

# Lockwood Water and Sewer District

***Water System Master Plan/Preliminary Engineering Report  
2018 Amendment  
Public Meeting***

*April 19, 2018*

Jill Cook, P.E.

Morrison-Maierle, Inc.



# Meeting Outline

1. Preliminary Engineering Report (PER)
2. Service Area/Population Projections
3. Water Demand
4. Supply & Intake
5. Treatment
6. Distribution & Storage System
7. Deficiencies / Items of Concern
8. Recommended Improvements and Costs
9. Environmental Considerations

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# Preliminary Engineering Report (PER)

- 2016 Master planning document (20 year planning period)
- 2018 Amendment
- Assess current situation
  - ✓ Planning area
  - ✓ Performance & capacity of each component
  - ✓ Identify deficiencies
- Assess future situation
  - ✓ Population projections
  - ✓ Water demand projections
  - ✓ Future regulations
- Develop & evaluate alternatives
- Develop implementation plan & funding strategy

# Preliminary Engineering Report (PER)

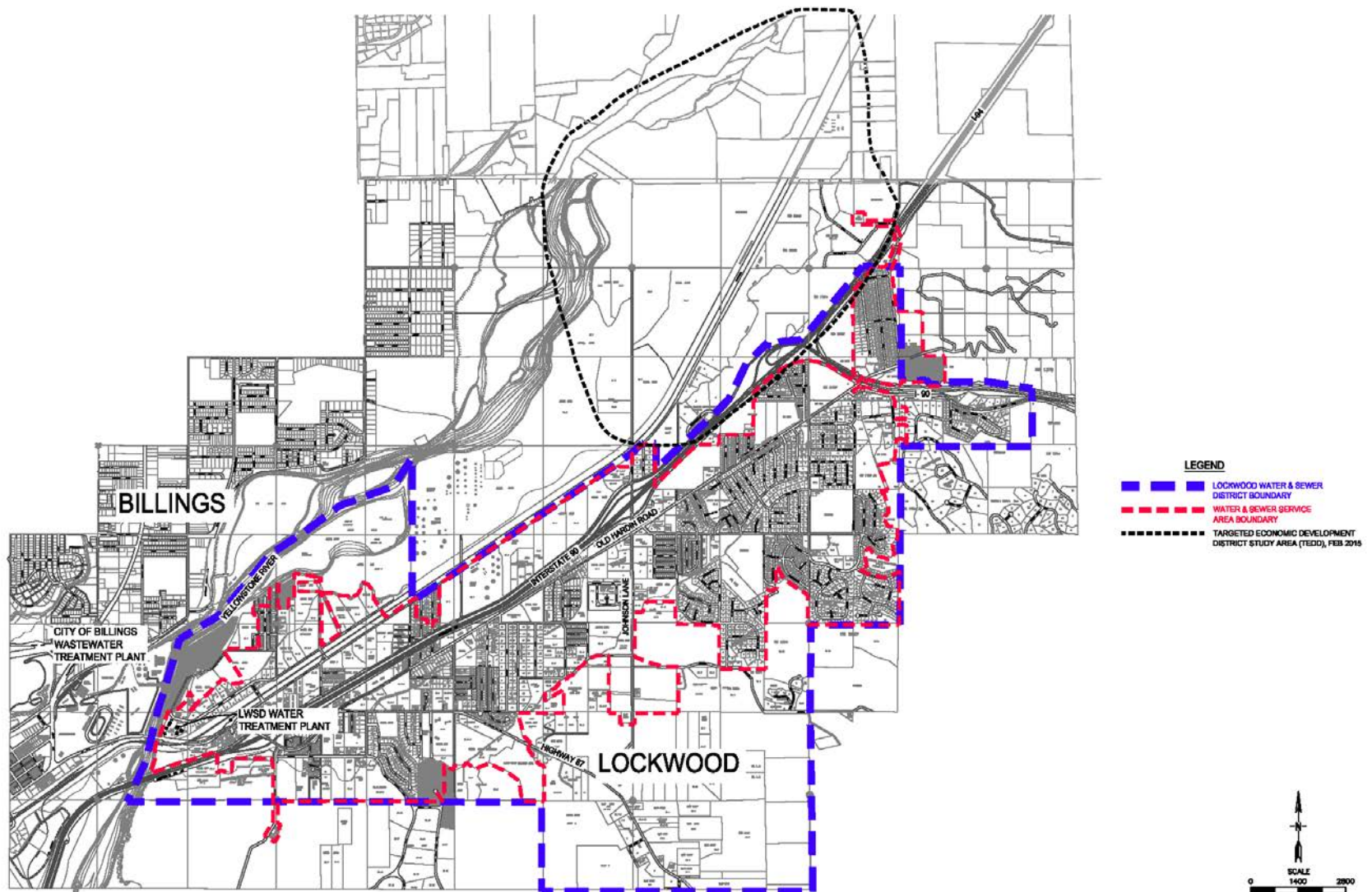
## Why Prepare a PER?

- Previous Master Plan was 2005 with an update in 2009
  - ✓ Population/water demand changes
  - ✓ New EPA/state regulations
  - ✓ Aging equipment/components
- Tool for effective decision making
  - ✓ Determine priorities for system
  - ✓ Estimate costs for upgrades
- 2016 PER with 2018 Amendment makes LWSD eligible for funding
  - ✓ State and Federal grants
  - ✓ Low interest loans (~3%)

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# Service Area/Population Projections



# Service Area/Population Projections

## Historical Population <sup>1</sup>

Population Center	1990	2000	2010
Census tracts which most closely match the LWSD Boundary	5,807	6,540	7,406
% Annual Increase over decade		1.2%	1.3%
Yellowstone County	113,419	129,352	147,972
% Annual Increase over decade		1.4%	1.4%

1 - Census Information, MT Dept of Commerce, Census and Economic Information Center



# Service Area/Population Projections

- Historical trends
  - ✓ “Lockwood” has typically been ~3% of Yellowstone County
  - ✓ Growth in District area has been 1.2%-1.3%
- Projections for Future
  - ✓ Potential for slightly increased growth due to availability of sewer in Phase 1 and 2 areas
  - ✓ Infill/Subdivision/Redevelopment
  - ✓ Consultation with City/County Planning and LWSD
  - ✓ Selection of 1.5% as reasonably conservative population growth rate

# Service Area/Population Projections

## Population Projections for LWSD Service Area

Population Center	2010	2015	2025	2035
LWSD Service Boundary*	6,242	6,724	7,803	9,056
% Annual Increase		1.5%	1.5 %	1.5%

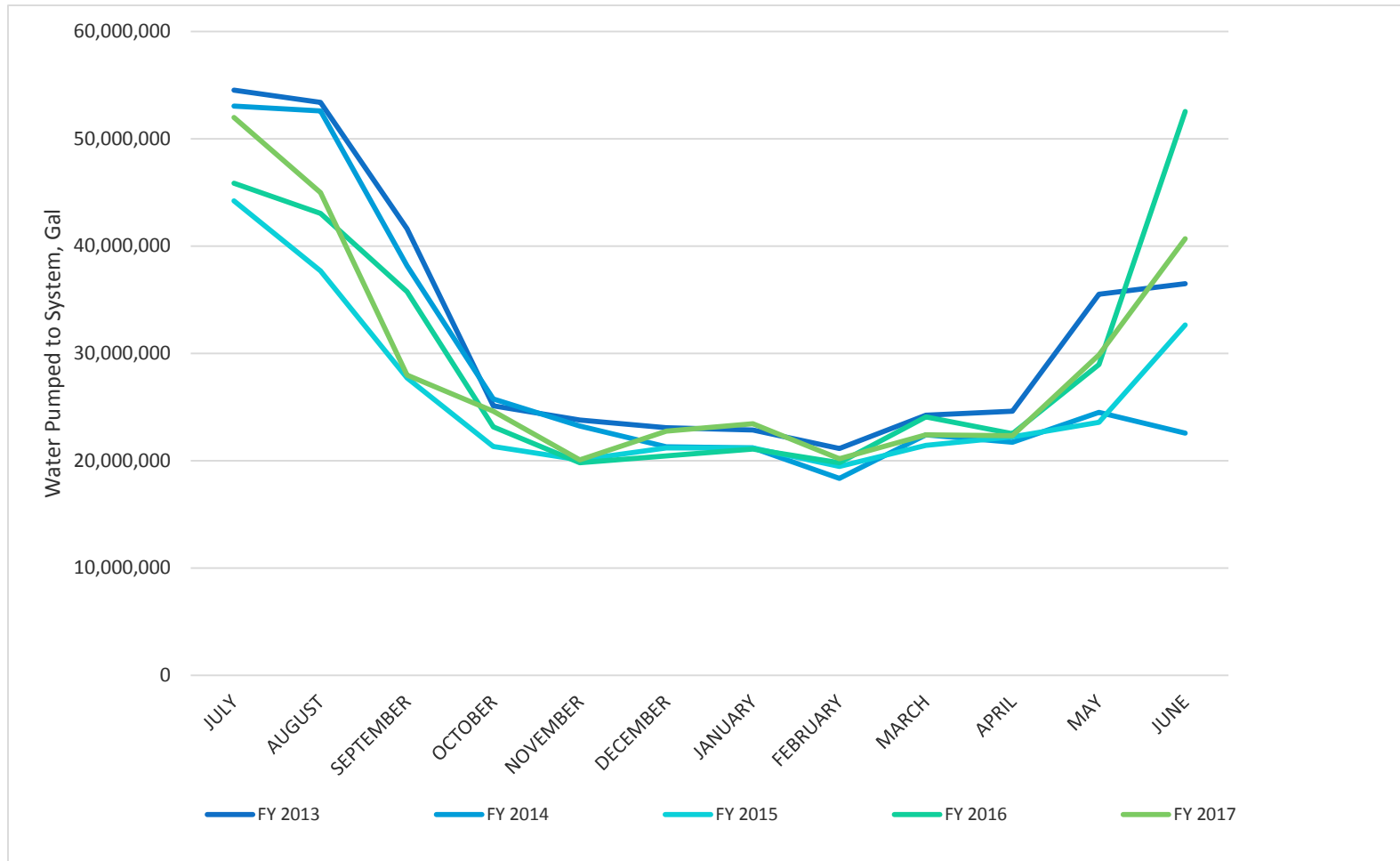
\*LWSD Boundary is smaller than the tracts used to estimate population growth rate on Slide 8.

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# Water Demand

## Historical Water Demand



# Water Demand

- Historical trends
  - ✓ Average water demand growth = 5%
  - ✓ Fluctuation year to year, especially summer watering (weather) and industrial use variation
- Projections for Future
  - ✓ Established highest water use year (2013)
  - ✓ Estimated 2013 population
  - ✓ Total 2013 water use/2013 population = per capita demand figure for future projections

# Water Demand

## HISTORICAL ANNUAL AVERAGE DEMAND AND PER CAPITA DEMAND

Year	Estimated Service Population	Annual Average Demand (mgd)	Annual Average Per Capita Demand (gpcd)
<b>2010</b>	6,242	0.79	<b>127</b>
<b>2011</b>	6,335	0.82	<b>129</b>
<b>2012</b>	6,430	0.98	<b>152</b>
<b>2013</b>	6,527	1.06	<b>162</b>
<b>2014</b>	6,625	0.94	<b>142</b>
<b>2015</b>	6,724	0.86	<b>127</b>
<b>2016</b>	6,825	0.98	<b>143</b>
<b>2017</b>	6,928	0.96	<b>139</b>
<b>Average</b>		0.93	<b>145</b>
<b>Future Planning Value (highest year)</b>			<b>162</b>

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# Supply & Intake

- Supply → Yellowstone River
- November 2017 – June 2018: Construction of Intake Improvements currently underway
- Improvements recommended in 2016 PER
- Added 4<sup>th</sup> raw water intake screen
- 4 vertical turbine pumps (installed vertically)
- Sized for future capacity
- New building with Hydroburst System
- Chlorination system upgrades
- Added mixers to Johnson Lane and East Reservoirs







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02.14.2018 12:17

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# Treatment System

- LWSD is in compliance with existing regulations for finished water quality
- Potential Future Regulations for all surface water treatment plants
  - ✓ TOC Removal
  - ✓ Disinfection Byproducts (DBPs)
  - ✓ Microbial contaminants
  - ✓ In compliance with current monitoring requirements



# Treatment System

## Existing Water Treatment Plant

- Original source 1955 → groundwater
- Surface water treatment in 1987
- Ongoing upgrades:
  - 2005 Pre-Sed
  - 2012 2nd Clearwell
  - 2014 Clarifier and filter upgrade
  - 2018 Chlorination upgrade
- Treatment Capacity → ~ 3.0 MGD



# Treatment System

## Treatment System → Conventional Filtration

1. Raw Water Pumping
2. Solids Removal
  - ✓ Sediment
  - ✓ Suspended solids
  - ✓ TOC removal
3. Filtration
  - ✓ Turbidity removal
4. Disinfection → Chlorine
  - ✓ Microbial inactivation
5. High Lift Pumping



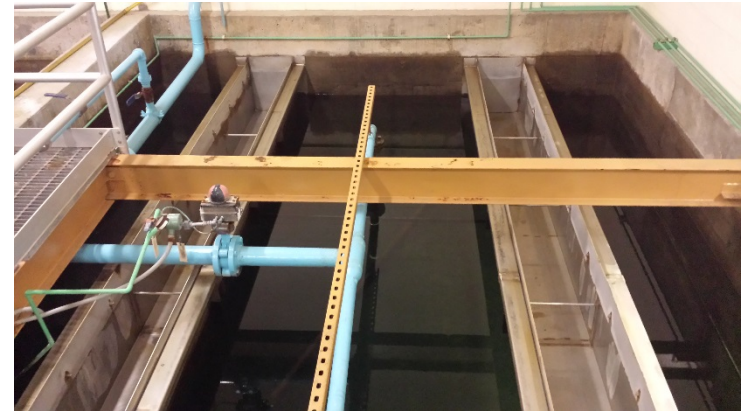


# Treatment System

Solids Removal – Pre-Sed and Clarifier



Filtration – Sand & Anthracite



Chlorine Gas Disinfection



High Lift Pumping



# Supply & Treatment System

Chemical Storage & Feed



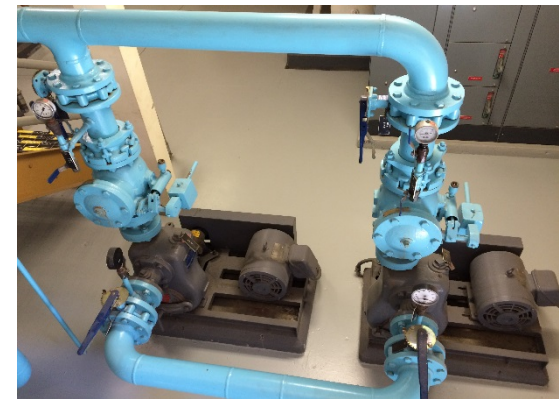
Electrical



Filter Backwash Piping



Reclaim Basin Pumps



# Supply & Treatment System

## Evaluation

- Meets current water demands and state quality regulations
- Very well maintained given age (1987 original equip)
- Plant works very well; Pre-Sed works very well to prep the water for conventional treatment -clarifier and filters
- Projected growth and demands will exceed filtration firm capacity
- Some operational limitations
  - ✓ Lack of redundancy with filter does not meet DEQ requirements.
  - ✓ Aging equipment & components
  - ✓ Some components are approaching end of useful life

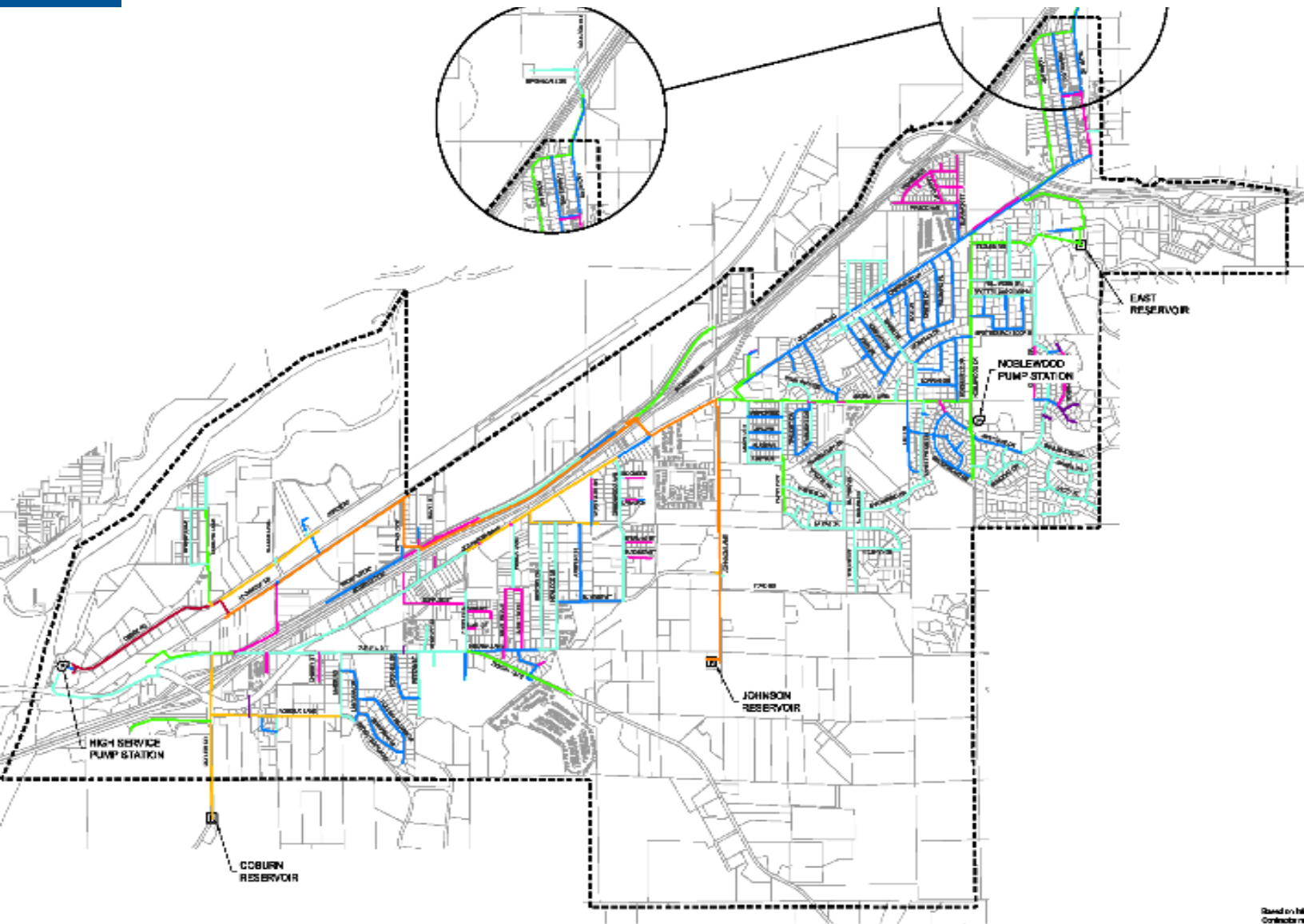


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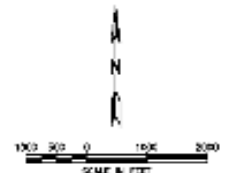
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# Distribution & Storage System

- Distribution system piping
  - ✓ 24-inch → 4,000 feet
  - ✓ 16-inch → 19,450 feet
  - ✓ 12-inch → 4,200 feet
  - ✓ 10-inch → 24,900 feet
  - ✓ 8-inch → 81,900 feet
  - ✓ 6-inch → 67,500 feet
  - ✓ 3 & 4-inch → 27,150 feet
  - Total 249,100 feet
- Pipe materials
  - ✓ Asbestos cement, PVC
- Evaluation → Some undersized mains lead to inadequate fire flows, additional looping needed for redundancy, future line extensions recommended



- LEGEND**
- DISTRICT BOUNDARY
  - ☐ RESERVOIR
  - ⊕ PUMP STATION
  - 3" PIPE
  - 4" PIPE
  - 8" PIPE
  - 9" PIPE
  - 10" PIPE
  - 12" PIPE
  - 16" PIPE
  - 24" PIPE



Based on information provided by LWSD, May 2014. Data interpretation and all contacts remain the responsibility of the user.

# Distribution & Storage System

- High Service Pumping
  - ✓ Built in 1987
  - ✓ Pumps to entire system
- Reservoirs
  - ✓ Johnson Lane
  - ✓ Coburn Road
  - ✓ East
- Noblewood Pumping Station
  - ✓ Boosts to Mid-Zone
- Evaluation → Pumping capacity is adequate; Additional storage needed in low and mid-zones.  
Mixers - Johnson Lane and East Reservoirs, 2018



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# Deficiencies / Items of Concern

- Intake
  - ✓ Taken care of by ongoing 2018 project
- Treatment:
  - ✓ Lack of filter redundancy and capacity to meet future demands
  - ✓ Aging equipment
- Distribution
  - ✓ Fire flow improvements
  - ✓ Looping and redundancy
  - ✓ Extensions for future
- Storage
  - ✓ Additional storage needed in low and mid-zones

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## SUMMARY OF CAPITAL COSTS FOR TREATMENT UPGRADE ALTERNATIVES

ALTERNATIVE	ESTIMATED CAPITAL COST
<b>Treatment Upgrade Alternatives</b>	
<b>T1 – Do Nothing</b>	-
<b>T2 – Additional Conventional Treatment Trains</b>	<b>\$4,600,000</b>
<b>T3 – Pressure Membrane Filtration</b>	<b>\$3,800,000</b>
<b>T4 – Submerged Vacuum Membrane Filtration</b>	<b>\$7,000,000</b>

**SUMMARY OF PRESENT WORTH COSTS FOR TREATMENT  
UPGRADE ALTERNATIVES**

<b>ALTERNATIVE</b>	<b>ESTIMATED ANNUAL O&amp;M COST</b>	<b>ESTIMATED PRESENT WORTH</b>
<b>Treatment Upgrade Alternatives</b>		
<b>T1 – Do Nothing</b>		-
<b>T2 – Additional Conventional Treatment Trains</b>	<b>\$18,000</b>	<b>\$4,700,000</b>
<b>T3 – Pressure Membrane Filtration</b>	<b>\$65,400</b>	<b>\$5,000,000</b>
<b>T4 – Submerged Vacuum Membrane Filtration</b>	<b>\$108,000</b>	<b>\$8,800,000</b>

## SUMMARY OF CAPITAL COSTS FOR DISTRIBUTION SYSTEM ALTERNATIVES

ALTERNATIVE	ESTIMATED CAPITAL COST, 2018 dollars
<b>Distribution System Alternatives</b>	
Alternative F1 - Fire Flow Recommended Upgrades (annual program)	\$330,000/yr
Alternative W1 - Water Main Recommended Upgrades (annual program)	\$500,000/yr
Alternative W2 - Future Pipe Extensions Recommended Upgrades	To be paid for by development
<b>Storage System Alternatives</b>	
Alternative S1 - New 1.1 MG Johnson Lane Reservoir	\$2,440,000
Alternative S2 – New Mid Zone Reservoir	\$750,000

### SUMMARY OF RECOMMENDED IMPROVEMENTS

Recommended Improvement	Approximate Construction Timeframe	Estimated Construction Cost (2015 Dollars)
<b>Priority 1 Near Term Improvements (1-3 years)</b>		
Alternative F1 - Fire Flow Recommended Upgrades (begin annual program)	Start annual program in 2019	~ \$330,000/yr
Alternative W1 - Water Main Recommended Upgrades (begin annual program)	Start annual program in 2019	~ \$500,000/yr
Alternative W2 - Future Pipe Extensions Recommended Upgrades	As needed	To be paid for by development
Alternative T2 - Additional Conventional Treatment Trains	2020	\$4,600,000
Alternative S2 – New Mid Zone Storage	2019/2020	\$750,000

Recommended Improvement	Approximate Construction Timeframe	Estimated Construction Cost (2015 Dollars)
<b>Priority 2 Mid-Term Improvements (3-8 years)</b>		
Alternative F1 - Fire Flow Recommended Upgrades (continue annual program)	Continue improvements started in 2019	~ \$330,000/yr
Alternative W1 - Water Main Recommended Upgrades (continue annual program)	Continue improvements started in 2019	\$500,000/yr
Alternative W2 - Future Pipe Extensions Recommended Upgrades	As needed	To be paid for by development
Alternative S1 - New 1.1 MG Johnson Lane Reservoir	2022	\$2,300,000
<b>Priority 3 Long – Term Improvements (8-20 years)</b>		
Alternative WS3 – Construct New River Intake Structure	2026 or beyond	\$2,700,000
Alternative F1 - Fire Flow Recommended Upgrades (continue annual program)	Continue improvements started in 2019	~ \$330,000/yr
Alternative W1 - Water Main Recommended Upgrades (continue annual program)	Continue improvements started in 2019	\$500,000/yr
Alternative W2 - Future Pipe Extensions Recommended Upgrades	As needed	To be paid for by development

**2020 WATER SYSTEM UPGRADE PROJECT  
TOTAL ESTIMATED PROJECT COST**

<b>Project Component</b>	<b>Cost</b>
<b>Total Construction Cost (Projected to 2020)<sup>1</sup></b>	<b>\$5,336,000</b>
<b>Engineering and Construction Administration (~20%)<sup>2</sup></b>	<b>\$1,067,000</b>
<b>Grant Administration and Financial Costs (~5%)<sup>2</sup></b>	<b>\$267,000</b>
<b>Total Project Cost</b>	<b>\$6,670,000</b>

**1. Engineering News Record (ENR) cost forecast data was used as guidance to develop the cost projection factor. These numbers should be adjusted to match the actual construction time frame. The above projection factor assumes 3% per year increase in costs.**

**2. Costs for engineering, technical, administration and financial services are based on a percent of total construction for budgeting purposes only. Final costs will be negotiated during the final design phase of the project and may vary depending on actual site conditions, availability of existing data, the final scope of services, etc.**



# Funding Options

- LWSD Capital Improvement Reserves
- Low Interest Loans
  - ✓ Revenue Bonds
- Grants
  - ✓ TSEP
  - ✓ RRGL
  - ✓ USDA-RD (based on MHI of served area)
  - ✓ CDBG (based on MHI of served area)
  - ✓ Coal Board

# Effect on Rates

- Depends on availability of grants and final funding package
- Assuming
  - \$625,000 TSEP
  - \$125,000 RRGL
  - SRF Loan at 2.5%, 30 yrs
- Projected rate increase = \$8.66 per EDU
- *Rate study and updated rates adopted in 2017 included planning for the identified upcoming capital projects, so this project is not expected to cause an additional increase beyond currently adopted rates between now and 2020.*

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# Environmental Considerations

- Environmental Checklist and an Environmental Assessment are available for review at the LWSD Office: 1644 Old Hardin Road.
- No endangered species will be impacted
- Best management practices will be used to control sediment and runoff during construction
- Temporary construction impacts
- Most improvements will occur in already developed areas
  - Only exception is reservoir construction
- Public can comment here or in writing

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3rd Public Meeting***

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