GOALS

**Development and Growth**: Implement growth and development strategies and policies that are consistent with other city utilities and provide water infrastructure to support continued sustainable growth in the community.

**Long-term Water Supply and Water Rights**: Evaluate the reliability and resiliency of the water supply, and provide recommendations for long-term water rights and water conservation strategies.

**Water System Leakage Reduction**: Implement industry best practices to evaluate and report on system leakage over time. Implement strategies and policies that will reduce real water loss over time.

**Key Water System Management and Operational Goals**: Maintain or improve the level of service provided to customers, including enhancing city council and customer’s knowledge of the water system and programs moving forward.

**Water Quality**: Ensure water quality criteria are met in the short and long-term, and provide adequate protection for the aquifer.

TIMELINE

1860s  
- Early Missoula settlers use water from Rattlesnake Creek

1860s  
- Rattlesnake Creek Water Rights filing

1870s  
- Worden and Co. started constructing a water system

1885  
- Worden and Co. sold to Missoula Water Works and Milling Co.

1895  
- Missoula Mercantile bought and renamed: Missoula Water Company

1906  
- W.A. Clark bought and renamed: Missoula Light and Water Company

1911-1923  
- Rattlesnake Wilderness Dams constructed

1930  
- System was purchased by Montana Power Company

1935  
- Wells were drilled to augment Rattlesnake Creek supply

1979  
- Park Water Company purchased the utility

1983  
- Rattlesnake Creek discontinued as water source

1991  
- Park Water Company (PWC) acquired Clark Fork Water Company

1999  
- PWC acquired Fort Missoula system

2000  
- PWC acquired Linda Vista Water Company

2001  
- PWC acquired Missoula Water Works system

2010  
- Carlyle Group purchased PWC

2016  
- Algonquin Power and Utilities Corp. purchased PWC

2017  
- City of Missoula took ownership of the water utility

2018  
- Water master planning process completed
**EXISTING WATER SYSTEM**

- **101 Million Gallons Per Day**
- water right at groundwater locations

- **40 Groundwater Wells**
- **73M Gallons Per Day** pumped
- **25 Water Storage Facilities**
- **10.4M Gallons of Total Storage**
- **22 Booster Stations**
- **36 Pressure Reducer Stations**
- **46 Pressure Zones**
- **331 Miles of Water Mains**
- **23,000 Service Connections**
- **1,450 Fire Hydrants**
- **66,000 Customers**

**WATER USE IN SURROUNDING AREAS**
gallons per capita per day

<table>
<thead>
<tr>
<th>City</th>
<th>MT</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
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<tr>
<td>Bozeman</td>
<td>113</td>
<td>2010</td>
<td></td>
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<tr>
<td>Missoula</td>
<td>140</td>
<td>2017</td>
<td></td>
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<tr>
<td>Rapid City</td>
<td>147</td>
<td>2017</td>
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<tr>
<td>Miles City</td>
<td>150</td>
<td>2010</td>
<td></td>
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<td>Helena</td>
<td>170</td>
<td>2010</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Billings</td>
<td>203</td>
<td>2010</td>
<td></td>
<td></td>
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</table>

**LEGEND**

- Water Main
- Pressure Regulating Valve (PRV)
- Booster Pump
- Well
- Water Storage Facility
- Dam Facility
- Study Area Boundary

**DATA SOURCE:** City of Missoula, MT
EVALUATING THE WATER SYSTEM

Water mains are ranked based on a number of criteria that represent the likelihood and consequence of failure including number and location of leaks, pipe type, pipe age, pipe size, soil conditions, and community impacts.

**STORAGE**
What is the system’s standby power? What is the total storage zone?

**PRESSURE**
Are there areas of the system where pressure is too low or too high?

**SUPPLY**
When and where does the system start to run short on water supply?

**WATER RIGHTS**
What are the quantifications for beneficial use?

**FIRE FLOW**
Have hydrant coverage requirements been sufficiently met?

**WATER QUALITY**
When and where does the system start to run short on water supply?

**RISK & RELIABILITY**
Are water supply wells dispersed throughout the system?

**WATER LOSS**
What factors are present that lead to water loss in the system?

WATER MAIN REHABILITATION AND REPLACEMENT

Water mains are ranked based on a number of criteria that represent the likelihood and consequence of failure including number and location of leaks, pipe type, pipe age, pipe size, soil conditions, and community impacts.

The map to the right shows the water main targeted for rehabilitation or replacement including steel invasion, kalmein, and pipes that are 75 years or older.

Image Credit: Gordon McLean (CC-NC-BY-2.0)
RATTLESnake WILDNESS DAMs

TIMELINE

1911-1923
10 dams built on 8 lakes in present-day Rattlesnake Wilderness Area to augment water supply for City of Missoula

1983
City discontinued use of Rattlesnake Creek for water supply, maintained for emergency backup supply

2017
City acquired dams and water rights from Mountain Water Company

Originally built to augment water supply for the City of Missoula, these approximately 100-year old structures are approaching the end of their useful life. While it’s difficult to predict when serious symptoms related to dam safety may appear, they would be inevitable in the future. Therefore, several options were evaluated for the dams including taking no action, rehabilitation, increasing storage, and decommissioning.

Those options were examined in terms of capital costs, life cycle costs, water rights, climate change, long-term community needs, regulatory agency requirements and goals, and environmental impacts.

CONSIDERATIONS

Preserve the Water Supply for Emergency Backup: The Rattlesnake Creek water source has been maintained as an emergency backup supply. It has limited value as a backup drinking water source because there is currently no means for water treatment, so any use of the source would require appropriate precautions. The City of Missoula is exclusively reliant on groundwater via the Missoula aquifer, which is an unconfined aquifer that is susceptible to contamination. However, the wells are geographically dispersed and widespread contamination is unlikely.

Store Water for Late Season Flows in Rattlesnake Creek: Rattlesnake Creek is critical habitat for Bull Trout, which are a threatened species. Rattlesnake Creek flows are influenced by the snow pack and runoff from the watershed, and the flows diminish in late summer early fall, to less than 10 cfs. The dams provide a means to store spring runoff for release later in the season.

Remove all Municipal Presence From the Wilderness Area: As described in this report, the Wilderness Act of 1964 puts very strict limitations on wilderness areas in order to preserve the pristine, quiet, contemplative, and natural settings. There may be a desire by some to remove the municipality from its legal access to the wilderness.

Water Rights Seniority: The City currently holds some of the most senior water rights in the basin at the Rattlesnake Dams. If the dams were decommissioned, those water right may be lost.

RECOMMENDATIONS

In order to maintain senior water rights, maximize the ability to release late season flows in Rattlesnake Creek for the benefit of fish habitat (specifically bull trout) and recreation, and optimize the cost/benefit of the considerable work required to either decommission or rehabilitate the dams, the following preliminary recommendations have been made.

- A water rights change application process should be started.
- Big Lake Dam, Sanders Lake Dam, and Glacier Lake Dam should be rehabilitated.
- All other dams should be decommissioned.
PLANNING FOR THE FUTURE

UPDATING THE MODEL

THE CITY'S HYDRAULIC MODEL
Robust, Calibrate, and Highly Accurate

CALIBRATION PROCESS:
Comparing Pressures in the Model and Adjusting Pipe Roughness

RESULTING MODEL:
Allows the City to Perform Simulations to Evaluate System Storage, Fire Flows, Pressures, and Velocities, and Model What-If Scenarios for New Development or Capital Improvement

CAPITAL IMPROVEMENT PLAN

POPULATION VS. WATER DEMAND

Near Term Developments

<table>
<thead>
<tr>
<th>Name</th>
<th>Units</th>
<th>Commercial SF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ROAM</td>
<td>488 multifamily</td>
<td>6,500 retail</td>
</tr>
<tr>
<td>2. Mercantile/Residence Inn</td>
<td>154 hotel rooms</td>
<td>24,000 retail/convention, 140,000 hotel</td>
</tr>
<tr>
<td>3. Hotel Fox</td>
<td>250 multifamily, 195 hotel rooms</td>
<td>35,000 retail, 50,000 office, 60,000 conference</td>
</tr>
<tr>
<td>4. Millard</td>
<td>800-700 single family, 400-600 multifamily</td>
<td>150,000-200,000</td>
</tr>
<tr>
<td>5. Linda Vista Estates</td>
<td>976 single family</td>
<td>--</td>
</tr>
<tr>
<td>6. Hillview Way</td>
<td>610 total units</td>
<td>--</td>
</tr>
</tbody>
</table>

LEGEND
- Near Term Significant System Improvements
- Near Term Significant Developments (1-5 yrs)
- Study Area Boundary
- City Limits

DATA SOURCE: City of Menlo Park, CA

FY2020 FY2021 FY2022 FY2023 FY2024

- Water Enterprise Fund
- ProForma
- Growth and Development