



**BOLTON
& MENK**

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Water System Review City of Maple Plain

October 28, 2025

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Table of Contents

I.	EXECUTIVE SUMMARY	3
A.	Water Demand Overview.....	3
B.	Water Model & Fire Flow Results	3
C.	Storage Analysis	3
D.	Storage Recommendations	4
II.	SUMMARY OF DEMANDS.....	5
III.	WATER MODEL RESULTS	6
IV.	STORAGE RECOMMENDATIONS.....	7
V.	CONCLUSION	9
	APPENDIX	11

I. EXECUTIVE SUMMARY

This report evaluates the current and future water system demands, fire flow capabilities, and storage requirements for Maple Plain, considering existing infrastructure and proposed developments including commercial areas, high-density residential, new gas station, Independence Developments, and Medina Apartments.

A. Water Demand Overview

- Existing System:
 - Avg Daily: 185,000 gpd
 - Peak Month Avg: 258,000 gpd
 - Max Daily: 643,000 gpd
- Future Additions:
 - Combined future developments add 135,600 gpd average daily demand and 356,900 gpd max daily demand.

B. Water Model & Fire Flow Results

- Existing System Hydrants:
 - Pressure: 52–85 psi (Avg 63)
 - Fire Flow: 1,100–5,000+ gpm (Avg 2,600)
- Independence Development Hydrants:
 - Pressure: 56–79 psi (Avg 64)
 - Fire Flow: 2,100–2,800+ gpm (Avg 2,500)
- Medina Apartment Hydrants:
 - Pressure: 71–77 psi (Avg 74)
 - Fire Flow: 1,900–2,100+ gpm (Avg 2,000)

All scenarios meet minimum fire flow requirements for single-family residential areas. Commercial and multi-family fire flow needs depend on building specifics and insurance standards.

C. Storage Analysis

Two water storage sizing methods are considered when sizing water towers including fire flow storage and the operation turn-over rate of the water. In northern states, the turn-over rate is recommended to be maintained between 1 and 2 days in comparison to average daily demands to prevent freezing in winter. For small cities, the recommended fire flow storage often results in turn-over rates above 2 days; therefore, for small cities, the turn-over rate method often determines the recommended storage volume.

- Fire Flow Storage Needs:
 - Existing system shows a minor deficit (10,000 gallons), which is considered acceptable.
 - Future scenarios show deficits ranging from 75,000 to 156,000 gallons.
- Turn-over Rate (to prevent freezing):
 - Desired range: 1–2 days.
 - Existing system and Medina Apartments scenario exceed 2-day turn-over under average daily demand but meet targets under peak month conditions.
 - All other future scenarios are within the desired range.

D. Storage Recommendations

Balancing turn-over storage and fire flow, the existing storage is sufficient for Maple Plain future needs and needs with the Medina Apartments. Proposed additions are recommended for the following scenarios:

- 50,000-gallon tank for Independence Development scenario.
- 100,000-gallon tank for combined Independence + Medina scenario.

II. SUMMARY OF SUPPLY AND DEMANDS

Existing System

The City of Maple Plain contains a water treatment plant with 1.0 million gallons per day (MGD) of treatment capacity, a 400,000-gallon elevated storage tank and a 95,000-gallon clearwell of additional storage. Three pumps exist to be able to supply water to the system, two main pumps capable of 700 gallons per minute (gpm) and 500 gpm and an emergency well capable of 125 gpm.

Demands

Four scenarios were analyzed based on the following growth factors and summarized in Table 1:

- Existing Conditions
 - Based on water use between January 2024 and August 2025.
- Future Developments
 - Known and assumed growth in Maple Plain.
 - Includes new gas station, downtown redevelopment property, and expansion of several commercial properties.
- Independence Developments
 - Addition of 394 Single Family Units south of Maple Plain.
- Medina Apartments
 - 100 units in a multi-family apartment on Southeast corner of Maple Plain.

Table 1 – Demand Summary			
	Average Daily Demand (gpd)	"Peak Month" Average Daily Demand (gpd)	Maximum Daily Demand (gpd)
Existing System	185,000	258,000	643,000
Future Developments	26,800	37,300	70,700
Independence Development	74,800	104,400	196,700
Medina Apartments	34,000	47,500	89,500

The “Peak Month” Average Daily Demand was the average daily demand used in the 2023 hydraulic analysis study and is for reference to prior assumptions. This is approximately the highest average daily demand seen in the data provided in October 2025. This demand column is used to evaluate water tower turn-over rate, as seen below.

The model was analyzed at average daily demands and maximum daily demands. Table results and figures provide the maximum daily demand results, since fire flow is only examined under maximum daily demand conditions. Under average daily demand

conditions, the pressures are higher than maximum daily demand pressures because the water tower is set at a higher water level.

The demands for each respective development indicate that an 8-inch watermain would be adequate to provide water to each location; while also providing fire protection.

III. WATER MODEL RESULTS

Pressures should be maintained between 35-100 psi, but are preferred between 60-80 psi. The minimum recommended fire flow is determined by the International Organization for Standardization (ISO) and varies based on building size and occupancy. For residential areas, the recommended minimum fire flow is 1,000 gpm, and 3,500 gpm is generally sufficient for commercial and industrial areas. The fire marshal and ISO should be consulted to verify actual required fire flow for insurance purposes.

Below is a summary of results for the existing system hydrants during each scenario examined.

Table 2 - Existing System Hydrants		
Scenario	Maximum Daily Demand - Pressure (psi)	Maximum Daily Demand - Fire Flow (gpm)
Existing System	52 - 85; Avg 63	1,100 - 5,000+; Avg 2,600
Future + Independence Development	52 - 84; Avg 62	1,100 - 5,000+; Avg 2,600
Future + Medina Apartments	52 - 85; Avg 62	1,100 - 5,000+; Avg 2,600
Future + Ind. Development + Medina Apartments	52 - 84; Avg 62	1,100 - 5,000+; Avg 2,600

Below is a summary of results for the hydrants in the Independence Development during each scenario examined.

Table 3 - Independence Development Hydrants		
Scenario	Maximum Daily Demand - Pressure (psi)	Maximum Daily Demand - Fire Flow (gpm)
Existing System	N/A	N/A
Future + Independence Development	56 - 79; Avg 64	2,100 - 2,800+; Avg 2,500
Future + Medina Apartments	N/A	N/A
Future + Ind. Development + Medina Apartments	56 - 79; Avg 64	2,100 - 2,800+; Avg 2,500

Below is a summary of results for the hydrants near the Medina Apartments during each scenario examined.

Table 4 - Medina Apartment Hydrants		
Scenario	Maximum Daily Demand - Pressure (psi)	Maximum Daily Demand - Fire Flow (gpm)
Existing System	N/A	N/A
Future + Independence Development	N/A	N/A
Future + Medina Apartments	72 - 77; Avg 74	1,900 - 2,100+; Avg 2,000
Future + Ind. Development + Medina Apartments	71 - 77; Avg 74	1,900 - 2,100+; Avg 2,000

Between scenarios at each respective area (i.e. existing system, Independence Development, and Medina Apartments) fire flows vary by a negligible amount; the amount they vary by is obscured by rounding to the nearest hundred.

Fire flow results show that the minimum recommended fire flow for single-family residential areas is achieved. Recommended fire flows for commercial and multi-family residential areas depends on building size and material; the recommended fire flow is determined by the insurance company or ISO.

IV. STORAGE RECOMMENDATIONS

There are two water storage sizing methods that are considered when sizing water towers. One considers fire flow storage recommendations, and the other considers the operation turn-over rate of the water. In northern states the turn-over rate is recommended to be maintained between 1 and 2 days in comparison to average daily demands, this is to prevent freezing in winter. For small cities the recommended fire flow storage often results in turn-over rates above 2 days; therefore for small cities the turn-over rate method often determines the recommended storage volume.

Table 5 summarizes the fire flow storage method for each scenario. Results indicate that the existing system has a deficit of 10,000 gallons, however storage tanks are not made for this small volume and the existing system would be considered compliant with fire flow storage recommendations. The other future scenarios show deficits of 120,000 gallons; 75,000 gallons; and 150,000 gallons when rounding.

Table 5 – Fire Flow Storage Summary				
	Existing System	Future + Independence Development	Future + Medina Apartments	Future + Ind. Development + Medina Apartments
Fire Demand (gpm)	2,000	2,000	2,000	2,000
Max Day Demand (gpm) ⁽¹⁾	540	760	670	830
Total Coincident Demand (gpm)	2,540	2,760	2,670	2,830
Firm Supply (gpm)	625	625	625	625
Withdrawal from Storage (gpm)	1,915	2,135	2,045	2,205
Fire Flow Duration (minutes)	180	181	181	182
Fire Fighting Storage (MG)	0.34	0.39	0.37	0.40
Equalizing Storage (25% Max. Day Demand)	0.16	0.23	0.20	0.25
Total Storage Required (MG)	0.51	0.61	0.57	0.65
Available Storage (MG)	0.495	0.495	0.495	0.495
Storage Deficit (MG): Excess (-) / Deficit (+)	0.010	0.119	0.076	0.156

⁽¹⁾ Assumes 20 hours to supply maximum daily demand

Table 6 summarizes turn-over rates when compared to the existing storage volume. This demonstrates that turn-over rates are above 2-days for the existing system scenario and the future scenario with the Medina Apartments, when looking at the average daily demands. Higher than normal average daily demands, as seen by the “Peak Month” average daily demands were also considered. Results show turn-over rates in the desired range; however, historically, only two months had average daily demands around this rate in the past two years.

Table 6 – Turn-over Storage Summary				
	Existing System	Future + Independence Development	Future + Medina Apartments	Future + Ind. Development + Medina Apartments
Average Daily Demand (MGD)	0.185	0.287	0.246	0.321
"Peak Month" Average Daily Demand (MGD)	0.258	0.400	0.343	0.447
Existing Storage (MG)	0.495	0.495	0.495	0.495
Turn-over rate (hrs) of Average Daily Demand	64.2	41.5	48.3	37.1
Turn-over rate (hrs) of "Peak Month" Average Daily Demand	46.0	29.7	34.7	26.6

Table 7 reviews turn-over rates when compared to proposed storage volumes for each scenario. Using this method, a 50,000-gallon tank would improve fire flow storage while also maintaining the 2-day turn-over rate for the future system with the Independence Development only. A 100,000-gallon tank would improve fire flow storage while also maintaining the 2-day turn-over rate for the future system with the Independence Development and the Medina Apartments. This table shows that the existing storage tanks are acceptable for the future system with the Medina Apartments only, since turn-over is just above the 2-day recommendation.

Table 7 – Proposed Storage Summary				
	Existing System	Future + Independence Development	Future + Medina Apartments	Future + Ind. Development + Medina Apartments
Average Daily Demand (MGD)	0.185	0.287	0.246	0.321
"Peak Month" Average Daily Demand (MGD)	0.258	0.400	0.343	0.447
Existing Storage (MG)	0.495	0.495	0.495	0.495
Proposed Storage (MG)	-	0.050	-	0.100
Total Proposed Storage (MG)	0.495	0.545	0.495	0.595
Turn-over rate (hrs) of Average Daily Demand	64.2	45.6	48.3	44.5
Turn-over rate (hrs) of "Peak Month" Average Daily Demand	46.0	32.7	34.7	31.9

Turn-over rates that are higher than the recommended 2-day limit can be managed by operating the tower at a lower level, particularly in the winter when demand is lower. Additional storage is recommended to improve the fire flow storage deficits where the system is not already showing longer than 48-hour retention times.

Costs for elevated storage range between \$2.5M-\$3.0M for a 50,000-gallon tank and \$2.75M - \$3.25M for a 100,000-gallon tank.

V. CONCLUSION

Based on the available data obtained from the City of Maple Plain, City of Independence and City of Medina for existing and proposed uses we recommend the following actions:

- The City of Maple Plain has sufficient system capacity for supply and storage for its own planned growth, mainly driven by redevelopment.
- The Medina Apartments scenarios, excluding Independence developments, do not trigger additional storage or system upgrade needs.
- The Independence Developments trigger system upgrades of additional storage requirements to improve fire flow storage needs. Improvements are recommended regardless if development occurs in Medina.

Appendix

Figures

Max Day Demand Available Fire Flow & Max Day Available Pressure for:

- Existing System
- Future + Independence Developments
- Future + Medina Apartments
- Future + Independence Developments + Medina Apartments



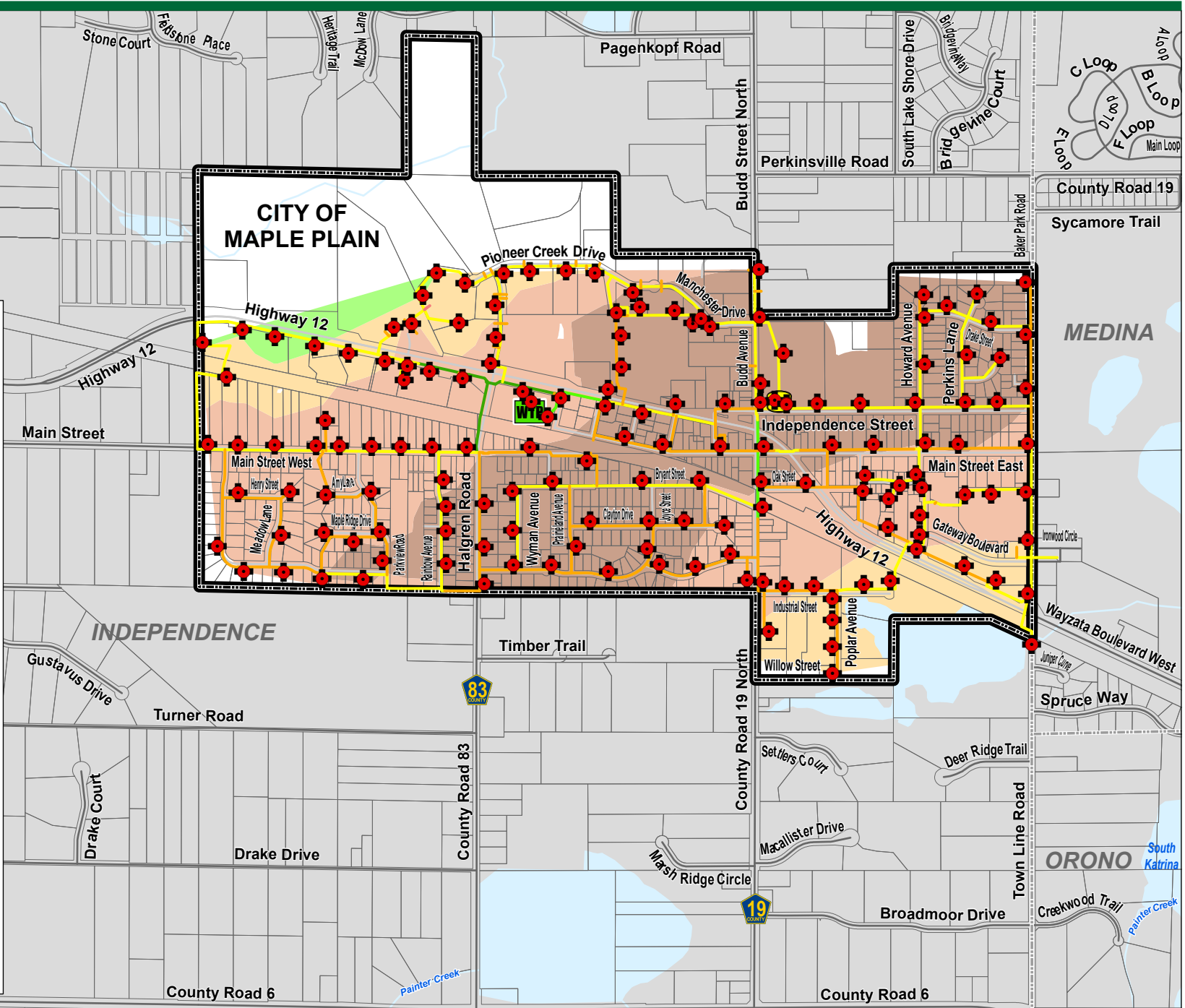
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Legend

- Hydrant - Existing
- Tower
- WTP
- Watermain - Existing
 - 4"
 - 6"
 - 8"
 - 10"
 - 12"
 - 99"
- Existing - Maximum Daily Pressure
 - 50 - 60 psi
 - 60 - 70 psi
 - 70 - 80 psi
 - 80 - 90 psi
 - 110 - 120 psi
- Pressure Zone - Existing
- Maple Plain Municipal Boundary
- Surrounding Community
- Parcels
- Maple Plain Roads
- Surrounding Community Roads
- Lakes & Rivers
- Rivers & Streams

0 0.25 Miles

Source: Hennepin County, MnDNR, MnDOT





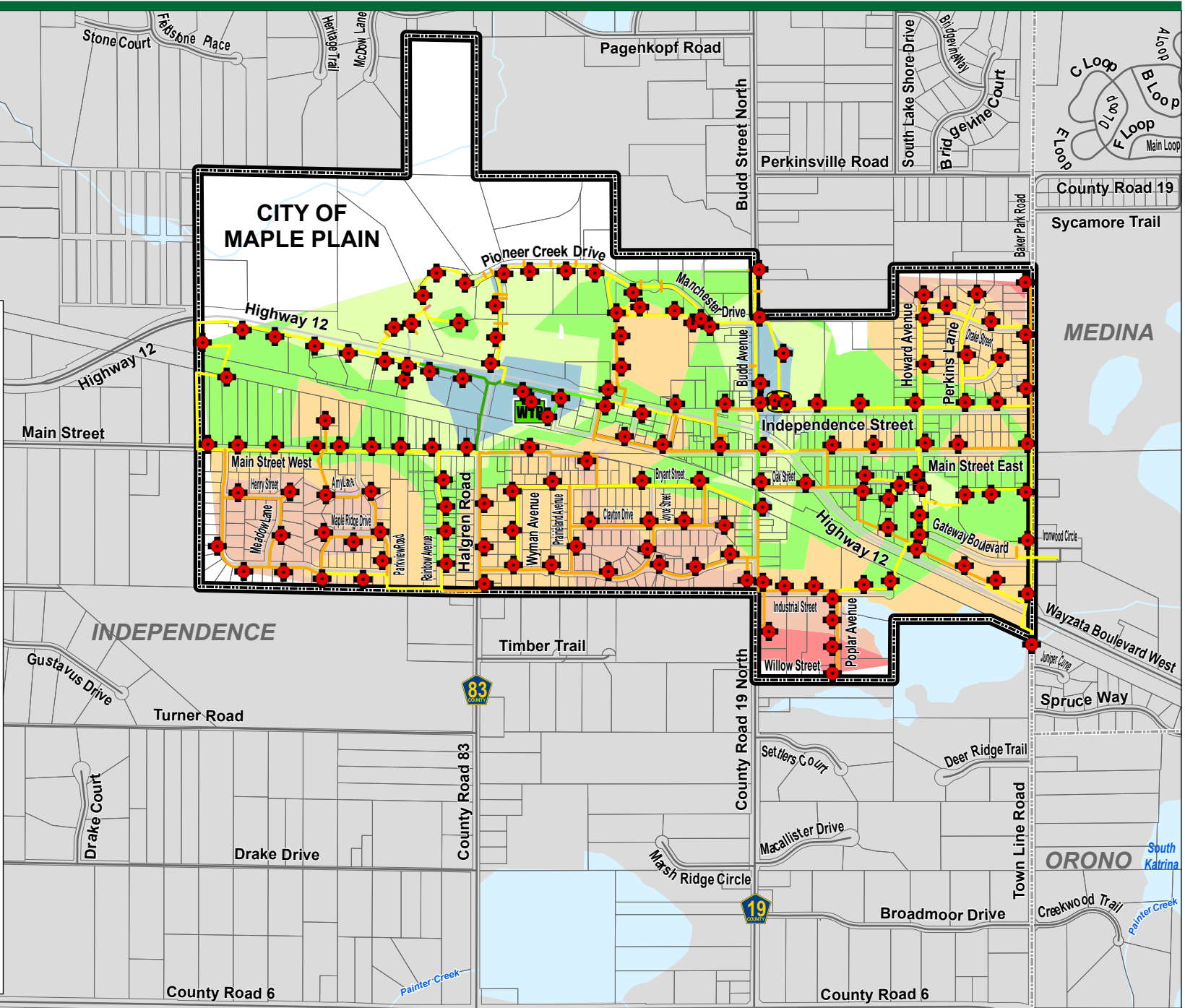
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Legend

- Hydrant - Existing
- Tower
- WTP
- Watermain - Existing
 - 4"
 - 6"
 - 8"
 - 10"
 - 12"
 - 99"
- Existing - Maximum Daily Fire Flow
 - 0 - 1500 gpm
 - 1500 - 2000 gpm
 - 2000 - 2500 gpm
 - 2500 - 3000 gpm
 - 3000 - 3500 gpm
 - 3500 + gpm
- Maple Plain Municipal Boundary
- Surrounding Community
- Pressure Zone - Existing
- Parcels
- Maple Plain Roads
- Surrounding Community Roads
- Lakes & Rivers
- Rivers & Streams

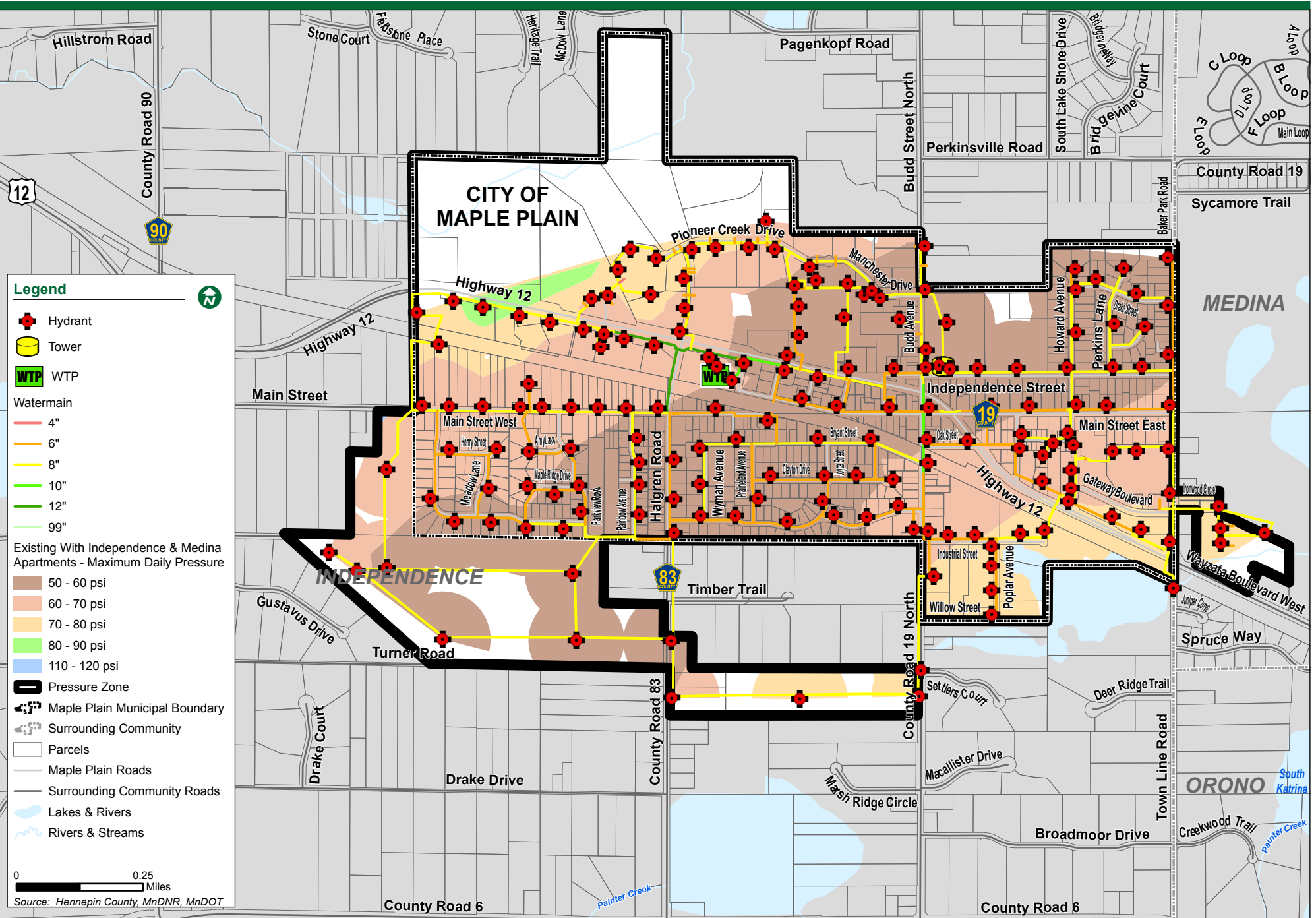
0 0.25 Miles

Source: Hennepin County, MnDNR, MnDOT



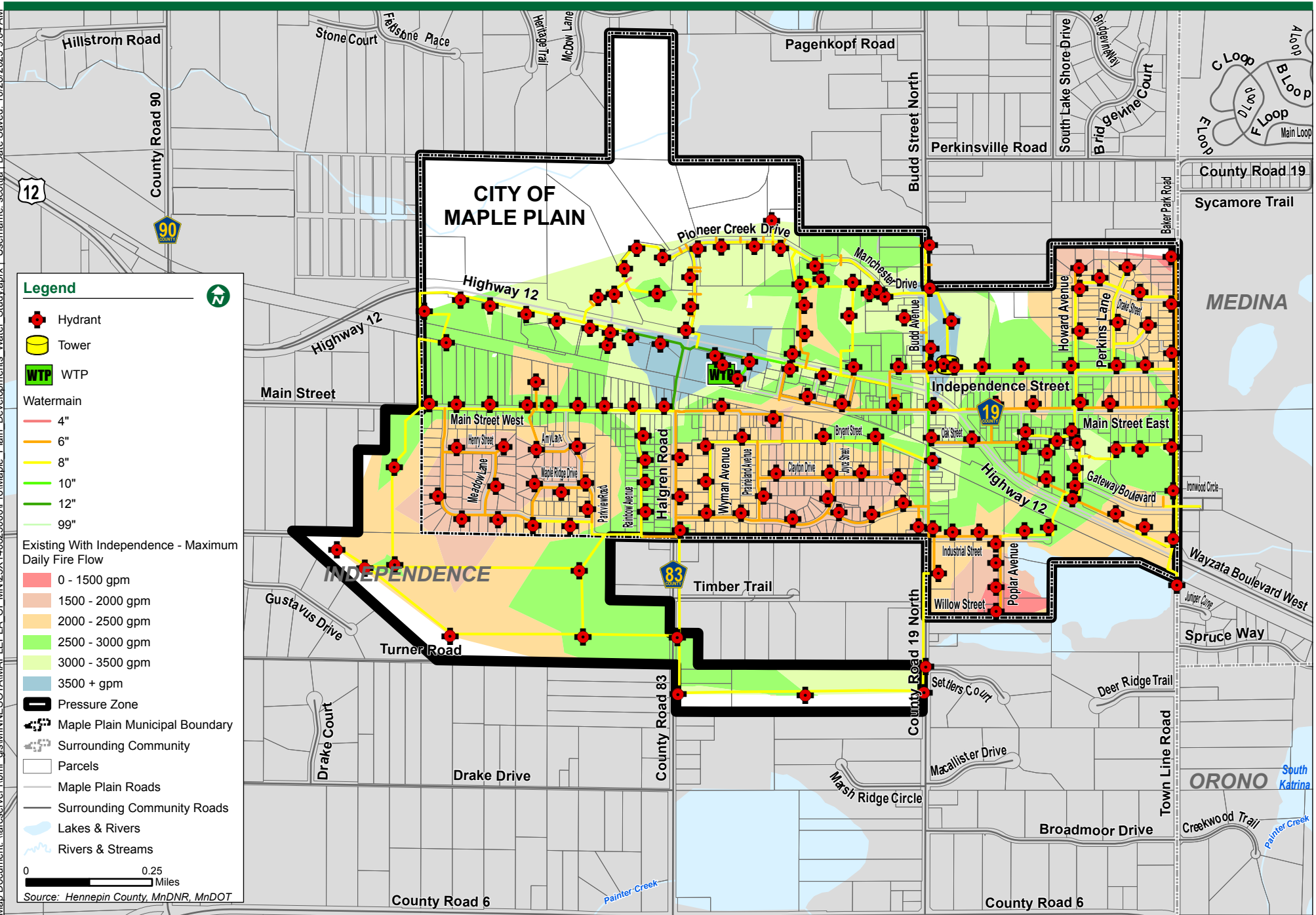


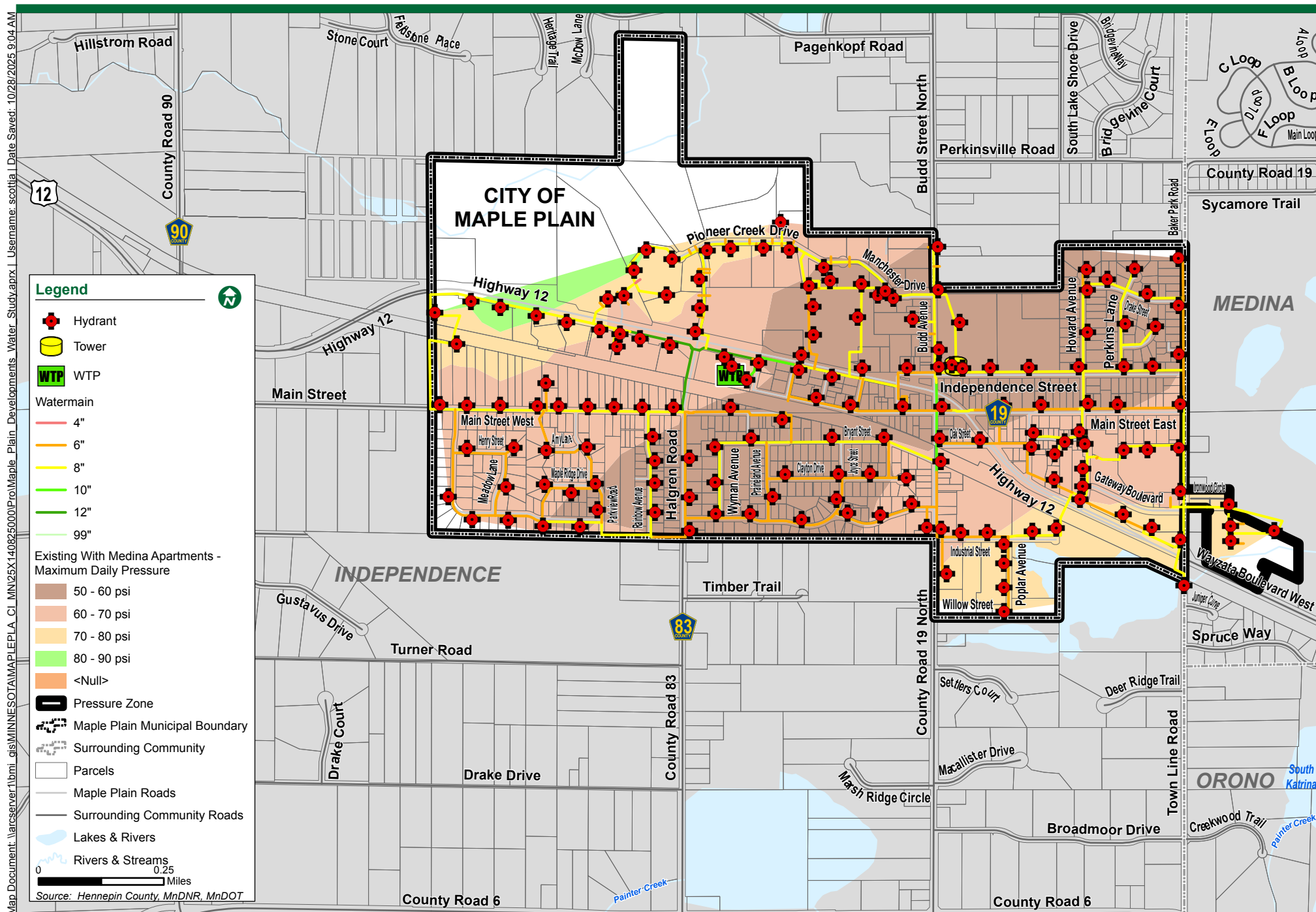
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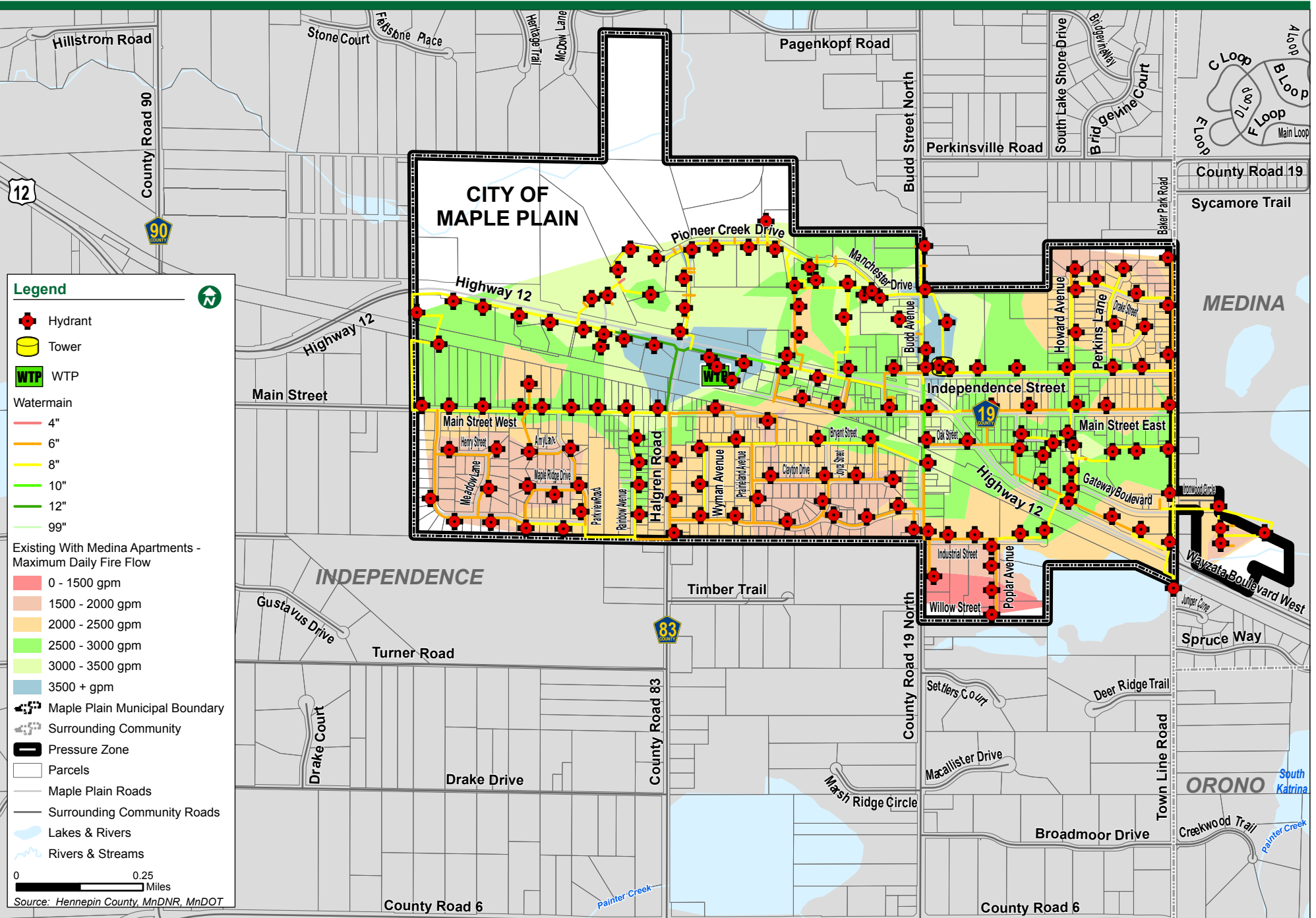
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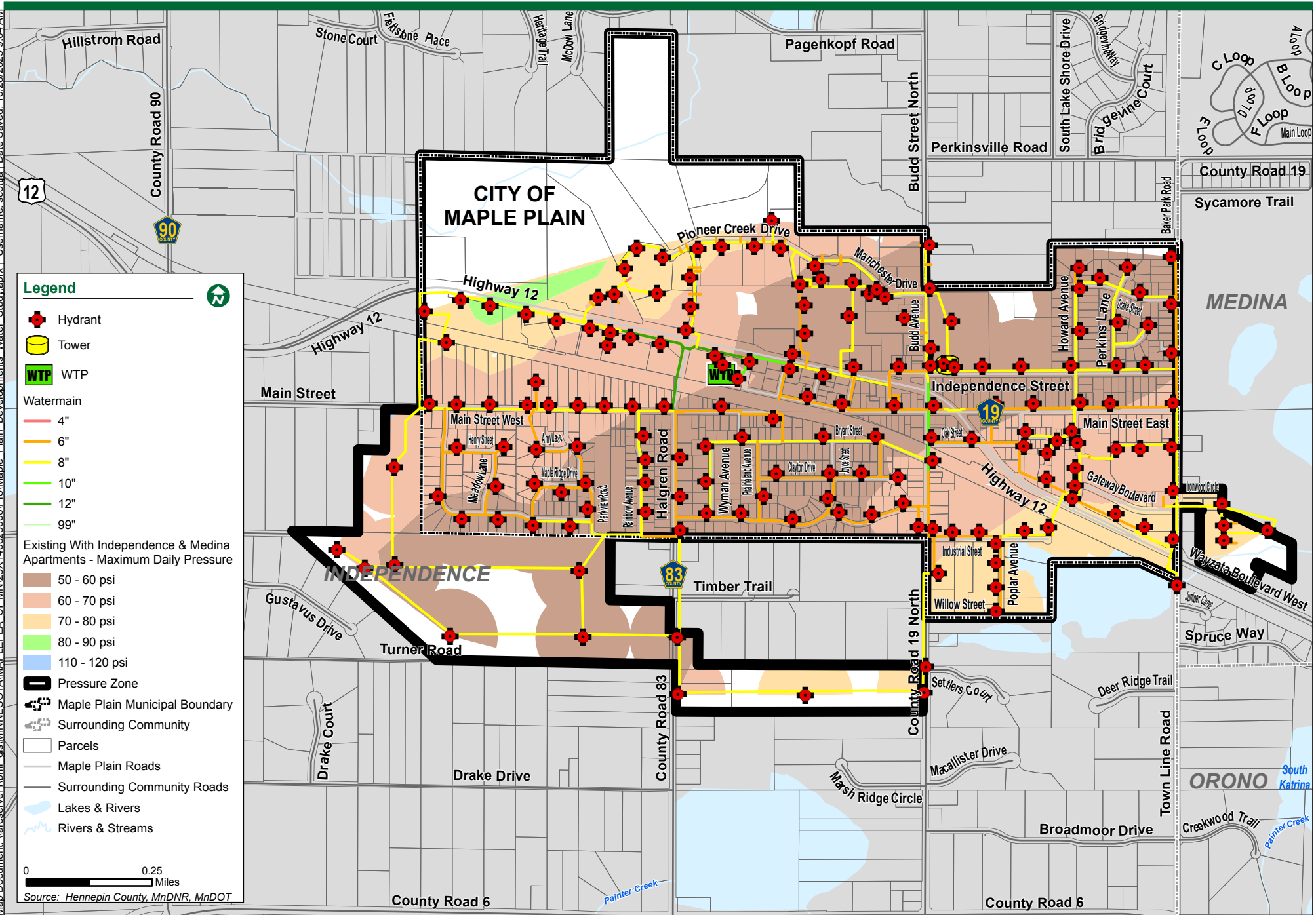


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