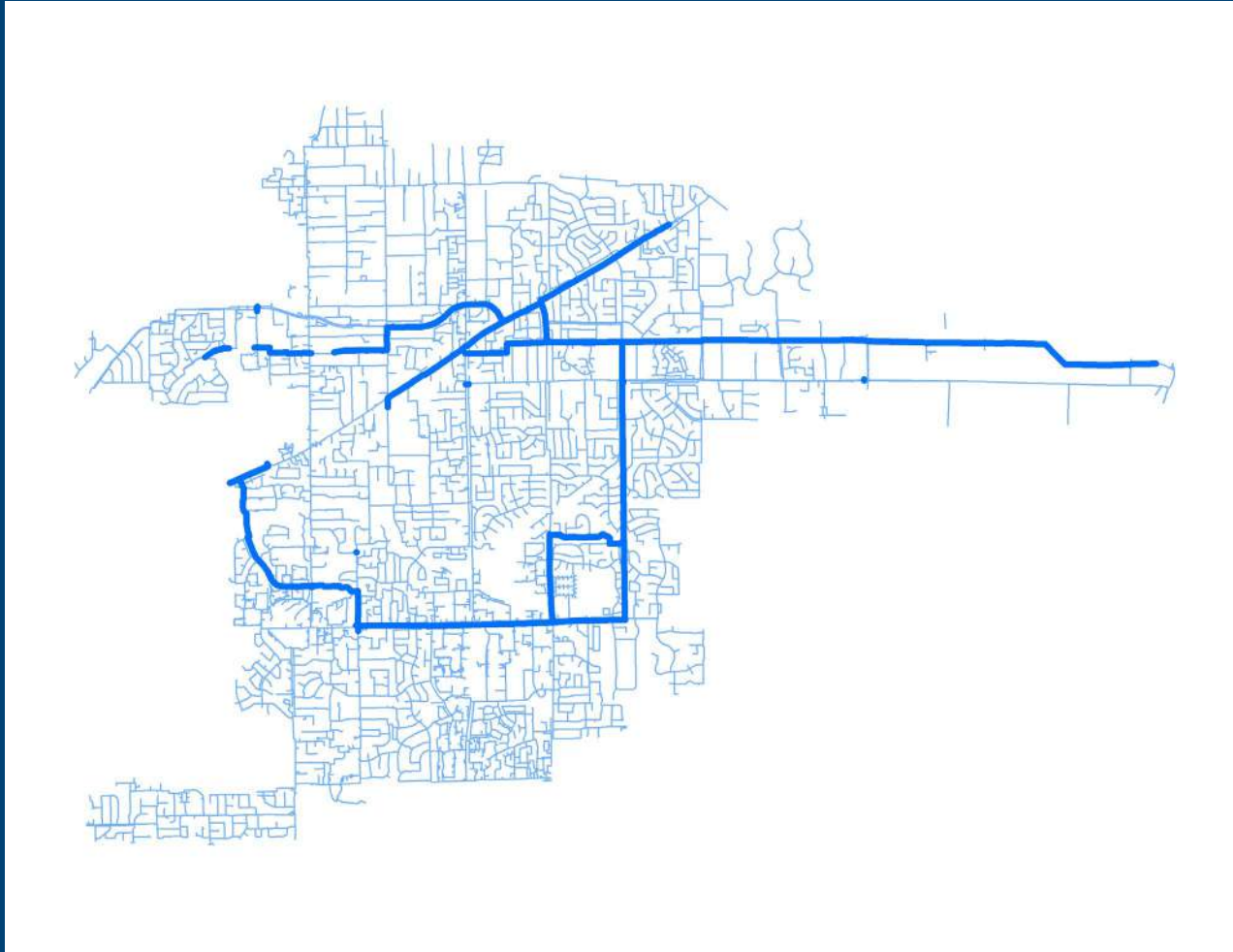
- **Transmission Mains** ($>$ 12 inch Diameter)

- Bring water from supply origin (e.g. San Juan Water)
- Ensure water flows quickly and efficiently throughout service area
- Larger diameter / higher flow capacities

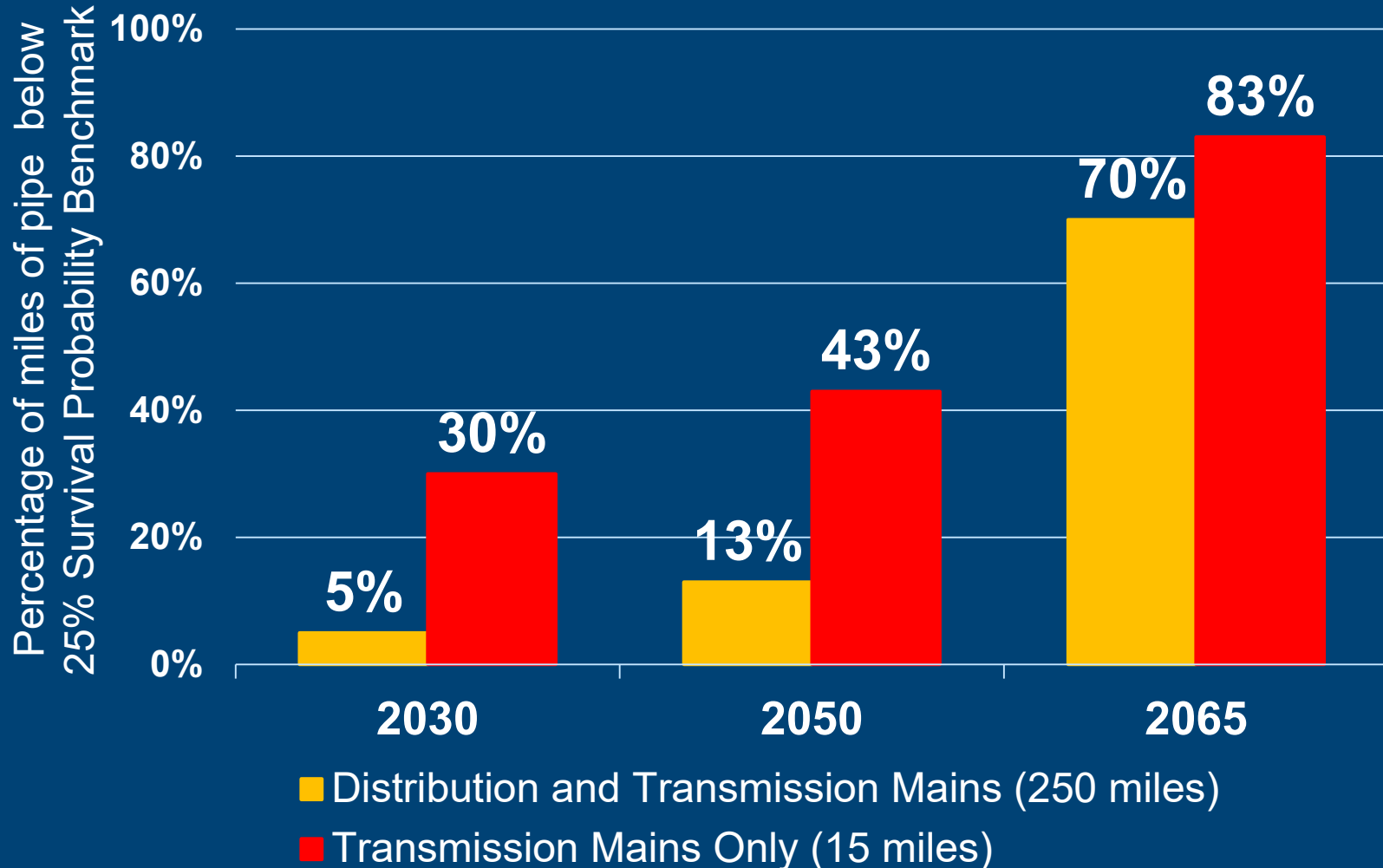




COF #3 MAP OF TRANSMISSION PIPELINES

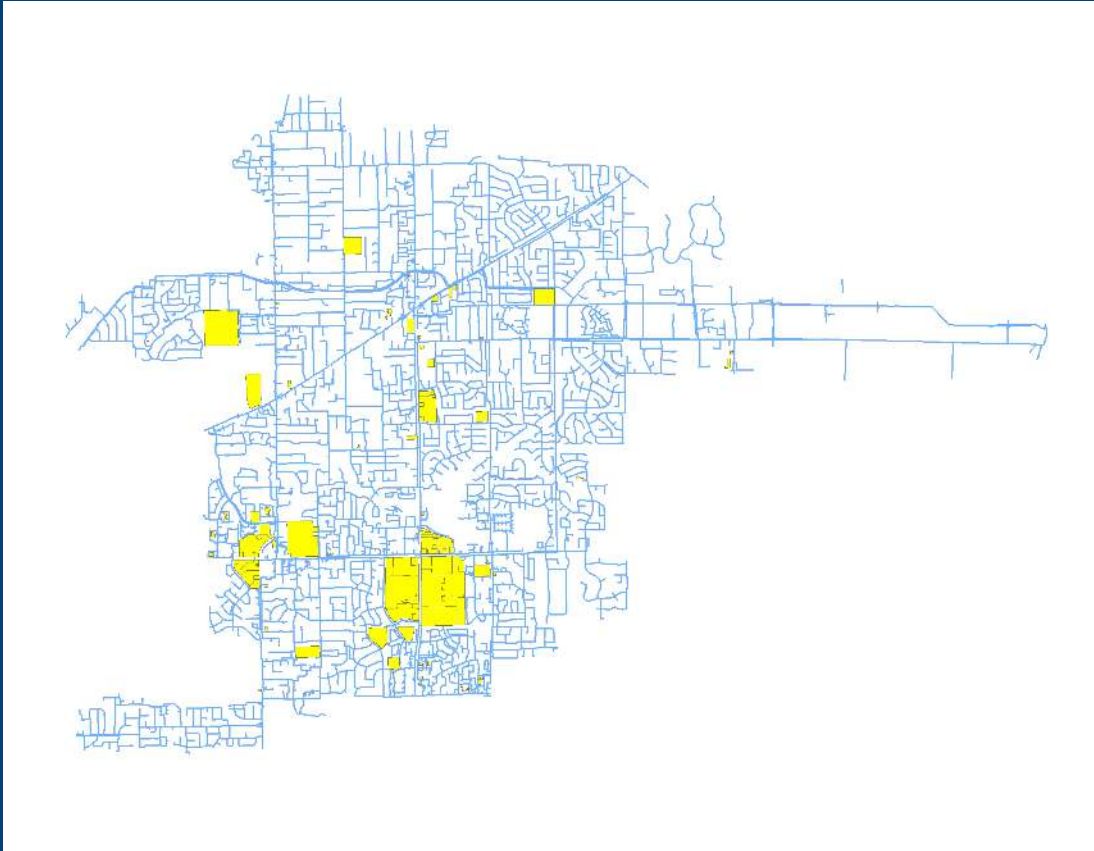


COMPARISON OF SURVIVAL PROBABILITY FOR ALL MAINS AND TRANSMISSION MAINS ONLY





COF #4: CRITICAL FACILITIES (10% WEIGHTING FACTOR)



- Assisted Living
- Commercial
- Dental Offices
- Medical Offices
- Public Services
- Schools



COF #5: CREEK CROSSINGS (ENVIRONMENTAL IMPACT) (10% WEIGHTING FACTOR)

- Potential release of chlorinated water to creeks due to pipe failure
- Releases subject to fines by state agencies





COF #6: HIGH TRAFFIC AREAS (10% WEIGHTING FACTOR)

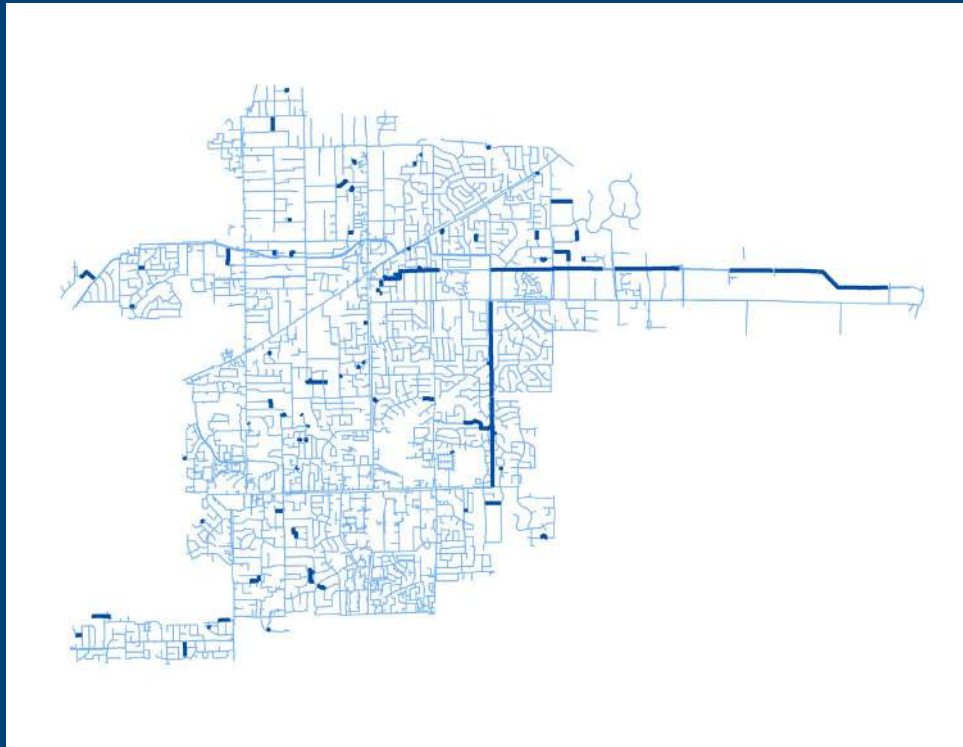


- Terminal Routes (Red)
 - Madison Ave
 - Greenback Lane
 - Sunrise Blvd
 - Hazel Ave
- Local Arterials (Green)
 - Old Auburn Rd
 - Oak Ave
 - San Juan / Sylvan
 - Antelope Rd



COF #7: DIFFICULT ACCESS “BACKYARD” WATER MAINS (5% WEIGHTING FACTOR)

- More difficult to access
- Would likely take longer to repair
- Potential damage to private property





NUMBER CRUNCHING





EXAMPLE OF MODEL OUTPUT

$$\text{COF} \quad \times \quad \text{LOF} \quad = \quad \text{TOTAL RISK}$$

ID	COF4 (Intersection)	COF5 (Intersection)	COF6 (Intersection)	COF10 (DIAMETER)	COF2 (Intersection)	COF12 (Intersection)	COF11 (Intersection)	Consequence of Failure	LOF1 (Major Intersection)	LOF4 (Intersection)	LOF5 (Intersection)	LOF6 (FD1 -)	Likelihood of Failure	Total Risk	Normalized Risk	Risk (By Grading)	Diameter	Material	Install Date
12288	100	0	0	200	180	250	0	730	75	0	##	400	575	419750	1000	5	42	CML	1/1/1957
12770	100	0	0	200	180	250	0	730	75	0	##	400	575	419750	1000	5	42	CML	1/1/1957
12781	100	0	0	200	180	250	0	730	75	0	##	400	575	419750	1000	5	42	CML	1/1/1957
12786	0	0	0	200	180	250	0	630	75	150	0	400	625	393750	938.05837	5	42	CML	1/1/1957
12769	0	50	100	200	180	250	0	780	75	0	0	400	475	370500	882.66825	4	42	CML	1/1/1957
12296	0	0	100	200	180	250	0	730	75	0	0	400	475	346750	826.08696	4	42	CML	1/1/1957
8262	0	50	0	140	180	250	0	620	75	150	0	300	525	325500	775.46158	5	24	CML	1/1/1960
12777	0	50	0	200	180	250	0	680	75	0	0	400	475	323000	769.50566	4	42	CML	1/1/1957
13337	0	50	0	200	180	250	0	680	75	0	0	400	475	323000	769.50566	4	42	CML	1/1/1957
8408	0	50	0	200	180	250	0	680	75	0	0	400	475	323000	769.50566	4	42	CML	1/1/1957
8409	0	50	0	200	180	250	0	680	75	0	0	400	475	323000	769.50566	4	42	CML	1/1/1957
921	0	50	0	200	180	250	0	680	75	0	0	400	475	323000	769.50566	4	42	CML	1/1/1957
11129	100	0	0	140	180	250	0	670	75	0	##	300	475	318250	758.1894	4	24	CML	1/1/1960
8586	0	0	100	140	180	250	0	670	75	0	0	400	475	318250	758.1894	4	24	CML	1/1/1957
12953	0	0	100	140	160	250	0	650	75	0	0	400	475	308750	735.55688	4	24	CML	1/1/1957
7303	0	0	0	200	200	250	0	650	75	0	0	400	475	308750	735.55688	4	42	CML	1/1/1957
12289	0	0	0	200	180	250	0	630	75	0	0	400	475	299250	712.92436	4	42	CML	1/1/1957
12295	0	0	0	200	180	250	0	630	75	0	0	400	475	299250	712.92436	4	42	CML	1/1/1957
12768	0	0	0	200	180	250	0	630	75	0	0	400	475	299250	712.92436	4	42	CML	1/1/1957
12771	0	0	0	200	180	250	0	630	75	0	0	400	475	299250	712.92436	4	42	CML	1/1/1957
12772	0	0	0	200	180	250	0	630	75	0	0	400	475	299250	712.92436	4	42	CML	1/1/1957
12773	0	0	0	200	180	250	0	630	75	0	0	400	475	299250	712.92436	4	42	CML	1/1/1957
12774	0	0	0	200	180	250	0	630	75	0	0	400	475	299250	712.92436	4	42	CML	1/1/1957
12775	0	0	0	200	180	250	0	630	75	0	0	400	475	299250	712.92436	4	42	CML	1/1/1957
12776	0	0	0	200	180	250	0	630	75	0	0	400	475	299250	712.92436	4	42	CML	1/1/1957



TECHNICAL MEMO #3 - REPLACEMENT COST ESTIMATES

REPLACEMENT COST ESTIMATES

- Planning Level Cost Estimates include:
 - Construction Costs
 - Other Project Costs (Soft Costs)
- Future Cost Considerations
 - Project Specific conditions
 - Pipe Rehabilitation Options
 - Alternative Pipe Replacement Techniques
 - Performed on a project-specific basis

REPLACEMENT COST ESTIMATES

- Construction Costs:
 - Materials
 - Labor
 - Traffic Control
 - Pavement Replacement
 - Flushing and Testing
 - Environmental





REPLACEMENT COST ESTIMATES

- Other Project Costs:
 - Project Management
 - Construction Management
 - Engineering
 - Permitting
 - Inspections
 - Contingencies





REPLACEMENT COST ESTIMATES

- To estimate Unit Costs the BNi Costbook used
- These unit costs are adjusted to our area using a Geographic Multiplier
- Recent District construction cost data was also used to confirm unit costs

BNi Building News

BNi Building News

PUBLIC WORKS

2018 COSTBOOK

TWENTY-FIFTH EDITION

"For over 71 years, BNi Building News has been dedicated to providing construction professionals with timely and reliable information. Based on this experience, our staff has researched and compiled thousands of up-to-the-minute costs for the BNi Costbooks. This book is an essential reference for contractors, engineers, architects, facility managers — any construction professional who must provide an estimate for any type of building project."



TOTAL PIPELINE REPLACEMENT COSTS

Pipe Classification	Total Miles	Cost (million)
Distribution Mains (<=12 inch diameter)	235	\$ 317
Transmission Mains (>12 inch diameter)	15	\$ 54*
Appurtenances (e.g. fire hydrants, customer service connections)	n/a	\$ 61
Total Construction Cost	n/a	\$ 432
Engineering, Management and Permitting	n/a	\$ 108
Total	250	\$ 540

* Factors affecting higher transmission main replacement unit cost:

- Larger diameter
- Creek crossings
- Difficult access (backyard mains / private easements)

SPENDING OVER VARIOUS PHASING TIME PERIODS





GATHER QUESTIONS



BREAK



BASIC FINANCIAL CONSIDERATIONS



TOPICS

01

Capital Costs

02

Spending Options

03

Funding 101

04

Debt Financing Overview

05

Spending and Funding Metrics

CHWD CAPITAL COSTS

- Current capital spending averages around \$4M
 - ~\$2M related to Water Main Replacement
- Water Main costs may exceed \$500M over 50 years
 - Average annual spending is dependent on time
 - Peak spending would also be considered
- Significant revenue needs when compared to today

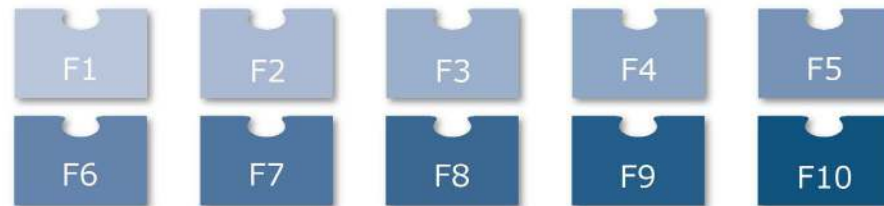


HOW SPENDING AND FUNDING OPTIONS BECOME ALTERNATIVES

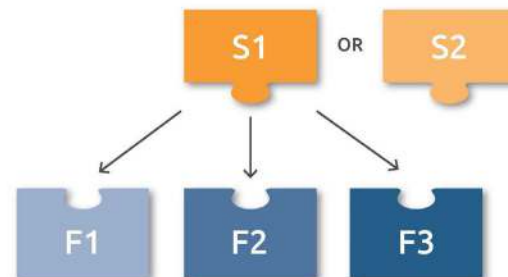
Spending Options



Funding Options



Spending & Funding Alternatives



CAPITAL FINANCIAL PLAN

- Capital Improvement Plan (CIP) is a primary driver of Financial Plan
 - A detailed capital plan generates a strong financial plan
 - Financial plans should extend at least through the life of CIP
- Catalog capital based on prioritizing needs
 - Critical Assets
 - Ongoing Repair & Replacement
- Identify construction timing and useful life of improvement
 - Determine short-term vs long-term needs
 - Typically threshold is > 5 years

Develop Funding Strategy for Water Main Replacement:

1. Financial sufficiency

- Generates adequate revenues for Labor, Operations & Maintenance (O&M), and planned capital costs
- Operating costs will also increase over time

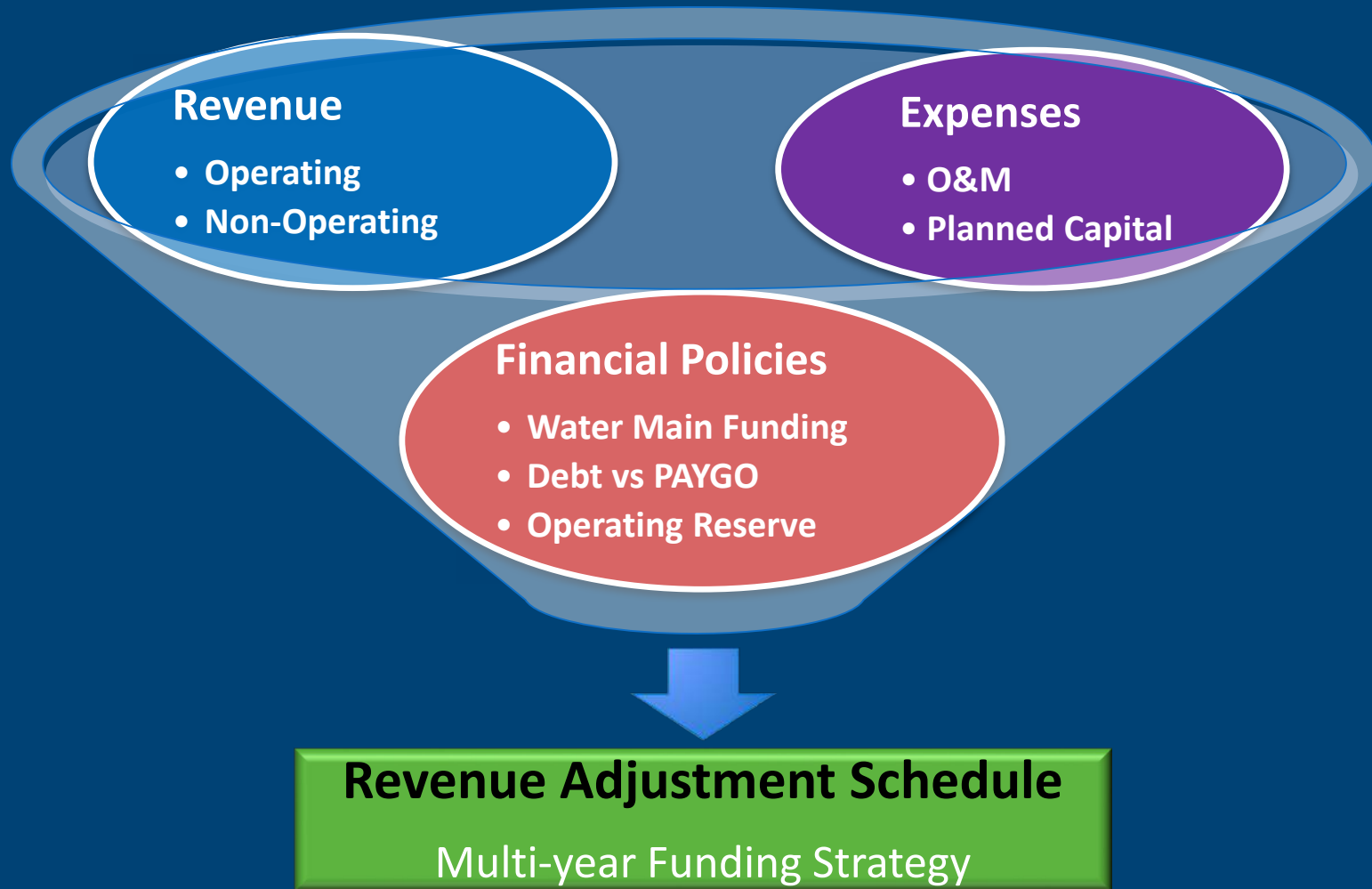
2. Evaluate benefits and impacts with debt-financing

- Level of capital funding
- Impacts to reserves
- Net income for debt coverage
- Affect to end customers' bills

3. Funding strategy should compliment District's Mission

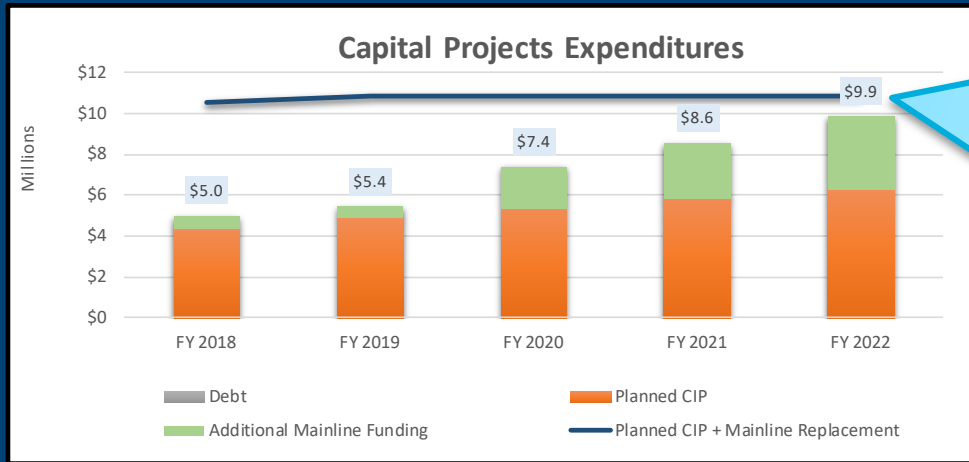
- Responsible management of capital assets

FINANCIAL PLAN DEVELOPMENT





CAPITAL FUNDING AND RESERVES



CIP & Funding Sources

- **Orange** bar – Planned Capital
- **Green** bar – Additional funding Water Mains
- **Black** line – Funding Goal (CIP + Mainlines)

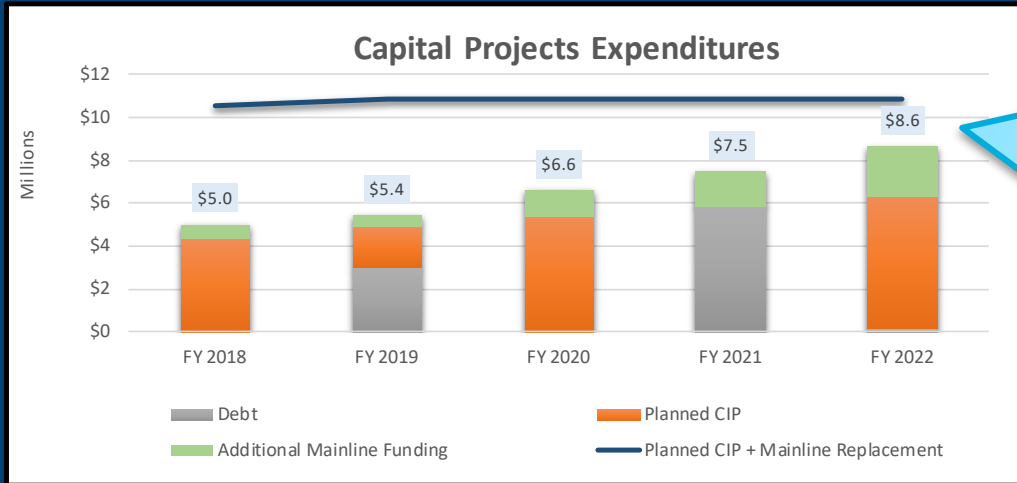


Reserve Balances

- **Blue** bar – projected ending balances
- **Green** line – Min Reserve target
- **Red** line – Ideal Reserve target



DEBT FUNDING OF CAPITAL



CIP & Funding Sources

➤ Grey bar – Debt proceeds introduced



Reserve Balances

➤ Debt proceeds fund capital while rate revenues build up reserves

Debt Considerations

- **Capital facilities are critical and needed right away**
- **Liquid cash is not sufficient on its own to fund capital**
- **Reliable future revenues are available to secure debt**
- **Strong credit rating to obtain low interest rate**
- **Capital has a long useful life**
- **Inter-generational equity**



ADVANTAGES & DISADVANTAGES

Advantages

- Save on interest charges
- Eliminate cost of issuance (COI) + debt reserve
- No bond covenants to satisfy - Maintain local control
- Projects only funded when cash is available
- Additional admin. costs are avoided

Disadvantage

- If capital costs spike - rates spike
- Capital may need to be deferred due to liquidity
- Existing customers are absorbing entire burden
- Inequity between existing / future customers
- Other needs not addressed due to CIP costs



DEBT

ADVANTAGES & DISADVANTAGES

Advantages

- Favorable low interest rates
- Critical capital projects may move forward
- Achieve intergenerational equity
- Mitigate rate spikes in specific years
- Smooth out revenue adjustments

Disadvantage

- Total project cost increases due to interest and COI
- Bond coverage requires additional revenue collection
- Incurring debt may not be an option - politically
- Debt payments must be made while revenue is variable

CAPITAL SPENDING METRICS

- Total costs of Water Main Replacement
- Annual spending
- Peak annual spending
- Timeframe for completion
- Amount of spending when compared to today
- Relative system risk



FUNDING METRICS

- Pre-funding (ramp up before 2030)
- Debt Financing
 - Percent of total CIP
 - Percent of operating costs
- Peak Revenue Need
- Total Revenue Increase
 - Shown as % compared to today and/or total \$\$\$

SPENDING METRICS

Total Cost



Annual Spending



Years to Complete



FUNDING METRICS

% Debt Funded



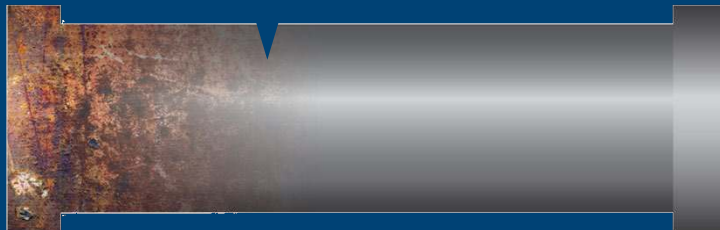
\$ Pre-Funded



\$ Peak Rev Need



High System Risk Low



Capital Spending

Current Revenue Pre-Funded Debt PAYGO



NEXT STEPS

- Develop multiple main replacement phasing/spending options.
- Develop multiple funding options.
- Combine phasing and funding options into discreet project alternatives.
- Derive total revenue increase required.



CAC Q&A ACTIVITY



PUBLIC COMMENT

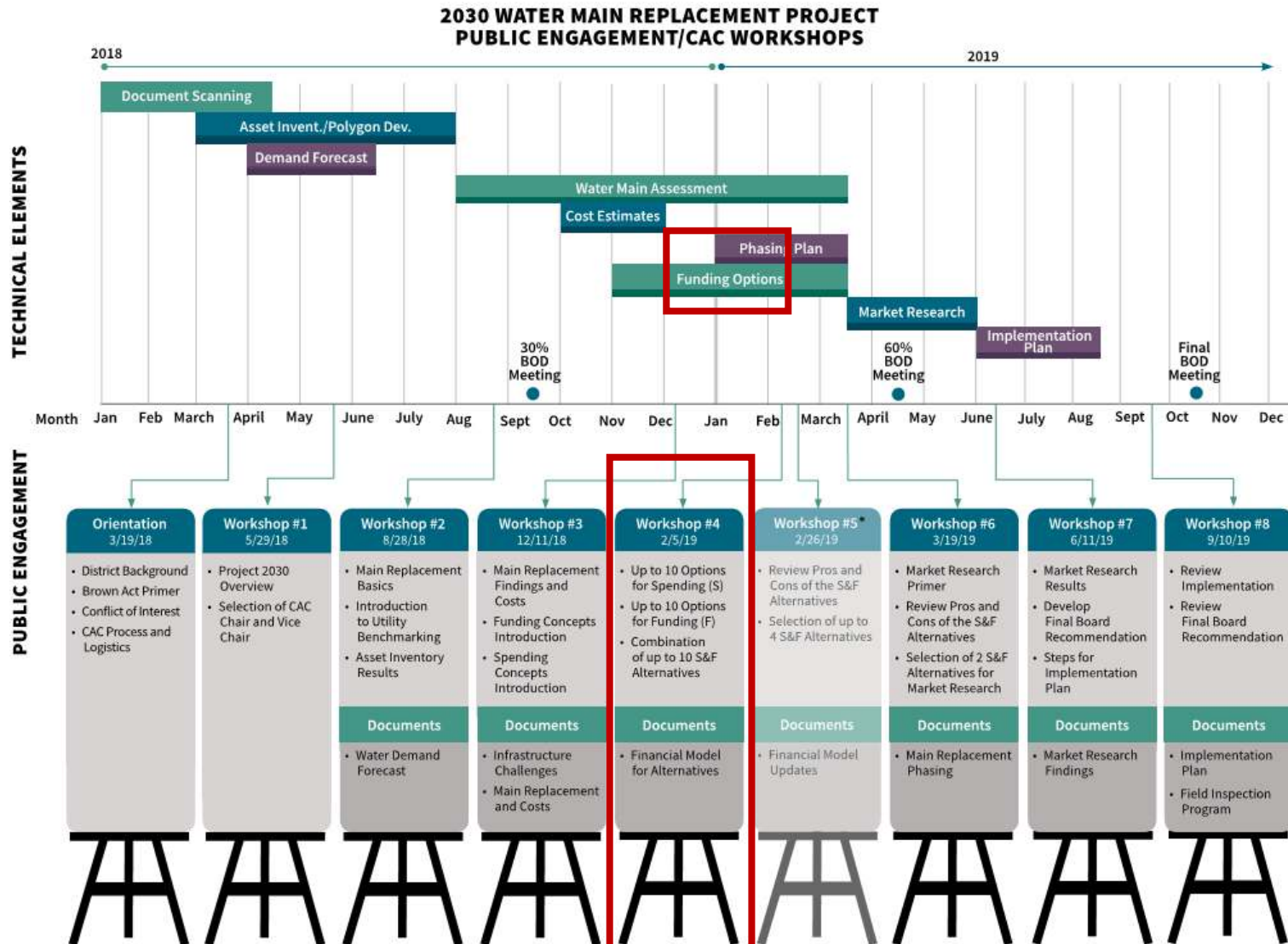


PUBLIC COMMENT





PREVIEW OF CAC MEETING 4





NEXT STEPS

Next Meeting: Tuesday, February 5th, 2019

Time: 6:30 pm – 9:15 pm

Location: Citrus Heights Community Center, Hall A



VISIT THE CAC WEBPAGE

[chwd.org/customer-
advisory-committee/](http://chwd.org/customer-advisory-committee/)



PARTICIPANT TAKE- AWAY'S

SUMMARY OF MEETING 3

- Main Replacement Findings and Costs
 - Transmission mains are more vulnerable and failure consequences are significant
 - The pace of main replacement will increase from current practice
 - Trade-off between pace of main replacement and risk of increasing pipe failures
- Basic Financial Considerations
 - Various options are available to fund project
 - Revenue increases are dependent on pace of main replacement
 - Ultimate goal is to provide multiple viable options



CLOSING