




25 Vaughan Mall
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Technical Memorandum

To: Russell Dean, Town Manager, Town of Exeter, NH
From: Meagan McCowan, P.E. (NH), Senior Project Engineer *MLM* 
Keith Pratt, P.E. (NH, ME, MA), President
cc:
Date: August 11, 2023
Subject: Fire Protection Charge Analysis for the Town of Exeter

Background

The Town of Exeter has requested Underwood Engineers (UE) to perform an analysis for and suggest an approximate Fire Protection Charge that could be assessed to the Town General Fund using American Water Works Association (AWWA) guidance.

Fire protection charges include costs associated with larger tanks, larger mains, backflow preventers, hydrants, etc. Sprinklers (service connections) are another source of revenue relating to fire protection. It is common practice that the General Fund (general taxation) is assessed a Fire Protection Charge because it is generally accepted that it is an obligation of general government, and fire protection benefits the entire Town, not just the water users. UE calculated a Fire Protection Charge for Exeter based on guidance by the “Principles of Water Rates, Fees, and Charges – Manual of Water Supply Practices (M1)” per AWWA standards.

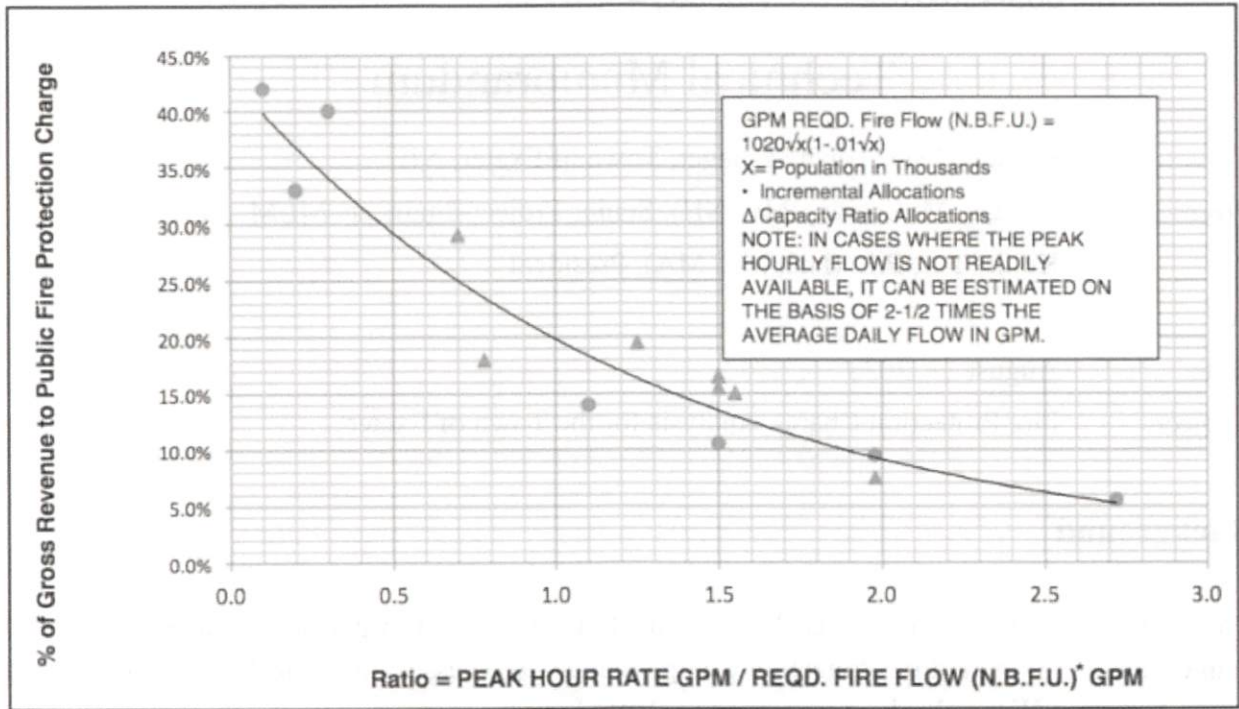
AWWA suggests that costs associated with fire protection in a water system range from 5% (larger systems) to 40% (smaller systems). Two methods are generally used to establish the costs associated with fire protection:

1. Cost Curves generated from a Maine Water Utilities Association study.
2. Cost Allocation Study (Cost of Service).

Computations

The Town of Exeter has not completed a Cost of Service Study, so the Cost Curve method was used in this analysis. The Cost Curve method uses the graph shown on *Figure 1* below. According to the method, the peak hour flow can be estimated using 2.5 times the average daily flow in gallons per minute.

Figure 1. Cost Curve Method



The average daily production for Exeter was calculated using an average for 2019 to 2021 data. See *Table 1* for a summary of average daily production.

Table 1. Summary of Exeter Average Daily Production

Year	Gallons Per Year	Days in Period	Gallons Per Day (Rounded)
2019	348,134,349	365	954,000
2020	337,766,143	366	923,000
2021	358,754,288	365	983,000
Average	348,218,260	365	953,000

The average daily production of 953,000 gallons per day is about 660 gpm. Consequently, the peak hour flow is estimated as 2.5 times 660 gpm, which is approximately 1,650 gpm.

The required fire flow is calculated using *Equation 1* described below, and as shown on *Figure 1*.

$$\text{Req. Fire Flow} = 1,020 \times \sqrt{x} \times (1 - 0.01\sqrt{x}) \quad \text{Eq. 1}$$

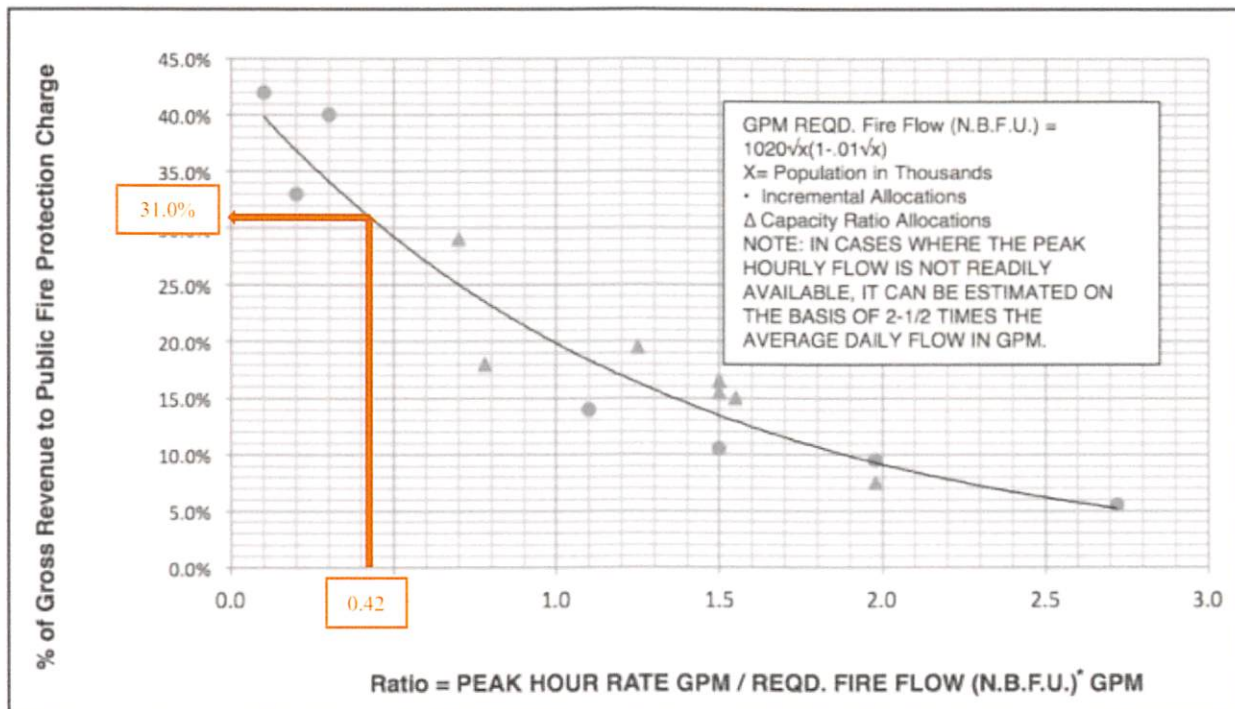
x = population in thousands

Fire Protection Charge
August 11, 2023

The population of the Town of Exeter is 15,847, according to the 2021 Census. Using this number, the required fire flow was calculated as approximately 3,900 gpm. Consequently, the ratio of Peak Hour flow and Required Fire Flow is 0.42.

Using the Cost Curve, a ratio of 0.42 is equivalent to 31% of gross revenue attributable to the Fire Protection Charge. See *Figure 2* below.

Figure 2. Percentage of Revenue Attributable to the Fire Protection Charge (Exeter)



While the cost curve indicates 31% of the Water Department budget could be assessed to the General Fund (\$1.6M in 2024), UE recommends targeting 15% of the Water Department budget until the cost of service can be computed. Fifteen percent is equal to approximately a \$750k General Fund contribution in 2024 and a \$1.1M contribution in 2028. UE recommends that the General Fund Contribution be increased in steps over the next several years until the 15% target is reached.



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From: Meagan McCowan, P.E. (NH), Senior Project Engineer *MLM*
Keith Pratt, P.E. (NH, ME, MA), President *KP*
cc:
Date: August 11, 2023
Subject: Irrigation and Deduct Meter Review
Water Enterprise Fund
Exeter, NH

Background

The Town of Exeter has requested Underwood Engineers (UE) review the current Town practices for offering and charging for irrigation and deduct meters, and to provide recommended actions where appropriate.

Exeter currently bills accounts a service fee and a consumption charge. It is assumed that the metered water enters the sewer system (i.e. showers or sink faucets) so the same metered amount is billed for sewer as well. Exeter allows irrigation/deduct meters in certain cases. When provided, irrigation and deduct meters measure usage that is not expected to enter the sewer system. These meters are both used to measure irrigation usage, with irrigation meter usage being measured in parallel to the master meter and deduct meter usage being measured following the master meter and subtracted out from the sewer bill. Irrigation and deduct meters incur costs associated with installation and maintenance of an additional water meter at a property, administration/billing, and water usage.

The intent of this review is to provide recommendations, based on financial and logistical impacts, for opening the irrigation program to all users and allowing deduct meters for commercial non-irrigation purposes.

Rate Structure & Current Rates

As stated above, Exeter water and sewer rates include a quarterly service fee and a tiered consumption charge. The quarterly fixed fee is the same for all users, regardless of meter size. There are three tiers for consumption, which increase in cost as more water is used. Tier 1 currently

includes 0-21,000 gallons per quarter and captures about 97% of residential consumption. Tier 2 includes consumption between 21,000 – 105,000 gallons per quarter, and Tier 3 includes Consumption >105,000 gallons per quarter. Existing irrigation meters are currently charged using these tiers and rates.

Current water and sewer rates are included in Table 1.

Table 1. Current Water & Sewer Rates

Rate Type	Quarterly Service Fee	Tier 1 Consumption Charge (\$/1000 gal)	Tier 2 Consumption Charge (\$/1000 gal)	Tier 3 Consumption Charge (\$/1000 gal)
Water	\$43	\$9.32	\$11.66	\$13.98
Sewer	\$41	\$16.34	\$20.42	\$24.51

Irrigation Rates

UE reviewed Irrigation Charges from Portsmouth, NH as a model to determine what Exeter’s system may look like. The current rates are shown below. Portsmouth charges a service fee based on meter size, which was not included on this table.

Table 2. Portsmouth Rates (per unit of 748 gallons)

Tier	Water	Sewer	Irrigation	Ratio of Irrigation Charge to Tier 1 Water Charge
Tier 1 (0-10 units)	\$4.54	\$15.78	\$5.46	1.2
Tier 2 (10-20 units)	\$5.46	\$17.36	\$10.30	2.3
Tier 3 (>20 units)			\$12.71	2.8

Portsmouth has historically noted that irrigation meters result in a loss of billed sewer usage and anecdotally may not actually encourage efficient use of water. Users are required to participate in the EPA Watersense Program in order to apply for an irrigation meter and are required to use a Watersense Certified contractor for irrigation system installation. This requirement should be considered by Exeter as well.

As an illustration, UE used the ratio of Portsmouth’s irrigation charge to their Tier 1 water charge to create an irrigation charge model for Exeter. These rates are shown below. It was assumed that the current Tier structure would remain and that irrigation would be billed at the respective Tier (i.e. an account may be billed at Tier 2 for water and Tier 1 for irrigation).

Table 3. Exeter Rates (per 1000 gallons)

Tier	Water	Sewer	Example Irrigation Rate	Ratio of Irrigation Charge to Tier 1 Water Charge
Tier 1 (0-21,000)	\$9.32	\$16.34	\$11.21	1.2
Tier 2 (21,001-105,000)	\$11.66	\$20.42	\$21.14	2.3
Tier 3 (>105,000)	\$13.98	\$24.51	\$26.09	2.8
Service fee	\$43.00	\$41.00	\$43.00	

UE calculated sample bills for Tier 1, Tier 2, and Tier 3 customers for Exeter using the current rate structure and the new rate structure that includes irrigation charges. These calculations are shown in Attachment A.

Although the customers with irrigation meters would be charged an additional service fee and higher consumption rates compared to water using the example presented in this memorandum, the increase in water revenue does not make up for the loss of sewer revenue. In order for this to be remedied, Exeter would need to increase sewer rates to cover revenue lost from irrigation users. UE found during the recent water and sewer rate study (June 2023) that Exeter's rates are already higher than the state average and similar systems and the current tiered rate structure provides incentives for conservation.

Irrigation rates are typically charged at a higher rate since they typically increase water demand during peak water usage times and to encourage conservation. UE recommends separate higher irrigation rates be implemented in Exeter at some point, similar to the Portsmouth model since it provides a more equitable structure. UE recommends that irrigation rates be reconsidered again in the future as conditions may warrant it.

Non-Irrigation Deduct Meters

Deduct meters for commercial non-irrigation purposes would be billed under the existing water rate structure instead of an increased irrigation rate. Sample bills were also calculated for non-irrigation deduct meters (Attachment A). Allowing these meters would result in revenue loss due to the lack of sewer consumption billed that would require sewer rate adjustments.

Conclusions

This review determined the following:

- Exeter currently allows irrigation meters within its water system for residential users. These users are billed for consumption at these meters under the current water rates. Non-irrigation deduct meters are not currently allowed.

- Expanding the irrigation meter program would likely result in a loss of sewer revenue without a rate adjustment.
- Expanding the use of deduct meters will result in a loss of sewer revenue unless sewer rates are adjusted.
- Deduct meters may be appropriate for commercial uses as well.

Recommendations

Based on these findings, UE presents the following recommendations:

- Allow irrigation and deduct meters for commercial users;
- Irrigation and deduct meters shall be subject to a separate service fee;
- Irrigation meters and deduct meters used for irrigation shall be charged irrigation rates if/when implemented;
- The irrigation rates shall be higher than water rates to recover the cost of the peak demands and to encourage conservation;
- The Town may choose to require the irrigation systems to be water-efficient and be certified by the EPA WaterSense program; and
- Prior to allowing deduct and irrigation meters, the Town should estimate the amount of anticipated lost revenue and plan for how that revenue will be recovered.

Attachment A
Sample Irrigation and Deduct Meter Bills
Water/Sewer Rate Study
Exeter, NH
April 11, 2023

Exeter Bills for Irrigation Water With and Without Irrigation Meter

User	Est. Usage per Quarter	Est. Irrigation Usage per Quarter	Current Bills			New Bills				Change in Revenue	
			Water	Sewer	Total	Water	Sewer	Irrigation	Total	Water	Sewer
Tier 1 User	20,000	10,000	\$229.40	\$367.80	\$597.20	\$136.20	\$204.40	\$155.09	\$495.69	\$61.89	-\$163.40
Tier 2 User	100,000	50,000	\$1,159.86	\$1,997.32	\$3,157.18	\$576.86	\$976.32	\$891.57	\$2,444.75	\$308.57	-\$1,021.00
Tier 3 User	250,000	125,000	\$3,245.26	\$5,653.37	\$8,898.63	\$1,497.76	\$2,589.62	\$2,576.36	\$6,663.74	\$828.86	-\$3,063.75

Exeter Rates (per 1000 gallons)

	Water	Sewer	Irrigation	Ratio of Irrigation Charge to Tier 1 Water Charge
Tier 1 (0-21,000)	\$9.32	\$16.34	\$11.21	1.2
Tier 2 (21,001-105,000)	\$11.66	\$20.42	\$21.14	2.3
Tier 3 (>105,000)	\$13.98	\$24.51	\$26.09	2.8
Service fee	\$43.00	\$41.00	\$43.00	

Exeter Bills for Deduct Meter

User	Est. Usage per Quarter	Est. Deduct Usage per Quarter	Current Bills			New Bills			Change in Revenue	
			Water	Sewer	Total	Water	Sewer	Total	Water	Sewer
Tier 1 User	20,000	10,000	\$229.40	\$367.80	\$597.20	\$229.40	\$204.40	\$433.80	\$0.00	-\$163.40
Tier 2 User	100,000	50,000	\$1,159.86	\$1,997.32	\$3,157.18	\$1,159.86	\$976.32	\$2,136.18	\$0.00	-\$1,021.00
Tier 3 User	250,000	125,000	\$3,245.26	\$5,653.37	\$8,898.63	\$3,245.26	\$2,589.62	\$5,834.88	\$0.00	-\$3,063.75

Notes/Assumptions

1. Exeter irrigation rates based on rate ratios of Portsmouth irrigation rates.
2. Assumed current Tiers structure.
3. Assumed that irrigation meters will be read and billed through water department.
4. Assumed that irrigation will be billed at the respective Tier based on irrigation usage, not total water usage (i.e. an account may be billed at Tier 2 for water and Tier 1 for irrigation).