

**STATE OF NEW HAMPSHIRE
PUBLIC UTILITIES COMMISSION**

Docket DW 21-134

Pennichuck Water Works, Inc.

Petition for Approval of Emergency Temporary Water Rate

Pennichuck Water Works, Inc. (PWW or Company) hereby petitions the Commission for approval, pursuant to RSA 378:9, of an emergency temporary rate for water supplied to Merrimack Village District (MVD). In support of this request, PWW states as follows:

Parties

1. PWW is a New Hampshire corporation and regulated water utility that provides service to approximately 29,000 customers in a number of municipalities in southern New Hampshire including the City of Nashua, and the Towns of Amherst, Bedford, Derry, Epping, Hollis, Merrimack, Milford, Newmarket, Newton, Plaistow, and Salem. PWW is owned by Pennichuck Corporation, a private corporation, which in turn is wholly owned by the City of Nashua. Although Pennichuck Corporation is wholly owned by a municipality, PWW is still a private corporation and regulated public utility within the definition of RSA 362:2 and 4.
2. MVD is a village district established and is regulated in accordance with the provisions of RSA 38 and 52. MVD manages over 7,500 service connections that include residential, municipal, commercial and industrial properties. MVD's service area covers more than 87% of the Town of Merrimack. MVD owns, services, and maintains approximately 930,800 feet (or roughly 176 miles) of water mains, 930 fire hydrants, six wells (Wells 2, 3, 4, 5, 7, and 8, three water storage tanks, an Iron & Manganese treatment plant, three booster stations and a Per- and Polyfluoroalkyl Substances (PFAS) Treatment Plant.

Legal Authorities

3. Pursuant to RSA 378:9, “[w]henver the commission shall be of the opinion that an emergency exists, it may authorize any public utility temporarily to alter, amend or suspend any existing rate, fare, charge, price, classification or rule or regulation relating thereto.” In emergency situations, pursuant to N.H. Code Admin. R. Puc 1601.01(e), the filing requirements of Chapter Puc 1600 do not apply. Furthermore, PWW only seeks approval for a rate specific to the facts and circumstances of a MVD, therefore, PWW is not seeking a general rate increase which would trigger a lengthy investigation under RSA 378:5 and 6. PWW avers that RSA 378:18 pertaining to special contracts is also not relevant. Special contracts under RSA 378:18 are customarily for known, large quantities of water supply taken by the customer over a specific period of years. As described below and in the attached pre-filed direct testimony and attachment of Mr. Donald L. Ware, an emergency has arisen and MVD needs an emergency source of water on a temporary basis at a rate that is just and reasonable and in the public interest.

NH Public Works Mutual Aid Group

4. The N.H. Homeland Security and Emergency Management has in place, an Emergency Support Function 3 (ESF-3) for Public Works & Engineering. The purpose of the ESF-3 is:

“to utilize resources (i.e., human, technical, equipment, facility, materials, supplies) of member agencies to provide technical expertise; evaluation; engineering services; contracting for emergency repair of dams, drinking water and wastewater treatment facilities; potable water; emergency power; public real estate; and debris management to assist the State in meeting its goals related to lifesaving and life-sustaining actions, damage mitigation, and recovery activities before, during, and after an emergency/disaster event” (emphasis added). ESF-3 at 3. <https://www.nh.gov/safety/divisions/hsem/documents/ESF03.pdf>

The Commission is a Support Agency to this ESF-3. Part of the Commission's support is to: "[p]rovide a liaison for the NH public and private electric, natural gas, water, sewage, and communications industry and coordinating groups for utility restoration support." ESF-3 at 11. Within the mutual aid arena, PWW and MVD are members of the NH Public Works Mutual Aid Group. This group was created to support members in times of emergencies. The Mutual Aid Program for Public Works was the first state-wide program in the U.S. created to specifically address mutual aid among public works departments. Source: <https://t2.unh.edu/ma>

The Emergency

5. Under the framework of mutual aid, MVD has contacted PWW for emergency potable water. The emergency need arose because, on September 23, 2021, MVD received a Notice of Violation (NOV) from the NH Department of Environmental Services (NHDES). The NOV was due to MVD's well water exceeding the State's PFAS standard. One type of PFAS, called PFOA, now has a Maximum Contaminant Level (MCL) of 12 ng/L¹. MVD exceeded that standard at Wells 2 (13 ng/L), 3 (20 ng/L), 7 & 8 (together, 25 ng/L). Two wells (Wells 4 & 5) have treatment for PFAS and the finished water quality from these wells is fully compliant with the State's PFAS standards. The remaining active wells do not yet have PFAS treatment. MVD has active construction underway to add PFAS treatment to Wells 7 & 8, however, those treatment facilities are not expected to be online until March 2022.² Construction experienced significant setbacks due to significant delays in obtaining necessary parts due to supply chain interruptions. This is more fully described in Mr. Ware's testimony. Additionally, one treatment vessel was damaged in transport. But for these delays, MVD would be meeting the PFAS

¹ Nanogram per liter (ng/L) is equal to 1 part per trillion (ppt).

² For completeness, MVD expects treatment for its last two wells (Wells 2 and 9) to be online in early fall of 2022. Well 9 is a new well which will replace Well 3.

standards, however, as a result of these construction delays, MVD now does not currently have enough compliant potable water to meet its customers' basic needs.³

6. As the Commission may be aware, PWW purchases water from MVD for two of its community water systems: the Greenfield Farms/Cabot Preserve/Parker Ridge water system in Bedford and the Souhegan Woods community water system in Amherst. The Greenfield Farms water system serves 383 residential customers. The Souhegan Woods water system serves 76 residential customers. Therefore, MVD's inability to provide PFAS-compliant water affects customers in these water systems and presents an emergency situation for PWW as well. For the time period that MVD is unable to provide PFAS-compliant water, PWW will be taking two courses of action for these systems. First, it has immediately ceased taking supply from MVD for its Souhegan Woods water system and will instead rely on its existing groundwater wells for sources of supply. Those wells are capable of meeting this water system's base non seasonal water demands. The Greenfield Farms/Cabot Preserve/Parker Ridge water system has no other source of water than MVD. PWW's provision of compliant, emergency water to MVD for delivery to these systems addresses that emergency in the near term.

Terms of Service and Rate

7. PWW is able to provide MVD with up to 1.0 MGD (million gallons per day) through an existing interconnection point. Therefore, no new physical interconnection needs to be constructed and no additional franchise expansion needs to be approved. The remainder of the applicable terms and conditions of PWW's tariff would apply.

³ MVD cannot meet its' base winter demand of about 1.6 to 1.7 MGD with its treated wells, Wells 4 and 5. Wells 4 and 5 can produce about 0.60 MGD on a year-round basis. Production from Wells 7 and 8, which are expected to be online in March 2022, can provide about 1.15 MGD and thereby meet MVD's expected non-summer demand.

8. PWW has determined a proposed rate to charge MVD under this emergency by taking the total cost of electricity, chemicals, and consumed carbon capacity and dividing it by the total gallons of raw water delivered to the Company's water treatment plant, treated at the water treatment plant, and then delivered into PWW's distribution system for consumption. The rate, based on 2020 costs with projected increases in power and chemical costs, is \$0.67 per 100 hundred cubic feet (CCF) (Initial Rate). Because 2022 chemical and power costs are not yet known and the amount of chemicals uses for treatment vary year to year based on raw water quality, the actual cost of water cannot not be known or calculated until the exact amounts PWW used during the emergency period are known definitively. In light of the likely changes to costs, PWW proposes to determine a final rate (Actual Rate) for the time period MVD takes emergency temporary service by taking the total variable expenses incurred during that time frame (power, chemicals and carbon) and dividing that total by the millions of gallons produced during that time frame, in order to determine the actual incurred variable cost of producing water during the emergency rate period. PWW proposes that the net between the Initial Rate and Actual Rate be billed (if the Initial Rate was less than the Actual Rate) or will be refunded (if the Initial Rate was higher than the Actual Rate) to Merrimack Village District. This reconciliation provision will ensure that PWW's rate payers do not subsidize or profit from the sale of water to MVD during this mutual aid emergency response.

9. PWW does not believe that any of its current retail rates are otherwise applicable to this emergency. MVD owns its own infrastructure and this is a temporary emergency situation. In contrast, PWW's retail rates are predicated upon the customer remaining an ongoing customer of the Company, purchasing water along with all of the other customers, with a water rate that is designed not only for variable cost of production, but also the long-term carrying costs of

supplying water, inclusive of capital costs. Here, MVD will temporarily take water from PWW and then transport the water within its own system and for as long as the emergency exists. As soon as MVD's treatment is online, the emergency is expected to be over. Furthermore, this emergency provision of water is to deliver "health based" water in compliance with the State PFAS standards to both MVD and PWW's customers. Lastly, if MVD were to pay retail rates it would be a windfall to PWW at the expense of an emergency. This would be contrary to the spirit of the Mutual Aid Group. If the retail rate was charged for a period of around 5 months, it would cost MVD about \$808,160. In comparison, at the variable cost of production, estimated to be about \$0.67 per CCF, the cost of water over a 5-month period would be about \$134,360.

10. Time is of the essence with respect to costs. MVD commenced taking water from PWW on October 20, 2021 when it shut off its non-compliant wells and began taking water from PWW. Because PWW does not yet have a rate to accommodate this unique emergency situation, MVD is paying PWW's retail rate. MVD has sufficient funds to pay the retail rate pending the Commission's approval but only until about November 18, 2021. At about that time, MVD will deplete its funds. Therefore, PWW and MVD request the Commission issue an order prior to November 18th that approves the emergency rate of \$0.67 per CCF. This rate is reflected in the tariff, Original Page 45A, being filed contemporaneously with this petition.⁴ Additionally, PWW requests that this emergency rate be allowed to apply retroactive to October 20, 2021, the date MVD first started taking water under this emergency.

⁴ The effective date of the tariff is shown as November 20, 2021, in compliance with RSA 378:3. If, however, the Commission approves this petition, PWW will file a compliance tariff reflecting an effective date of October 20, 2021.

11. Both the MVD and the NHDES support PWW providing emergency, temporary water to MVD. Because of the urgency of filing this petition, PWW will be filing the MVD and NHDES letters of support as soon as it receives them.

WHEREFORE, PWW respectfully requests that the Commission:

- A. Find, pursuant to RSA 378:9, that an emergency exists that warrants a temporary rate;
- B. Authorize, no later than November 18, 2021, PWW to charge the above-described emergency rate retroactively to October 20, 2021, the date MVD first took service under this emergency;
- C. Approve the emergency rate for effect until November 1, 2022 or the date on which all of MVD's wells have PFAS treatment installed and operational, whichever is earlier; and
- D. Grant such other and further relief as may be just and equitable.

Respectfully submitted,

PENNICHUCK WATER WORKS, INC.

By its Attorney,

NH BROWN LAW, PLLC

Date: October 21, 2021

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Certificate of Service

I hereby certify that a copy of the foregoing petition and supporting materials have been emailed this day to the Department of Energy and Office of the Consumer Advocate.

Marcia A. Brown
Marcia A. Brown, Esq.

**STATE OF NEW HAMPSHIRE
BEFORE THE
PUBLIC UTILITIES COMMISSION**

**PENNICHUCK WATER WORKS, INC.
DOCKET DW 21-___**

**PETITION TO ESTABLISH A TEMPORARY EMERGENCY PURCHASE
WATER RATE FOR THE MERRIMACK VILLAGE DISTRICT**

SWORN DIRECT PREFILED TESTIMONY

OF

DONALD L. WARE

October 21, 2021

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1 **I. BACKGROUND**

2 **Q. What is your name and what is your position with Pennichuck East Utility, Inc.?**

3 **A.** My name is Donald L. Ware. I am the Chief Operating Officer of the Pennichuck Water
4 Works, Inc. (PWW or the Company). I have worked for the Company since 1995. I am
5 a licensed professional engineer in New Hampshire, Massachusetts, and Maine.

6 **Q. Please describe your educational background.**

7 **A.** I have a Bachelor in Science degree in Civil Engineering from Bucknell University in
8 Lewisburg, Pennsylvania and I completed all the required courses, with the exception of
9 my thesis, for a Masters degree in Civil Engineering from the same institution. I have a
10 Masters in Business Administration from the Whittemore Business School at the
11 University of New Hampshire.

12 **Q. Please describe your professional background.**

13 **A.** Prior to joining the Company, I served as the General Manager of the Augusta Water
14 District in Augusta, Maine from 1986 to 1995. I served as the District's engineer
15 between 1982 and 1986. Prior to my engagement with the District, I served as a design
16 engineer for the State of Maine Department of Transportation for six months and before
17 that as a design engineer for Buchart-Horn Consulting Engineers from 1979 to 1982.

18 **Q. What are your responsibilities as Chief Operating Officer of the Company?**

19 **A.** As Chief Operating Officer, I am responsible for the overall operations of the Company,
20 including customer service, water supply, distribution, and engineering.

21

1 **II. DESCRIPTION OF EMERGENCY WATER NEED**

2 **Q. What is the purpose of your testimony?**

3 **A.** My testimony explains why PWW is seeking approval for an emergency water rate for
4 water sold to the Merrimack Village District (MVD), due to a current situation as it
5 relates to MVD's ability to comply with and supply water that is in compliance with the
6 Maximum Contaminant Level (MCL) set by the State of NH for Perfluorooctanoic Acid
7 (PFOA), as administered by the New Hampshire Department of Environmental Services
8 (NHDES).

9 **Q. Please describe the reasons and rationale that are driving this request at this time.**

10 **A.** On September 23, 2021, the MVD received notice from the NHDES that the water
11 produced from 4 of its 6 wells had failed the State of NH/NHDES PFOA standard of 12
12 parts per trillion (ppt), based upon quarterly samples averaged for a 12-month trailing
13 period. MVD operates 6 wells at present, in supplying water for their distribution
14 system, as well as water delivered to other consecutive systems linked to their
15 distribution systems. Those wells are: Wells 2, 3, 4, 5, 7 and 8. Based upon the
16 emerging PFOA contamination situation surrounding the Saint-Gobain site in northern
17 Merrimack, Wells 4 and 5 had previously been found to be contaminated with PFOA
18 significantly above the current and previous emergency standards, and treatment was
19 installed and placed online in the Summer of 2020, such that water being produced from
20 those wells would be in compliance with the NHDES' PFOA standard. A plan was also
21 put in place and approved by the residents of the Town of Merrimack, to install treatment
22 on the remaining wells, with Wells 7/8 slated for MVD to have treatment facilities online
23 in mid-2021 and Wells 2/3 slated for that installation to be online in mid-2022. Based

1 upon that plan's overall timeframe, and certain unforeseen and uncontrollable
2 circumstances which impeded the 2021 milestone, Wells 7, 8 and 2, 3 do not currently
3 have treatment to remove PFOA. At present, the untreated water from these wells
4 averages between 13 ppt and 25 ppt (based on a four-quarter running average per the
5 NHDES' monitoring rules).

6 **III. EFFECT OF MVD'S WATER QUALITY PROBLEMS ON PWV CUSTOMERS**

7 **Q. Why is PWV concerned about water quality issues of the MVD?**

8 **A.** PWV is concerned about MVD water issues because PWV, as one of the consecutive
9 systems alluded to above, has about 376 customers in Bedford who get their water supply
10 exclusively from MVD and, as another one of the consecutive systems, an additional 75
11 customers in Amherst who get supplemental water supply from the MVD. Until MVD
12 can get the Per- and Polyfluoroalkyl Substances (PFAS) treatment facilities up and
13 running on its untreated wells those PWV customers who depend upon MVD as their
14 exclusive supplier of water will be receiving water that is in violation of the NHDES
15 PFOA standard of 12 ppt.

16 **IV. STATE MUTUAL AID GROUP**

17 **Q. Please describe the State's Public Works Mutual Aid Group.**

18 **A.** PWV and MVD are part of the New Hampshire Public Works Mutual Aid Group which
19 was established to allow communities to share resources with one another to help
20 alleviate emergencies. PWV views MVD's inability to produce PFOA compliant water
21 as an emergency and is proposing to provide PFOA compliant water to MVD at its
22 variable cost of production (the cost of power, chemicals, and carbon) until MVD can get
23 treatment installed and operational on its non-compliant wells. PWV believes that this

1 assistance, and the basis of the costs used to derive this rate is analogous to any
2 emergency rates which would be sought for similar situations as this with any other third
3 parties, is what is envisioned by the New Hampshire Public Works Mutual Aid group.
4 Also, in light of the many concerns in the State about the presence and adverse health
5 effects of PFOA, the Company, its management team, and its Board of Directors, feel
6 very strongly that the ability to aid in this situation where water is available in conformity
7 with the State' MCL, to both the MVD, and the Company's customers, is an essential
8 imperative, and the consideration of this rate request should be expeditiously considered
9 to the benefit of those residents and customers.

10 **V. HISTORY OF MVD'S VIOLATION AND PFAS STANDARD**

11 **Q. Why was MVD issued a Violation notice of the PFAS standard at this time?**

12 **A.** The State standard for certain PFAS compounds, which included a specific standard for
13 PFOA, went into effect during the third quarter of 2020 and is based on a "four-quarter
14 running average" such that that the first official compliance period for PFOA was the
15 third quarter of 2021 (or as of September, 2021). It was the first "four-quarter running
16 average" for each of MVD's wells 2, 3, 7 and 8 that exceeded the State Standard of 12
17 ppt and resulted in the September 23, 2021 Notice of Violation from the NHDES to the
18 MVD.

19 **Q. The NHDES standard for 12 ppt for PFOA was under consideration back in 2019.**
20 **Why didn't MVD initiate the design and construction of treatment on Wells 2, 3, 7**
21 **and 8 when the NHDES proposes a standard of 12 ppt for PFOA, allowing them to**
22 **avoid this Violation?**

1 **A.** The MVD did react to the proposed standard and, in the winter of 2019, got approval
2 from its rate payers, via the passage of several warrant articles, to install treatment on all
3 of its wells. The approved plan was to have the treatment designed, constructed and
4 online for Wells 7 and 8 by the end of July 2021 and the treatment online for Wells 2 and
5 3 by July 2022. At the time this vote was taken and approved, the NHDES had not yet
6 established the final PFAS standards, and as such, MVD's approved plans were prudent
7 and anticipatory of the needs for treatment, the compliancy needed, and the timing for
8 which that compliancy could occur given all of the design, construction, and installation
9 elements of this overall project.

10 **Q.** **Please explain why the treatment for Wells 7 and 8 did not go online in July of 2021**
11 **as originally projected?**

12 **A.** The simple response is the direct and indirect impact of COVID-19. The pandemic
13 created supply chain difficulties which hampered the ability to procure the granulated
14 carbon treatment vessels, which no one could have envisioned in the winter of 2019. To
15 further exacerbate that situation, one of the two carbon treatment vessels that were
16 procured initially, was damaged in transit to the site, and had to be reordered, creating a
17 further time delay in getting the treatment for these two wells online. The MVD and its
18 engineers have worked tirelessly to get the proposed treatment systems up and running as
19 soon as practical in the current environment.

20 **Q.** **When does MVD expect the treatment for Wells 7 and 8 to be online?**

21 **A.** The treatment for Wells 7 and 8 is expected to go online no later than the end of March
22 2022.

23 **Q.** **When does MVD expect the treatment for its remaining wells to be online?**

1 A. I should note that according to MVD, Well 3 is being permanently decommissioned and
2 is being replaced by Well 9. Treatment for Wells 2 and 9 is expected to go online
3 sometime during the summer of 2022.

4 **Q. Can MVD produce all the water needed from Wells 4 and 5 to meet the demands of**
5 **its customers, if no outside water is sourced?**

6 A. No. Well 4 and 5 can produce about 0.60 MGD (million gallons per day) on a year-
7 round basis and can be pushed for a period of months to an average daily production level
8 of about 0.75 MGD. The base winter demand for MVD is about 1.6 to 1.7 MGD, leaving
9 a shortfall of 1.0 to 1.1 MGD if MVD were to terminate the use of its PFOA non-
10 compliant wells, until those wells have treatment installed.

11 **VI. PWW TO PROVIDE WATER TO MVD**

12 **Q. Can PWW provide enough water to MVD to allow it to operate without using its**
13 **non-compliant wells?**

14 A. Yes, under its existing permits, PWW has sufficient capacity to provide up to 1.0 MGD
15 to MVD through an existing interconnection with MVD's distribution system on Route
16 101A in Amherst. PWW's water meets the current NHDES PFOA MCL. When
17 combined with the production of MVD's wells 4 and 5, this 1.0 MGD will allow MVD to
18 meet its non-seasonal water demand under all but emergency conditions (ie., (1) the
19 temporary loss of operation of Wells 4 or 5, (2) a significant power outage (more than 12
20 hours) at the interconnection pump station, or (3) a large fire or water main break that
21 requires additional capacity above base demands to be produced for a period of days).
22 An emergency situation such as one of these could require MVD to temporarily turn back

1 on one or more of its non-compliant wells to provide water during the emergency, and
2 then shut those wells back off immediately after the emergency passes.

3 **Q. Please explain why MVD has an existing interconnection with PWW.**

4 **A.** MVD has an existing direct interconnection with PWW on Route 101A in Amherst
5 which is used to supplement MVD's overall water capacity needs. Given the size of
6 that interconnection, PWW that can deliver up to 1.0 MGD. MVD has taken water from
7 this interconnection in the past when there has been a well failure, well maintenance, fire
8 event, high summer demand, etc. As these are neither health based needs like the current
9 situation, nor a need that would persist for a prolonged period of time, MVD and the
10 Company have not requested a special rate for usage of that interconnection to date, as
11 this short term procurement of water via the interconnection is subject to the Company's
12 full retail water rates. Should MVD require a long term usage from this interconnection
13 of a guaranteed minimum daily and monthly quantity, MVD and the Company will
14 pursue the approval of a special contract to establish a special purchased water rate for
15 that defined purpose, and the cost of service that would be applicable to those specified
16 parameters.

17 **Q. You stated that PWW can supply 1.0 MGD and satisfy MVD's non-seasonal water**
18 **demand under all but emergency conditions. Please explain what would happen if**
19 **an emergency condition arose, where would MVD obtain water?**

20 **A.** As stated above, an emergency situation such as one of these could require MVD to
21 temporarily turn back on one or more of its non-compliant wells to provide water during
22 the emergency, and then shut those wells back off immediately after the emergency
23 passes. This situation would not put either the MVD or the Company in violation of the

1 NHDES PFOA MCL, as the impact of a situation like this would not materially alter the
2 overall PFOA levels in the system for any significant period of time, and/or alter the
3 overall hydraulics of the system long term.

4 **Q. Does the N.H. Department of Environmental Services support this solution to**
5 **MVD's violation? Please explain.**

6 A. Yes. The Company has had discussions with the NHDES, at various levels within that
7 organization, indicating what is being sought in this filing. They have indicated their
8 support of this solution, as it brings about a solution for the time period until treatment is
9 installed and producing water from the non-compliant wells, that would be in compliancy
10 with the PFOA MCL.

11 **Q. Will this supply arrangement to MVD satisfy the needs of PWW's consecutive water**
12 **systems you previously mentioned?**

13 A. Yes. As I stated earlier, PWW owns and operates the Greenfield Farms/Cabot
14 Preserve/Parker Ridge water system in Bedford. That system is comprised of about 376
15 customers. MVD is the exclusive source of water for this subdivision. PWW also owns
16 and operates the Souhegan Woods system in Amherst. That system is comprised of
17 about 75 customers and receives supplemental water from MVD. PWW ordinarily
18 purchases water from MVD for these systems. PWW's supply of water to MVD during
19 this emergency will mean that PWW's customers in these systems will continue to
20 receive safe and adequate water as required by RSA 374:1. Additionally, as a
21 precautionary measure, and to provide some relief to the MVD system and the overall
22 water needs, the Company has "shut off" the interconnection to the Souhegan Woods
23 system for the time being, and plans to leave that turned off until the non-compliant wells

1 are treated and back online. The Company has the ability to do this, as that
2 interconnection is a supplementary connection for that system, as its wells and storage in
3 the system can meet the base demands there. Should an emergency situation (ie. a pump
4 failure on those wells, or a fire, where additional capacity is needed) the connection can
5 be turned back on temporarily, until that emergency has passed.

6 **Q. Will this supply arrangement impinge on PWW's supply needs?**

7 **A.** No. The Company has ample capacity to meet the needs through the existing
8 interconnection.

9 **VII. PROPOSED RATE**

10 **Q. Why is PWW seeking to propose an emergency rate in lieu of just charging MVD its
11 current retail rate?**

12 **A.** The retail rate is not intended for this type of situation. MVD owns its own
13 infrastructure. The retail rate is predicated upon the premise of an ongoing customer of
14 the Company, purchasing water along with all of the other customers, with a water rate
15 that is designed not only for variable cost of production, but also the long-term carrying
16 costs of supplying water inclusive of capital costs. Here, MVD would take water from
17 PWW at the Route 101A interconnection point and then transport the water within its
18 own system.
19 Next, this is an emergency situation relating to the delivery of "health based" water in
20 compliancy with the PFAS standards in the State, to both MVD and PWW's customers.
21 That is not to be understated, as to the importance and urgency of this filing and request.
22 In addition to the retail rate being more than the cost to serve MVD, charging the retail
23 rate would essentially bankrupt MVD. The cost of 1.0 MGD at PWW's current retail rate

1 (\$4.03 per hundred cubic feet (CCF)), would result in a charge of about \$5,388 per day,
2 or approximately \$161,600 per month (based on a 30-day month). This would be a short-
3 term boon for PWW's water revenues but this would constitute a subsidy from MVD to
4 PWW and its customers. To put this in perspective, if the retail rate was charged for a
5 period of around 5 months (late October to late March), until the expected treatment
6 comes online for Wells 7 and 8, the additional operating cost for the purchased water
7 from PWW (by MVD) would be about \$808,160. This is almost 20% of MVD's annual
8 operating budget and is not an expense it has budgeted for. Over and above the
9 magnitude of this large cost of MVD purchasing water at PWW's retail rate for this 5-
10 month period is the important fact that MVD only has about \$140,000 in its currently
11 available and approved discretionary funds from which it could use those funds to
12 purchase water from PWW. As such, this cost is well above and beyond that which is in
13 MVD's current budget and would require them to seek approval for those excess needed
14 funds via a public meeting (including a significant time delay for that process in this
15 emergency situation) where the MVD Board would seek the authority from its rate payers
16 to spend these additional funds. Absent that entire process approving those additionally
17 needed funds, MVD could only purchase water from PWW to supplement the water from
18 Wells 4 and 5 for a about 1 month, based upon its existing available funds, and then it
19 would need to revert back to using water from MVD's PFOA non-compliant wells to
20 provide water to its customers (which is entirely contrary to the overall intentions of a
21 public water utility, in supplying water in compliancy with water standards, if at all
22 possible). This very "tug of war" between costs and health based production and supply
23 is something that is imperative in its ability to swing the pendulum to providing health

1 compliant water, unlike decisions that have been made in other parts of the country (and
2 widely publicized throughout the country and the region), where decisions were not made
3 in this same vein, and supported and/or ignored by the direct (a municipality or public
4 water system) and indirect (regulators) parties to those situations.

5 If PWW can sell water to MVD at its variable cost of production, which is about \$0.67
6 per CCF, for the duration of the water quality emergency, then MVD's expected
7 additional costs for purchasing 1.0 MGD of water for about 5 months (until treatment
8 goes online for Wells 7 & 8) would be about \$134,360. This aggregate sum is within the
9 bounds of the budgetary authority granted to MVD until its next annual meeting in the
10 spring of 2022, which in turn would not require a special meeting and vote to purchase
11 water from PWW necessary to allow MVD to keep all of its PFOA non-compliant wells
12 off line until the treatment facilities are completed on those wells.

13 **Q. Please explain the basis of the \$0.67 per CCF emergency rate.**

14 A. The basis is PWW's actual variable cost of producing water in 2020 inclusive of
15 projected increases in PWW's power and chemical costs that are anticipated to occur in
16 2022.. 2020 is being used as the basis for this calculation, as it is the most recent year for
17 which the Company has a full year's worth of data to support the calculation. This cost is
18 detailed in Attachment DLW-1 to this testimony. It is the total cost of electricity,
19 chemicals, and consumed carbon capacity divided by the total gallons of raw water
20 delivered to the Company's water treatment plant, treated at the water treatment plant,
21 and then delivered into PWW's distribution system for consumption by its customers.
22 The 2020 electric expenses, and chemical expenses have then been adjusted to proform
23 the projected 2022 electric and chemical expenses based upon the current market

1 conditions and projections as to what will happen to those conditions over the next year.

2 In Attachment DLW-1, the 2020 Electrical energy supply cost per KWH is projected to
3 increase from its current level of \$0.0695 per KWH to \$0.1200 per KWH. Additionally,
4 the incurred electric distribution cost of each KWH (as one of the elements included in
5 the Company's total cost of electricity) is projected to increase by 10% in the model. The
6 cost of chemicals from 2020 to 2022 is expected to increase by about 15% and is treated
7 in the cost model accordingly. Finally, the most recent cost per pound of carbon is
8 included in the model based upon the most recent carbon change out the Company
9 completed May 2020. The carbon is expected to last for about two years and be replaced
10 or "changed out" again in May 2022.

11 **Q. What if PWW's projection of increases to electrical and chemical expenses are**
12 **incorrect, either too high or too low?**

13 A. PWW is proposing that the rate be set at \$0.67 per CCF until the earlier of: (1) November
14 1, 2022 or (2) the date for which all of MVD's wells have PFOA treatment installed and
15 that treatment is operational, allowing MVD to produce fully PFOA compliant water
16 exclusively from its own wells. PWW is proposing that a reconciliation occur after this
17 emergency period has expired, whereby a final rate (Actual Rate) would be established
18 for the time period that MVD needed PWW as an emergency source by: taking the total
19 variable expenses incurred during that time frame (power, chemicals and carbon) and
20 dividing that total by the millions of gallons produced during that time frame, in order to
21 determine the actual incurred variable cost of producing water during the emergency rate
22 period. The Actual Rate, as determined above, would then be multiplied by all the CCF's
23 used by MVD during the emergency rate period and a final bill would be generated and

1 compared against the amounts paid by MVD during time the emergency rate was in
2 effect, and any difference (positive or negative) would then be settled up between PWW
3 and MVD. The Company would anticipate that this reconciliation process and “settling
4 up” between the parties would occur not later than 90 days after the emergency period
5 expires.

6 **Q. Why doesn't MVD seek a vote from its customers to expand their budgetary**
7 **authority to purchase water from PWW at its retail rate and eliminate the need for**
8 **PWW to seek an emergency rate?**

9 A. An affirmative vote from MVD's voters is not guaranteed. As noted above, a retail rate
10 is above the cost to provide water to MVD and voters could view this as a subsidy and as
11 unnecessary and thereby defeat the vote. Paying the retail rate would increase MVD's
12 budget by 20% for the current fiscal year, which some voters may find objectionable
13 regardless of the reason for the increase.

14 Also, as with many issues today, the public's view of PFOA and its potential health risks
15 varies dramatically amongst individuals and entities. Some believe that water with any
16 detectable level of PFOA (which can only currently be detected down to about 2 ppt) is a
17 large health issue, whereas some believe that the EPA's current health advisory level of
18 70 ppt (which is currently under heavy scrutiny, and is being reviewed by the EPA with
19 the intent of establishing a national MCL by the end of 2023) is fully protective of human
20 health. Depending on which crowd shows up at the emergency special meeting, the vote
21 could range from:

- 22 1. Vote that no change to the current budget be approved, which would result in
23 MVD not being above to buy water from PWW as a way for MVD to deliver

1 PFOA-compliant water to MVD's customer until treatment was placed into
2 service on its PFOA non-compliant wells 7 and 8. MVD would still purchase
3 water from PWW when MVD's combined wells (both PFOA compliant and
4 PFOA non-compliant) can't meet MVD's base water needs, but this would be
5 based upon consumption needs, not a need to be in compliance with the MCL.
6 PWW's customers would then be directly impacted by an adverse budgetary
7 decision, in having the water supplied to them being excess of the PFOA
8 MCL until such time the non-compliant wells are treated, or

9 2. Vote to purchase water from PWW at the current retail rate, such that MVD
10 does not have to use any PFOA non-compliant wells for its water supply
11 except in the event of an emergency as defined above, or

12 3. Begin a drawn-out process of deliberation, or deferral on the issue, by and
13 between the voters. During which time, non-compliant water would continue
14 to be delivered to residents in MVD and customers of the Company, at odds
15 with the State's health based MCL.

16 Based on conversations with the MVD Board, they believe that the most likely result
17 would be a "no" vote due to the large additional cost and that people are already
18 consuming PFOA non-compliant water. A "no" vote would leave PWW in a difficult
19 position with its customers who get water from MVD as PWW has heard from many of
20 those customers (and the leadership at the Town of Bedford) who are upset that there is
21 PFOA in the water, and will be very upset when they are notified that the PFOA in their
22 water supply is above the safe drinking water limits established by the NHDES, in spite
23 of logical solutions (such as is being requested in this filing) available to avoid this, with

1 either cost or a regulatory approval barring that from being a reality. The term “lawsuit”
2 has been mentioned numerous times by customers in their discussions with PWW
3 regarding PFOA contamination. A suit of that type would cause the Company to take a
4 similar action in reaction to that. And, it is vitally important to note that the Company
5 and its Board feels that the ability to eradicate this troublesome situation, which is at odds
6 with the Company’s core mission of providing clean, safe drinking water to its
7 customers, by simply gaining approval of this emergency rate in conformity with the
8 Mutual Aid alliance, is essential.

9 **Q. Does PWW believe that offering the proposed rate due to this PFOA contamination**
10 **event is the best way to protect its customers as well as the customers of MVD?**

11 A. Yes. Offering this rate is the best way to eliminate the need for MVD to operate and
12 produce water from MVD’s PFOA non-compliant wells for the following reasons:

- 13 1. This will allow MVD to purchase water from PWW without having to seek an
14 emergency approval from its rate payers, which is risky for the reasons noted above.
- 15 2. This will allow MVD to have access to sufficient fully PFOA compliant water at a
16 slight increase in operating expenses to allow it to shut of its PFOA non-compliant
17 wells until the treatment facilities are in service at those wells.
- 18 3. This will ensure that PWW’s customers, who receive their water from MVD, receive
19 fully PFOA compliant water as soon as practical and for the duration of the
20 emergency.
- 21 4. This will allow the Company and MVD to proactively communicate to their
22 respective customers (along with the statutorily required Violation notice that must be
23 provided to customers of both systems), the positive actions that are already being

1 taken or put into motion to alleviate this situation, as treatment facilities are being
2 brought online for the non-compliant wells. Not only minimizing concerns for
3 customers, but also delivering water that is compliancy with the standards.

4 5. The emergency rate is predicated upon PWW's mutual aid responsibility to help
5 MVD with water that is fully PFOA complaint with the NHDES drinking water
6 standards until MVD can come into full compliance with the addition of treatment to
7 MVD's wells. It is being offered because there is an emergency as it pertains to the
8 aggregate water quality provided from MVD's wells, in spite of the fact that was not
9 created through any fault of the MVD. The proposed emergency rate is a temporary,
10 one time rate available only because of the water quality emergency facing the MVD,
11 and PWW as a result, that it would not have faced except for the pollutions of its
12 ground water sources by a third party and the unforeseen delays of MVD's progress
13 toward the completion of its PFOA treatment systems due to supply chain issues
14 created directly and indirectly by the COVID pandemic.

15 6. The emergency rate, as proposed, is structured to ensure that the exact variable cost of
16 producing the supplemental supply of water from PWW to MVD is paid for by MVD.
17 Thereby assuring the Commission that the Actual Rate for this emergency period of
18 time would neither subsidize nor benefit from this arrangement, but merely secure
19 funding to pay for the cost of this water delivered.

20 This emergency rate has a defined "sunset" and a specific application resulting in a
21 rate that will allow MVD to serve fully PFOA compliant water until their treatment is
22 online. It will also ensure PWW's customers receive fully compliant water during
23 this time period.

1 **VIII. COMMISSION APPROVAL NEEDED BY DATE CERTAIN**

2 **Q. When does PWW need a final order from the Commission to ensure fully compliant**
3 **water?**

4 **A.** As noted above, MVD can only purchase water from PWW at its retail rate for about 30
5 days before it loses its budgetary authority to continue to do so. Therefore, to ensure the
6 flow of PFOA compliant water from PWW to MVD during the duration of the PFOA
7 water quality violation **it is essential that** an order allowing it to charge the proposed
8 emergency rate prior to the stated 30-day period expiring. Based upon the fact that MVD
9 began purchasing water from PWW, via the existing interconnection for this purpose, on
10 October 20, 2021 an Order is needed from the NHPUC authorizing the proposed
11 emergency rate, effective **on or before November 19, 2021 and that it be retroactive**
12 **back to the start of MVD taking water service, October 20, 2021.**

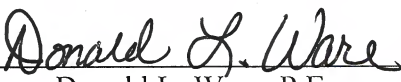
13 **Q. Does this conclude your testimony?**

14 **A.** Yes.

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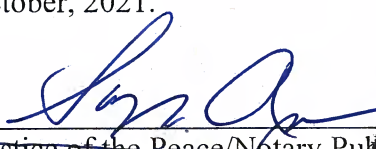
I, Donald L. Ware, P.E., Chief Operating Officer of Pennichuck Water Works, Inc., being first
duly sworn, hereby depose and say that the foregoing testimony and facts alleged therein are true
to the best of my knowledge and belief.

Dated: October 21, 2021


Donald L. Ware, P.E.

STATE OF NEW HAMPSHIRE
COUNTY OF HILLSBOROUGH

Sworn to and subscribed before me this 21st day of October, 2021.


Justice of the Peace/Notary Public
My Commission Expires:



Variable Costs of Production:

Attachment DLW-1

	Jan.	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	12 month average
WTP finished water production per month in millions of gallons -	281.05	252.30	278.19	280.53	395.39	460.98	513.43	491.17	432.69	326.06	271.14	277.10	
Projected 2022 Electric Costs per million gallons -	\$ 204	\$ 214	\$ 192	\$ 210	\$ 185	\$ 187	\$ 194	\$ 195	\$ 181	\$ 190	\$ 192	\$ 194	
Projected 2022 Chemical Costs (including residuals disposal) per million gallons -	\$ 331	\$ 330	\$ 331	\$ 331	\$ 330	\$ 330	\$ 355	\$ 355	\$ 355	\$ 330	\$ 330	\$ 331	
Total Variable Costs (not including Merrimack River station electricity) per MG -	\$ 535	\$ 545	\$ 523	\$ 541	\$ 515	\$ 518	\$ 549	\$ 550	\$ 536	\$ 520	\$ 522	\$ 525	\$ 532
Merrimack River Electric cost/mg of finished water -	\$ 120	\$ 141	\$ 132	\$ 136	\$ 109	\$ 160	\$ 123	\$ 131	\$ 84	\$ 112	\$ 153	\$ 114	\$ 126
Total Variable Costs w/ Merrimack River per MG before GAC consideration -	\$ 655	\$ 685	\$ 655	\$ 677	\$ 624	\$ 678	\$ 672	\$ 680	\$ 620	\$ 632	\$ 676	\$ 638	\$ 658
Variable Cost/100 CCF w/ Merrimack River before GAC consideration -	\$ 0.49	\$ 0.51	\$ 0.49	\$ 0.51	\$ 0.47	\$ 0.51	\$ 0.50	\$ 0.51	\$ 0.46	\$ 0.47	\$ 0.51	\$ 0.48	\$ 0.49

GAC Analysis

	2016	2017	2018	2019	2020	Total in five years	Average/year
Millions of gallons processed through WTP/year -	4,870	4,308	4,256	3,997	4,423	21,854	4,371
Millions of gallons through an individual filter -	406	359	355	333	369	1,821	364
qty. of media in each filter in Cubic feet -	2,460						
qty of media in all 12 filters -	29,520						
Life span of filter media in months -	18						
Average flow through an individual filter per year in million gallons -	364						
Average flow through an individual filter per month in million gallons -	30.4						
Replacement cost per pound of virgin GAC -	\$ 1.77						
average unit weight of dry GAC in pounds/cubic foot -	30.5						
Cost per cu/ft virgin GAC -	\$ 53.99						
Cost/filter bed with virgin GAC -	\$ 132,803						
Cost for 12 filters virgin GAC -	\$ 1,593,637						
Cost per million gallons of water processed during media lifespan, Virgin GAC -	\$ 243.08						
Cost per 100 CCF, Virgin GAC -	\$ 0.18						

Projected 2022 Plant Variable Costs w/ Virgin GAC	
per MG	\$ 900.77
per 100 CCF	\$ 0.67

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Gallons Pumped in millions of gallons -			281.05	252.30	278.19	280.53	395.39	460.98	513.43	491.17	432.69	326.06	271.14	277.10	4,260
KWH consumed per month @ WTP -			333,747	300,348	303,316	335,021	390,804	463,419	549,011	539,181	434,684	342,736	292,094	303,991	4,588,352
KW Demand (peak value per month) -			486	558	506	558	900	1057	1126	993	852	658	518	519	
Customer Charge per month			\$ 190.14	\$ 190.14	\$ 190.14	\$ 190.14	\$ 190.14	\$ 190.14	\$ 190.14	\$ 190.14	\$ 190.14	\$ 190.14	\$ 190.14	\$ 190.14	
Distribution Demand Charge															
	Jan. - June	July - Dec													
First 100 KW	\$ 6.070000	\$ 6.070000	\$ 607.00	\$ 607.00	\$ 607.00	\$ 607.00	\$ 607.00	\$ 607.00	\$ 607.00	\$ 607.00	\$ 607.00	\$ 607.00	\$ 607.00	\$ 607.00	\$ 607.00
following KW	\$ 5.810000	\$ 5.810000	\$ 2,242.66	\$ 2,660.98	\$ 2,360.80	\$ 2,658.08	\$ 4,648.97	\$ 5,559.20	\$ 5,963.00	\$ 5,190.27	\$ 4,368.15	\$ 3,243.43	\$ 2,427.13	\$ 2,435.84	\$ 2,435.84
Transmission Demand Charge per KWH	\$ 10.400000	\$ 10.400000	\$ 5,054.40	\$ 5,803.20	\$ 5,265.87	\$ 5,798.00	\$ 9,361.73	\$ 10,991.07	\$ 11,713.87	\$ 10,330.67	\$ 8,859.07	\$ 6,845.80	\$ 5,384.60	\$ 5,400.20	\$ 5,400.20
Stranded Cost Recovery Demand Charge per KWH	\$ 0.650000	\$ 0.650000	\$ 315.90	\$ 362.70	\$ 329.12	\$ 362.38	\$ 585.11	\$ 686.94	\$ 732.12	\$ 645.67	\$ 553.69	\$ 427.86	\$ 336.54	\$ 337.51	\$ 337.51
KWH Distribution Charge	\$ 0.006500	\$ 0.006500	\$ 1,300.00	\$ 1,300.00	\$ 1,300.00	\$ 1,300.00	\$ 1,300.00	\$ 1,300.00	\$ 1,300.00	\$ 1,300.00	\$ 1,300.00	\$ 1,300.00	\$ 1,300.00	\$ 1,300.00	\$ 1,300.00
Following KWH	\$ 0.005540	\$ 0.005540	\$ 740.96	\$ 555.93	\$ 572.37	\$ 748.02	\$ 1,057.06	\$ 1,459.34	\$ 1,933.52	\$ 1,879.06	\$ 1,300.15	\$ 790.76	\$ 510.20	\$ 576.11	\$ 576.11
KWH Stranded Cost Recovery Charge (credit)	\$ 0.006430	\$ 0.006430	\$ 2,146.00	\$ 1,931.24	\$ 1,950.32	\$ 2,154.19	\$ 2,512.87	\$ 2,979.79	\$ 3,530.14	\$ 3,466.93	\$ 2,795.02	\$ 2,203.79	\$ 1,878.16	\$ 1,954.66	\$ 1,954.66
System Benefits Charge per KWH	\$ 0.007430	\$ 0.007430	\$ 2,479.74	\$ 2,231.59	\$ 2,253.64	\$ 2,489.21	\$ 2,903.68	\$ 3,443.20	\$ 4,079.15	\$ 4,006.11	\$ 3,229.70	\$ 2,546.53	\$ 2,170.26	\$ 2,258.66	\$ 2,258.66
Apparatus Rental Charge per month			\$ 698.64	\$ 698.64	\$ 698.64	\$ 698.64	\$ 698.64	\$ 698.64	\$ 698.64	\$ 698.64	\$ 698.64	\$ 698.64	\$ 698.64	\$ 698.64	\$ 698.64
Energy Supply charge per KWH	12/1/19 - 11/30/21	\$ 0.069500	\$ 23,195.44	\$ 20,874.19	\$ 21,080.48	\$ 23,283.97	\$ 27,160.91	\$ 32,207.63	\$ 38,156.24	\$ 37,473.06	\$ 30,210.54	\$ 23,820.13	\$ 20,300.51	\$ 21,127.39	\$ 21,127.39
Total Electric cost/month WTP based on 2021 electric rate of -			\$ 38,970.88	\$ 37,215.61	\$ 36,608.38	\$ 40,289.61	\$ 51,026.11	\$ 60,122.95	\$ 68,903.81	\$ 65,787.54	\$ 54,112.10	\$ 42,674.07	\$ 35,803.17	\$ 36,886.16	\$ 568,400.39
2021 WTP Electric Cost/MG/Month -			\$ 138.66	\$ 147.50	\$ 131.60	\$ 143.62	\$ 129.05	\$ 130.43	\$ 134.20	\$ 133.94	\$ 125.06	\$ 130.88	\$ 132.04	\$ 133.11	\$ 134.17
Projected 2022 Electric Supply charge per KWH	\$ 0.120		\$ 40,049.68	\$ 36,041.77	\$ 36,397.96	\$ 40,202.54	\$ 46,896.54	\$ 55,610.30	\$ 65,881.28	\$ 64,701.68	\$ 52,162.09	\$ 41,128.28	\$ 35,051.23	\$ 36,478.95	\$ 36,478.95
Projected 2022 increase in Transmission Demand charge	10.00%		\$ 17,352.98	\$ 17,975.55	\$ 17,080.69	\$ 18,706.20	\$ 26,251.72	\$ 30,706.85	\$ 33,822.32	\$ 31,145.93	\$ 26,291.72	\$ 20,739.34	\$ 17,052.93	\$ 17,334.64	\$ 17,334.64
Total Electric cost/month WTP based on 2021 electric rate of -			\$ 57,402.67	\$ 54,017.32	\$ 53,478.64	\$ 58,908.74	\$ 73,148.25	\$ 86,317.15	\$ 99,703.61	\$ 95,847.61	\$ 78,453.81	\$ 61,867.62	\$ 52,104.16	\$ 53,813.59	\$ 825,063.18
2021 WTP Electric Cost/MG/Month -			\$ 204.24	\$ 214.10	\$ 192.24	\$ 209.99	\$ 185.00	\$ 187.25	\$ 194.19	\$ 195.14	\$ 181.32	\$ 189.74	\$ 192.16	\$ 194.20	\$ 194.96
															Rate per KWH - \$ 0.1798
															Projected increase in Electrical Costs - 45.2%
Merrimack River Pumps station:			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Estimated total monthly cost @ 2021 Rates -	\$		22,874.99	24,442.62	25,222.19	26,145.22	30,070.71	51,355.63	43,795.08	44,000.00	25,000.00	25,087.72	28,511.19	21,571.04	
Estimated total monthly cost @ 2022 Rates -	\$		33,694.01	35,477.72	36,845.35	38,227.77	43,107.73	73,730.11	63,371.35	64,104.77	36,245.96	36,371.44	41,492.18	31,470.21	
Estimated Merrimack River 2022 Electric cost/mg -	\$		119.89	140.62	132.45	136.27	109.03	159.94	123.43	130.51	83.77	111.55	153.03	113.57	

Attachment DLW-1

Chemical Quantities (lbs)																	Annual Total in lbs
January	February	March	April	May	June	July	August	September	October	November	December						
2021 profomed WTP Pumpage in millions of gallons	281.1	252.3	278.2	280.5	395.4	461.0	513.4	491.2	432.7	326.1	271.1	277.1	4260				
Chemical Dose (PPM)																	
qtr. 1	qtr. 2	qtr. 3	qtr. 4														
Sodium Permanganate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50% Caustic Soda coag. pH adjust	10	10	15	10	23439.7368	21041.9868	23200.8792	23396.3688	32975.526	38445.3984	64230.093	61445.1168	54129.519	27193.2372	22613.4096	23110.4736	415300
Carbon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ferric Chloride	35	35	40	35	82039.0788	73646.9538	81203.0772	81887.2908	115414.341	134558.894	171280.248	163853.645	144345.384	95176.3302	79146.9336	80886.6576	1303500
Polymer	0.3	0.3	0.3	0.3	703.192104	631.259604	696.026376	701.891064	989.26578	1153.36195	1284.60186	1228.90234	1082.59038	815.797116	678.402288	693.314208	10700
Sodium Hypochlorite	2.5	2.5	2.5	2.5	5859.9342	5260.4967	5800.2198	5849.0922	8243.8815	9611.3496	10705.0155	10240.8528	9021.5865	6798.3093	5653.3524	5777.6184	88900
Zinc Ortho-phosphate	2.5	2.5	2.5	2.5	5859.9342	5260.4967	5800.2198	5849.0922	8243.8815	9611.3496	10705.0155	10240.8528	9021.5865	6798.3093	5653.3524	5777.6184	88900
Tetra potassium pyrophosphate	0.65	0.65	0.65	0.65	1523.682892	1367.72914	1508.05715	1520.78397	2143.40919	2498.9509	2783.30403	2862.62173	2345.61249	1767.56042	1469.87162	1502.18078	23100
50% Caustic Soda final pH adjust	20	20	20	20	46879.4736	42083.9736	46401.7584	46792.7376	65951.052	76890.7968	85640.124	81926.8224	72172.692	45368.4744	45226.8192	46220.9472	710600
25% Caustic Soda (sludge adjust)	70	70	70	70	1314.414024	1179.04248	1301.31355	1314.41402	1847.16655	2157.21106	2401.7532	2296.94942	2021.83951	1524.02158	1266.37896	1296.94673	20000

Chemical Cost																		
Unit Cost per quarter	qtr. 1	qtr. 2	qtr. 3	qtr. 4	Unit	January	February	March	April	May	June	July	August	September	October	November	December	
Sodium Permanganate	\$ 0.2135	\$ 0.2135	\$ 0.2135	\$ 0.2135	lbs.	\$ 5,010	\$ 4,500	\$ 4,960	\$ 5,000	\$ 7,050	\$ 8,210	\$ 13,720	\$ 13,120	\$ 11,560	\$ 5,810	\$ 4,830	\$ 4,940	\$ 88,710
50% Caustic Soda coag. pH adjust					lbs.	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Carbon Dioxide					lbs.	\$ 24,210	\$ 21,730	\$ 23,960	\$ 24,160	\$ 34,050	\$ 39,700	\$ 50,530	\$ 48,340	\$ 42,590	\$ 28,080	\$ 23,350	\$ 23,870	\$ 384,570
Ferric Chloride	\$ 1.82	\$ 1.82	\$ 1.82	\$ 1.82	lbs.	\$ 1,280	\$ 1,150	\$ 1,270	\$ 1,280	\$ 1,810	\$ 2,100	\$ 2,340	\$ 2,240	\$ 1,980	\$ 1,490	\$ 1,240	\$ 1,270	\$ 19,450
Polymer	\$ 0.6400	\$ 0.6400	\$ 0.6400	\$ 0.6400	lbs.	\$ 3,760	\$ 3,370	\$ 3,720	\$ 3,750	\$ 5,280	\$ 6,160	\$ 6,860	\$ 6,560	\$ 5,780	\$ 4,360	\$ 3,620	\$ 3,700	\$ 56,920
Sodium Hypochlorite	\$ 0.590	\$ 0.590	\$ 0.590	\$ 0.590	lbs.	\$ 3,460	\$ 3,110	\$ 3,430	\$ 3,460	\$ 4,870	\$ 5,680	\$ 6,320	\$ 6,050	\$ 5,330	\$ 4,020	\$ 3,340	\$ 3,410	\$ 52,480
Zinc Ortho-phosphate	\$ 1.20	\$ 1.20	\$ 1.20	\$ 1.20	lbs.	\$ 1,830	\$ 1,650	\$ 1,810	\$ 1,830	\$ 2,580	\$ 3,000	\$ 3,340	\$ 3,200	\$ 2,820	\$ 2,130	\$ 1,770	\$ 1,810	\$ 27,770
TKPP	\$ 0.2840	\$ 0.2840	\$ 0.2840	\$ 0.2840	lbs.	\$ 13,320	\$ 11,960	\$ 13,180	\$ 13,290	\$ 18,740	\$ 21,840	\$ 24,330	\$ 23,270	\$ 20,500	\$ 15,450	\$ 12,850	\$ 13,130	\$ 201,860
50% Caustic Soda final pH adjust	\$ 0.4490	\$ 0.4490	\$ 0.4490	\$ 0.4490	lbs.	\$ 600	\$ 530	\$ 590	\$ 600	\$ 830	\$ 970	\$ 1,080	\$ 1,040	\$ 910	\$ 690	\$ 570	\$ 590	\$ 9,000
25% Caustic Soda	\$ 53,470	\$ 48,000	\$ 52,920	\$ 53,370	lbs.	\$ 53,470	\$ 48,000	\$ 52,920	\$ 53,370	\$ 75,210	\$ 87,660	\$ 108,520	\$ 103,820	\$ 91,470	\$ 62,030	\$ 51,570	\$ 52,720	\$ 840,760

Sludge produced 100 cubic feet																	
Sludge produced gallons/MG	qtr.1	qtr.2	qtr.3	qtr.4	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WTP Sludge disposal	8000	8000	8000	8000	100 ccf	3010	2700	2980	3010	4230	4940	5500	5260	4630	3490	2900	2970
Sludge gallons/mg of raw water flow	0	9.07	9.07	9.07	9.07	\$ 27,310	\$ 24,490	\$ 27,030	\$ 27,310	\$ 38,370	\$ 44,810	\$ 49,890	\$ 47,710	\$ 42,000	\$ 31,660	\$ 26,310	\$ 26,940
Unit cost/100 cuft					mnthly. \$	18,7773432	16,843464	18,5901936	18,7773432	26,3880936	30,8173008	34,31076	32,8135632	28,8834216	21,7717368	18,091128	18,5278104
Million lbs/month																	
Chemical costs/MG produced (2021) -	\$ 287	\$ 287	\$ 287	\$ 288	\$ 287	\$ 287	\$ 309	\$ 309	\$ 308	\$ 287	\$ 287	\$ 293	\$ 309	\$ 309	\$ 308	\$ 287	\$ 287
Chemical costs/MG produced (2022) ¹ -	\$ 331	\$ 330	\$ 331	\$ 331	\$ 330	\$ 330	\$ 355	\$ 355	\$ 355	\$ 330	\$ 330	\$ 337	\$ 355	\$ 355	\$ 330	\$ 330	\$ 331

Liquid Chemical Conversion Lbs to Gallons																	
Specific Gravity of Liquid Chemicals					Gallons/month												
solution	Strength	Specific Gravity	wet Lbs/gallon	2021 Dry lbs/gallon	\$/gallon	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
Sodium Permanganate	40%	1.375	11.4675	4.587		0	0	0	0	0	0	0	0	0	0	0	0
50% Caustic Soda	50%	1.55	12.927	6.72	\$ 1.43	10470	9400	10360	10450	14730	17170	22310	21340	18900	12150	10100	10320
Ferric Chloride	39%	1.4	11.676	4.55364	\$ 1.34	18020	16180	17840	17990	25350	29550	37620	35990	31700	20910	17390	17770
Sodium Hypochlorite	13%	1.2	10.008	1.251	\$ 0.80	4690	4210	4640	4680	6590	7690	8560	8190	7220	5440	4520	4620
Zinc Orthophosphate	100%	1.55	12.927	12.927	\$ 7.63	460	410	450	460	640	750	830	800	700	530	440	450
25% Caustic	25%	1.27	10.5918	2.752474	\$ 1.24	480	430	480	480	680	790	880	840	740	560	470	480

1. 2022 Chemicals Expenses expected to increase by 15.0%