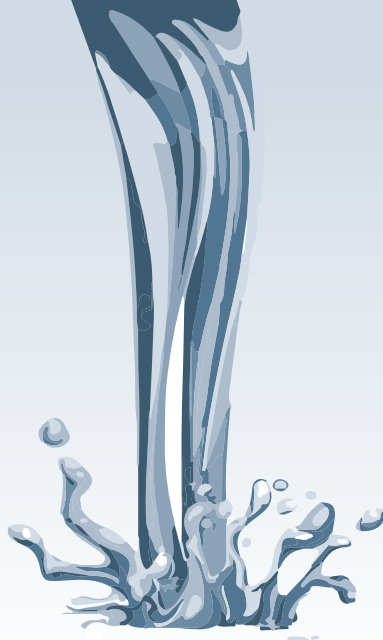




# City of Hendersonville Water Distribution System Master Plan Report FINAL



City of Hendersonville, North Carolina  
June 2026



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# **Water Distribution System Master Plan Report FINAL**

Hazen Project No. 31238-012  
June 2026



# Water System Master Plan Report



## Hazen

804 Green Valley Road  
Suite 206  
Greensboro, NC 27408  
Hazen 31238-012  
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## Executive Summary

The City of Hendersonville authorized Hazen to develop a comprehensive Water System Master Plan to identify capital improvements to address existing system deficiencies, maintain regulatory compliance and support projected growth through 2050 planning horizon. The project included developing a unidirectional flushing (UDF) plan in Laurel Park. This report summarizes the work. This effort builds upon previous system studies completed in 2015 and 2017 and incorporates updating hydraulic modeling, field testing, demand forecasting, and coordination with the City staff and regional planning partners.

Hendersonville's water system currently serves approximately 72,000 people and supplied an average of 7.51 million gallons per day (MGD) in 2021, with a maximum day demand of 9.51 MGD.

The water system master plan includes expanding the service area into both the urban area and the rural transition area by 2050. The service area was defined through meetings with city staff and the county planning department. Population estimates for the service area were based on projections developed by the French Broad River Metropolitan Planning Organization for traffic analysis zones (TAZs) as well as city staff knowledge for expected growth. These projections show the water system will supply a population of 124,000 people by 2045, as well as an employment population of 51,000. Figure 0-1 shows the historical and estimated population of the existing and proposed Service Areas between the years 2010 and 2045.

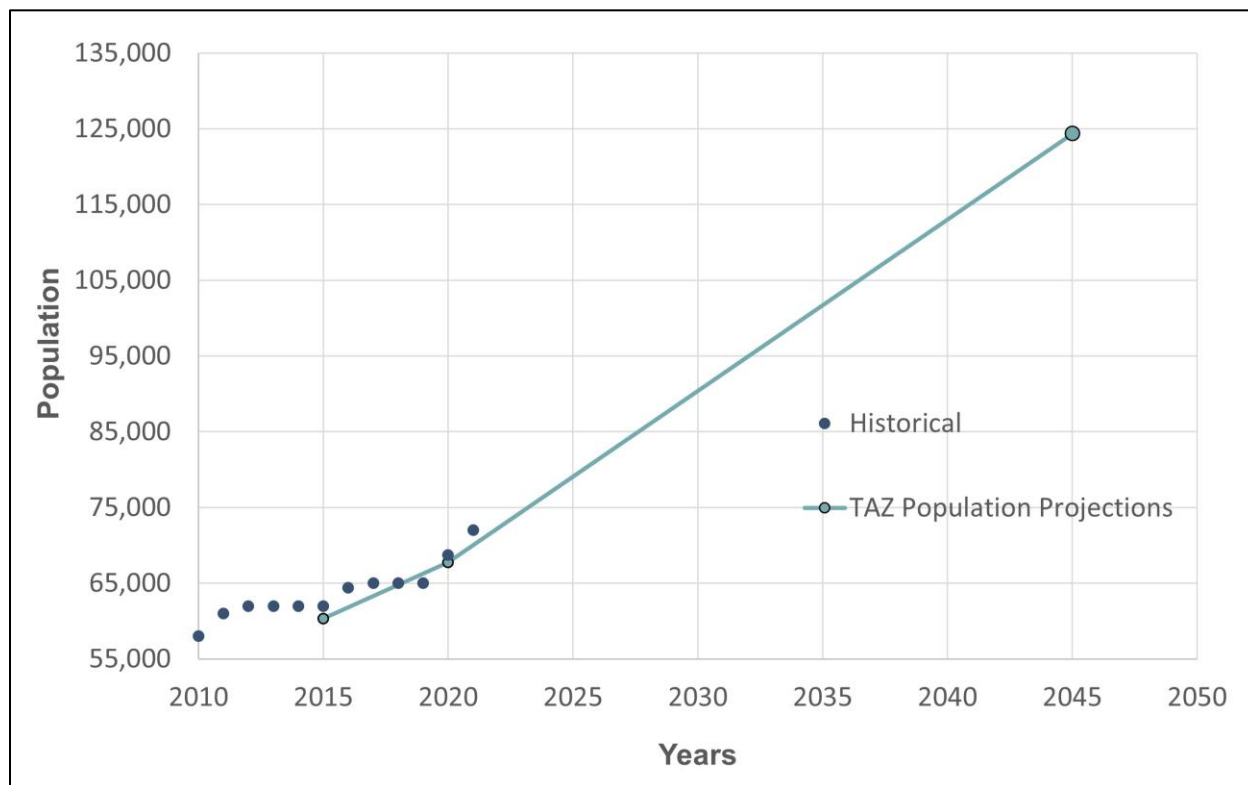
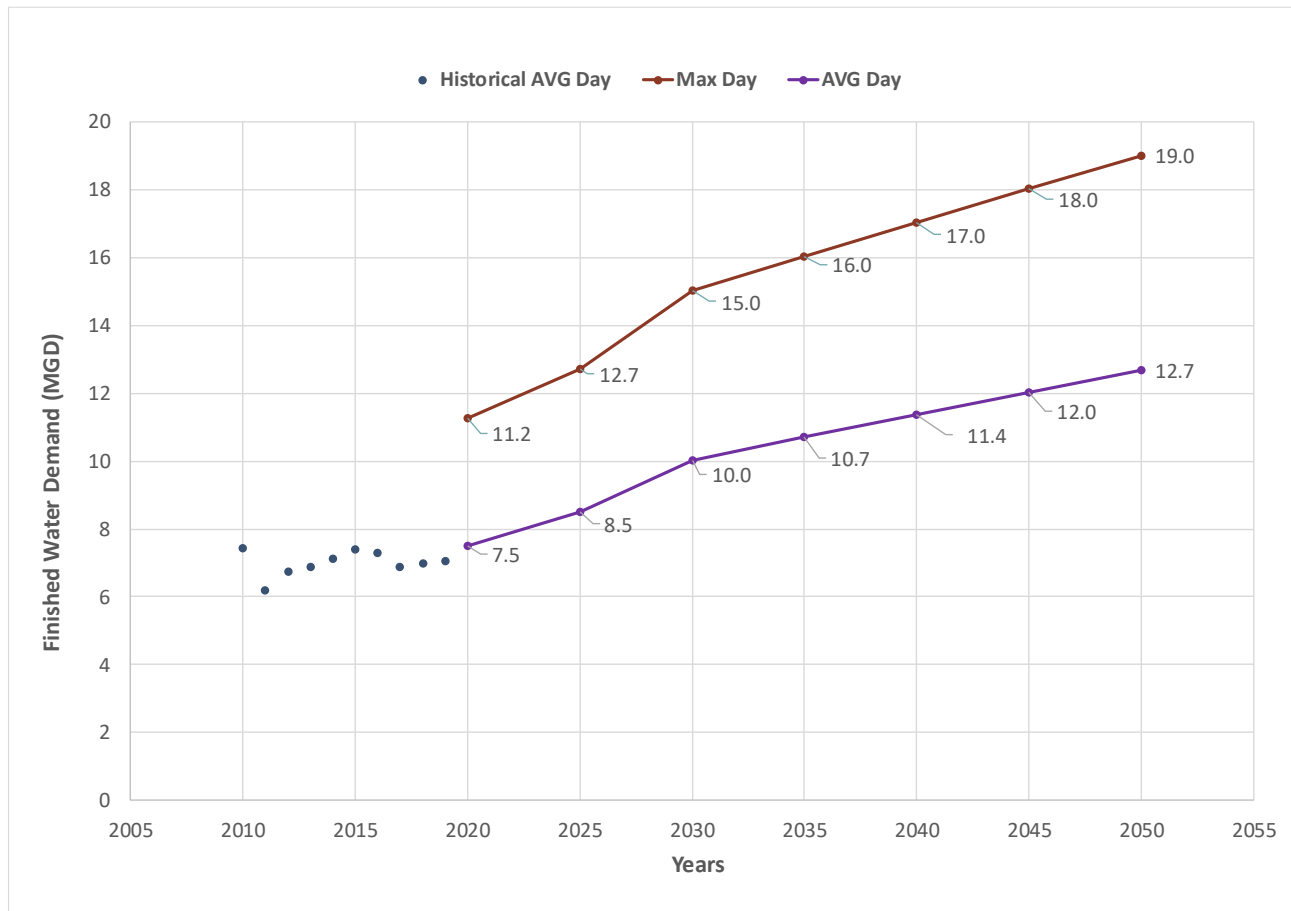


Figure 0-1: Population in Existing and Future Service Areas through 2050 Planning Horizon

Future water requirements were calculated based on projected population growth and estimated water usage per capita. The average usage per capita was adjusted to include the non-revenue water of 26.5%. The adjusted residential and employment unit demands were 57.4 gallons per capita per day (gpcd) and 88.4 gallons per employee per day (gped), respectively. Additionally, estimates for larger customers and wholesale needs were provided by city staff. Future water demand is projected to increase significantly, shown in Figure 0-2, reaching by 2050:

- 12.7 MGD average day demand (ADD)
- 19.0 MGD maximum day demand (MDD)

The historical peak factor (maximum day demand divided by average day demand) of 1.5 was used for projecting future MDD. These increases are driven by regional growth, planned developments and expansion of the City's service area.



**Figure 0-2: Potable Water Demand for the City through the 2050 Planning Horizon**

The master planning process identified several issues affecting system performance and long-term reliability. These include localized areas that experience pressure below desired service levels during peak demand conditions, fire flow limitations, water age, and storage and pumping hydraulic imbalances.

To address current deficiencies and accommodate future growth in the potable water distribution system, this master plan recommends a comprehensive set of capital improvements. A Water Treatment Facility (WTF) Master Plan is concurrently being performed with recommendations for treatment facility upgrades.

The current firm finished water pumping capacity at the WTF is 18 MGD. By 2040 it is recommended that one of the 5-MGD pumps be replaced by a new 8-MGD pump, and a 36-inch parallel water line be installed from the WTF to Haywood Road. By 2045 it is recommended that the other 5-MGD pump be replaced with an 8-MGD pump. These costs will be included in the Water Treatment Facility Master Plan.

To accommodate the projected growth, the following major recommendations in the distribution system were made:

- Thirteen (13) new pump stations. Fleetwood Booster Pump Station (BPS) is now constructed and is not included in cost estimates in this report.
- Thirteen (13) new pressure zones to support growth.
  - One zone includes Long John Mountain Pressure Zone to serve customers along NC 191 and US 64. This new pressure zone will include a new pump station (one of the 13) and storage tank, along with a series of pressure-reducing valves and two existing pumps stations. This new zone will enable the city to remove 11 booster pump stations and two tanks.
  - Another is a new Southside Pressure Zone to improve pressure in the south side of the system. This zone would be supplied by a proposed pump station on the existing 12-inch pipe on Crail Farm Road.
- New Crail Farm BPS, designed for 2.0 MGD with a total dynamic head (TDH) of 187 feet for a discharge hydraulic grade of approximately 2464 feet.
- Two new storage tanks (Long John Mountain and Glassy Mountain) and two replacements storage tanks to support pressures and fire flow (Cummings Cove and Laurel Park Hendersonville). The Glass Mountain tank recommended nominal volume is 0.5 million gallons (MG) with an overflow elevation of 2,460 feet.
- Merge Trenhom and Dunroy pressure zones by installing a 6-inch pipe from Kalimar Heights to Dunroy Drive and abandoning Trenhom PS.
- Replacement of the 24-inch transmission main on Haywood Rd outside of the WTF with a 36-inch that transitions to a 30-inch transmission main which will be completed with the North Carolina Department of Transportation (DOT) improvements. These water lines improve headloss and increase the WTF finished water pumping capacity.

The DOT project is critical to the completion of the second phase of the replacement of the 24-inch transmission main with a 30-inch pipe from Stoney Mountain Road to the 16-inch connections to the Ewart Hills Reservoir. This improvement is needed when the maximum day

demand nears 12 MGD, otherwise, pumping capacity at the WTF will be limited by the headloss through the 24-inch water line.

- Clear Creek BPS is proposed on Clear Creek Road near I-26 to meet capacity within the Eastside Zone. This is recommended when Eastside pressure zone maximum day demand approaches a consistent 1.1 mgd of demand. The new Clear Creek BPS should be the same size as the Eastside BPS (2.09 mgd at 250 feet of TDH).
- The replacement of the asbestos concrete (AC) pipe on Berkeley Road with a 16-inch from Asheville Highway along Berkeley Road to Clear Creek Road is recommended to support the future Clear Creek BPS, along with a 16-inch along Clear Creek Road.
- A parallel 16-inch water line extension to Chimney Rock Road from the current 16-inch at Nix Road & Clear Creek Road to convey the flow from Clear Creek Road into the Eastside system.
- Pinnacle Mountain Tank removal and replacement with a pressure reducing valve (PRV) to maintain adequate pressure in the Pinnacle Mountain Pressure Zone.

The recommended capital improvement projects are mapped and tabulated with demand triggers in this report. Opinions of probable construction costs are included in the Appendices. Capital improvements were phased in accordance with demand triggers and the estimated years for those triggers.

The total probable construction cost for an immediate critical subset of the proposed projects and larger infrastructure (some 12- and all 16-inch waterlines and their associated tanks, valve stations, and pump stations) are shown in Table 0-1. The total cost for this subset of projects is **\$236 Million** in current cost and **\$346 million** when adjusted for future costs. Appendix F includes total costs for all projects, including linear assets, tanks, pump stations and valve stations. The costs include projects expected to be development driven.

Implementation of the distribution system master plan recommendations will provide the following benefits:

- Improved fire protection: Achieve the City's goal for fire flow in new service areas of 1,000 gallons per minute (gpm) at 20 pounds per square inch (psi) at most hydrant.
- Reliable Service Pressure: Maintain adequate pressure under peak demand conditions.
- Capacity for Growth: Support planned population and economic development through 2050.
- Enhanced Water Quality: Reduce water age and associated water quality risks.
- Operational Efficiency: Optimize system performance for improved infrastructure and staff efficiency.
- System Resilience: Improve redundancy and reduce risk of service interruptions.

This document provides a roadmap to transform the existing system into a more resilient, efficient, and growth-ready utility. While the City's system currently meets many operational needs, proactive investment is required to address existing deficiencies and accommodate future growth.

Phased implementation of the recommended improvements will allow the City to maintain high levels of service, protect public safety, and support continued economic growth through 2050 and beyond

**Table 0-1: Summary of Critical Capital Improvements**

| <b>CIP Phase</b>        | <b>Demand Trigger (MGD)<sup>2</sup></b> | <b>Number of Waterline Projects</b> | <b>Number of New Tanks</b> | <b>Number of New Pump Stations</b> | <b>Number of New Pressure Zones</b> | <b>Opinion of Probable Construction Cost, Current Day (\$)<sup>3</sup></b> | <b>Opinion of Probable Construction Cost, Escalated (\$)<sup>4</sup></b> |
|-------------------------|-----------------------------------------|-------------------------------------|----------------------------|------------------------------------|-------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------|
| <b>2025<sup>1</sup></b> | 9.54                                    | 21                                  | 1                          | 1                                  | Long John Mountain (LJM)            | \$120,340,000<br>(17,540,000 LJM)                                          | \$120,340,000                                                            |
| <b>2030</b>             | 11.27                                   | 11                                  | 2                          | 3 <sup>5</sup>                     | 4                                   | \$44,547,000                                                               | \$65,817,000                                                             |
| <b>2035</b>             | 12.03                                   | 7                                   | 1                          | 0                                  | 0                                   | \$42,166,000                                                               | \$79,511,000                                                             |
| <b>2040</b>             | 12.78                                   | 2                                   | 0                          | 1 <sup>6</sup>                     | 1                                   | \$8,899,000                                                                | \$21,416,000                                                             |
| <b>2045</b>             | 13.50                                   | 3                                   | 0                          | 7 <sup>6</sup>                     | 7                                   | \$19,706,000                                                               | \$59,196,000                                                             |
| <b>Total</b>            |                                         | 44                                  | 4                          | 12                                 | 12                                  | <b>\$235,658,000</b>                                                       | <b>\$346,280,000</b>                                                     |

1. 2025 cost includes top 25 projects that include Long John Mountain

2. 75% of the entire system MDD

3. 2022\$ (Construction + 15% Engineering + 5% Construction Administration+ 25% Contingencies) (rounded to nearest \$1,000)

4. Cost escalated at 5% per year (rounded to nearest \$1,000)

5. Includes Laurel Park PS

6. Does not include WTF pump upgrades. WTF Pump upgrades are included in the Treatment Facility Master Plan

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