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2025

Neenah

WSSAP
City of Neenah
Neenah Water Utility

City of Neenah

Neenah Water Utility

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WATER SUPPLY SERVICE AREA PLAN

CITY OF NEENAH - NEENAH WATER UTILITY

Finalized Month ##, 2025

Approved by the Neenah Water Works Commission: Month ##, 2025

Approved by Wisconsin DNR: Month ##, Year

Written in Cooperation with;

Neenah Water Utility

Department of Community Development

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1. INTRODUCTION

1.1 Purpose

Pursuant to Wis. Stats. 281.348(3)(a)(2), Neenah Water Utility is required to prepare a Water Supply Service Area Plan ("WSSAP") on or before December 31st, 2025, since Neenah Water Utility provides service to a population of more than 10,000 using withdrawals from the waters of the state. The required contents of a WSSAP are dictated by Wis. Admin Code Ch. NR 854.

The intended purpose of this plan is to satisfy the statutory compulsion of the Neenah Water Utility to prepare a WSSAP, to the extent required by NR 854. This plan shall also be used to inform future development within the planning area, and the future growth of the Neenah Water Utility distribution system.

It is the City of Neenah and Neenah Water Utility's position that department approval of this plan creates exclusivity with regards to the right; but not the obligation, of serving the planning area in part or in whole.

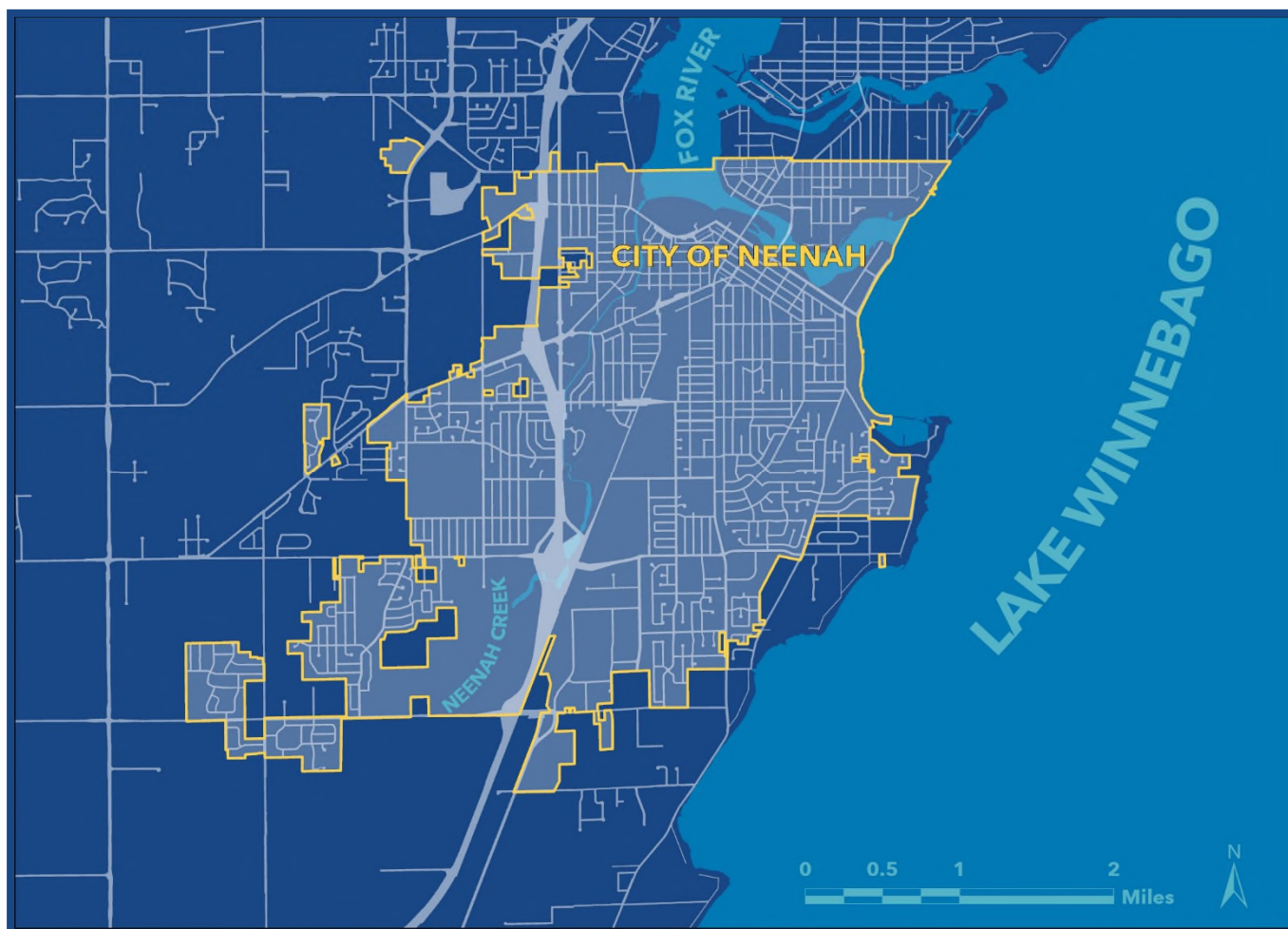


Figure 1. Map of the City of Neenah

1.2 Location and History

The City of Neenah is located within Winnebago County, Wisconsin. It is comprised of 9.37 square miles of area located on the banks of Lake Winnebago, Little Lake Butte des Morts, and the Fox River and is situated approximately 10 miles northeast of Oshkosh and 40 miles southwest of Green Bay. Originally known as Winnebago Rapids, Neenah was incorporated as a village in 1856 and a city in 1873. Thanks in part to its location on the Fox River, in the mid-1800s Neenah attracted flourmills and the lumber industry. By the 1870s, paper mills began to take over the industrial landscape of the area and continued to play an important role in the City's economy.

The population grew rapidly in the 1880s, and the city began the process of creating a municipal sewer system in 1881. Along with the population explosion, the need for a large well and water pumping facility was discussed, but the plans did not come to fruition until 1893. Unfortunately, the well water was found to be extremely high in calcium, and the population was forced to continue the use of private wells and cisterns. In 1936, a new water treatment facility was built which incorporated a lime softening process and used Lake Winnebago as the primary water source. The newest water treatment facility was completed in 2007 and featured the newest water treatment techniques of the time.

1.3 Planning Period

This plan is intended to cover a 20-year period; to the year 2045. The projections and recommendations provided in this plan shall be substantive until January 1st, 2046, where upon this plan shall be considered expired.

NR 854 requires that a WSSAP be designed for a minimum of a ten-year planning period, and no more than a 20-year planning period. However, it is strongly recommended that city and utility staff review the plan annually to ensure compliance with the overall goals of the plan and continued consistency with the projections and recommendations outlined therein. This annual review should also be used to determine if a "major" plan amendment is required.

The WSSAP is a dynamic document. The plan should be updated when new demographic, economic, or water source and quality information become available and impacts the projections or recommendations of this plan. It is not anticipated that the plan will need a major amendment unless unexpected or extreme changes regarding water consumption, sources, or water quality change the circumstances under which this plan was created.

1.4 Planning Area

This Water Supply Service Area Plan was developed for the land which is currently served by or will potentially be served by the Neenah Water Utility within the planning period. This area includes all property within the City of Neenah, excluding the Alliant Energy plant at 200 County Rd CB. This area also includes an extended area beyond the City limits, which primarily consists of the Fox Cities Sewer Service Area (SSA) Planning Boundary for the Neenah-Menasha SSA, excluding the portions within the City of Menasha. Also included is all the land not within the Fox West SSA bound by County Rd II to the north, County Rd GG to the south, and north/south line created by extending the west line the east half of Section 15 of Township 19 North, Range 16 East.

The City of Neenah has a well-established water service area bound by ordinance to include only those properties located within the City's municipal boundary. However, there are three properties which were located within the Town of Menasha (which incorporated into the Village of Fox Crossing in 2016) that were at one time served by ordinance. There are also four city properties served by the Village of Fox Crossing.

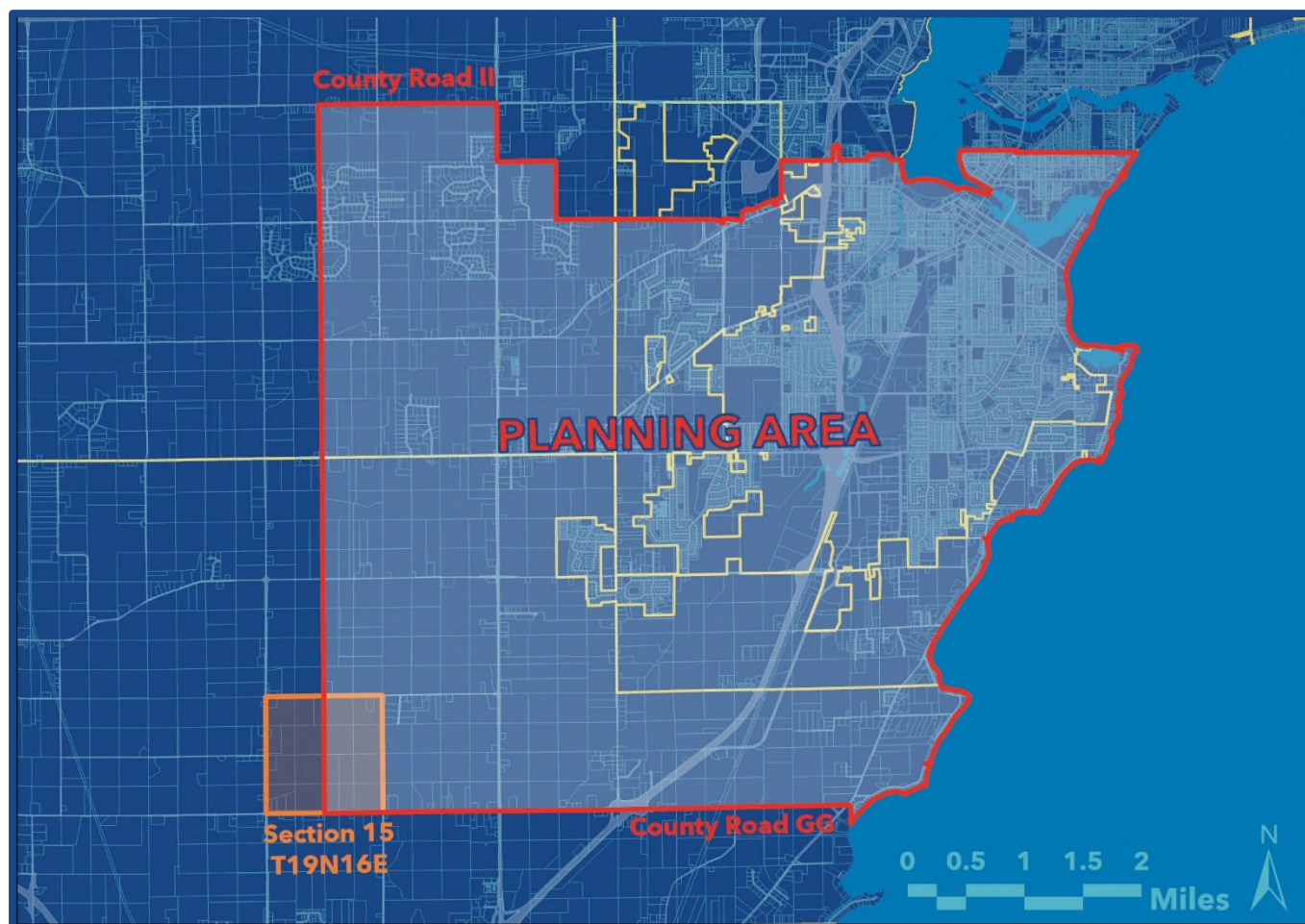


Figure 2. WSSAP Planning Area

2. WATER SUPPLY SOURCES

2.1 Existing Supply Sources

Water used by the Neenah Water Utility is withdrawn from Lake Winnebago and in an Emergency, the Fox River. A 36-inch pipe withdraws from Lake Winnebago with a maximum withdrawal capacity of 12 MGD. The emergency Fox River 16-inch pipe has a maximum withdrawal capacity of 4 MGD. The intake systems are further described in [Section 3.2](#) of this plan.

The average daily withdrawal from Lake Winnebago in 2024 was 3.59 MGD, the highest it has been in the past ten years. The average daily withdrawal has increased every year for the past five years, indicating a recent growth in water demand.

Water withdrawn is measured with a mag-meter at the Raw Water Pumping Station. Non-revenue water is calculated monthly by comparing billings to actual treated water entering the Distribution Systems.

Water treatment expected of both Lake Winnebago water and the Fox River water coincides with the treatment methods deployed by the Neenah Water Utility and are described in [Section 3.3](#) of this plan.

Average Annual Withdrawal from Lake Winnebago in MGD

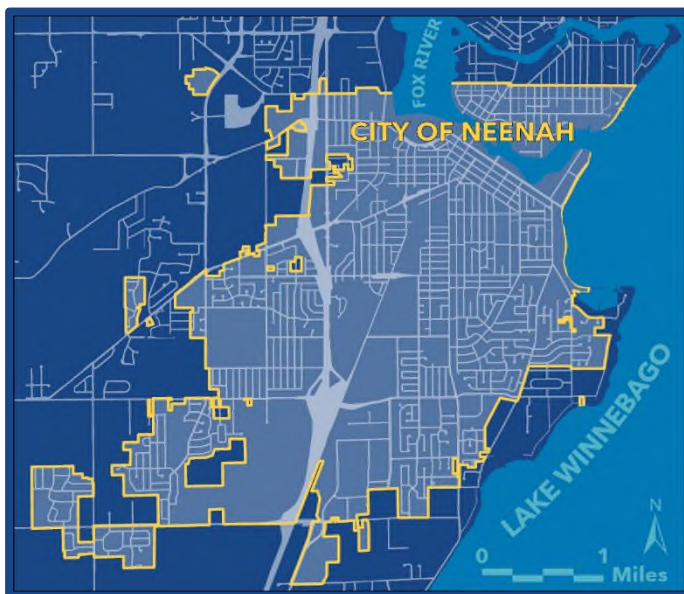
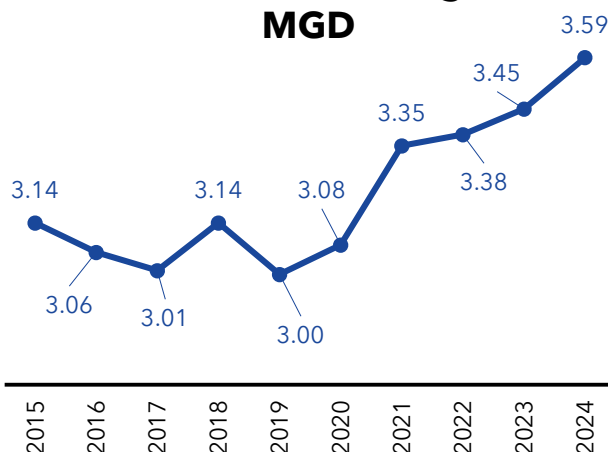


Figure 3. The Fox River and Lake Winnebago

2.2 Unused Supply Sources

While water is abundant in Lake Winnebago and the Fox River, the number of alternative sources are limited. The water in Lake Winnebago flows through the Fox River all the way to Green Bay, meaning that a withdrawal at any point along this connected water system is in reality, a withdrawal from them all. Neenah is located at the mouth of the Lower Fox River and subsequently withdraws water the farthest point upstream Neenah's geography allows. The two alternatives identified are The Neenah Creek and the groundwater table.

Neenah Slough, “Neenah Creek”

There is a small stream which feeds into the Fox River separate from Lake Winnebago. The source is a large area of agricultural fields, and the stream flows north through the City before contributing to the Fox River system. The stream has several wider areas near the intersection of Jewelers Park Dr and Harrison St but otherwise is consistently narrow. The stream has an extremely limited capacity and would be unable to meet the demands of the Neenah Water Utility. Additionally, the stream is the destination of the decant water from the sludge lagoons. The stream has quality concerns due to agricultural runoff and proximity to industrial uses. The stream would be an inadequate source for the Neenah Water Utility.

Groundwater Table

In the late 1800s when Neenah was experiencing rapid population growth, the possibility of a large well and pumping facility was discussed for the purpose of supplying the residents with water. At the time, the water was discovered to be high in calcium, and private wells and cisterns had to be relied upon until a facility that withdrew from Lake Winnebago was constructed in 1936. Today, it is known that the groundwater in Winnebago County has one of the highest concentrations of Arsenic in the nation. This makes sourcing drinking water from groundwater at a large scale impractical without significant and expensive treatment.

Conclusion

As the residents of Neenah have determined in the past, Lake Winnebago is the most logical, cost effective, and sustainable source available.



Neenah Slough



Lake Winnebago



The Fox River

3. WATER SUPPLY SYSTEM

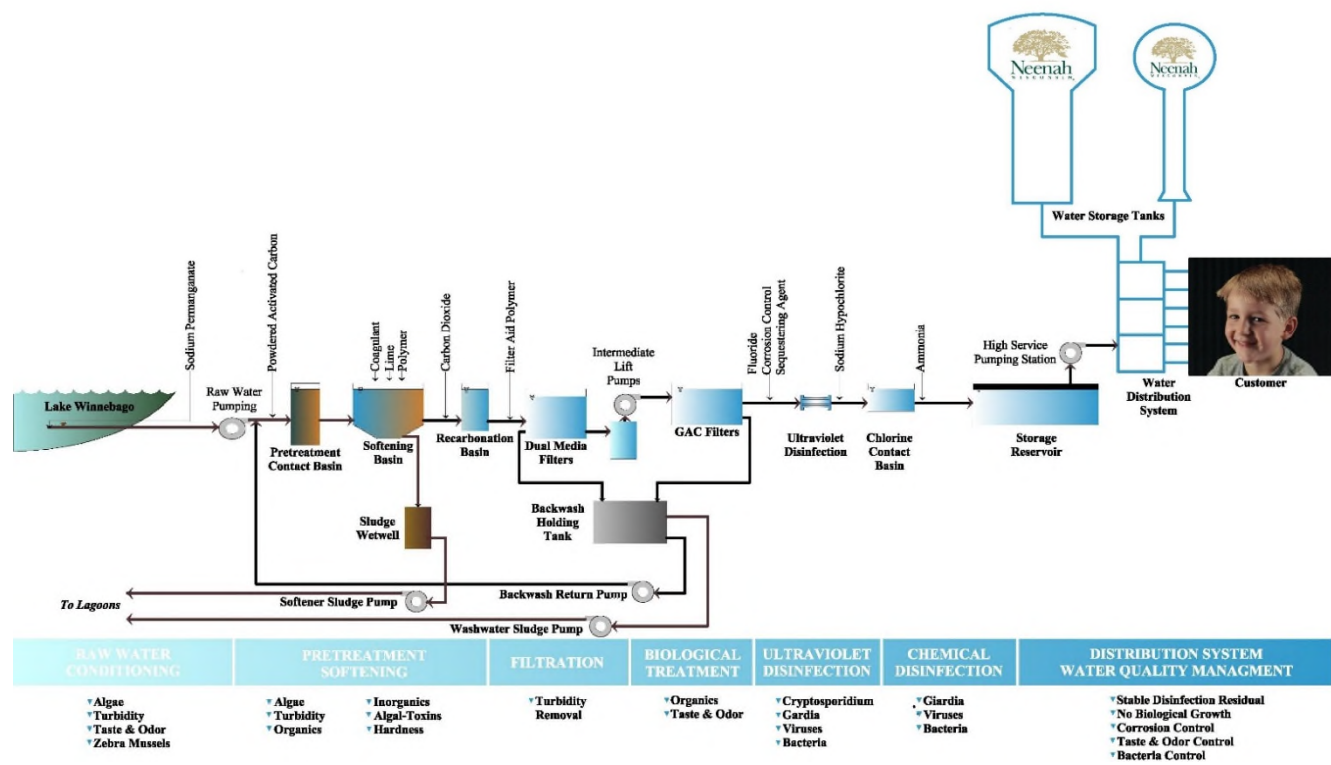
3.1 Summary

Neenah Water Utility serves a population of approximately 27,500 residents and hundreds of commercial, institutional, and manufacturing facilities. The average daily pumpage was 3.59 MGD (Million Gallons per Day) in the year 2024, with a peak day of 4.77 MG. The water treatment plant is designed for a capacity of 12 MGD. The two-pressure zone distribution system has two elevated storage tanks with a combined storage volume of 2 MG. The clearwell at the treatment plant has a storage volume of 2.5 MG.

3.2 Intakes

There is a single 36-inch diameter intake pipe extended 1,600-feet into Lake Winnebago. Sodium permanganate is continuously injected at the inlet of the pipe through a series of diffusers for zebra mussel control. Lake water at an average rate of 3.59 MGD is drawn into the pipe by one or more of the four low lift or raw water pumps. Powdered activated carbon, used for taste and odor control, is pumped into the low lift pump discharge line, which empties into the pretreatment contact basins. There is a 16-inch backup intake which would draw water from the Fox River in an emergency. All the intake, treatment, and distribution facilities as well as potential service areas are located well within the Great Lakes Basin.

NEENAH WATER UTILITY
WATER TREATMENT PROCESS & FLOW SCHEMATIC



3.3 Treatment

Lime Softening

Pretreated water then flows into three softeners, each capable of treating 6 MGD. Ferric sulfate, polymer and lime are metered into the influent of each softener. Solids removed during the softening process are blown into two sumps, and the sludge is pumped to lagoons located offsite. The softened water is then stabilized to a pH of 9.2 with the addition of a carbon dioxide solution in each of the two recarbonation basins. The recarb basin water flows into a filter inlet channel and is equally distributed through a set of weirs to the four dual media filters.

Dual Media Filtration

The filters are each 12-feet by 60-feet with a surface area of 720-feet. Filtration rates are 2.9 gpm/ft² (Gallons Per Minute per Square Foot) at a plant flow rate of 12 MGD with all four filters in service. Backwash water is pumped from the clearwell to provide backwash rates of up to 20 gpm/ft² and air scour is designed at up to 4 scfm/ft² (Standard Cubic Feet per Minute per Square Foot). If needed, polymer is added to the water at a dosage level of 0.25 ppm (Parts Per Million) to assist in final turbidity removal in the filter media.

Granular Activated Carbon

The filter effluent flows by gravity into the intermediate pump wetwell where three 6 MGD intermediate lift pumps pump the water up to the GAC (Granular Activated Carbon) inlet channel from which weirs equally distribute the water to four GAC contactors. These four contactors assist in the TOC (Total Organic Carbon), taste and odor removal. Each contactor is 12-feet by 48 feet resulting in a loading rate of 3.6 gpm/ft² at 12 MGD.

UV Disinfection

The water from the GAC contactors flows into a common header and then into the UV reactors. Fluoride and a corrosion inhibitor are injected into the header before the UV treatment. There are three Trojan Swift 6L24 UV reactors set up in parallel. Each 24-inch reactor is rated for up to 6 MGD with 6 lamps per reactor. UV is used as a primary disinfectant, providing giardia and cryptosporidium inactivation. Sodium hypochlorite is injected into the water after the UV treatment for additional disinfection.

Free Chlorine CT

Two free Chlorine CT basins, each with a volume of 144,800 gallons and operating in parallel, receive UV effluent and provide inactivation for viruses.

Auxiliary Power

Auxiliary power is provided by a 1,750 kVa generator at the treatment plant which is sized to run the plant at the full capacity of 12 MGD for a minimum of 48 hours.

3.4 Storage and Distribution

Clearwell and High Lift Pumping

The clearwell has a 2.5 MG storage volume. There are five high lift pumps that pull water from the clearwell and pump to the distribution system. These pumps are manually triggered based on the level in the towers and are equipped with variable frequency drives. The entry point sample tap is after the high lift pumps.

Elevated Storage

There are two elevated storage tanks in the system. The Industrial Tower has a storage volume of 500,000 gallons. The Cecil Street Tower has a storage volume of 1.5 MG.



Figure 4. The City of Neenah in Relation to the Great Lakes Basin

Distribution System

The distribution system consists of approximately 143 miles of water mains from 4-inch to 20-inch in diameter. Currently there are two pressure zones within the system.

Booster Station

The southwest side of the distribution system is served by a booster station which boosts the pressure from approximately 45 psi to 65 psi for the newest development areas.

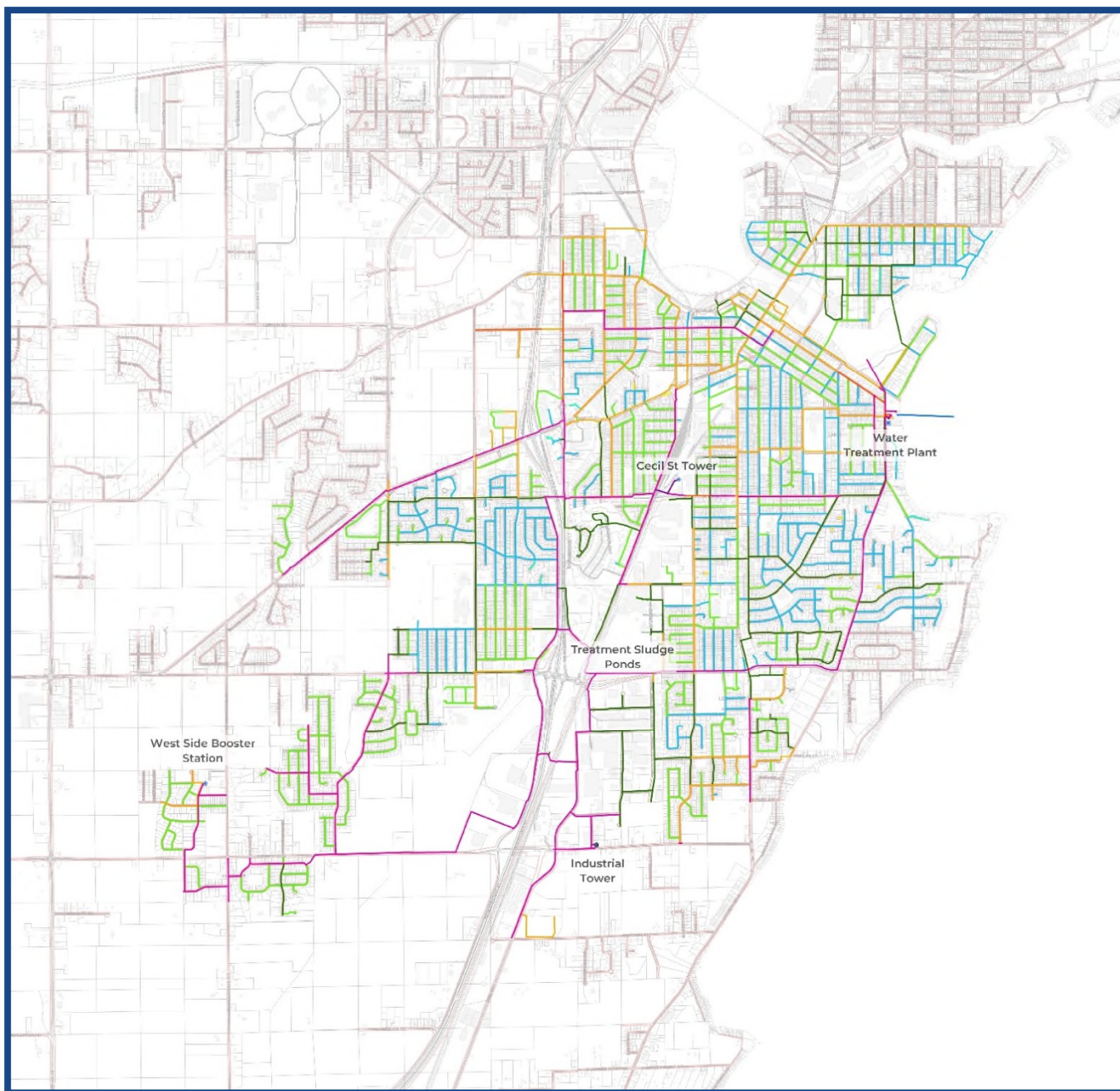


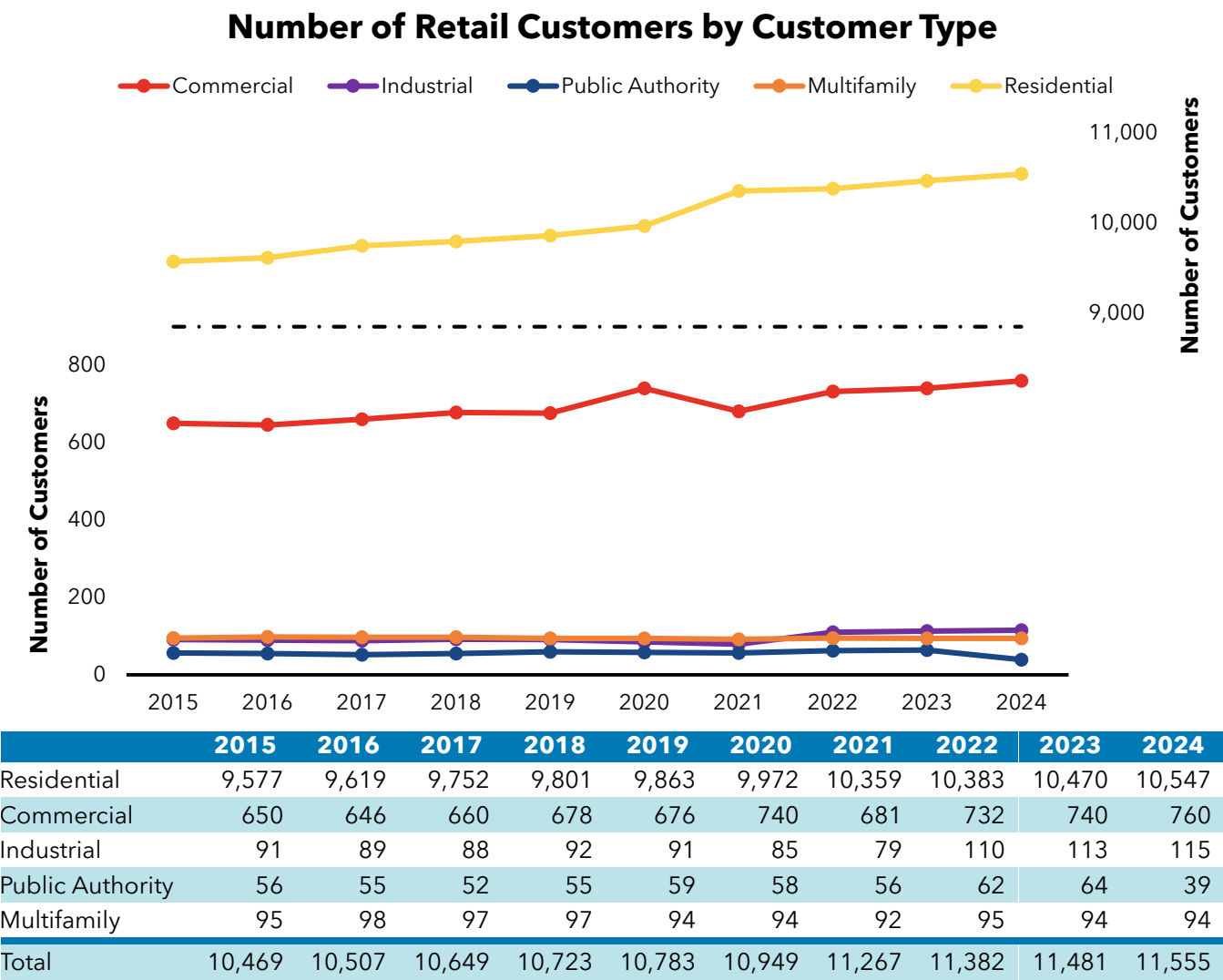
Figure 5. General Location of Water Mains and Service Facilities

4. CURRENT WATER USE

4.1 Population and Land Use

Retail Customers

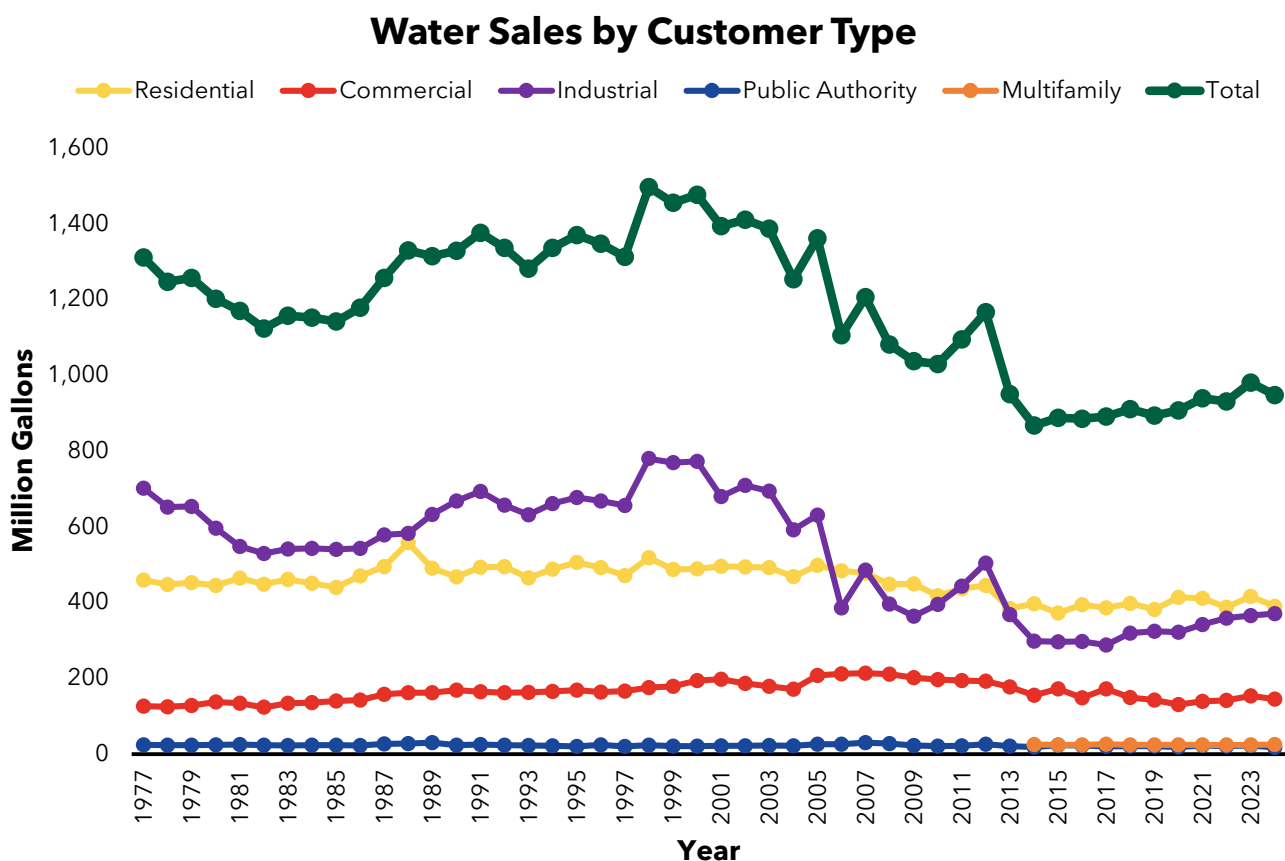
The City of Neenah had a population of 27,319 at the time of the 2020 Census. During that period the City was 9.512 square miles in area, making the population density 2,872 inhabitants per square mile. Neenah Water Utility exclusively serves properties within the City of Neenah, so residential retail customers can be an indicator of the number of households in the City. In 2024, 10,547 residential customers purchased water from the Neenah Water Utility, which is over 9,000 more than commercial, the second largest customer base. This is consistent with current land use trends within the City, where single-family and two-family residential homes are the most common land use and the properties are generally less than one acre.



Water Sales by Customer Type

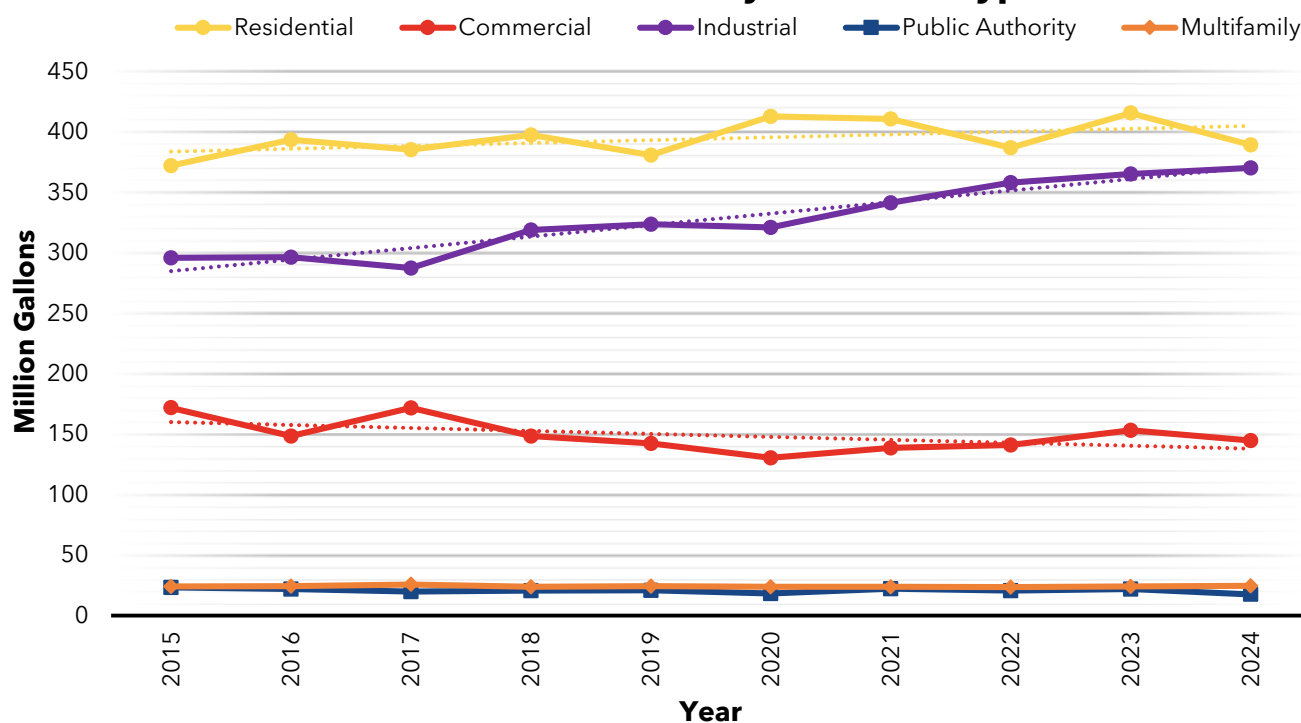
The number of customers does not closely reflect land use distribution, since each customer type has different space requirements. The number of customers also does not closely reflect water demand, as each customer type has unique water needs. While residential customers exceedingly outnumber the other customer types, each residential customer typically draws an average of 110 gallons per day. Meanwhile, multifamily customers can draw on average upwards of 600 gallons per day, commercial customers can consume upwards of 500 gallons per day, public authority usage averages upwards of 1,000 gallons per day, and industrial usage averages upwards of 9,000 gallons per day.

Water sales volume by customer type more accurately reflects the effect land use patterns have on water demand. Residential customers first began purchasing the most water out of all the customer types in 2006. Before then, Industrial customers had consistently topped the sales volume out of all customer types. Industrial sales are the most volatile in their demand fluctuations due to the nature of the customer type. Industrial customers typically have large water demands, and as facilities close or open, water sales can drop or spike drastically. Meanwhile, Commercial and Residential sales have been fairly stable over the years, and as such, the total water sales have been primarily dependent on the volume of Industrial sales.



Recent data indicates that Industrial sales may yet again overtake Residential sales. This would coincide with the development trends the City has been experiencing in the last decade. Land suitable for residential development is limited, while new industrial development and existing industrial expansions are occurring consistently. Commercial sales decreased slightly in 2018, while Residential and Industrial sales increased slightly, providing an overall consistent usage in the past five years. Rate increases, weather, environmental concerns, and the general state of the economy affect these categories. The Multifamily customer type was introduced in 2014, as it was previously included in the Commercial customer base. The slight decline in sales to Industrial, Commercial, and Public Authority customers in 2020 can be attributed to effects from COVID-19.

Metered Water Volume by Customer Type

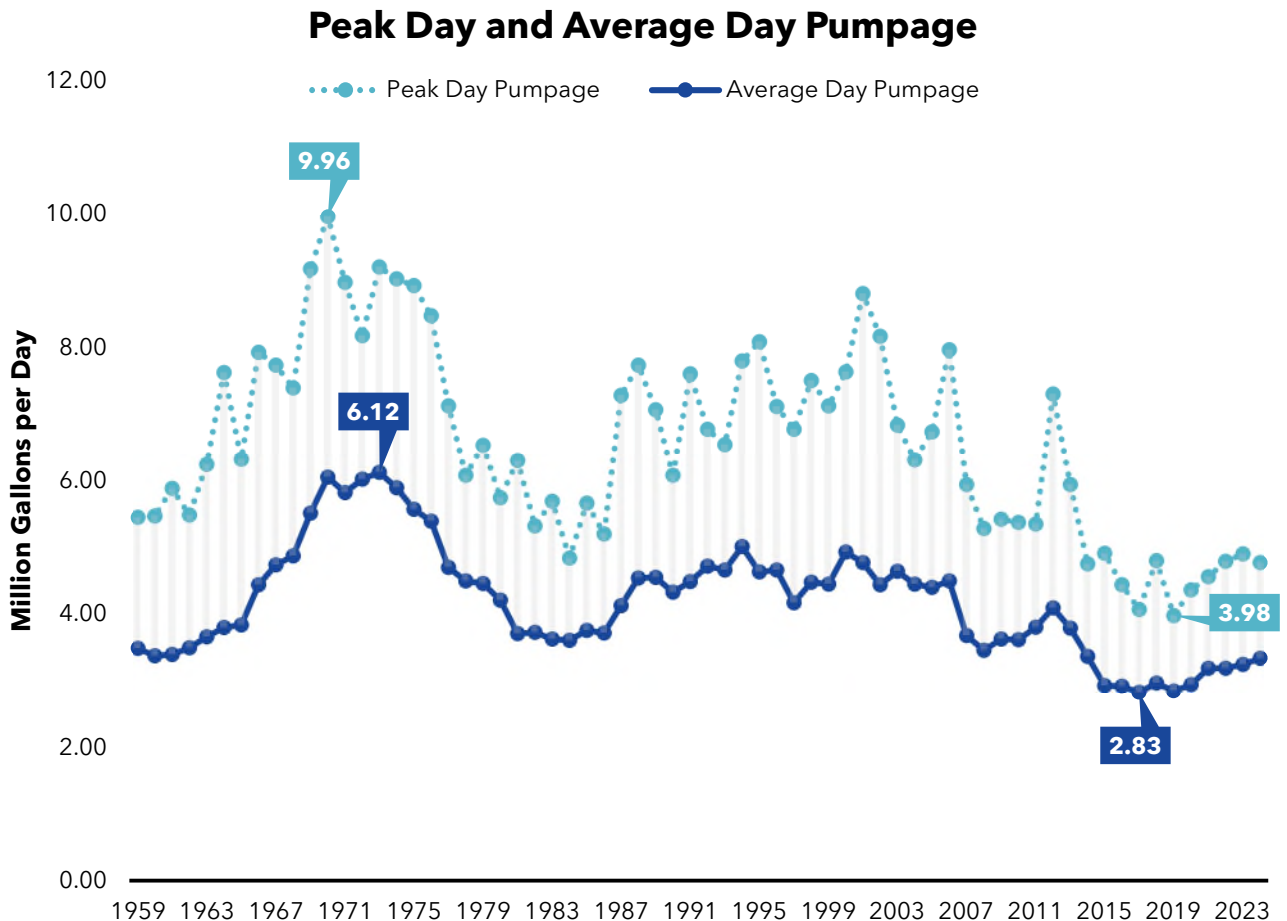
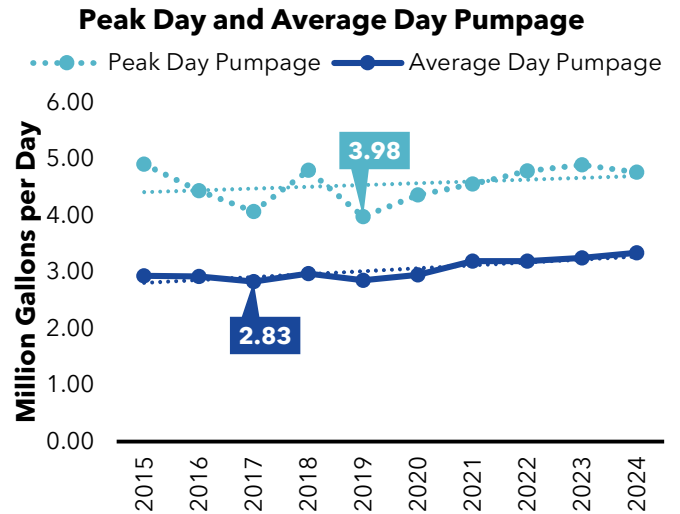


Year	Residential	Commercial	Industrial	Public Authority	Multifamily	Total
	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)
2015	372.258	171.953	295.948	23.227	23.914	887.300
2016	393.594	148.356	296.379	22.000	24.249	884.578
2017	385.354	171.710	287.465	19.820	25.867	890.765
2018	397.479	148.551	319.022	20.682	23.852	910.154
2019	380.911	142.483	323.652	20.826	24.217	892.642
2020	412.890	130.508	321.019	18.190	23.824	906.431
2021	410.874	138.687	341.577	22.227	23.702	938.484
2022	387.075	141.076	358.235	20.627	23.599	930.612
2023	415.836	153.304	365.331	21.860	24.112	980.443
2024	389.331	144.857	370.412	17.598	24.517	946.715

4.2 Water Usage History

Peak Day and Average Day Pumpage

Overall water demand has decreased significantly over the past few decades. In 2017, the water demand was the lowest in recent history, despite continuous City growth. Since it is understood that industrial uses most significantly impact water use, it can be inferred that the water use trends are a result of a decline in water-heavy industries in the City, such as the numerous paper mills which once were present. Additionally, the gap between the average day and peak day pumpage has shrunk drastically in difference. The lowest peak day in the Utility's history was in 2019 at 3.98 MGD. The difference between the peak day and average day pumpage is greatest at peaks of water use and are the smallest at valleys and declines.

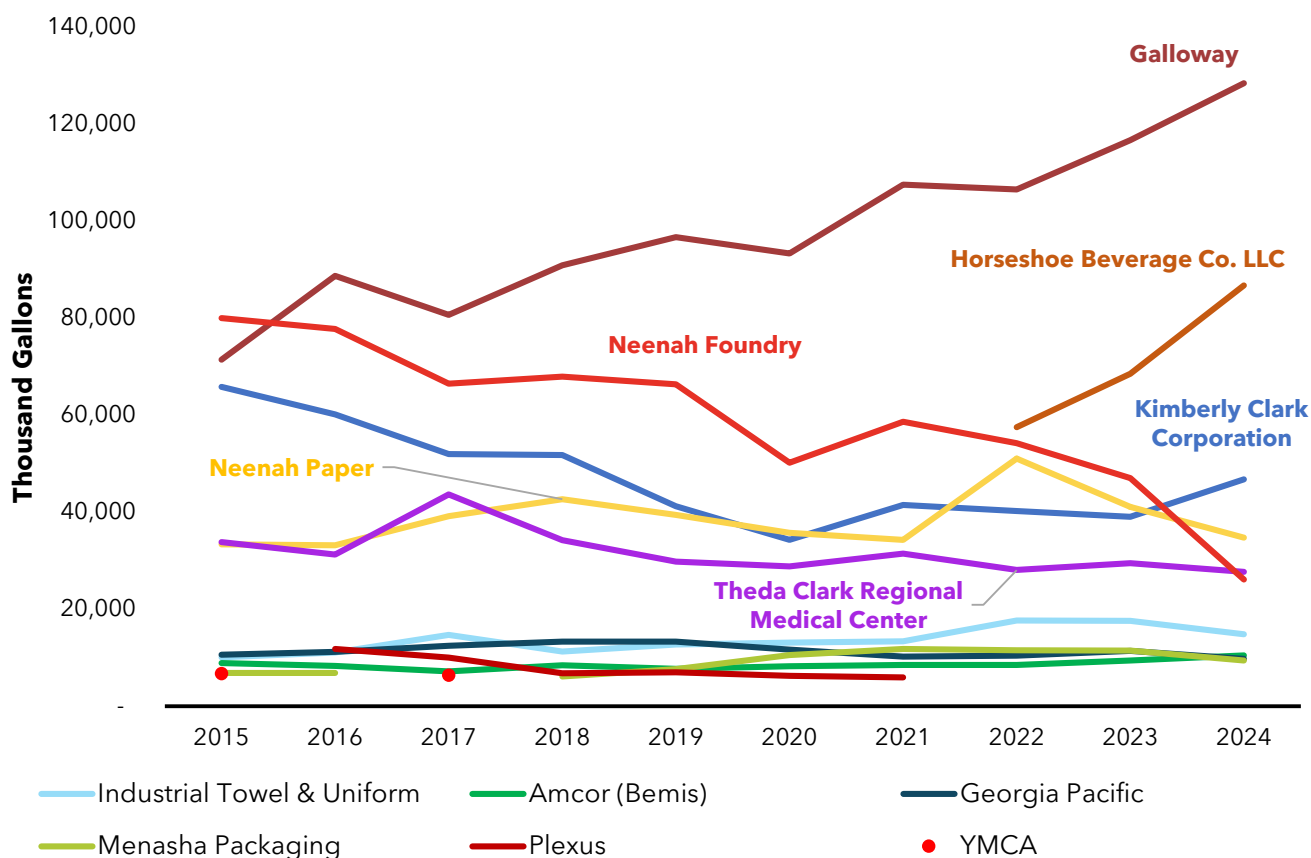


Largest Retail Customers

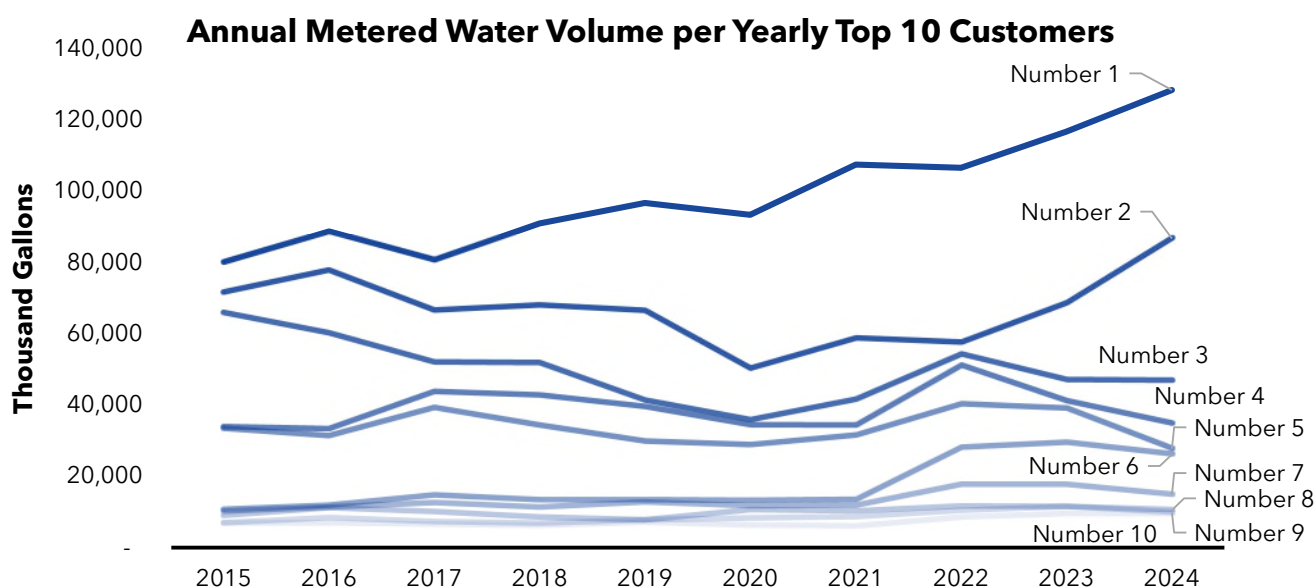
Nearly all the top retail customers of Neenah Water Utility are industrial in nature, with a few exceptions for healthcare and fitness. While the majority of the top retail customers remain relatively stable in their water consumption, there is occasional fluctuation in volume throughout the years. These influences can be attributed to changes in processes, practices, and magnitude of output.

A few industries are seeing definitive trends in their water consumption. Galloway has been the top customer since 2016 and is steadily growing larger with industrial expansions. Neenah Foundry was the top consumer in 2015 but has remained the second largest consumer as its water use steadily declined until it was overtaken by Horseshoe Beverage in 2022, and then again by several other businesses in 2024. Horseshoe Beverage; which began operating in 2018, made the top 10 consumer list in 2022, immediately becoming the second largest consumer.

Annual Metered Water Volume of Recent Top 10 Customers



Overall, the distribution of the top ten largest customers is growing, with the largest two increasing exponentially, while the subsequent customers remain consistent in their water consumption. In 2024, the ten largest retail customers consisted of 42% of the Water Utility volume sales, and 24% of the overall Water Billing. The chart below displays the demand of each of the top ten water customers for each year over time. This reveals a drastic difference in the top water customer versus the second, and subsequent eight. The chart indicates that the number one customer shall continue to grow and that the second customer will follow while other customer positions will remain consistent.



Subsequently listed are the top ten water customers for the past ten years, the nature of their business, and their water demand. These tables are useful for seeing positional changes in the top rankings and in understanding the significance the top customers of the Utility have on water demand and revenue.

2024

Rank	Name	Nature of Business	Thousands of Gallons	Water Billing
- 1	Galloway	Dairy Products	128,433	\$638,393
- 2	Horseshoe Beverage Co. LLC	Beverage Manufacturing	86,773	\$424,133
▲ 3	Kimberly Clark Corporation	Paper Research / Products	46,791	\$232,614
- 4	Neenah Paper	High Quality Bond Paper	34,747	\$174,290
▲ 5	Theda Clark Regional Medical Center	Healthcare	27,712	\$146,635
▼ 6	Neenah Foundry	Castings	26,160	\$141,290
- 7	Industrial Towel & Uniform	Commercial Laundry	14,845	\$78,764
▲ 8	Amcor	Packaging	10,535	\$57,550
- 9	Georgia Pacific	Paper Research	9,796	\$53,314
▼ 10	Menasha Packaging	Packaging	9,455	\$48,201

2023

Rank	Name	Nature of Business	Thousands of Gallons	Water Billing
- 1	Galloway	Dairy Products	116,665	\$590,940
- 2	Horseshoe Beverage Co. LLC	Beverage Manufacturing	68,543	\$336,570
- 3	Neenah Foundry	Castings	47,040	\$245,784
- 4	Neenah Paper	High Quality Bond Paper	41,095	\$204,760
- 5	Kimberly Clark Corporation	Paper Research / Products	39,046	\$195,195
- 6	Theda Clark Regional Medical Center	Healthcare	29,450	\$157,699
- 7	Industrial Towel & Uniform	Commercial Laundry	17,590	\$91,937
- 8	Menasha Packaging	Packaging	11,450	\$63,636
- 9	Georgia Pacific	Paper Research	11,423	\$61,966
- 10	Amcor	Packaging	9,455	\$51,798

2022

Rank	Name	Nature of Business	Thousands of Gallons	Water Billing
- 1	Galloway	Dairy Products	106,533	\$532,000
▲ 2	Horseshoe Beverage Co. LLC	Beverage Manufacturing	57,551	\$283,838
▼ 3	Neenah Foundry	Castings	54,217	\$281,310
- 4	Neenah Paper	High Quality Bond Paper	51,065	\$252,614
▼ 5	Kimberly Clark Corporation	Paper Research / Products	40,218	\$201,394
▼ 6	Theda Clark Regional Medical Center	Healthcare	28,072	\$148,730
▼ 7	Industrial Towel & Uniform	Commercial Laundry	17,673	\$92,335
▼ 8	Menasha Packaging	Packaging	11,569	\$64,165
▼ 9	Georgia Pacific	Paper Research	10,393	\$56,291
▼ 10	Amcor	Packaging	8,475	\$46,468

2021

Rank	Name	Nature of Business	Thousands of Gallons	Water Billing
- 1	Galloway	Dairy Products	107,502	\$536,902
- 2	Neenah Foundry	Castings	58,669	\$303,392
▲ 3	Kimberly Clark Corporation	Paper Research / Products	41,493	\$194,729
▼ 4	Neenah Paper	High Quality Bond Paper	34,276	\$172,030
- 5	Theda Clark Regional Medical Center	Healthcare	31,464	\$165,580
- 6	Industrial Towel & Uniform	Commercial Laundry	13,374	\$71,700
▲ 7	Menasha Packaging	Packaging	11,815	\$56,455
▼ 8	Georgia Pacific	Paper Research	10,223	\$55,599
- 9	Amcor (Formerly Bemis)	Packaging	8,518	\$46,478
- 10	Plexus	Electronic Components / HQ	5,972	\$33,178

2020

Rank	Name	Nature of Business	Thousands of Gallons	Water Billing
- 1	Galloway	Dairy Products	93,342	\$468,480
- 2	Neenah Foundry	Castings	50,202	\$261,872
▲ 3	Neenah Paper	High Quality Bond Paper	35,757	\$179,135
▼ 4	Kimberly Clark Corporation	Paper Research / Products	34,306	\$173,265
- 5	Theda Clark Regional Medical Center	Healthcare	28,797	\$153,589
- 6	Industrial Towel & Uniform	Commercial Laundry	13,099	\$70,381
▲ 7	Georgia Pacific	Paper Research	11,652	\$63,106
▼ 8	Menasha Packaging	Packaging	10,560	\$57,334
- 9	Bemis	Packaging	8,237	\$53,954
- 10	Plexus	Electronic Components / HQ	6,267	\$34,654

2019

Rank	Name	Nature of Business	Thousands of Gallons	Water Billing
- 1	Galloway	Dairy Products	96,684	\$449,389
- 2	Neenah Foundry	Castings	66,385	\$321,402
3	Kimberly Clark Corporation	Paper Research / Products	41,252	\$208,720
4	Neenah Paper	High Quality Bond Paper	39,419	\$196,717
- 5	Theda Clark Regional Medical Center	Healthcare	29,802	\$156,229
- 6	Georgia Pacific	Paper Research	13,327	\$71,315
7	Industrial Towel & Uniform	Commercial Laundry	12,731	\$68,546
8	Bemis	Packaging	7,687	\$42,032
▲ 9	Menasha Packaging	Packaging	7,660	\$42,736
▼ 10	Plexus	Electronic Components / HQ	6,992	\$38,704

2018

Rank	Name	Nature of Business	Thousands of Gallons	Water Billing
- 1	Galloway	Dairy Products	90,894	\$456,518
- 2	Neenah Foundry	Castings	67,962	\$350,944
- 3	Kimberly Clark Corporation	Paper Research / Products	51,750	\$261,072
▲ 4	Neenah Paper	High Quality Bond Paper	42,673	\$212,335
▼ 5	Theda Clark Regional Medical Center	Healthcare	34,213	\$179,453
▲ 6	Georgia Pacific	Paper Research	13,332	\$71,501
▼ 7	Industrial Towel & Uniform	Commercial Laundry	11,276	\$65,832
▲ 8	Bemis	Packaging	8,467	\$46,207
▼ 9	Plexus	Electronic Components / HQ	6,774	\$37,575
▲ 10	Menasha Packaging	Packaging	6,141	\$34,447

2017

Rank	Name	Nature of Business	Thousands of Gallons	Water Billing
- 1	Galloway	Dairy Products	80,676	\$407,085
- 2	Neenah Foundry	Castings	66,465	\$341,984
- 3	Kimberly Clark Corporation	Paper Research / Products	51,949	\$259,728
▲ 4	Theda Clark Regional Medical Center	Healthcare	43,689	\$224,417
▼ 5	Neenah Paper	High Quality Bond Paper	34,213	\$195,495
▲ 6	Industrial Towel & Uniform	Commercial Laundry	14,686	\$77,998
- 7	Georgia Pacific	Paper Research	12,478	\$67,251
▼ 8	Plexus	Electronic Components / HQ	10,005	\$29,858
- 9	Bemis	Packaging	7,241	\$39,647
▲ 10	YMCA	Health / Fitness Center	6,472	\$35,533

2016

Rank	Name	Nature of Business	Thousands of Gallons	Water Billing
▲ 1	Galloway	Dairy Products	88,729	\$445,688
▼ 2	Neenah Foundry	Castings	77,746	\$393,660
▲ 3	Kimberly Clark Corporation	Paper Research / Products	60,123	\$305,412
▲ 4	Neenah Paper	High Quality Bond Paper	33,237	\$167,045
▼ 5	Theda Clark Regional Medical Center	Healthcare	31,271	\$161,775
▲ 6	Plexus	Electronic Components / HQ	11,833	\$65,346
▼ 7	Georgia Pacific	Paper Research	11,218	\$60,128
▼ 8	Industrial Towel & Uniform	Commercial Laundry	11,079	\$59,844
▼ 9	Bemis	Packaging	8,326	\$45,450
▼ 10	Menasha Packaging	Packaging	6,836	\$38,131

2015

Rank	Name	Nature of Business	Thousands of Gallons	Water Billing
1	Neenah Foundry	Castings	80,052	\$405,995
2	Galloway	Dairy Products	71,490	\$363,339
3	Kimberly Clark Corporation	Paper Research / Products	65,834	\$331,819
4	Theda Clark Regional Medical Center	Healthcare	33,846	\$175,161
5	Neenah Paper	High Quality Bond Paper	33,358	\$167,623
6	Georgia Pacific	Paper Research	10,632	\$57,550
7	Industrial Towel & Uniform	Commercial Laundry	10,107	\$54,976
8	Bemis	Packaging	8,913	\$48,589
9	Menasha Packaging	Packaging	6,878	\$38,314
10	YMCA	Health / Fitness Center	6,777	\$37,161

5. PROJECTED WATER USE

5.1 Population and Land Use Projections

Growth Limits

The City of Neenah has two important documents which inform the future land use patterns in and around the City. Firstly, Neenah has a future land use map as a part of the City of Neenah Comprehensive Plan, which encompasses almost all the planning area for this plan. Secondly, The City of Neenah has a boundary agreement with the Town of Neenah which outlines where both municipalities can grow and develop. This boundary agreement expires in 2040, five years before the end of the planning period. These two documents are key to understanding water demand projections for the Neenah Water Utility.

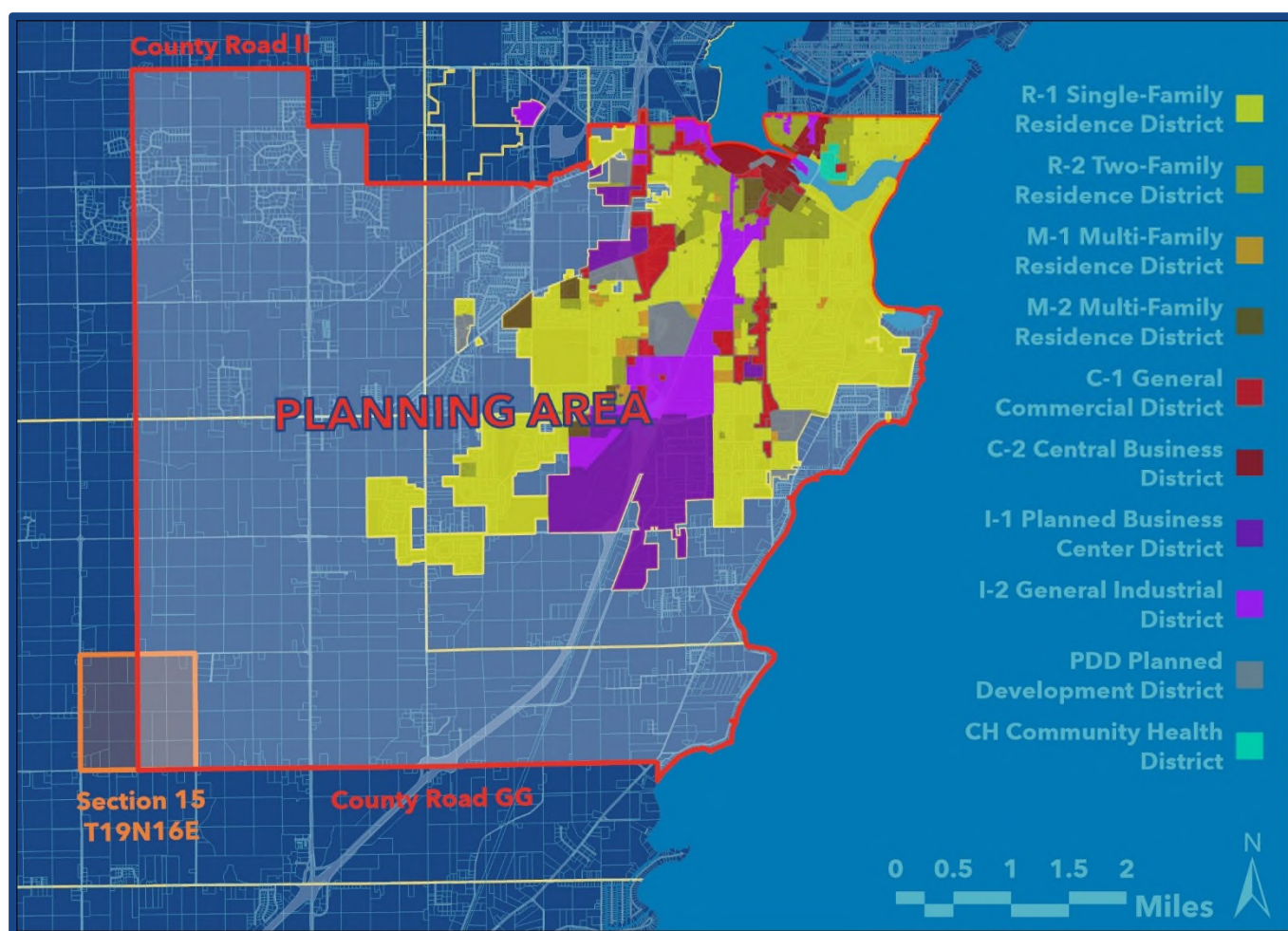


Figure 6. The City of Neenah Zoning Districts in Relation to the Planning Area

The Neenah Water Utility exclusively sells water to properties within the City, and City growth is currently very restricted. Within the current municipal boundaries, there is little undeveloped land, and land that has been developed is unlikely to undergo drastic changes besides incremental infill development and the occasional industrial expansion.

The boundary agreement further restricts City growth to only certain areas within the Town of Neenah, and the City has limited access to unincorporated land beyond the Town. The growth of the City is anticipated to be gradual during the planning period, even after the Boundary Agreement expires. For the purpose of this plan, City growth will be projected in a best-case scenario, where growth will be projected at its maximum feasible extent.

Future Land Use

The Future Land Use Map encompasses all the City boundaries, the entirety of the Town of Neenah, and a 3 mile extraterritorial range between County Rd II and County Road GG. This covers almost the entirety of the planning area. Within the City Growth Area of the Town of Neenah, there are primarily two potential land uses; Light Density Residential and Neenah Industrial Core. In the extraterritorial range, the primary land uses are Rural Preservation Area and Neighborhood Investment Areas. For the purposes of this plan, any planning area that does not have a future land use designation shall be treated as Rural Preservation Area.

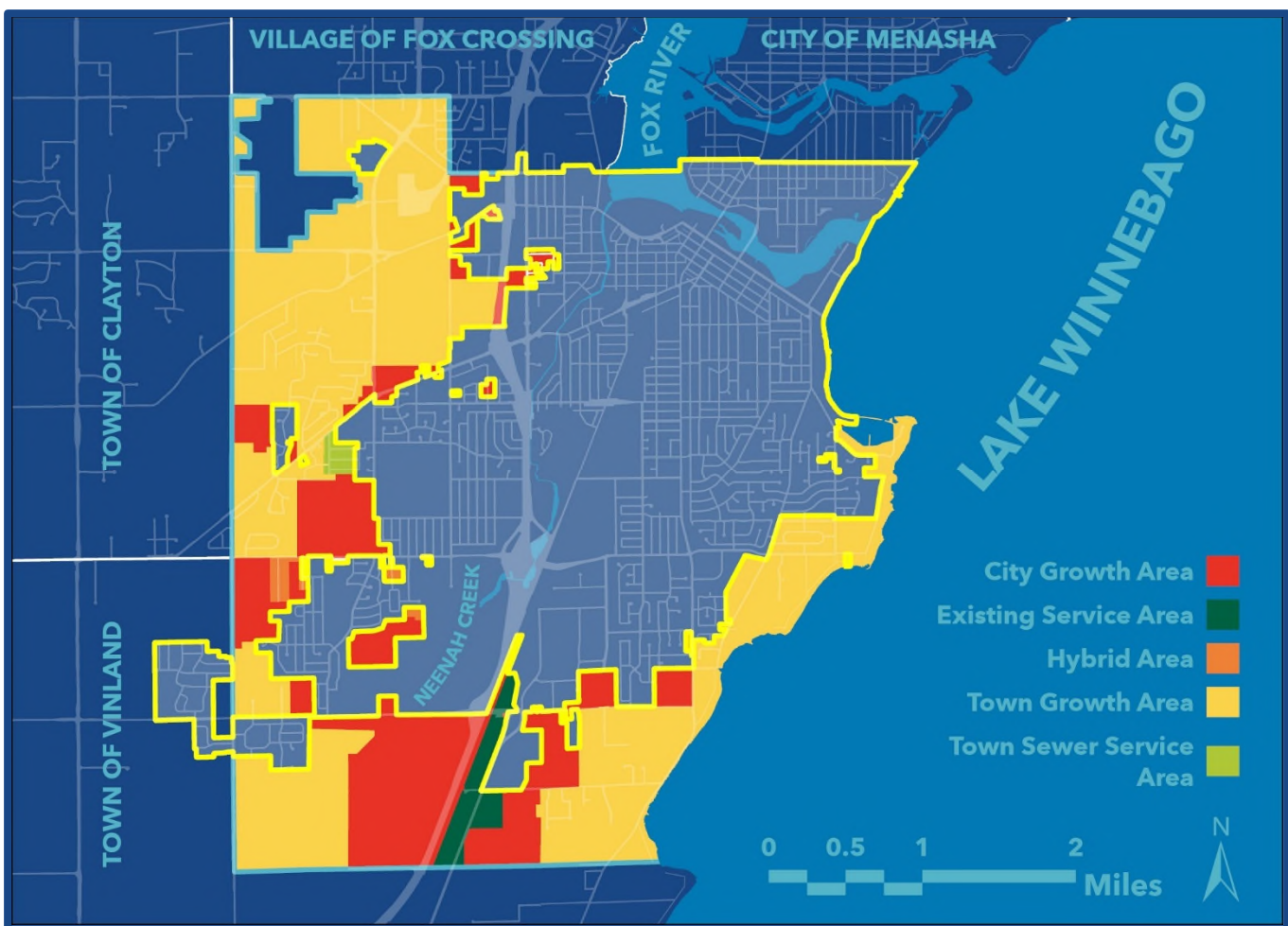


Figure 7. Boundary Agreement with the Town of Neenah

Future Land Use Projections

The future land use projections in this plan will include only unincorporated land within the City Growth Area in the Town of Neenah, and unincorporated land in the extraterritorial range.

For areas within the City Growth Area of the Town of Neenah, the future land use designations from the comprehensive plan will be used to identify the possible development types within these areas. For the purpose of these calculations, it will be assumed that land annexed in the City Growth Area will contain land use types proportional to the future land use designations within the City Growth Area as a whole.

For areas within the extraterritorial range, the future land use designations will also be used to identify possible development within these areas; however, the primary future land use designation within the extraterritorial range is Rural Preservation Area, which is land preserved until a time where there are adequate City services available for development. Therefore, Rural Preservation Areas could realistically be any land use. For the purpose of these calculations, it will be assumed that annexed land in the extraterritorial range will contain land use types proportional to the future land use designations within the extraterritorial range, and that Rural Preservation Areas will contain land uses proportional to existing land uses within existing City borders.

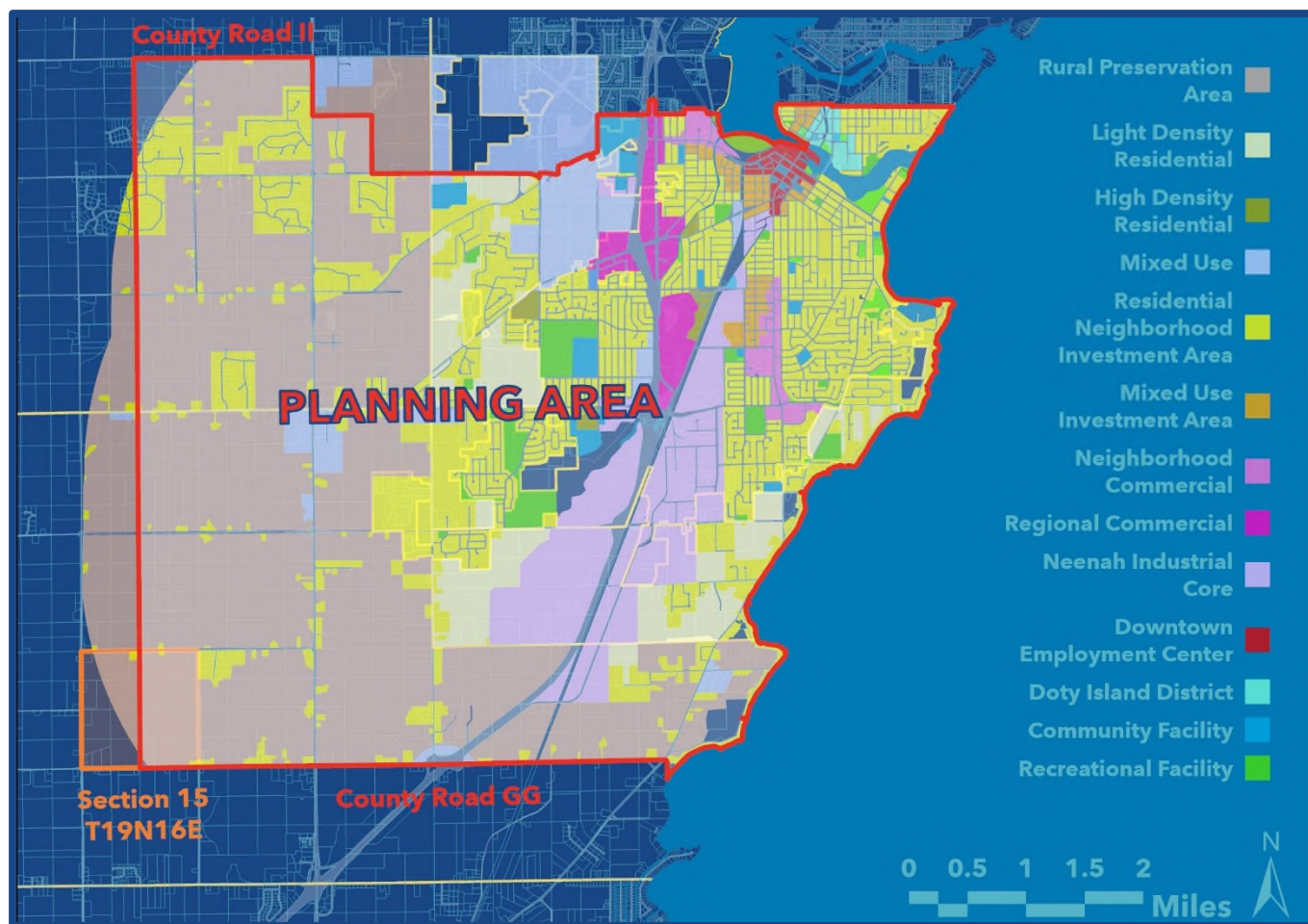
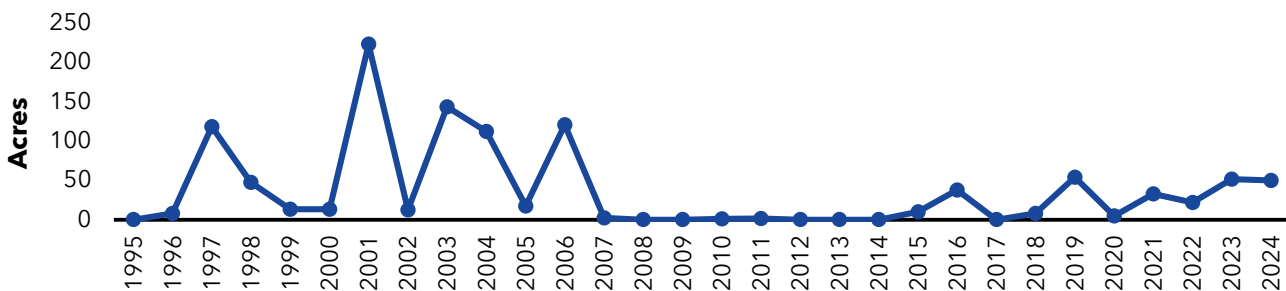


Figure 8. City of Neenah Future Land Use Map in Relation to Planning Area

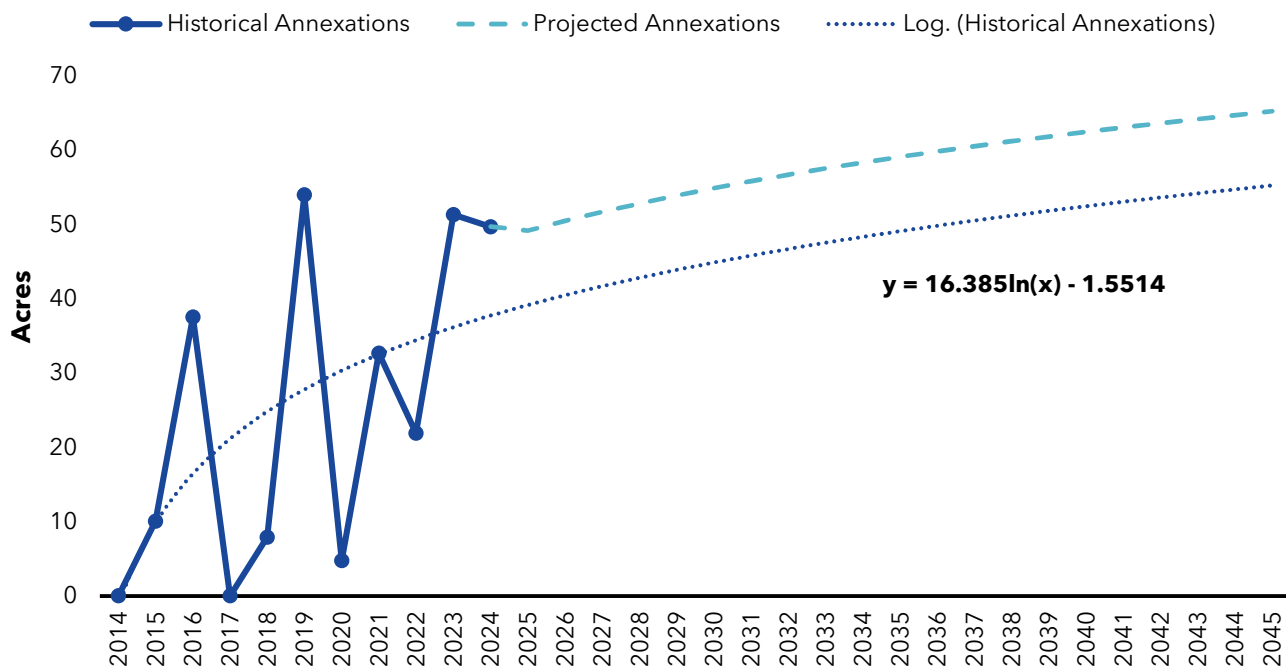
To apply the future land use ratios, it is necessary to estimate the amount of land expected to be annexed into the City over time. This requires an analysis of recent annexation trends to forecast the area of land that may be added into the City in future years. The City has had a recent revival in its growth since its brief suspension after the 2008 recession. Before 2008, annexations were sporadic and unpredictable, while in the past ten years annexation area per year has grown steadily on average. It is these past ten years which will be used to chart a projection of annexation area each year using a logarithmic trend, plus a small bonus margin for an upper-bound projection.

Area Annexed by City over Time



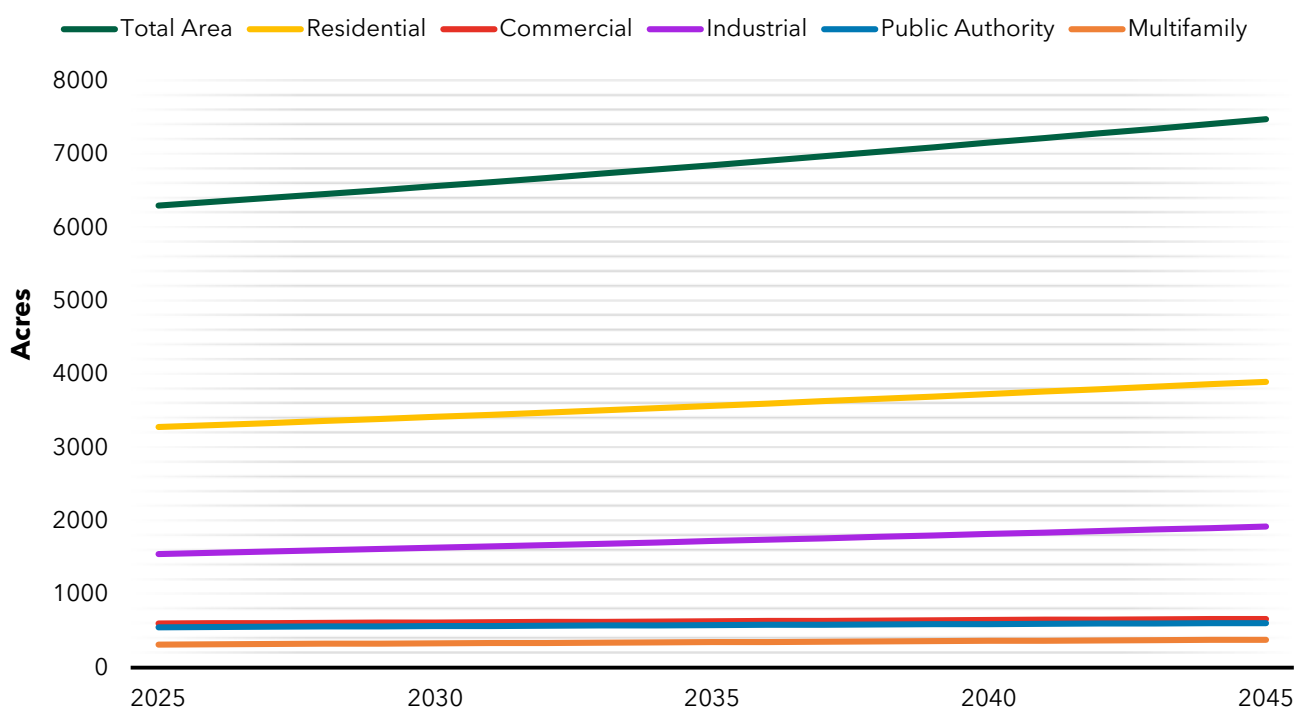
Using annexation area data from 2014 to 2024, the trendline of $y = 16.385 \ln(x) - 1.5514$ was obtained. To add a buffer margin, ten was added to the equation so that future annexation area is calculated with $y = 16.385 \ln(x) + 9.5514$, where x is the number of years since 2014.

Projected Annexation Area over Time



Recent annexation data reveals that about 60% of annexations in the past 10 years were in the Town of Vinland, and about 40% were within the City Growth Area in the Town of Neenah. For the purpose of these calculations, City growth will be projected with these same proportions, where 60% of growth will be projected as extraterritorial growth and 40% as growth in the City Growth Area in the Town of Neenah. Using the projected annexation growth, as well as the projected land use ratios established for both the City Growth Area and the extraterritorial range, the projected acreage of each land use during the planning period can be derived. For the end purpose of producing water demand projections, land use has been categorized into the five customer types of retail water sales.

City Acreage by Land Use over Time



City Acreage by Land Use over Time

Year	2024	2025	2030	2035	2040	2045
	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)
Residential	3,253.89	3,306.12	3,417.84	3,568.37	3,728.54	3,896.52
Commercial	598.02	603.54	615.34	631.25	648.17	665.91
Industrial	1,534.35	1,565.96	1,633.60	1,724.73	1,821.70	1,923.39
Public Authority	549.78	554.56	564.77	578.54	593.18	608.54
Multifamily	312.98	318.55	330.47	346.54	363.63	381.56
Total City Area	6,249.02	6,298.22	6,562.02	6,849.42	7,155.22	7,475.92

Population

Population estimates can be derived either from official sources such as the Wisconsin Department of Administration (DOA) or the US Census Bureau, or from the land use projections calculated in this section. A limitation of projections derived from the DOA or Census data is that they do not factor in City growth, they are simply estimates of population either within existing City boundaries or based on historical population trends. Since the Neenah Water Utility will serve all properties within City boundaries including future territorial growth, population estimates provide insight into potential growth of the Neenah Water Utility.

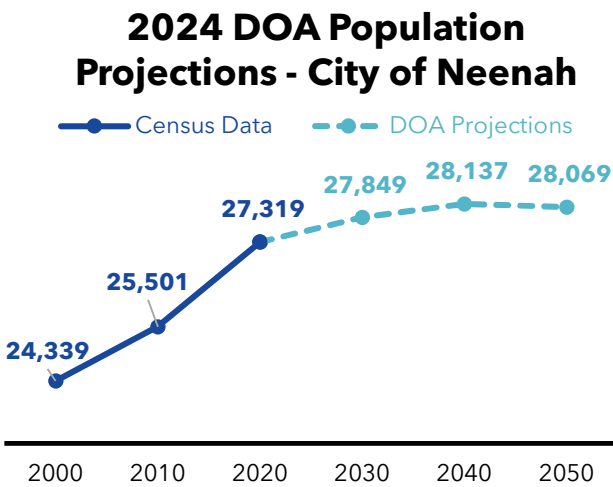
The DOA projections for the City of Neenah estimate that the City will see a population of 28,137 in 2040 - the year the Boundary Agreement with the Town of Neenah dissolves. Ten years later, it estimates the population will shrink to 28,069 in 2050.

Estimating only population is not adequate for producing water demand projections. While residential customers encompass the most numerous customers, they provide minimal incremental water usage. Industrial customers amount to a fraction of residential customers, but their water consumption as a whole is nearly equivalent. For the purpose of this plan in producing water demand projections, basing population projections; both residential and otherwise, on land use projections will give the more accurate insight into potential water demand in the City’s future.

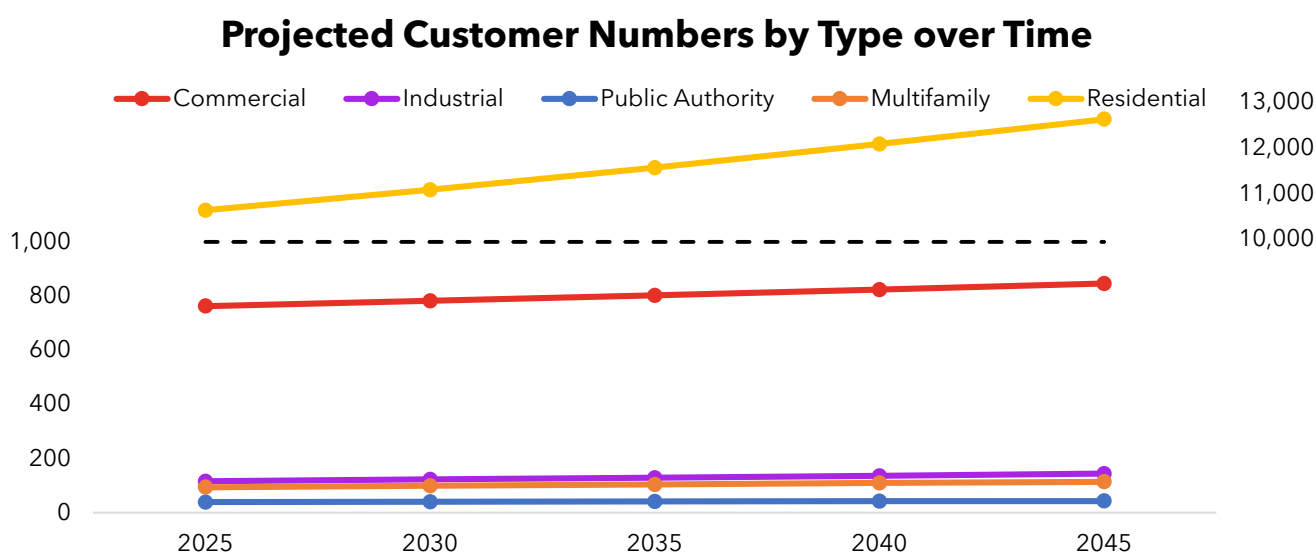
Customer numbers for each customer type can be estimated for future land use area by calculating the average density of each customer type and multiplying by the projected area for each. Below is a table of the calculated density of each customer type.

2024 Customer Density

Customer Type	Customers	Area Occupied	Average Density
		(Acres)	(Customers/Acre)
Residential	10,547	3,253.9	3.241
Commercial	760	598.0	1.271
Industrial	115	1,534.3	0.075
Public Authority	39	549.8	0.071
Multifamily	94	313.0	0.300



By applying the average customer densities by the expected land use area for each customer type each year, the expected number of customers can be projected throughout the remainder of the planning period.



Customer Numbers by Type over Time

Customer Type	2024	2025	2030	2035	2040	2045
Residential	10,547	10,630	11,078	11,566	12,085	12,629
Commercial	760	763	782	802	823	846
Industrial	115	116	122	129	136	144
Public Authority	39	39	40	41	42	43
Multifamily	94	94	99	104	109	114
Total	11,555	11,642	12,121	12,642	13,195	13,776

Lastly, to aid in estimation of population, average household sizes can be applied to residential customer numbers to derive population. The 2023 American Community Survey 5-year Estimates placed the average household size in the City of Neenah at 2.41. This average size can only be applied to residential customers, as multifamily customers can have any number of households. Below is a table estimating the population of people residing in a non-multifamily structure over time.

Population Residing in Non-multifamily Structures over Time

	2025	2030	2035	2040	2045
Population	25,618	26,697	27,874	29,124	30,345

5.2 Water Demand Projections

By Customer Type

In practice, population estimates alone will not aid in the calculation of water demand projections, as population is not the sole driving factor for water demand. Instead, customer type estimates reveal much more since they encompass all land uses within the City. Customer type-based estimates also account for the disproportionate water demands among different land use types. Therefore, for the purposes of this plan, water demand projections will be primarily shaped by customer type estimates.

Since customer type numbers have been estimated over time in the previous section, all that is needed to calculate water demand projections is the average annual water demand per customer for each customer type. For the purposes of this plan and its water demand projections, the average customer demand per customer will be calculated using 2024 water use data.

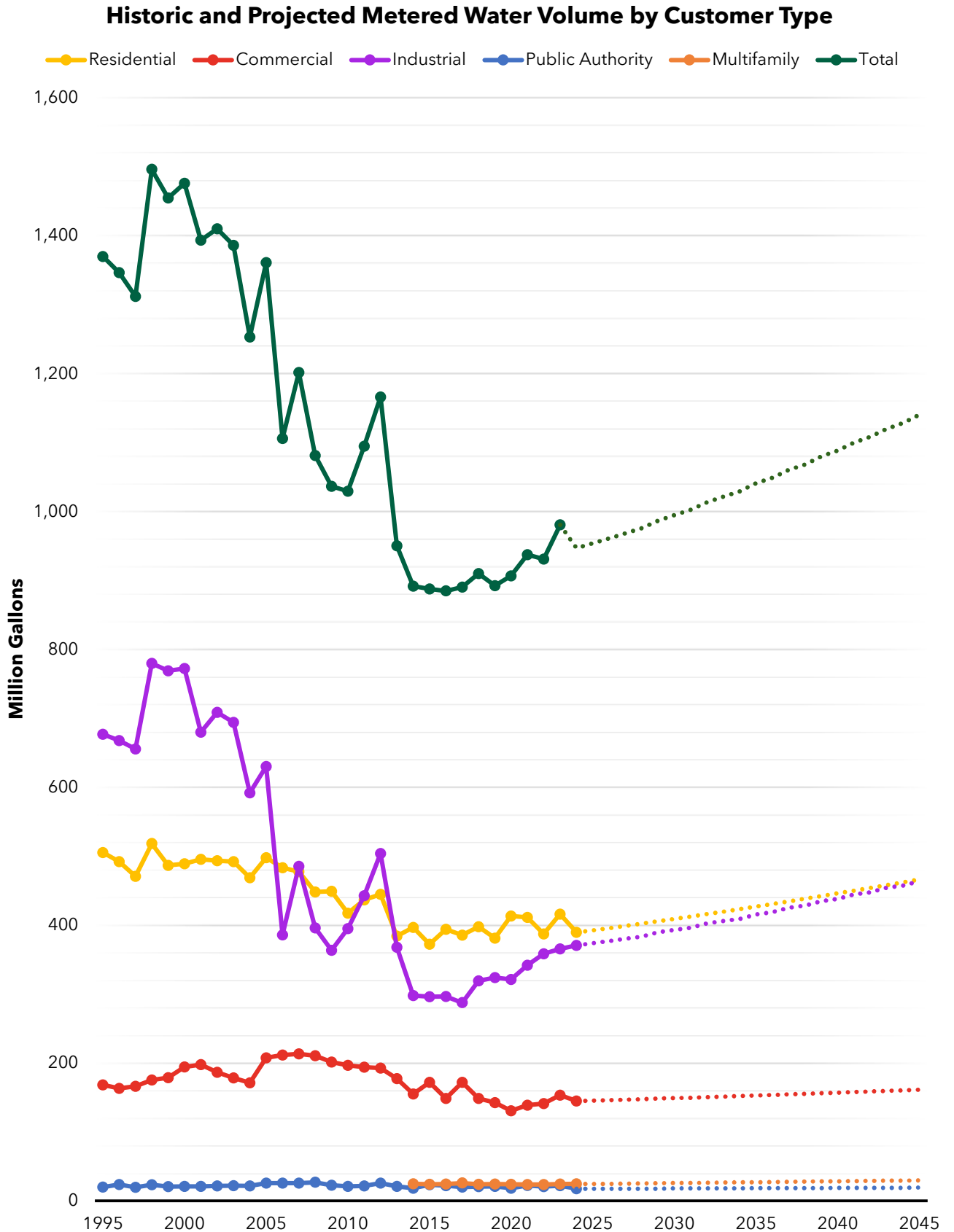
2024 Customer Average Annual Water Use

Customer Type	Customers	Total Annual Water Use	Average Annual Water Use
		(MG)	(MG / Customer)
Residential	10,547	389.331	0.0369
Commercial	760	144.857	0.1906
Industrial	115	370.412	3.2209
Public Authority	39	17.598	0.4512
Multifamily	94	24.517	0.2608

Applying the average annual water use per customer per customer type to the projected customer number estimates results in the water demand projections in the table below.

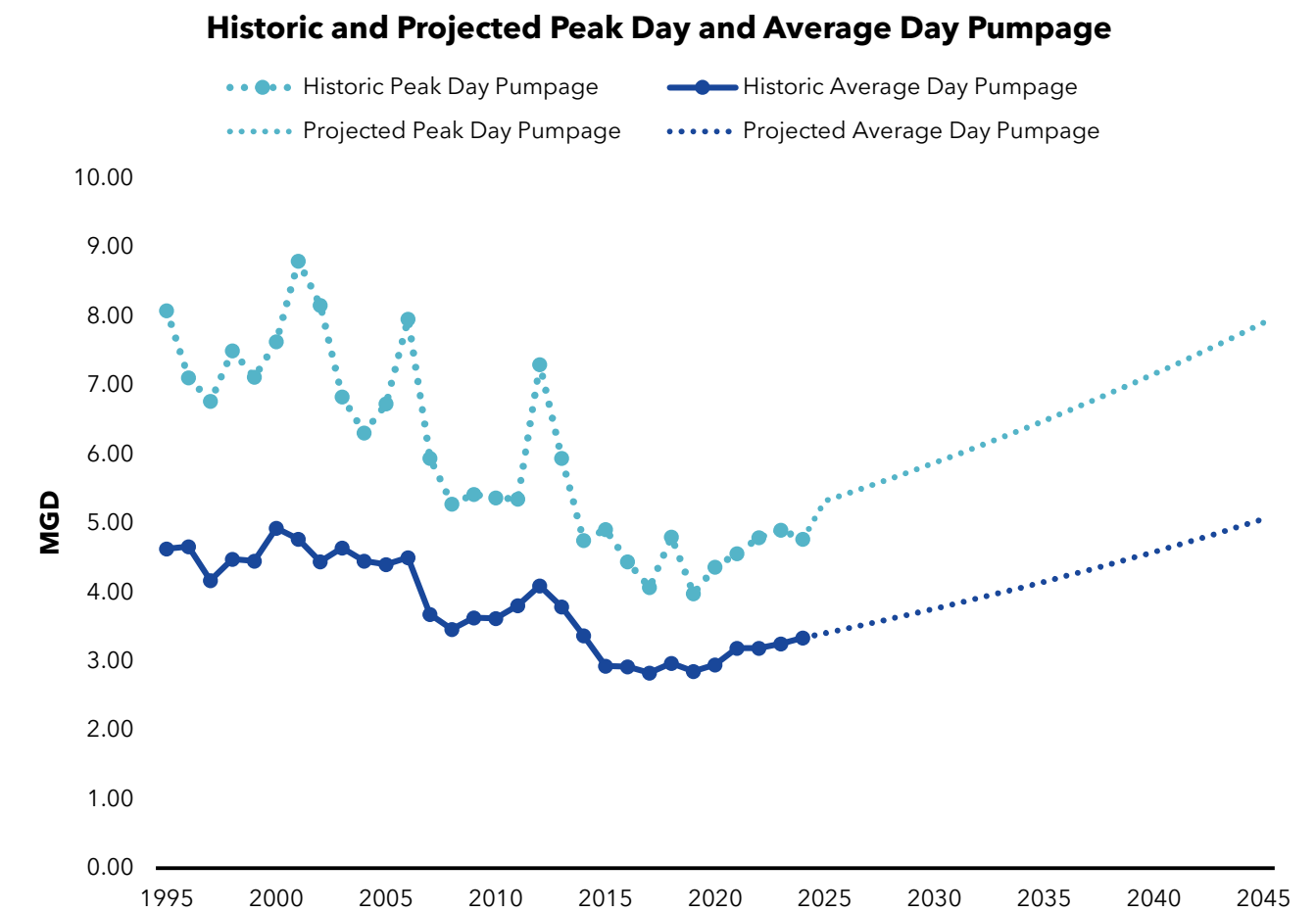
Water Demand Projections by Customer Type

Customer Type	2024	2025	2030	2035	2040	2045
	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)
Residential	389.331	392.39	408.93	426.95	446.10	466.19
Commercial	144.857	145.43	149.05	152.86	156.86	161.25
Industrial	370.412	373.63	392.96	415.51	438.05	463.82
Public Authority	17.598	17.60	18.05	18.50	18.95	19.40
Multifamily	24.517	24.52	25.82	27.13	28.43	29.73
Total	946.715	953.57	994.81	1,040.94	1,088.40	1,140.39



Peak Day and Average Day Pumpage

Calculation of peak day and average day pumpage will be based on historic peak and average day ratios, as well as an estimated 2% annual increase in water pumpage. This 2% increase was determined by averaging the annual increase in the total water demand projections as obtained in the previous section and rounding up to the nearest integer. Average day pumpage will be projected by the 2% average annual growth, and the peak day pumpage will be based on the average ratio between the average day and peak day for the past 20 years, which is approximately 1.57.



Peak and Average Day Pumpage Projections

	2024	2025	2030	2035	2040	2045
	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)
Peak Day	4.77	5.32	5.88	6.49	7.16	7.91
Average Day	3.34	3.41	3.76	4.15	4.59	5.06

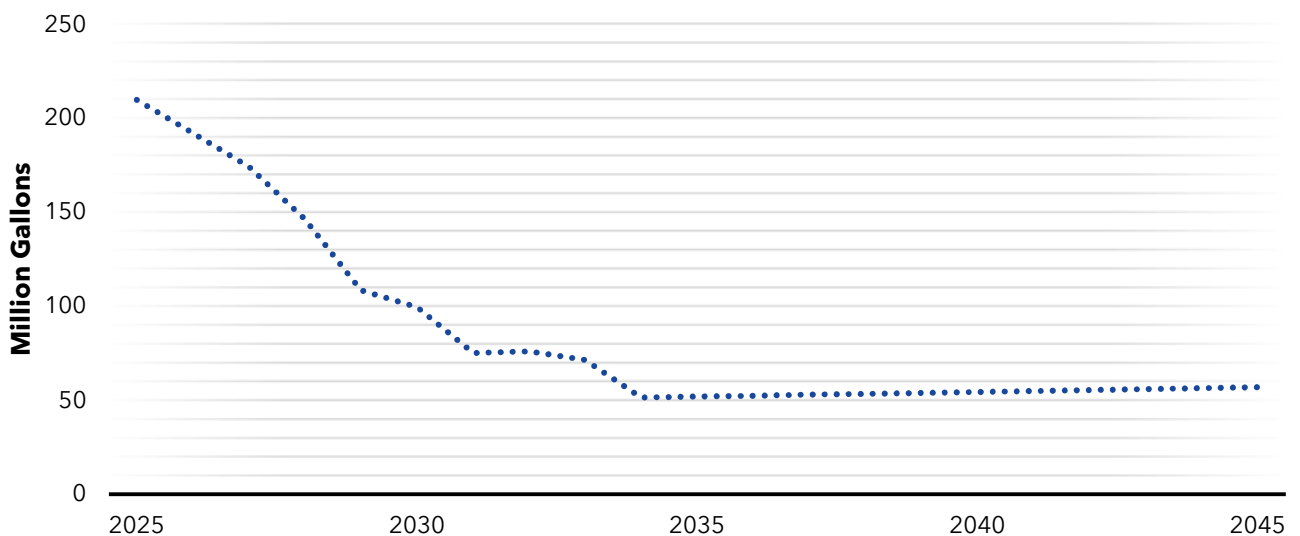
Non-Revenue Water

As described in [Section 2.1](#), non-revenue water is calculated monthly by comparing the volume of treated water entering the distribution system against billings. Currently, non-revenue water volumes are 20% of revenue water; however, this is expected to decrease immensely over the planning period. Neenah Water Utility is pursuing a more aggressive water main replacement strategy that the Utility believes will start to drastically decrease the amount of non-revenue water.

Ultimately, the Utility is targeting a maximum of non-revenue water at 5% volume of revenue water by 2034 and continuing through the remainder of the planning period. The Utility has identified several water mains within the City which are showing the most severe signs of degradation. These mains were manufactured of poor-quality ductile iron from the 1960s and 1970s. This fact is counterintuitive as the oldest mains within a municipality would typically be the most likely candidates for replacement. In addition, the Utility has found that leakage from service lines is almost exclusively due to degradation of lead service lines. Thus, a mixed approach of replacing identified susceptible network segments such as lead service lines and poor-quality ductile iron mains in addition to the regular replacement of the oldest mains will result in the significant decline in non-revenue water volume.

Projections of non-revenue water volumes will be produced by using the anticipated percentage of non-revenue water volumes as related to revenue water each year.

Projected Volume of Annual Non-Revenue Water over Time



	2024	2025	2030	2035	2040	2045
	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)
Non-Revenue Water	208.277	209.786	99.481	52.047	54.420	57.020

Summary

The projections calculated in this plan are consistent with trends from the past ten years of Neenah Water Utility's operation. All projected customer types are increasing at a similar rate to their historical pattern and are maintaining their position in relation to each other. Residential and Industrial demands are slowly converging which is consistent with the development patterns the City is currently experiencing. Peak day and average day pumpage is also projected along a trend closely matching the past ten years of data. Non-revenue water is anticipated to shrink drastically in volume as the Utility pursues its combined approach strategy for replacing distribution segments. The graphs provided in this plan effectively visualize the projection of recent trends into the planning period.

An additional buffer has been included in each projection to create a "best-case scenario", where development occurs at the anticipated maximum speed. This is to demonstrate the largest feasible increase in water demand to the Water Utility, and whether the Utility has the capacity to serve such an increase. However, for reasons discussed under Project Limitations, it is impossible to fully predict water demand or land use patterns. Therefore, it is entirely possible for future demands to outpace the projected amounts in this plan due to unforeseen variables.

Water Demand Projections Summarized

	2025	2030	2035	2040	2045
	(MG/Day)	(MG/Day)	(MG/Day)	(MG/Day)	(MG/Day)
Annual Peak Day Pumpage	5.32	5.88	6.49	7.16	7.91
Annual Average Day Pumpage	3.41	3.76	4.15	4.59	5.06
	2025	2030	2035	2040	2045
	(MG)	(MG)	(MG)	(MG)	(MG)
Residential	392.395	408.932	426.946	446.105	466.186
Commercial	145.429	149.050	152.862	156.865	161.249
Industrial	373.633	392.959	415.506	438.052	463.820
Public Authority	17.598	18.049	18.500	18.952	19.403
Multifamily	24.517	25.821	27.125	28.429	29.733
Total	953.572	994.812	1,040.940	1,088.403	1,140.391
	2025	2030	2035	2040	2045
	(MG)	(MG)	(MG)	(MG)	(MG)
Non-Revenue Water	209.786	99.481	52.047	54.420	57.020

5.3 Insights

Potential Future Impacts

At the time of the creation of this plan, Neenah Water Utility does not anticipate selling water to consecutive systems; however, the Water Utility does not rule this out as a possibility. Should the need from a neighboring community arise and it is found to be compatible with the goals and objectives of the Neenah Water Utility and within the best interests of the City of Neenah, it is possible for the sale of water to consecutive systems to occur within the planning period.

Currently, large-scale data centers are becoming an increasing possibility for communities within Wisconsin, as the State has a large amount of land suitable for development near large water resources; which data centers require. With Neenah's proximity to large surface-water sources and extensive extraterritorial land suitable for development, a data center could potentially desire to be located nearby and seek service from Neenah Water Utility within the planning period.

The Water Utility does not currently have a Water Conservation Plan, nor does it have plans to create one in the near future. There are also no active water conservation alternatives being deployed to Utility customers. This is not to say that the Utility does not value water conservation, but rather that these efforts have been proven unnecessary due to low-flow toilet and faucet mandates, and the historic decline of water consumption despite the City growing in population. Water demand per customer is expected to shrink on average as appliances become more efficient. Neenah does have a Sustainability Committee which focuses on environmental sustainability and has previously provided options to reduce water demand such as rain barrels. If the need arises, the Water Utility may explore the possibility of creating a Water Conservation Plan or raising awareness on water conservation alternatives.

Projection Limitations

Predicting accurate land use forecasts is inherently impossible, as there are innumerable variables which can affect land use and development patterns. All numerical projections in this plan are based solely on current and historic water use and land use data, as well as planned land uses from the comprehensive plan. Variables such as economic influence, natural disaster, legislative restriction, new technology, or any other items which may dictate potential impacts to water use within the planning period are not included within these calculations. Therefore, it is apt that the future calculations are labeled "projections", as they are the simply current trends projected into the future, and do not account for the variables listed above.

6. RECOMMENDATIONS AND IMPLEMENTATION

6.1 Plan Recommendations

Water Supply Sources

As described in [Section 2](#) of this plan, Neenah Water Utility withdraws water from Lake Winnebago with an emergency intake in the Fox River. When considering alternative sources such as groundwater or the Neenah Slough, these sources possess complications such as lack of adequate supply, water quality issues, or conflicts with the treatment process. Lake Winnebago is the most logical, cost effective, and sustainable choice for withdrawal. Therefore, this plan finds that with projected water demands for current and potential service areas, the current water source of Lake Winnebago is the best source available, and no change in source is needed.

Water Supply System

As described in [Section 3](#) of this plan, the Neenah Water Utility has an extensive water supply system including a 12 MGD treatment plant, a 36-inch intake pipe, a clearwell and two elevated storage tanks equaling a total of 4.5 MG of storage, a booster station, and an extensive network of water distribution pipes. The storage and distribution facilities are necessary and adequately sized with room for growth. The water treatment facility is operating at about 30-percent capacity, meaning the City could completely double in size and the plant would be well within its rated capacity. Therefore, this plan finds that the water supply system is effectively utilized to the extent practicable, and has ample room to accommodate growth in the City.

Current Water Use

As described in [Section 4](#) of this plan, the Neenah Water Utility serves water exclusively to properties within the City of Neenah. The top water users of the Utility are primarily industrial in nature, and attribute to nearly a quarter of the Utility's revenue. The water purchased from the Utility is reflective of the land use patterns occurring within the City. Therefore, this plan finds that the Neenah Water Utility is correctly configured to and is currently accommodating the current demand.

Projected Water Use

As described in [Section 5](#) of this plan, the Neenah Water Utility anticipates continued growth within and to the west of the City. While the current primary facilities are more than capable of meeting the projected future demands, the ability to supply water in an emergency may not be sufficient in future years. The emergency intake is only 16-inch with a maximum withdrawal capacity of 4 MGD, as opposed to the 36-inch main intake with a 12 MGD

withdrawal capacity. In 2024, the average day demand was 4.77 MGD, meaning if the main intake were incapacitated, the 16-inch backup intake may not be able to supply the demand required, especially if the City continues to see industrial growth and residential growth west. Therefore, this plan recommends the enlargement of the emergency Fox River intake to a 24-inch intake within the planning period. The enlarged intake would consist of 2,090-feet of 24-inch pipe at \$300 a linear foot, as well as a new intake structure. The total project cost is estimated to be around \$859,000.

6.2 Analysis of Consistency with Other Plans and Agreements

Comprehensive Plan

The City Comprehensive Plan ("Plan") 2040 was adopted in 2017 and updated in 2024. The Plan meets the requirements of Wisconsin State Statute 66.1001. The Plan is used to help identify the projected planning area within the water supply service area plan and the future land use designations were used to identify the use and projected water demand. The water service planning area is consistent with the adopted projected growth identified in the Plan. The water supply service area plan furthers major goals and objectives in the Plan including the following:

- Provide services in a manner that will promote efficient, cost-effective, and orderly growth and development and will meet existing and projected future needs.
- Create a balance pattern of land uses that meets the needs and desires of residents, preserves and enhances quality of life and is compatible with adjacent land uses.
- Ensures that environmentally sensitive areas such as wetlands, floodplains, corridors and surface water resources are protected.
- Participate in cooperative planning efforts with local governmental units and service providers.
- Direct the extension of public utility systems to suitable areas that can be most efficiently and economically serviced.
- Develop a map that depicts how future area will be served with the provision of public utilities.

The future land use map from the Plan was used in producing population, land use, and water demand projections.

The 2024 Fox Cities Sewer Service Area Plan

The 2024 Fox Cities Sewer Service Area ("SSA") Plan was updated and certified by the Wisconsin DNR in 2024. Within the Fox Cities SSA is the Neenah-Menasha sewer service area. The sewer service area was reviewed and amended as part of the 2024 updated to include areas within the City's projected growth area. The current Neenah-Menasha sewer service area and planning area were used in the creation of the water supply service area map.

The water supply service area plan furthers the major goals and objectives of the Fox Cities SSA including the following:

- Encourage an orderly and planned pattern of community growth and development.
- Promote balanced allocation of land areas to accommodate current and future urban development needs which contain centralized, compact, contiguous and compatible urban development patterns.
- Promote urban development which protects environmentally sensitive areas and is compatible with the natural resource base.
- Promote efficient and cost-effective development in urban growth areas.
- Preserving rural land uses by requiring planning which considers water and sanitary sewer adequacy. Provide efficient, economical, and equitable public facilities and services to urban development.
- Provide services where efficiency, equity, and economies of scale can be obtained through cooperation and coordination.
- Improve and protect surface and groundwater quality.

The Planning Boundary for the Neenah-Menasha SSA was used to inform portions of the planning area for this plan.

Cooperative Boundary Agreement

The City of Neenah and Town of Neenah entered into a Cooperative Boundary Agreement (Agreement) in 2003. The Agreement was amended in 2022 with an expiration date of 2040. The Agreement sought orderly, planned growth for the City and Town and the provision of appropriate, cost-effective municipal services for such development. Within the Agreement, the City and Town agreed to City Growth area within the Town that were suitable for future development. City Growth Areas are not currently in the City, however, the Agreement allows for proper planning and utility extensions to serve these areas in the future, since they are likely to annex and develop in the City.

The Agreement further seeks to prevent unplanned development leading to urban sprawl, and protection of the area's natural resources, including its lakes, streams, rivers, wetlands, and woodlands. The Agreement also grants the ability for the Neenah Water Utility to provide water wholesale to a specific small parcel in the Town of Neenah provided it develops. At the time of this plan, the development has not occurred, and the Utility does not serve that property.

The Agreement was used to help determine future land use, population projections, and future water demand. The WSSAP included the goals and objective of the Agreement in this plan.

6.3 Public Participation

Public Notice

Notice was given on the creation of the WSSAP on [DATE HERE] by [METHOD(S) OF NOTICE HERE].

Public Hearing

A public hearing was held at [LOCATION HERE] on [DATE AND TIME HERE]. At the hearing, copies of the WSSAP were available for viewing. Staff was also present to answer potential questions on both the WSSAP and other aspects of the Water Utility and its processes and future. During this hearing, an opportunity to provide written comment on the plan was available. Written comments from the hearing are provided as an appendix to this plan.

6.4 Submission of Plan to Local Governments

Purpose

According to Wis. Admin Code NR 854.05(11), this plan must include documentation that it has been submitted to the governing body of each municipality whose public water supply is addressed by the plan. This plan addresses first and foremost the City of Neenah's public water supply, but also indirectly impacts the public water supply of other municipalities as well, since this plan assumes water service area growth into area currently belonging to other municipalities. These municipalities include; the Town of Neenah, the Town of Vinland, and the Town of Clayton. Records of delivery are available with the Neenah Water Utility.

City of Neenah Common Council

Submitted: [DATE OF SUBMISSION]
Via: [METHOD OF SUBMISSION]

Town of Clayton Town Board

Submitted: [DATE OF SUBMISSION]
Via: [METHOD OF SUBMISSION]

Town of Neenah Town Board

Submitted: [DATE OF SUBMISSION]
Via: [METHOD OF SUBMISSION]

Town of Vinland Town Board

Submitted: [DATE OF SUBMISSION]
Via: [METHOD OF SUBMISSION]

Approval by Neenah Water Works Commission

This plan was introduced to the Neenah Water Works Commission ("Commission") meeting on September 9th, 2025. Presentation was given on the purpose of the document, including the legislative requirements compelling its creation, in addition to the content of the plan. After brief discussion the plan was approved by the Commission.