



CITY OF HENDERSONVILLE
WATER SEWER ADVISORY COUNCIL
2nd Floor Meeting Room | 160 6th Avenue E. | Hendersonville NC 28792
Monday, January 22, 2024 – 4:00 PM

MINUTES

Present: City of Hendersonville Council Member & Chair Jennifer Hensley, County Commissioner & Vice Chairman Daniel Andreotta, City of Hendersonville Water/Sewer Customer Representative Chuck McGrady, Town of Fletcher Council Member Sheila Franklin, Town of Laurel Park Council Member Paul Hansen, City of Saluda Council Member Stan Walker, Town of Mills River Mayor Pro-Tem Randy Austin

Absent: City of Hendersonville Council Member Debbie Roundtree
Henderson County Water/Sewer Customer Representative Andrew Riddle
Partnership for Economic Development Representative Carsten Erkel
Village of Flat Rock Council Member Cheryl Stuller

Staff Present: City Manager John Connet, City Clerk Jill Murray, Budget Manager Adam Murr, Public Service Director Brent Detwiler, and Utilities Director Adam Steurer and others.

Others Present: Crystal Broadbent
Jared Hostetler

1. CALL TO ORDER

Chairman Jennifer Hensley called the meeting to order at 4:00 p.m. and welcomed those in attendance.

2. APPROVAL OF AGENDA

Chuck McGrady, seconded by Paul Hansen, to approve the agenda as presented. A unanimous vote of the Committee Members present followed. Motion carried.

3. APPROVAL OF MINUTES

A. Approval of the October 24, 2023

Chuck McGrady moved, seconded by Daniel Andreotta, to approve the minutes of October 24, 2023 as presented. A unanimous vote of the Committee Members present followed. Motion carried.

4. NEW BUSINESS

A. Presentation of City of Hendersonville Water Distribution and Water Treatment Facility Master Plans by Hazen & Sawyer - Adam Steurer, Utilities Director

Jared Hostetler and Crystal Broadbent gave the PowerPoint presentation.



Water Treatment Facility and Distribution System Master Plans Hendersonville Water and Sewer Advisory Council

January 22nd, 2024

Introduction

Hazen Team

Crystal Broadbent, Senior Associate

- 23 years of experience with Hazen
- Focus on hydraulic and surge modeling

Jared Hostetler, Associate

- 12 years (8 with Hazen)
- Focus on drinking water/wastewater treatment and pumping systems

Hazen and Sawyer (Hazen)

- Formed in 1951
- Focused exclusively on water & sewer projects

What is a Master Plan?

This is the first WTF Master Plan; This is an update for the Distribution System Master Plan

Both look at every component within the system

Master Plans Provide:

- Plan for growth
- Plan for redundancy and resiliency
- Improve system capacity
- Optimize operations
- Assist fire departments with Insurance Service Office (ISO) rating
- Provide preliminary engineering for developing projects to be constructed
- Identify major capital improvements to be incorporated into City's budget

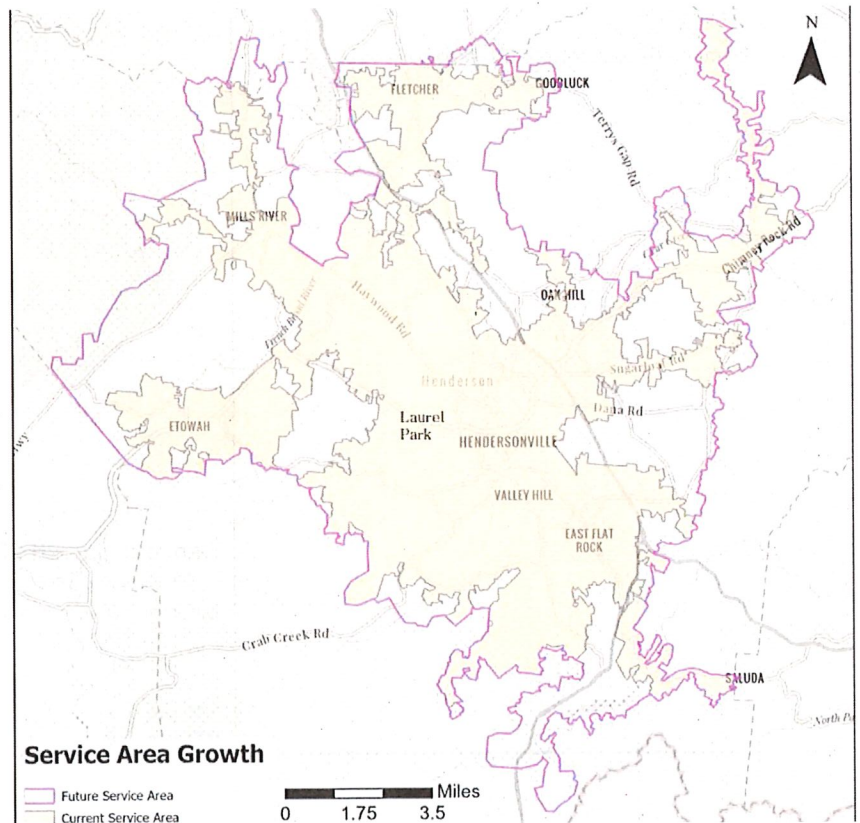


Capital Improvement Projects (CIPs) – Overview of Drivers

- Water Treatment Facility
 - Capacity expansion needs (meeting future demands)
 - Replacement of aging equipment
 - Rehabilitation of facilities
 - Risk reduction (process/personnel)
 - Process efficiency/operability improvements
- Distribution (project drivers not individual projects)
 - Improving Pressure
 - Connectivity/Redundancy
 - Fire Flow (areas less than 1,000 gpm)
 - Meet Future Demand

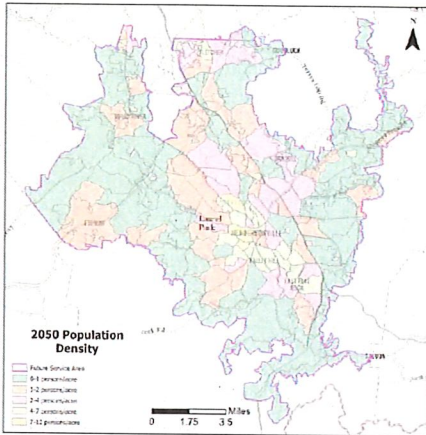
Future Demand

Current and Future Service Area

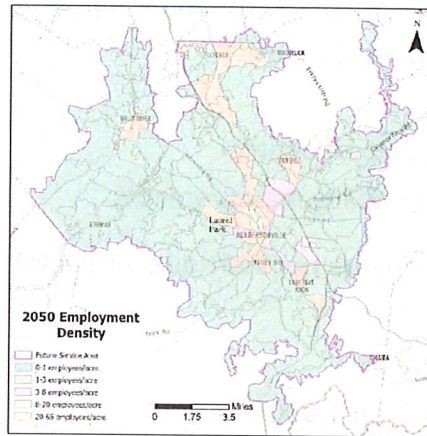


Future Water Demands Based on Traffic Analysis Zones (TAZs) and Input From City and County Planning Department

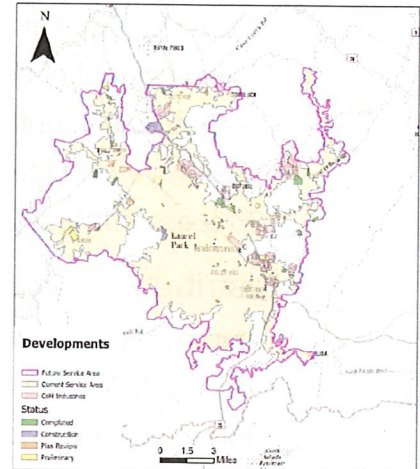
2050 TAZ Population Density



2050 TAZ Employment Density

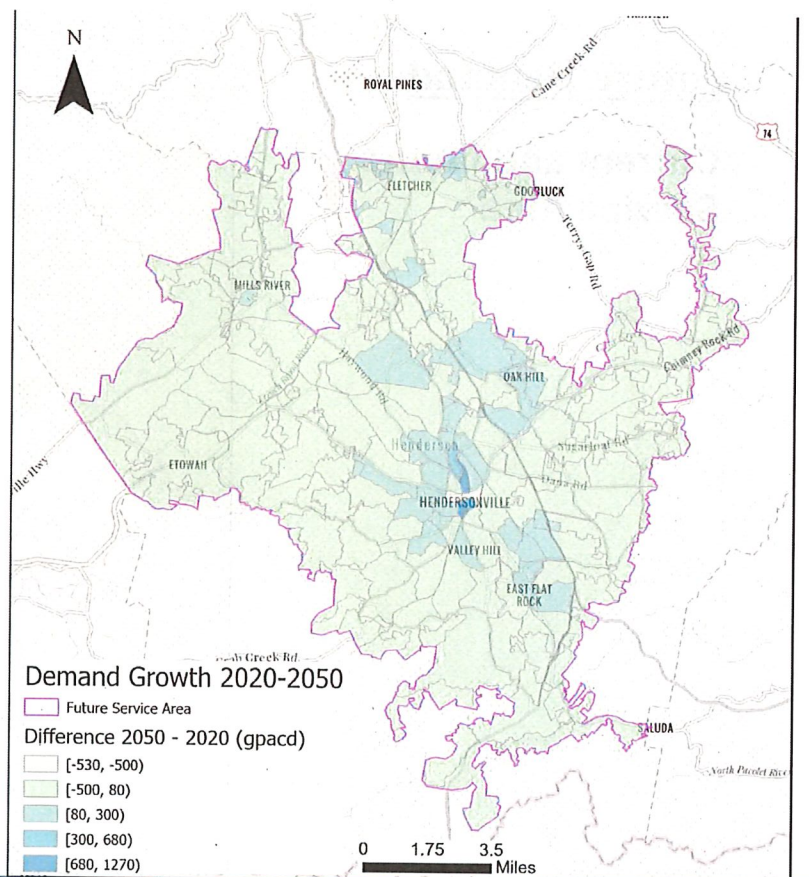


New Developments and Industries



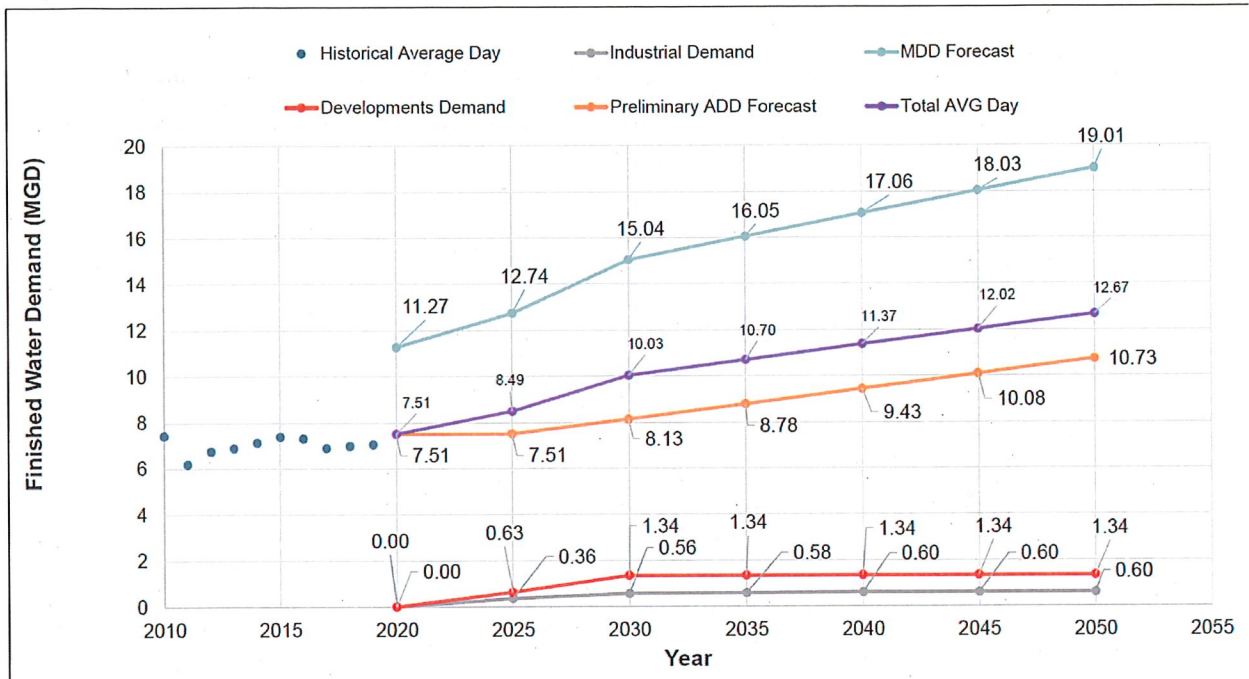
Future Demand Projections and Growth Areas

Demand Growth from 2020 – 2050

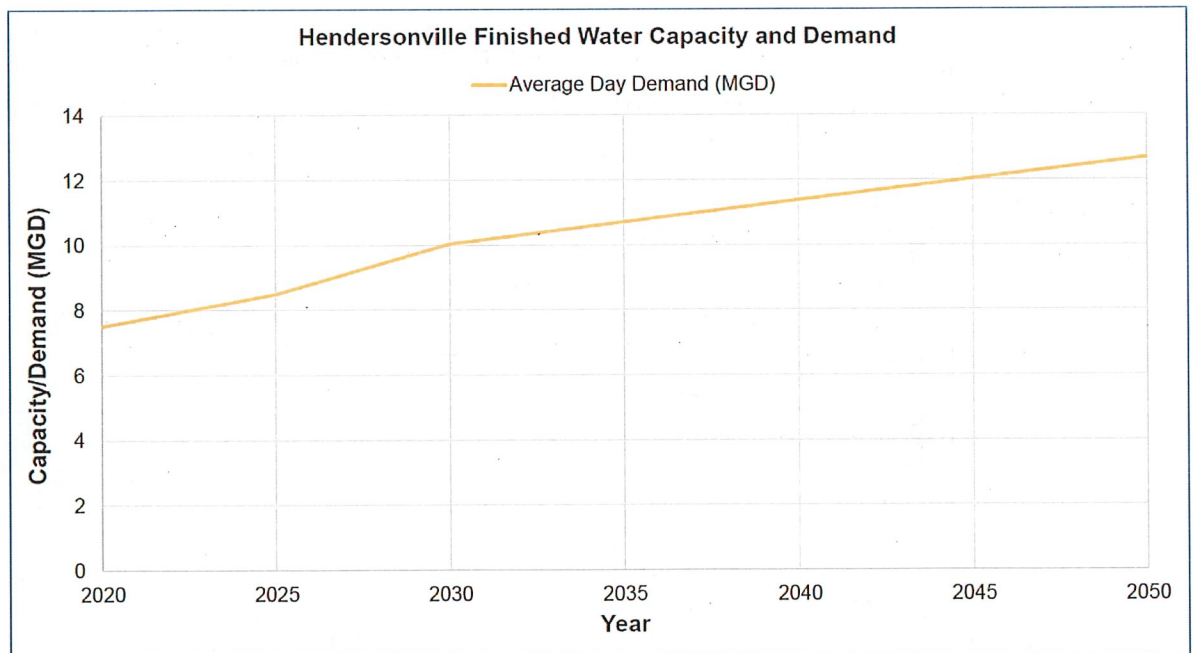


Future Demand Projections and Growth Areas

Finished Water Demand for City

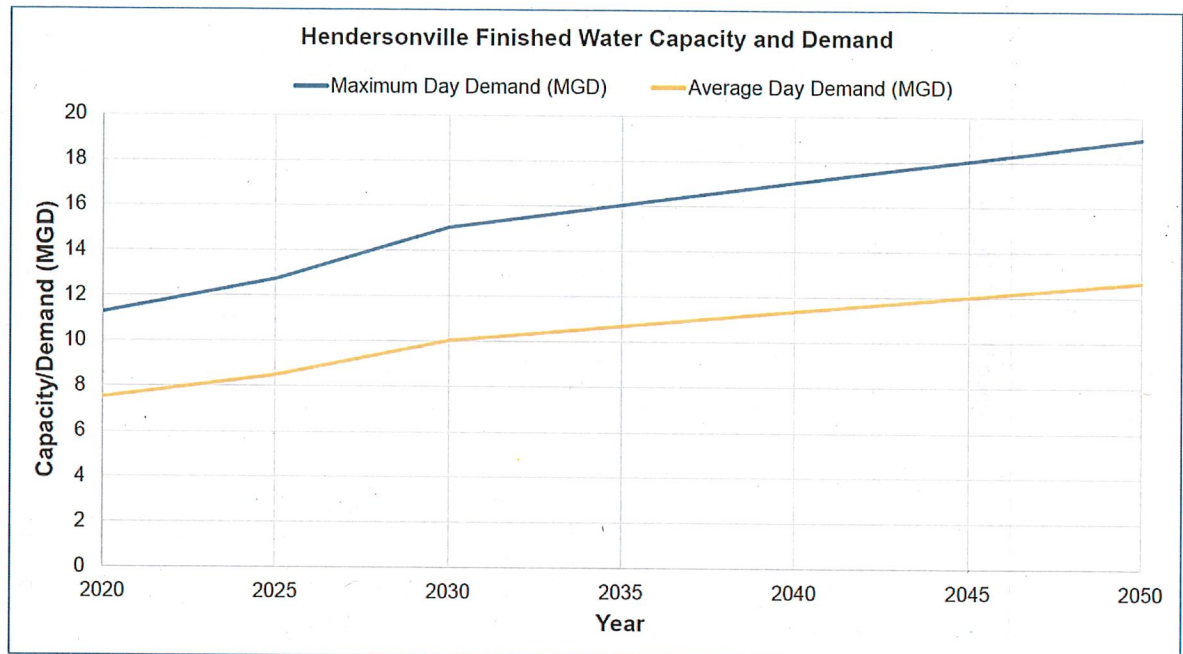


WTF Capacity, FWPS Capacity, and Future Demand

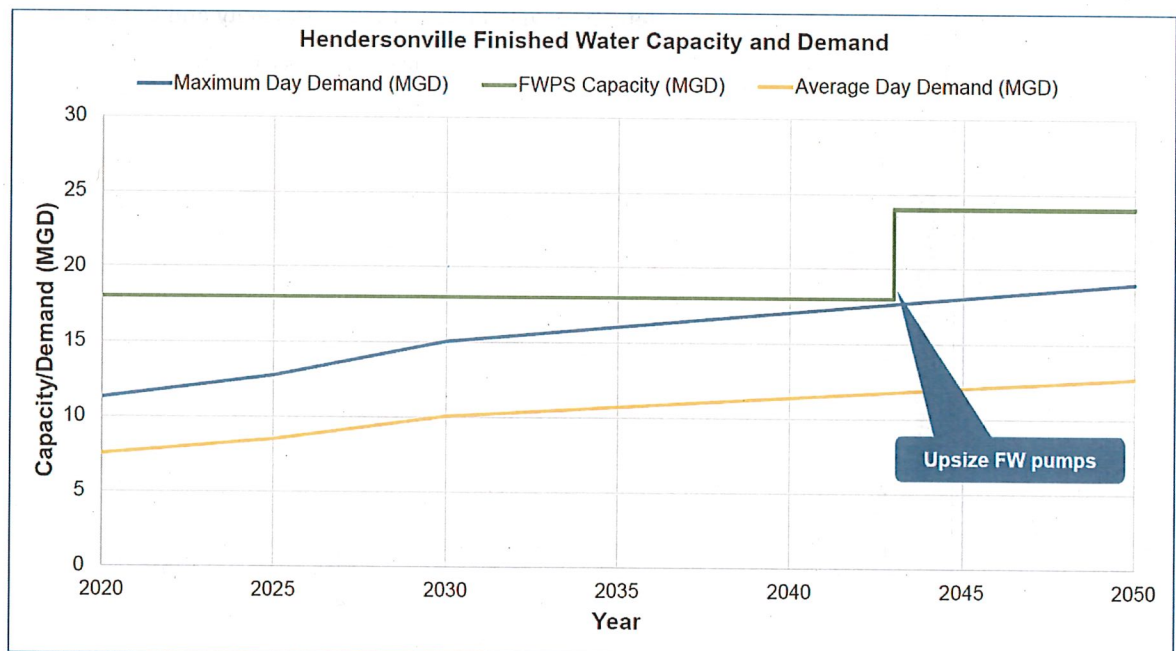


WTF Capacity, FWPS Capacity, and Future Demand

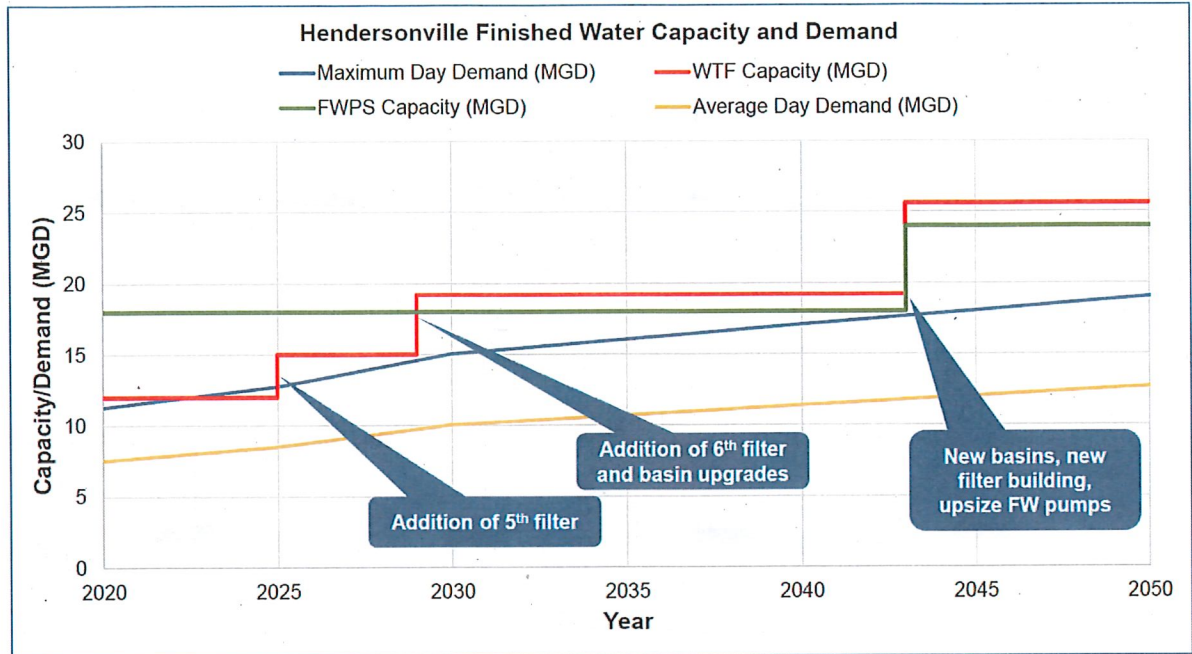
Peaking Factor 1.5



WTF Capacity, FWPS Capacity, and Future Demand



WTF Capacity, FWPS Capacity, and Future Demand

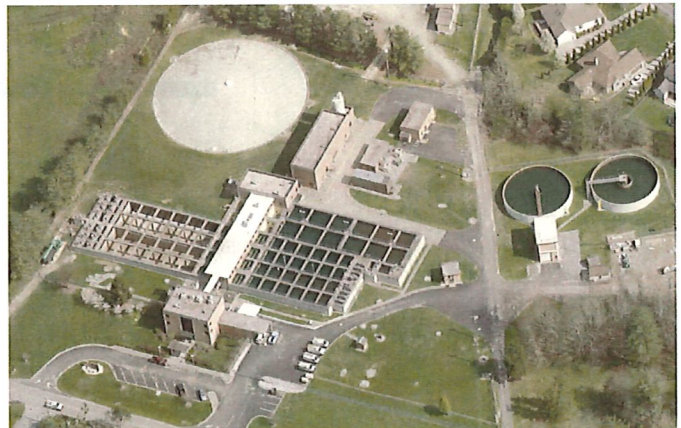


Water Treatment Facility

Water Treatment Facility

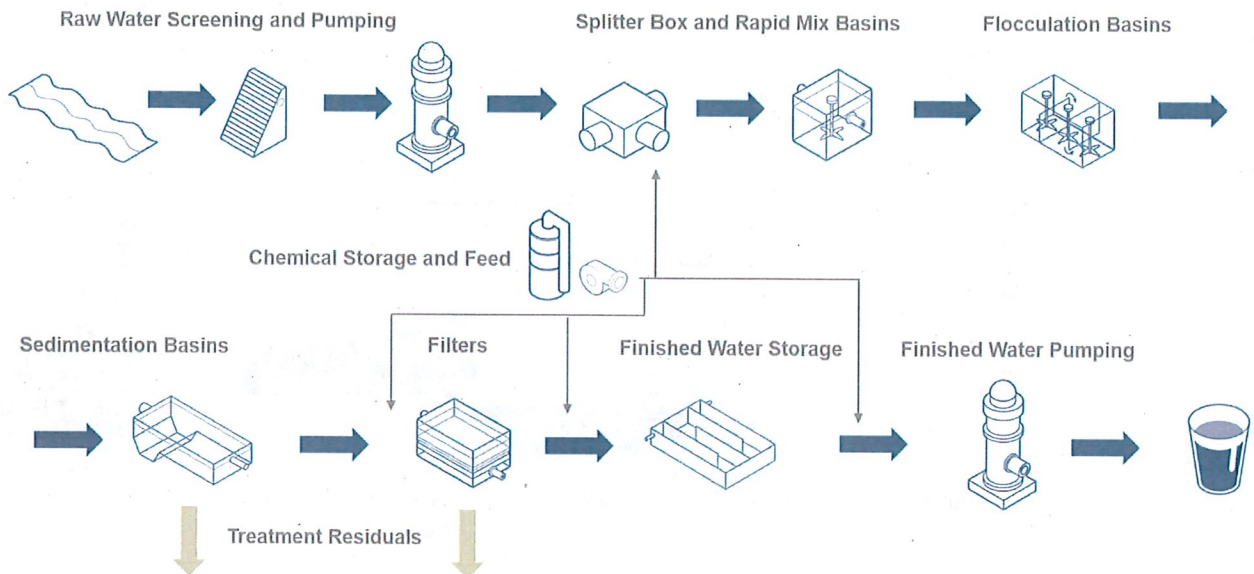
Overview

- Located on Hwy 191 (Haywood Rd.) in Mills River
- Originally constructed in the mid-1960s, with subsequent major improvements including:
 - Residuals thickening and dewatering facilities
 - Several upgrades to process basins, filters, chemical facilities, and pumping stations
- WTF is permitted to treat 12 MGD
 - 2023 average day flow: 7.3 MGD
 - 2023 maximum day flow: 9.4 MGD
- Finished water is analyzed for a wide range of potential contaminants and water quality parameters in accordance with state and federal regulations.



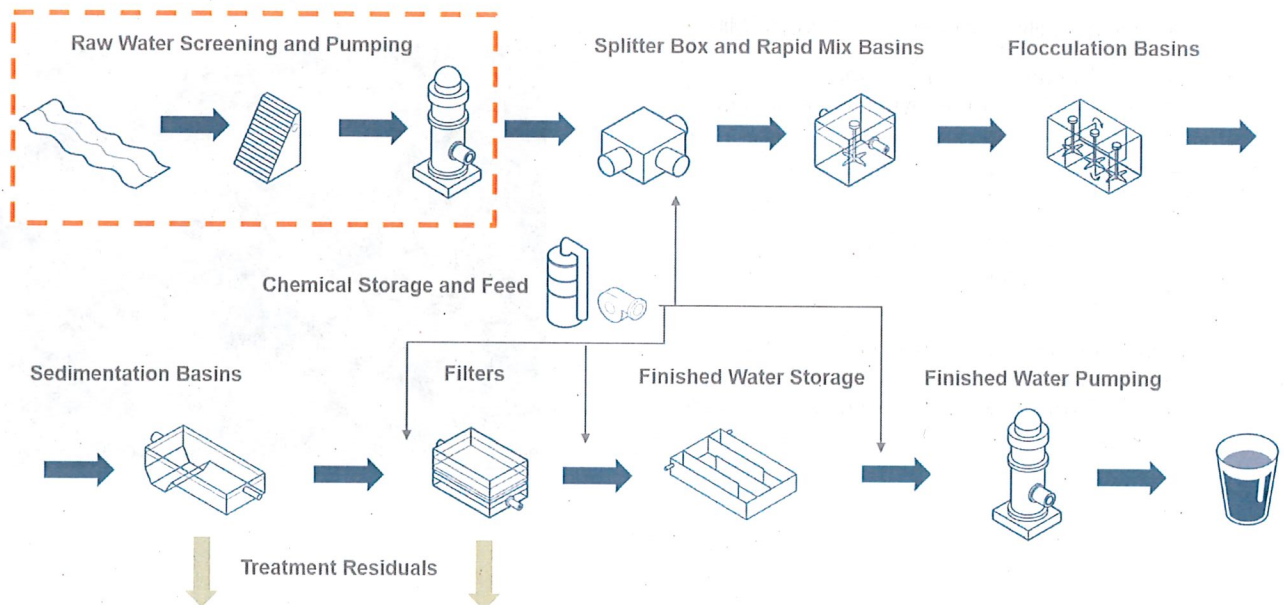
Water Treatment Facility Master Plan

Process Overview



Water Treatment Facility Master Plan

Process Overview

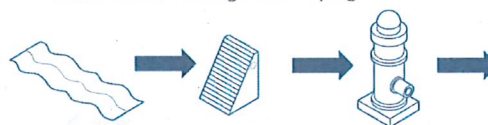


Water Treatment Facility Master Plan

Raw Water Screening and Pumping Facilities

- Mills River Intake and Pump Station
 - Permitted withdrawal capacity 12 MGD
- French Broad Intake and Pump Station
 - Under construction
 - Permitted withdrawal capacity 15 MGD
- North Fork Reservoir and Transmission Main
 - Located in Pisgah National Forest
 - Permitted withdrawal capacity 2 MGD
 - Flows by gravity to HWTF
- Bradley Creek Reservoir and Transmission Main
 - Located in Pisgah National Forest
 - Permitted withdrawal capacity 2.5 MGD
 - Flows by gravity to HWTF
- **Total Permitted Raw Water Capacity = 31.5 MGD**

Raw Water Screening and Pumping

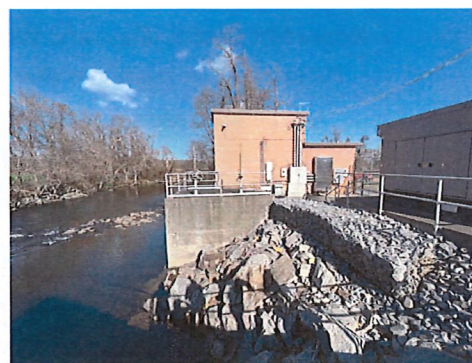
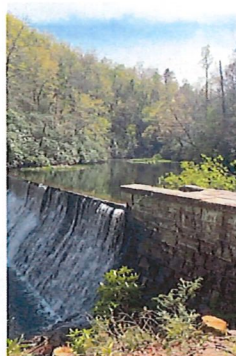
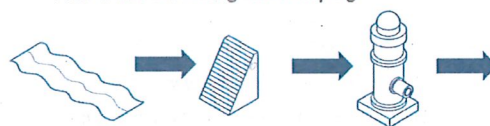


Water Treatment Facility Master Plan

Raw Water Screening and Pumping Facilities

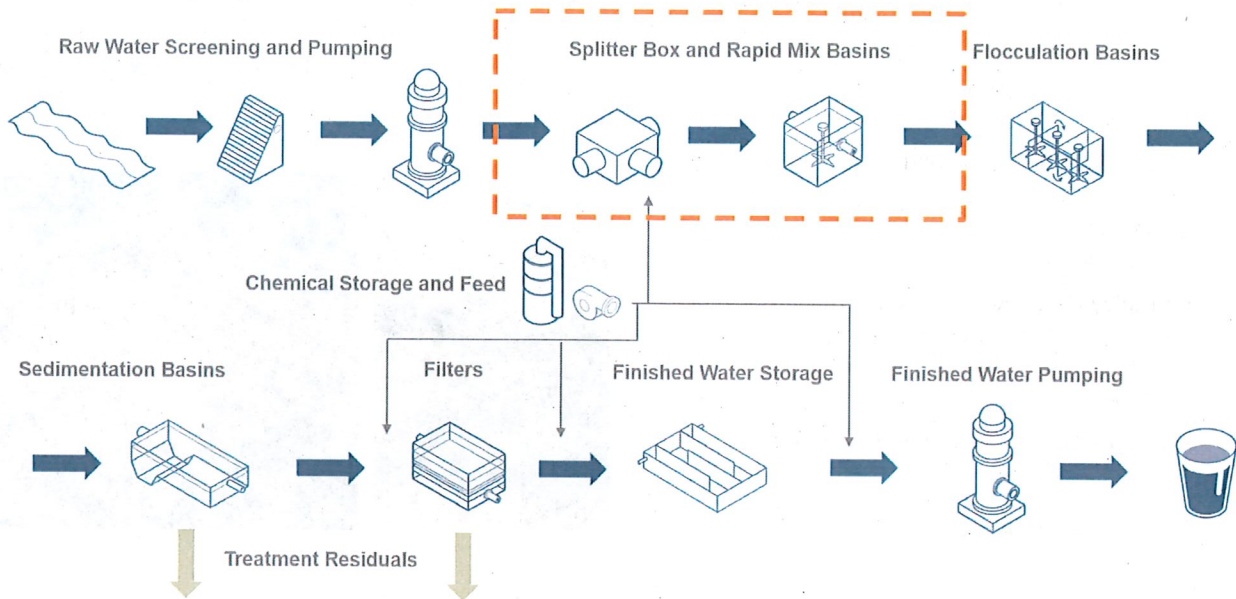
- Mills River Intake and Pump Station
 - **Air burst equipment to be replaced**
 - Will allow leaves and debris to more effectively be cleaned from intake screens
- French Broad Intake and Pump Station
 - N/A
- North Fork Reservoir and Transmission Main
 - **Aging transmission main to be inspected and assessed**
 - Remaining service life and needed repairs will be confirmed
- Bradley Creek Reservoir and Transmission Main
 - **Aging transmission main to be inspected and assessed**
 - Remaining service life and needed repairs will be confirmed

Raw Water Screening and Pumping



Water Treatment Facility Master Plan

Process Overview



Water Treatment Facility Master Plan

Splitter Box and Rapid Mix Basins

- Splitter Box
 - Receives flow from all raw water sources
 - Distributes it to the east and west process trains
 - Raw water treatment chemicals added here
- Rapid Mix Basins (East and West)
 - Equipped with vertical mixers which are not in service

Splitter Box and Rapid Mix Basins



Water Treatment Facility Master Plan

Splitter Box and Rapid Mix Basins

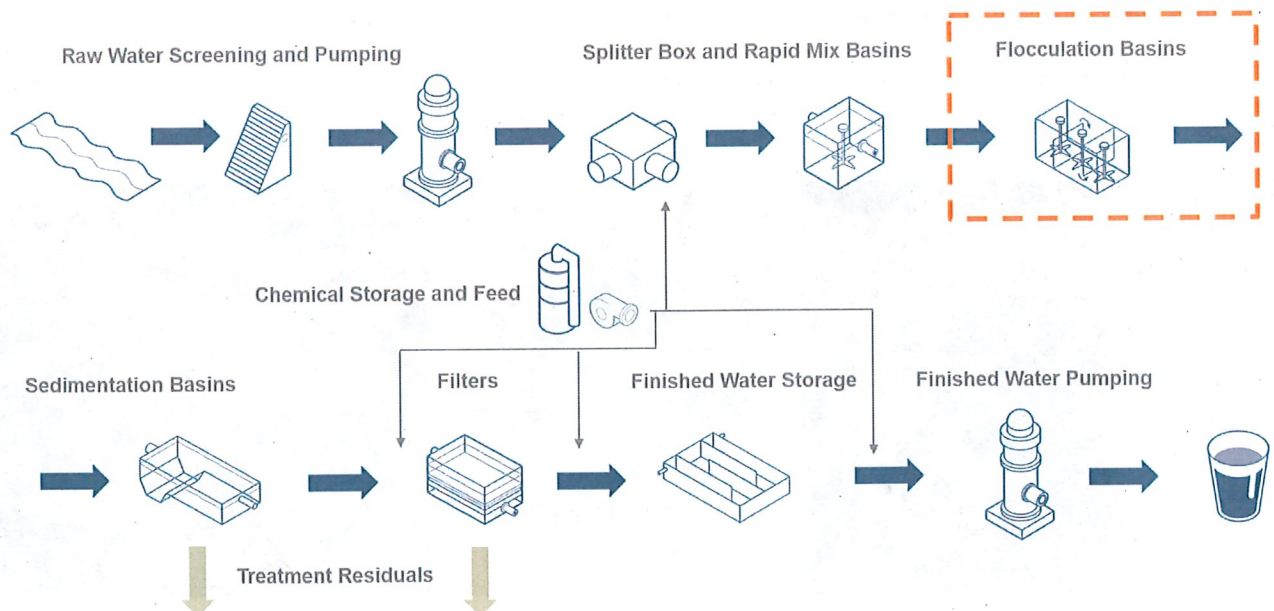
- Splitter Box
 - River water lines to be interconnected in the yard upstream
 - Will provide operational flexibility, allowing either rate setter to be used
 - Minor structural repairs
- Rapid Mix Basins (West)
 - Piping to be extended to west train during future expansion phase
 - Will allow capacity to be increased

Splitter Box and Rapid Mix Basins



Water Treatment Facility Master Plan

Process Overview



Water Treatment Facility Master Plan

Flocculation Basins

- Flocculation Basins
 - Promote growth of “flocs” by gentle mixing
 - Mixing energy is gradually decreased through the process
 - Certain amount of mixing time is required

Flocculation Basins



Water Treatment Facility Master Plan

Flocculation Basins

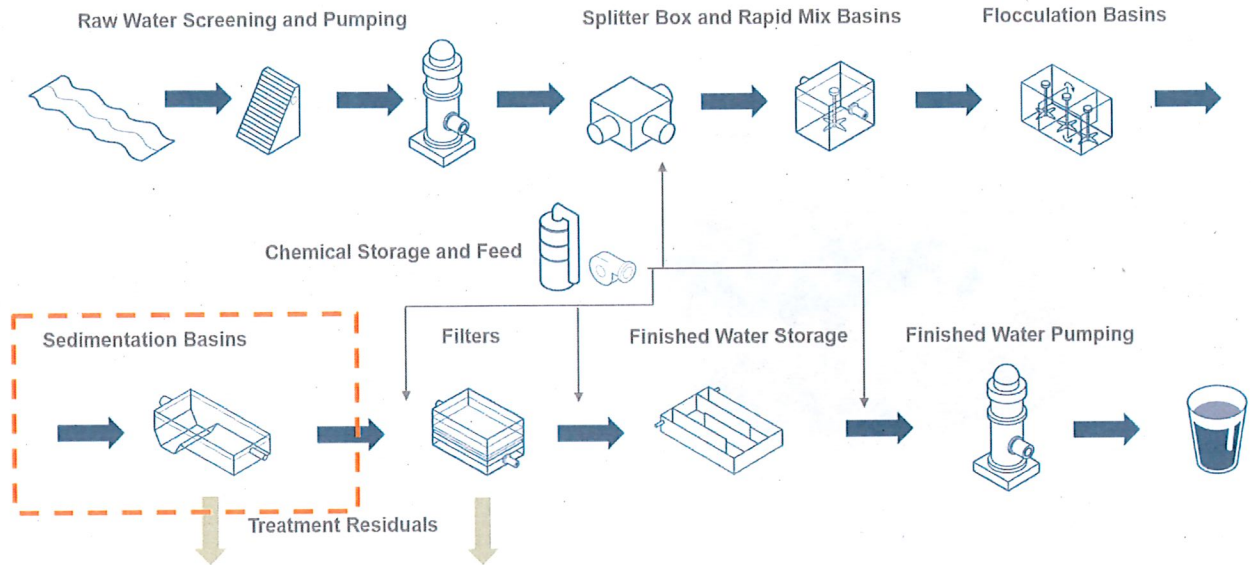
- Flocculation Basins
 - **East basins to be retrofitted during future expansion phase**
 - Will provide additional mixing time and address minor structural issues
 - **New basins to be added to west train during future expansion phase**
 - Will allow capacity to be increased

Flocculation Basins



Water Treatment Facility Master Plan

Process Overview



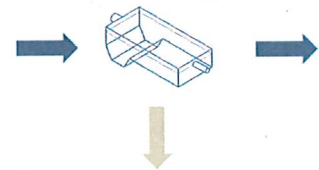
Water Treatment Facility Master Plan

Sedimentation Basins

• Sedimentation Basins

- Provide quiescent conditions for flocs to settle out
- Settled sludge is removed periodically
- Treatment capacity determined by basin geometry and the time the water spends in each basin

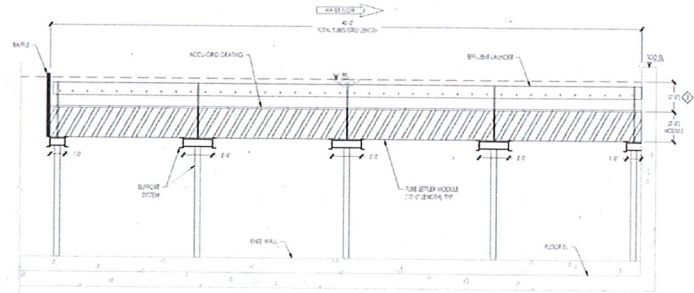
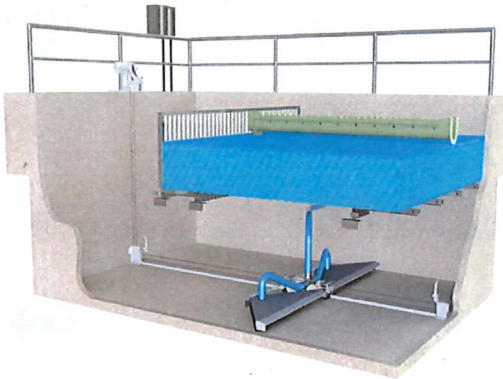
Sedimentation Basins



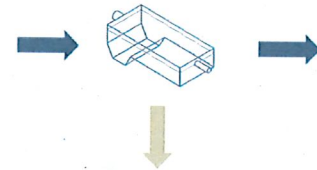
Water Treatment Facility Master Plan

Sedimentation Basins

- Sedimentation Basins
 - All existing basins to be outfitted with tube settlers during future expansion phase
 - Will maximize available treatment capacity by increasing effective settling area
 - New basins to be added to west train during future expansion phase
 - Will allow capacity to be increased



Sedimentation Basins



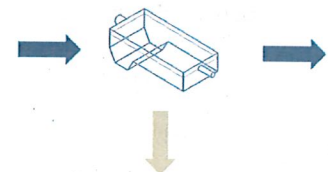
Water Treatment Facility Master Plan

Sedimentation Basins

- Sedimentation Basins
 - Minor structural repairs to existing basins
 - To include leak injection, mortar repair, coating application, etc.
 - Minor process efficiency improvements to existing basins
 - To include ladder replacement, additional portable cranes, valve replacement, etc.

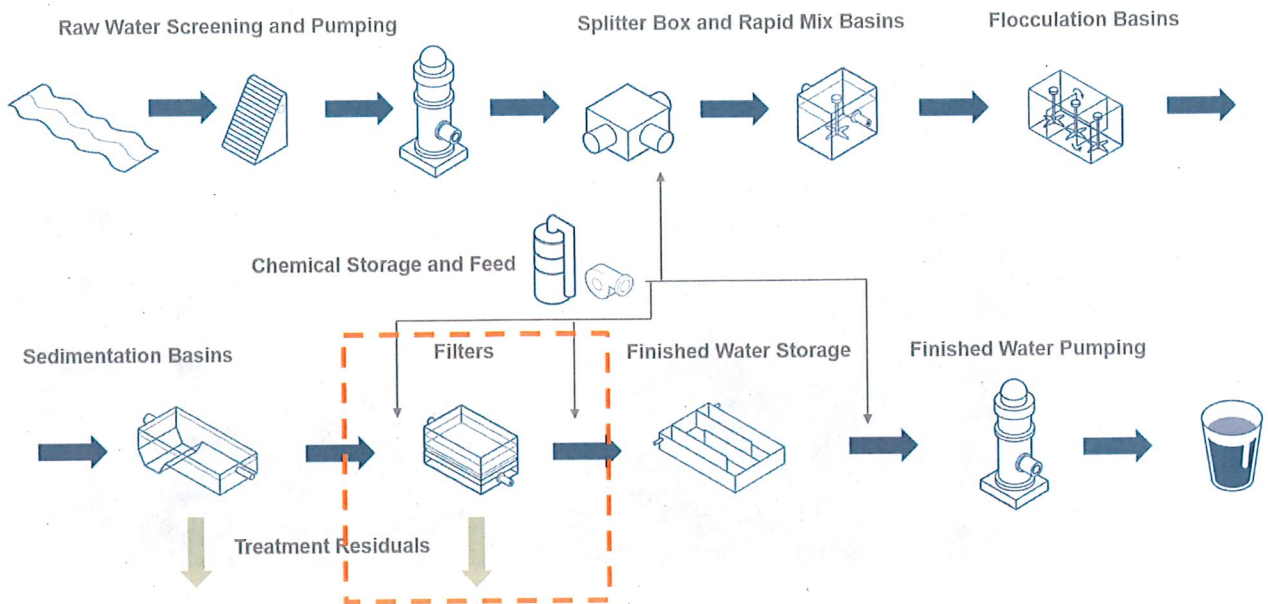


Sedimentation Basins



Water Treatment Facility Master Plan

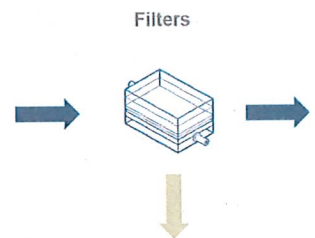
Process Overview



Water Treatment Facility Master Plan

Filters

- **Filters**
 - Remove particles that are carried over from the sedimentation basins
 - Media bed consists of layers of anthracite coal and sand
 - Treatment capacity determined by basin geometry and media profile
 - Chlorine is added for disinfection
 - Filters are cleaned (backwashed) periodically

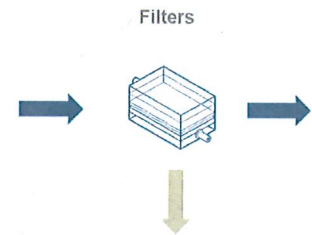


Water Treatment Facility Master Plan

Filters

- Filters

- **5th filter to be placed into service in 2025**
 - Will increase the rated filtration capacity to 15 MGD
- **6th filter to be placed into service in future expansion phase**
 - Will increase the rated filtration capacity to 19.2 MGD
- **7th and 8th filters to be constructed in future expansion phase**
 - Will increase the rated filtration capacity to 25.6 MGD

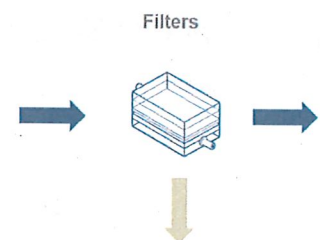


Water Treatment Facility Master Plan

Filters

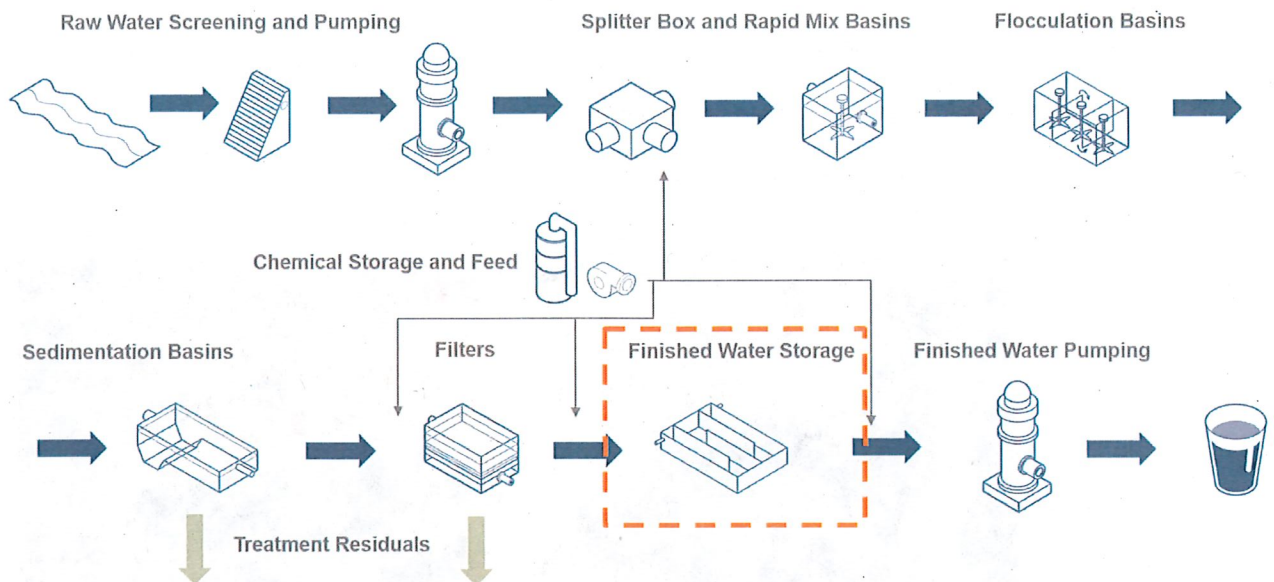
- Filters

- **Additional backwash pump to be furnished in the near term**
 - Will provide redundancy for critical process
- **Backwash air scour blowers to be replaced/relocated in future expansion phase**
 - Will make room for future filter building



Water Treatment Facility Master Plan

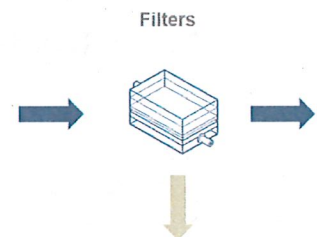
Process Overview



Water Treatment Facility Master Plan

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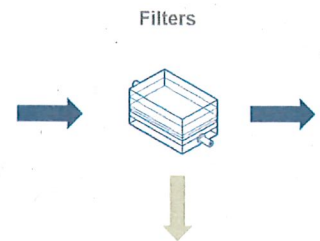


Water Treatment Facility Master Plan

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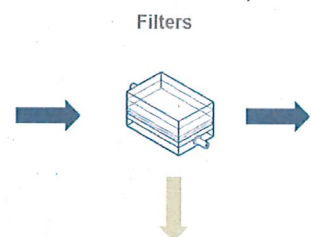


Water Treatment Facility Master Plan

Filters

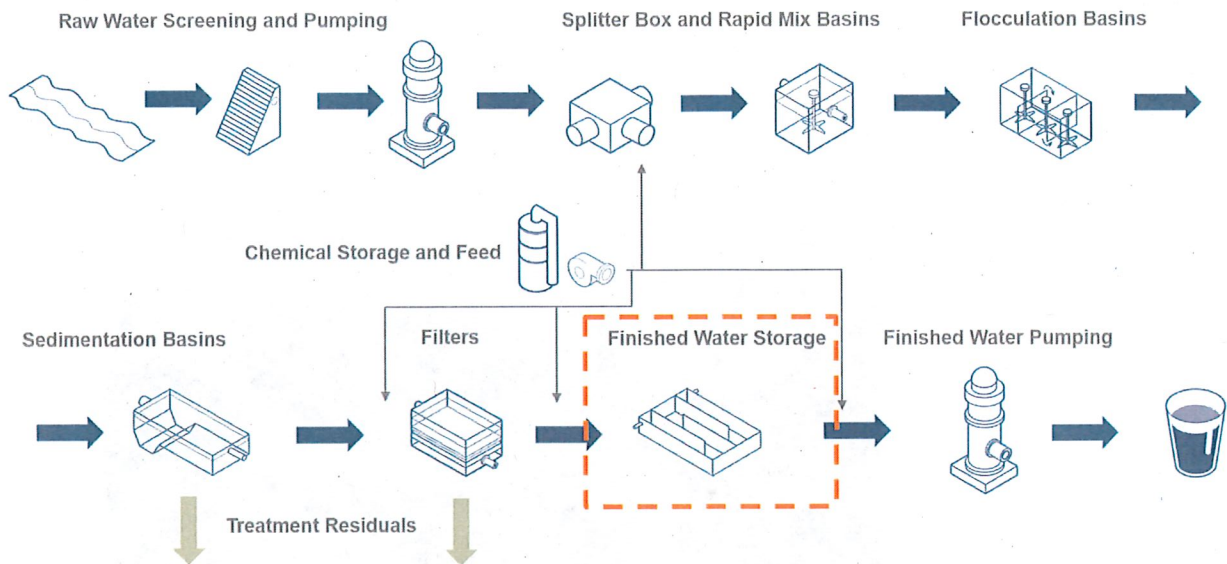
• Filters

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 - Will provide redundancy for critical process
- **Backwash air scour blowers to be replaced/relocated in future expansion phase**
 - Will make room for future filter building



Water Treatment Facility Master Plan

Process Overview



Water Treatment Facility Master Plan

Finished Water Storage

- Finished Water Storage
 - Clearwell provides contact time for chlorine and other finished water chemicals
 - Also provides reserve storage volume upstream of Finished Water Pump Station



Water Treatment Facility Master Plan

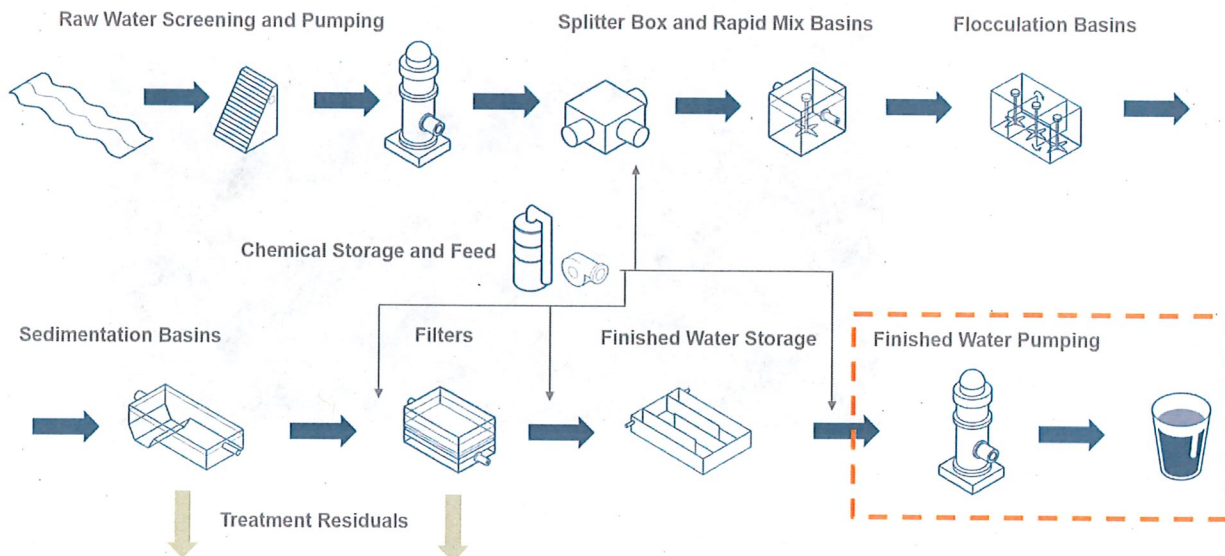
Finished Water Storage

- Finished Water Storage
 - **Additional 2 MG clearwell to be constructed**
 - Will provide redundancy and allow existing clearwell to be isolated for maintenance
 - **Baffle curtains to be installed within existing clearwell following construction of new clearwell**
 - Will improve chemical mixing and contact time within clearwell



Water Treatment Facility Master Plan

Process Overview



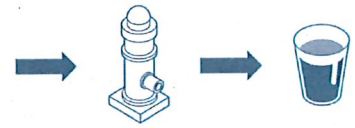
Water Treatment Facility Master Plan

Finished Water Pump Station

- Finished Water Pump Station
 - Recently upgraded (2019)
 - Pumps finished water into the distribution system to customers
 - Equipped with 4 FW pumps – firm capacity 18 MGD
 - Ultimate firm capacity 24 MGD
 - Houses backwash pump as well



Finished Water Pumping



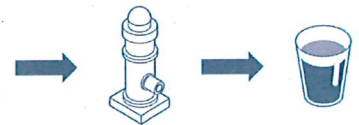
Water Treatment Facility Master Plan

Finished Water Pump Station

- Finished Water Pump Station
 - **FW Pumps No. 1 & No. 2 to be upsized in future expansion phase**
 - Will increase firm pumping capacity to 24 MGD
 - **Ancillary improvements to FWPS**
 - To include access/egress and plumbing improvements
 - **Redundant finished water line**
 - Routed from FWPS to transmission main on Hwy 191



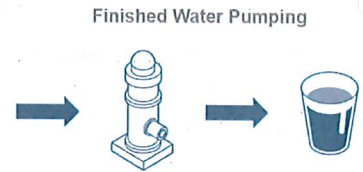
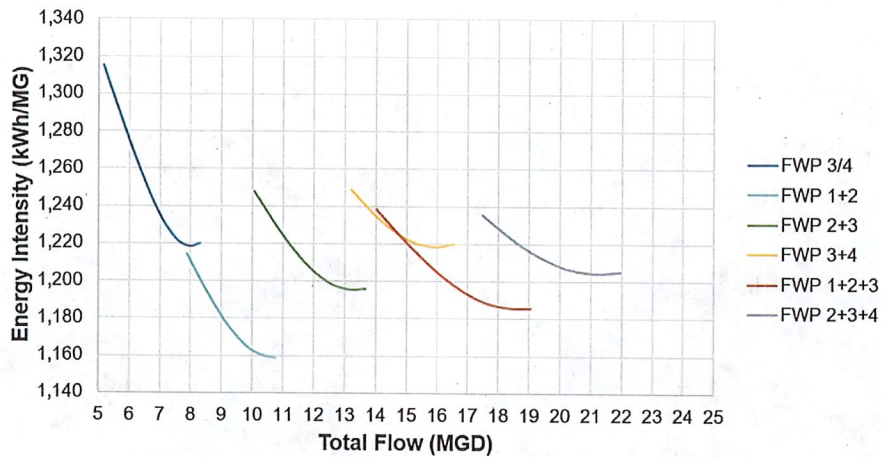
Finished Water Pumping



Water Treatment Facility Master Plan

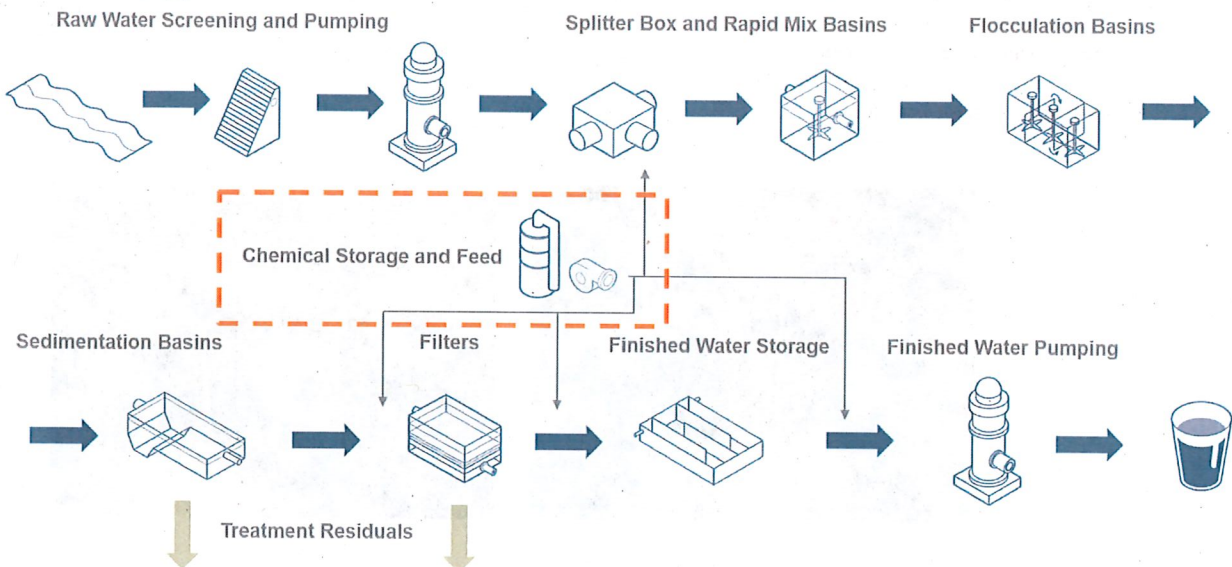
Finished Water Pump Station – Energy Optimization

- No CIPs identified to improve energy efficiency at the WTF
- Hazen included recommendations to operate the FW pumps in the most efficient manner (minimizing kWh per MG pumped)



Water Treatment Facility Master Plan

Process Overview



Water Treatment Facility Master Plan

Chemical Storage and Feed



Chemical Storage and Feed Facilities

- Polyaluminum chloride
 - Coagulant
 - Fed at splitter box
- Sodium hydroxide
 - pH adjustment
 - Fed at splitter box and upstream of clearwell
- Sodium bicarbonate
 - Alkalinity adjustment/corrosion control optimization
 - Fed upstream of FWPS
- Gaseous chlorine
 - Disinfection
 - Fed upstream of each filter and upstream of FWPS
- Fluoride
 - Dental health
 - Fed upstream of clearwell
- Orthophosphate
 - Corrosion inhibitor
 - Fed upstream of clearwell



Water Treatment Facility Master Plan

Chemical Storage and Feed



Chemical Storage and Feed Facilities

- Sodium bicarbonate
 - **Additional silo to be constructed**
 - Will provide redundancy for critical process
 - **Existing feed equipment to be replaced**
 - At end of useful life



Water Treatment Facility Master Plan

Chemical Storage and Feed



- Gaseous chlorine
 - Unit prices have increased substantially in recent years, and potential supply chain interruptions have been noted
 - **New Chemical Building to be constructed during future expansion phase**
 - Will house temporary sodium hypochlorite (bleach) storage and feed facilities
 - Could also house future bulk orthophosphate tank

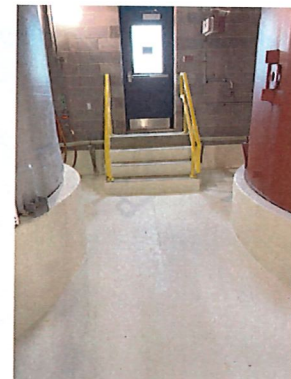


Water Treatment Facility Master Plan

Chemical Storage and Feed

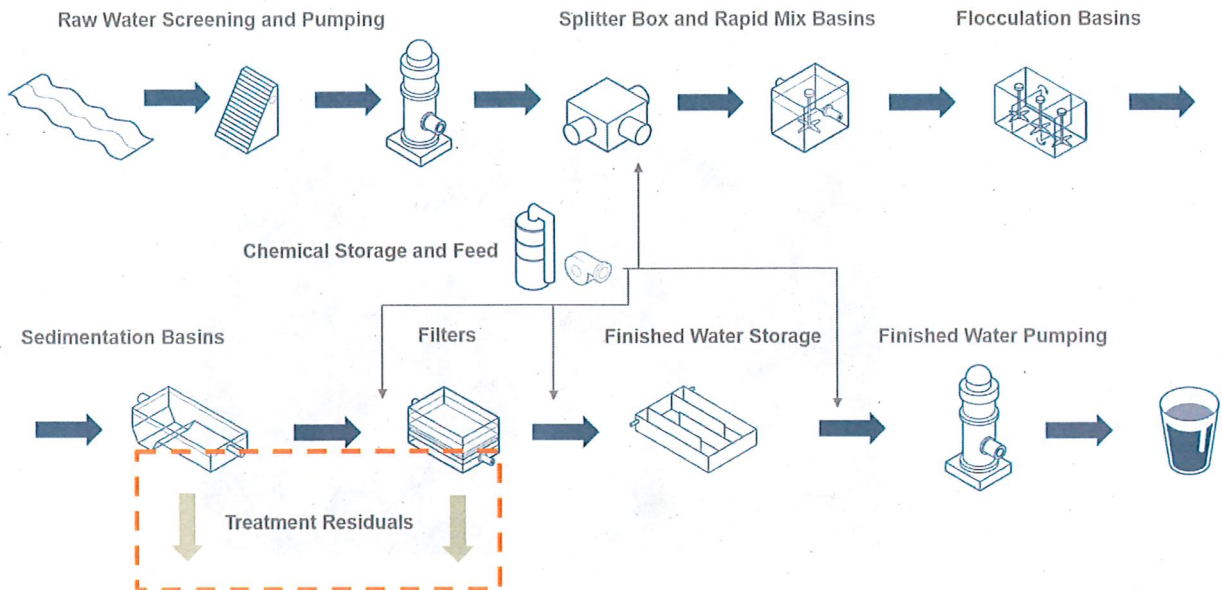


- Miscellaneous improvements
 - **Spare orthophosphate metering pump to be installed**
 - Will improve reliability/redundancy for critical process
 - **Structural improvements to existing bulk chemical building**
 - To separate acids and bases and mitigate risk of potential reaction
 - **Duty/standby chemical transfer pumps for coagulant and caustic**
 - Will improve reliability



Water Treatment Facility Master Plan

Process Overview



Water Treatment Facility Master Plan

Sludge Transfer Pump Station

- Sludge Transfer Pump Station
 - Receives all process drain flows
 - Pumps blended residuals to thickening and dewatering processes
 - Equipped with a single pump that is approaching the end of its useful life



Water Treatment Facility Master Plan

Sludge Transfer Pump Station

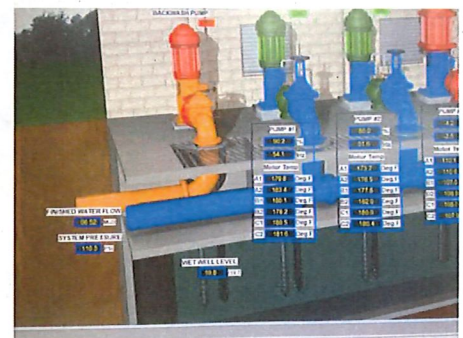
- Sludge Transfer Pump Station
 - Existing pump to be replaced
 - Second pump to be installed
 - Will provide redundancy for critical process



Water Treatment Facility Master Plan

Additional Facilities/Improvements

- Miscellaneous concrete/structural repairs
- New maintenance facility
- Miscellaneous control system improvements



Water Treatment Facility Master Plan

Buildout Capacity

Unit Process	Ultimate Operational Capacity
Raw Water Sources	31.5 MGD
Splitter Box/Rapid Mix/Flocculation/Sedimentation Basins	26.4 MGD
Filters	25.6 MGD
Finished Water Storage	24+ MGD
Chemical Storage and Feed Facilities	24+ MGD
Finished Water Pump Station	24+ MGD

Buildout capacity of the Water Treatment Facility is 24 MGD

Water Treatment Facility Master Plan

CIP Summary: 2020 - 2025

Process Area	Improvement	Driver	Timing	Estimated Cost
Raw Water Facilities	Replacement of Mills River RWPS air burst equipment	Replacement	2020 - 2025	\$539,000
Filters	Addition of 5th filter	Capacity Improvements	2020 - 2025	\$2,707,000
Filters	Addition of standby backwash pump	Risk Reduction	2020 - 2025	\$1,691,000
Sludge Transfer Pump Station	Pump upgrades	Replacement / Risk Reduction	2020 - 2025	\$896,000

Total (2023): \$5,833,000

Water Treatment Facility Master Plan

CIP Summary: 2025 - 2030

Process Area	Improvement	Driver	Timing	Estimated Cost
Raw Water Facilities	Inspection/assessment of aging raw water transmission mains from mountain reservoirs	Risk Reduction	2025 - 2030	\$1,278,000
Splitter Box / Rapid Mix Basins	Influent yard piping modifications	Process Efficiency	2025 - 2030	\$191,000
Flocculation / Sedimentation Basins	Retrofit of existing basins and addition of tube settlers	Capacity Improvements / Process Efficiency / Rehabilitation / Replacement	2025 - 2030	\$8,928,000
Filters	Addition of 6th filter	Capacity Improvements	2025 - 2030	\$2,707,000
Clearwells	Addition of 2nd clearwell	Risk Reduction	2025 - 2030	\$7,979,000
Clearwells	Installation of baffle curtains in existing clearwell	Process Efficiency	2025 - 2030	\$364,000

(continued)

Water Treatment Facility Master Plan

CIP Summary: 2025 - 2030

Process Area	Improvement	Driver	Timing	Estimated Cost
Finished Water Pump Station	Miscellaneous structural/plumbing improvements	Risk Reduction	2025 - 2030	\$106,000
Chemical Facilities	Construction of new chemical building, installation of 2nd sodium bicarbonate silo, and replacement of existing sodium bicarbonate feed equipment	Replacement / Risk Reduction / Rehabilitation	2025 - 2030	\$5,315,000
Chemical Facilities	Miscellaneous structural/mechanical improvements	Risk Reduction	2025 - 2030	\$251,000
Miscellaneous	Maintenance Facility	Replacement	2025 - 2030	\$1,944,000
Miscellaneous	Control system improvements	Process Efficiency	2025 - 2030	\$200,000

Total (2023): \$29,263,000

Water Treatment Facility Master Plan

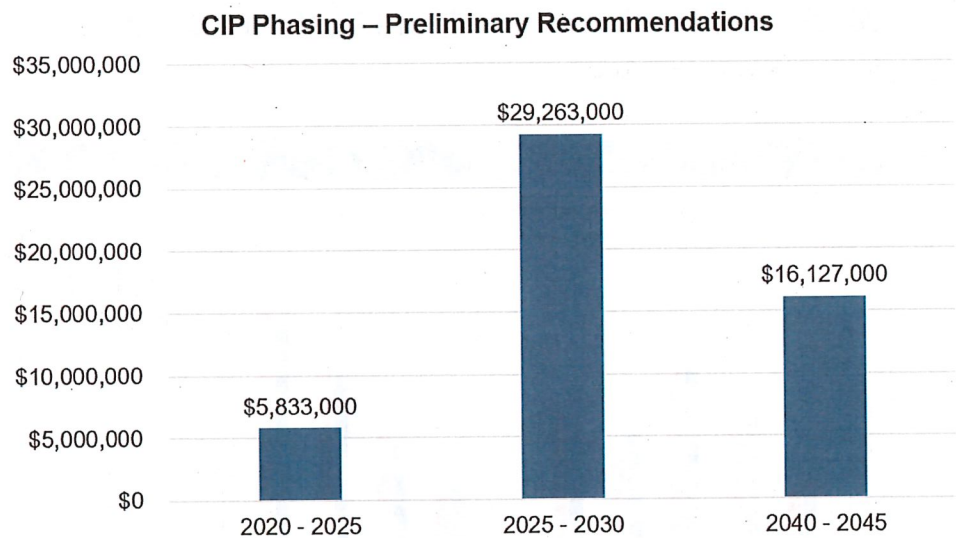
CIP Summary: 2040 - 2045

Process Area	Improvement	Driver	Timing	Estimated Cost
Splitter Box / Rapid Mix Basins	Yard piping to future basins	Capacity Improvements	2040 - 2045	\$554,000
Flocculation / Sedimentation Basins	Addition of future west basins	Capacity Improvements	2040 - 2045	\$4,793,000
Filters	Addition of 7th - 8th filters	Capacity Improvements	2040 - 2045	\$5,928,000
Filters	Relocation/replacement of air scour blowers	Capacity Improvements / Replacement	2040 - 2045	\$991,000
Finished Water Pump Station	Upsizing FWP No. 1/2	Capacity Improvements	2040 - 2045	\$2,154,000

Total (2023): \$16,127,000

Water Treatment Facility Master Plan

CIP Summary



Water Distribution System

Hendersonville's Hydraulic Model

If you need a subhead, put it here

Model first built in 2015 with support from Fire Departments

Pipe network built from GIS water main info

Existing water demand data from customer billing records

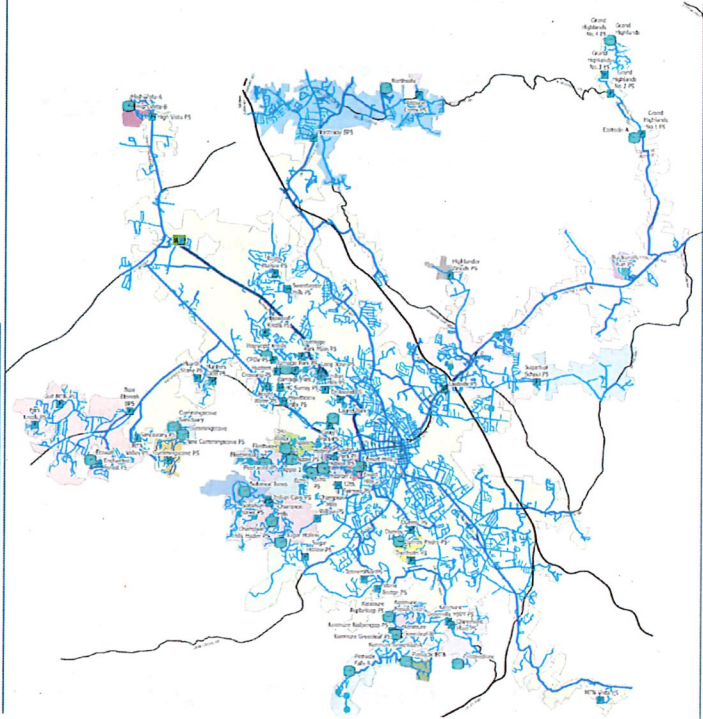
Elevations from digital topo data

Calculates flows and pressures

Predicts pump and tank performance

<input checked="" type="checkbox"/> Modeling		
Length (ft)	4674.2551352	
Diameter (in)	18.0000000	
Roughness	79.0000000	
Minor Loss	0.0000000	
Totalizer	No	
Check Valve	No	
<input checked="" type="checkbox"/> Information		
Year of Installation	1922	
Year of Retirement	9999	
Zone	Main Zone	
Material	Cast Iron	

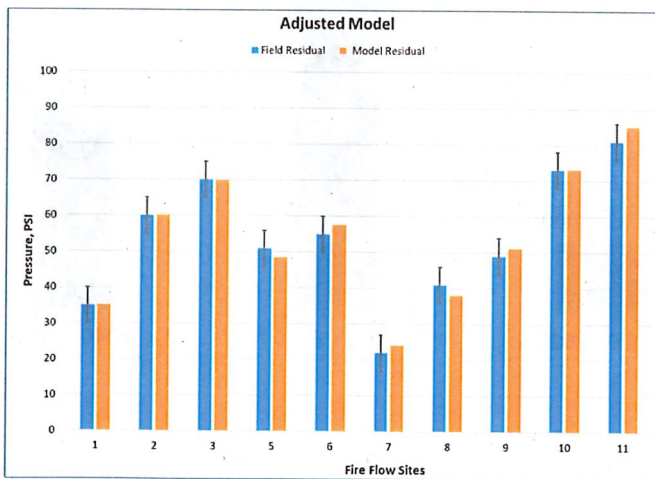
<input checked="" type="checkbox"/> Modeling		
2022 RES (mgd)	0.0000000	
Pattern 1		
2022 LARGE (mgd)	0.1271200	
Pattern 2	K3/BERLY_CLARK11326_DURU	
2022 NRV (mgd)	0.0000000	
Pattern 3		
Flushers/future growth for old run	0.0000000	
Pattern 4		
2025DEMAND (mgd)	0.0000000	
Pattern 5		
2030DEMAND (mgd)	0.0000000	
Pattern 6		
2035DEMAND (mgd)	0.0000000	
Pattern 7		
2040DEMAND (mgd)	0.0000000	
Pattern 8		
2045DEMAND (mgd)	0.0000000	
Pattern 9		
2050DEMAND (mgd)	0.0000000	
Pattern 10		



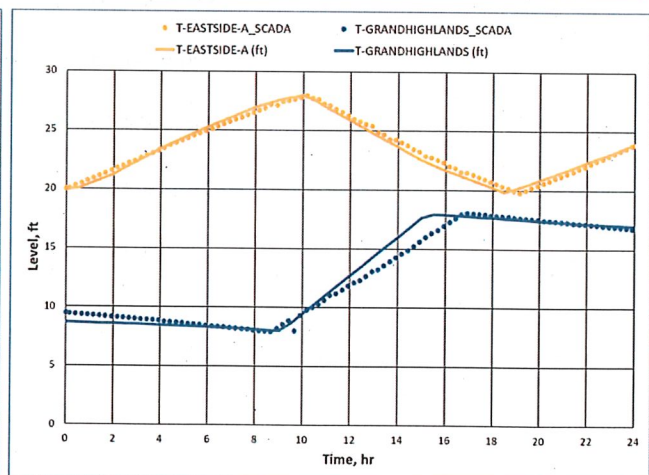
Model Calibration Using Field Test and SCADA

If you need a subhead, put it here

Fire Flow Test

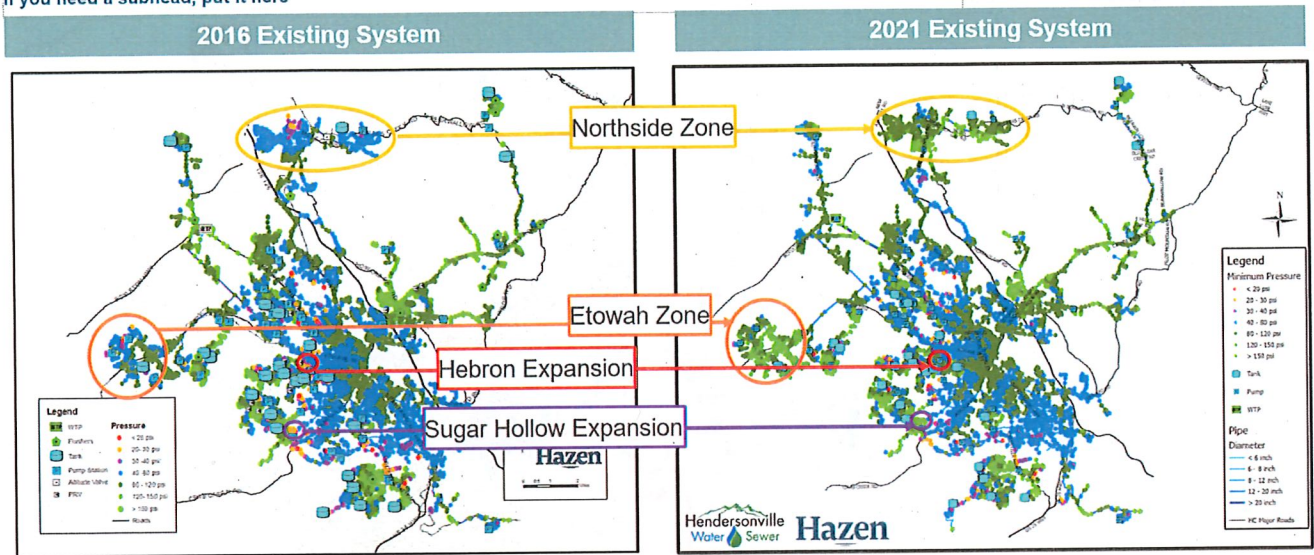


SCADA Match



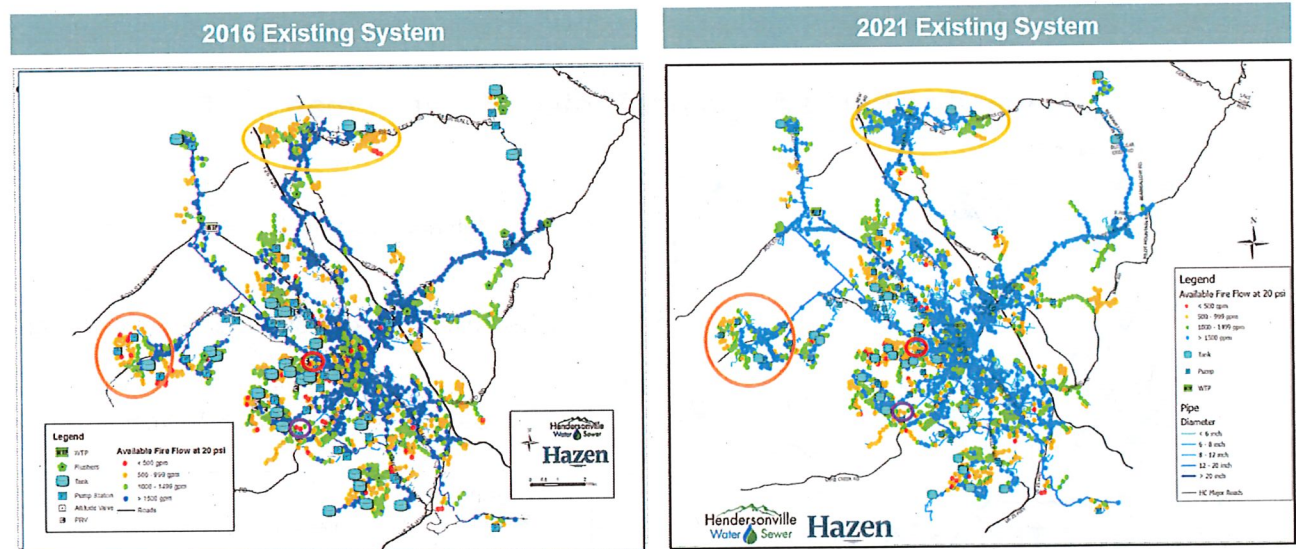
System Peak Hour Pressures

If you need a subhead, put it here



Available Fire Flow

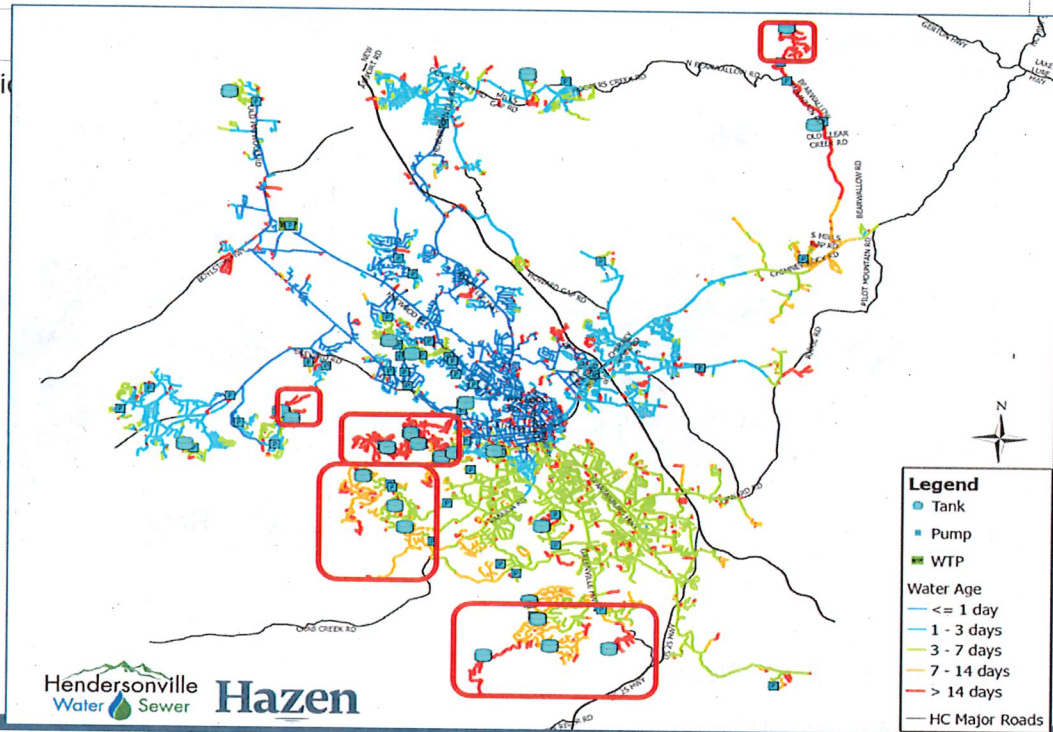
If you need a subhead, put it here



Water Age Map and Unidirectional Flushing Plan

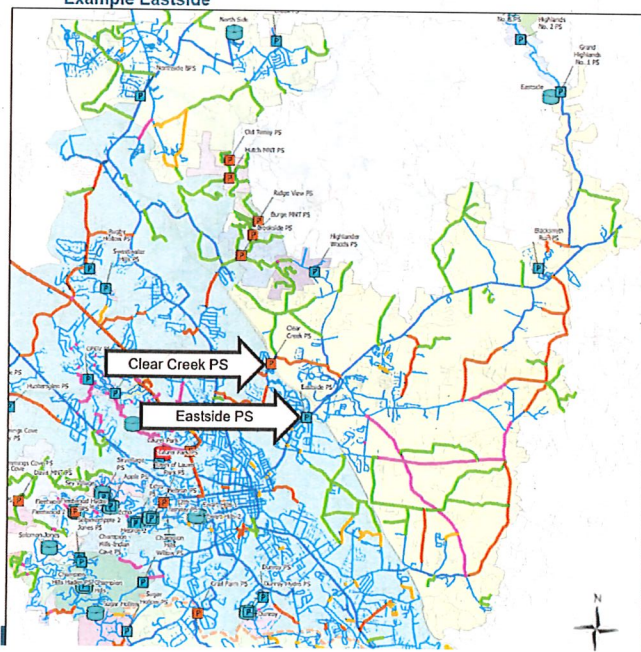
If you need a subhead, put it here

age photo/graphic



Pump Capacity Checked Against Project Water Demand in Each Zone

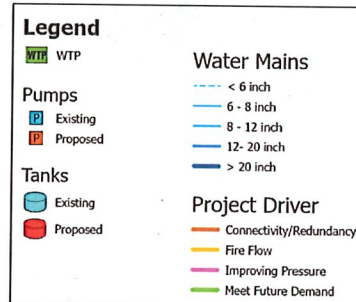
Example Eastside



2050 demand in Eastside zone is 2.84 mgd

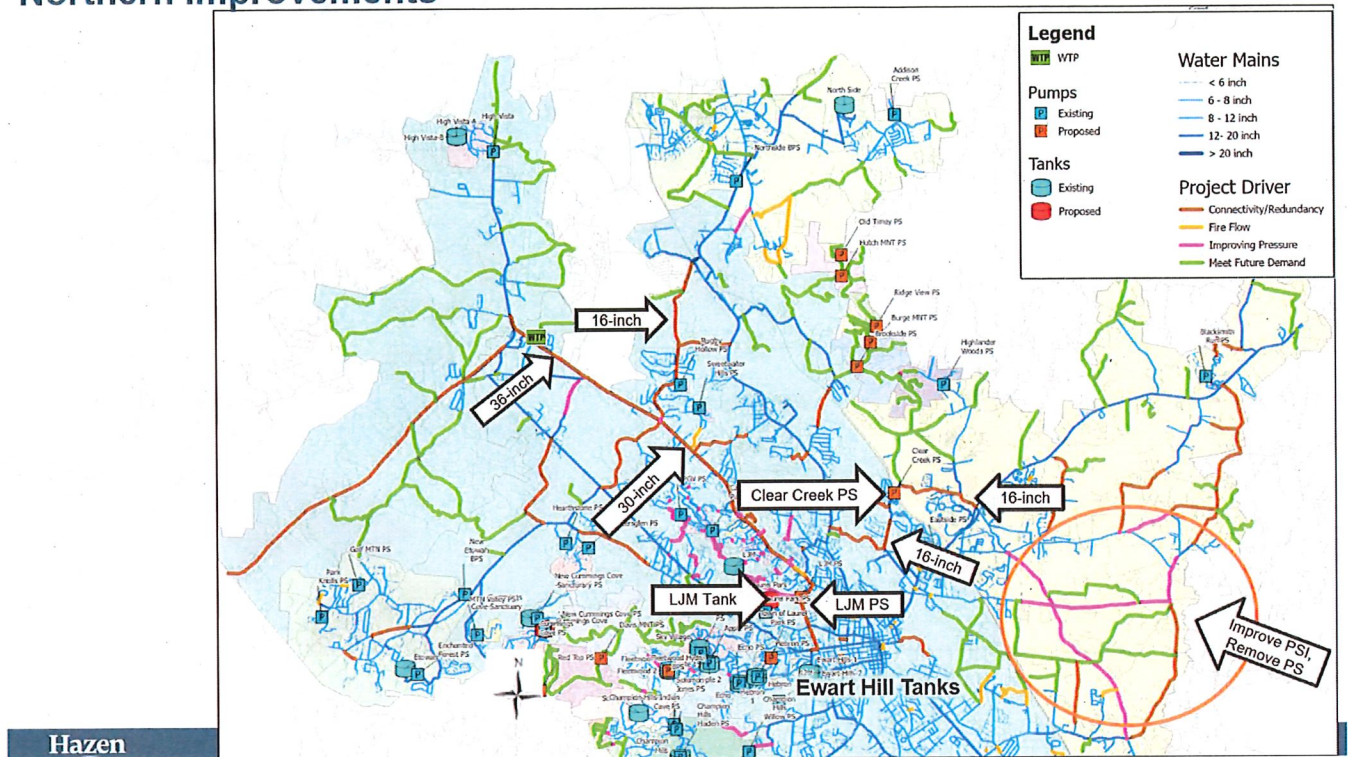
Existing firm capacity at Eastside Pump Station is 2 mgd

Proposed Clear Creek Station firm capacity of 2 mgd



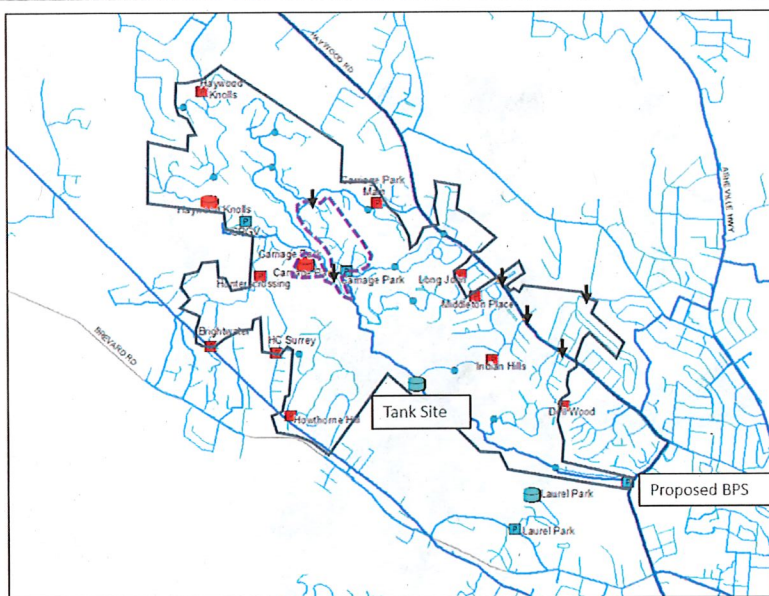
63

Northern Improvements



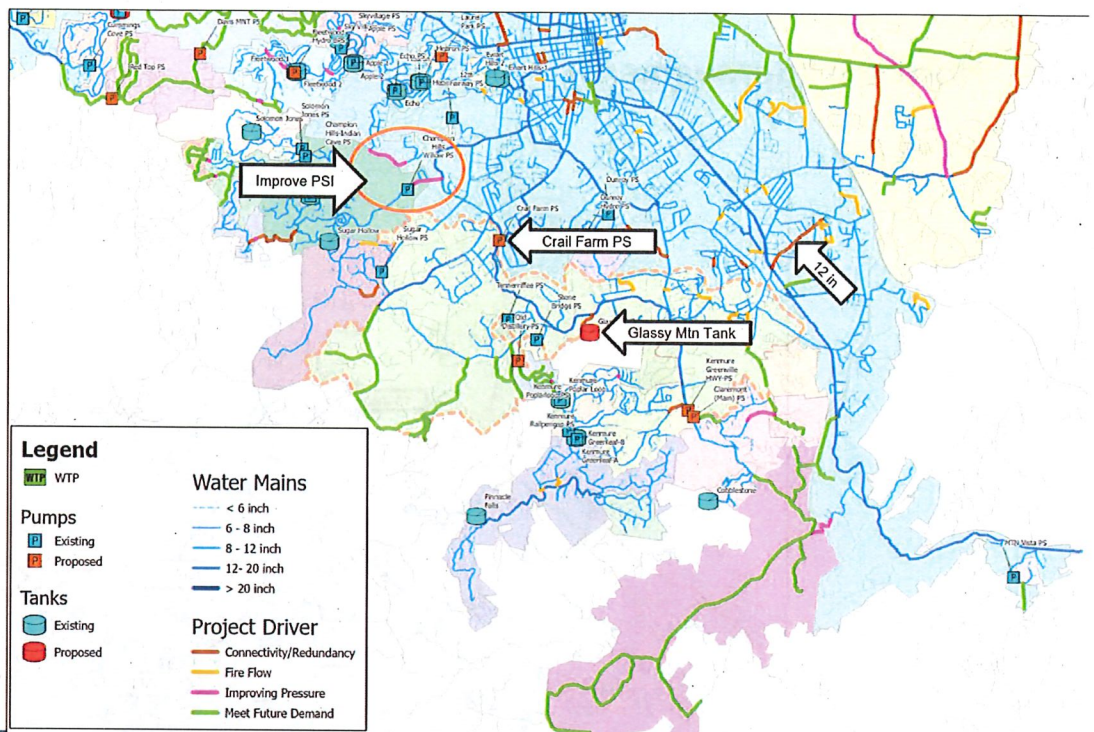
Long John Mountain Improvements

If you need a subhead, put it here



- 1 New PS
- 1 New Tank
- Series of Pressure Reducing Valves
- Abandon 2 Tanks (Red)
- Abandon 11 Pump Stations (Red)
- Expanded zone for improve fire
- 6 check valves for fire flow assistance

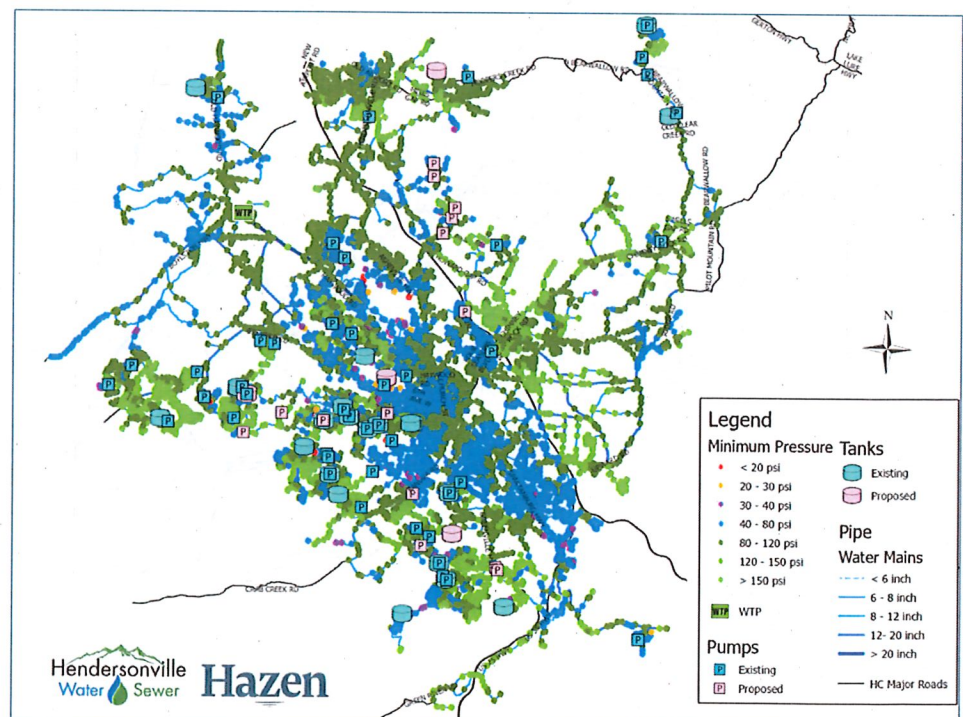
Southern Improvements



2050 Peak Hour Pressures

If you need a subhead, put it here

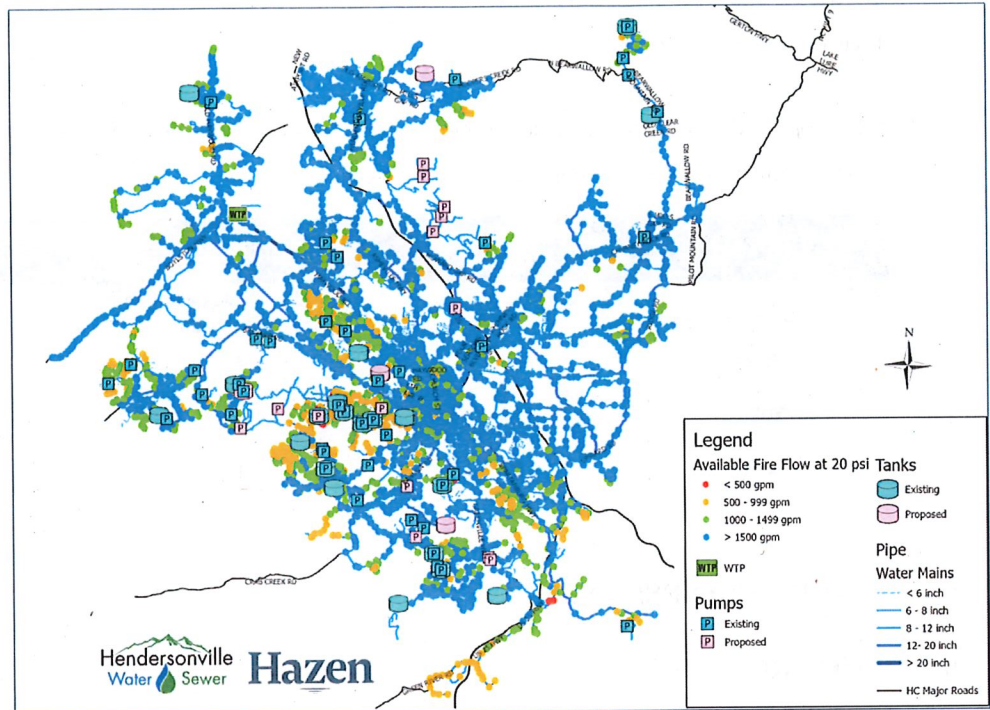
Caption for the image or graphic.
Should not need bullets because the image/graphic speaks for itself



2050 Available Fire Flow at 20 psi

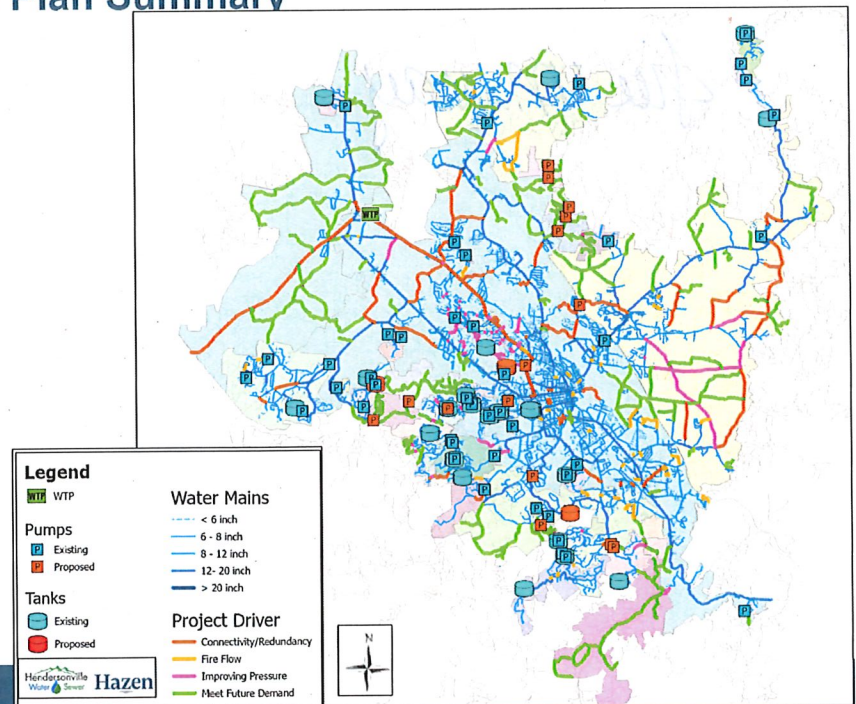
If you need a subhead, put it here

Caption for the image or graphic.
Should not need bullets because the image/graphic speaks for itself



Water Distribution Master Plan Summary

- 13 new pump stations
- 2 new storage tanks
- 13 new pressure zones
- Abandon 11 pump stations
- Abandon 2 storage tanks
- 200 miles of new pipe



Distribution System CIP

If you need a subhead, put it here

City Projects driven by connectivity/ redundancy/ improving pressure and significant fire flow improvements

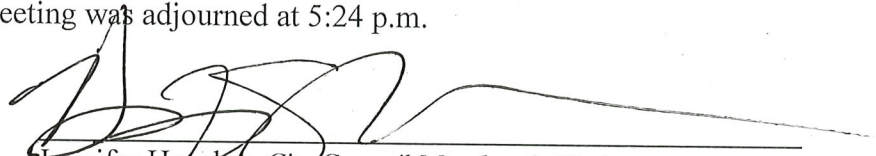
Projects driven by future demand not included here

CIP Year	Demand Driver (mgd)	Projects	Tanks / PS	Estimated Cost (\$Million)
2025	9.5	Top 25 projects including Long John Mountain	1/1	120.0 (17.5 LJM)
2030	11.3	4	2/3	48.3
2035	12.0	6	1/0	62.3
2040	12.8	1	0/1	6.8

5. OTHER BUSINESS - None

6. ADJOURNMENT

There being no further business, the meeting was adjourned at 5:24 p.m.


Jennifer Hensley, City Council Member & Chairman

ATTEST:


Jill Murray, City Clerk