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**BEFORE**
**THE PUBLIC UTILITIES COMMISSION OF OHIO**

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| In the Matter of the Application of Ohio American Water Company for Authority to Increase its Rates For Water and Sewer Service Provided to its Entire Service Area. | ) ) ) ) | Case No. 07-1112-WS-AIR |

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**OHIO AMERICAN WATER COMPANY RESPONSE**
**TO**
**DOCUMENTS FILED BY STEVE KENNEDY, PRAIRIE TOWNSHIP TRUSTEE**

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Ohio American Water Company ("Ohio American" or "Company") submits this Response to Documents filed with the Public Utilities Commission of Ohio ("Commission") by Steve Kennedy, Prairie Township Trustee, on January 22, 2008 (letter dated January 17, 2008 referred to as the "first letter"); February 1, 2008 (letter dated January 31, 2008); and February 6, 2008 (letter dated February 5, 2008) (collectively referred to as "Documents") in which Mr. Kennedy encloses "results from random hardness tests" conducted during various days in October, November and December in 2007 and in January 2008.

## I. Introduction

In response to concerns expressed by Mr. Kennedy regarding the stability of the Lake Darby hardness, a meeting was held with Mr. Kennedy, PUCO Staff, OEPA Staff and Company representatives on December 21, 2007. Mr. Kennedy presented data sheets indicating that hardness data from water samples he collected at the Prairie Fire Township Fire Station on Hubbard Road. His data showed results outside of the specifications in the Stipulation filed in Ohio American's last rate case, Case No. 06-433-WS-AIR on January 10, 2007 ("Stipulation") at paragraph 13 E.

Concerned about the allegations presented by Mr. Kennedy during the meeting, Ohio American management immediately undertook to evaluate the data presented from his field samples and test results.

Subsequent to the December 21, 2007 meeting, Mr. Kennedy sent the PUCO the first letter with the information attached which purported to be results from samples taken at the Prairie Township Fire station on Hubbard Road showing hardness concentrations. During the time Mr. Kennedy was submitting letters to the PUCO, Ohio American was conducting an operational evaluation of the performance of the Lake Darby water treatment plant ("LDWTP").

## II. Ohio American's Investigation of the Hardness Allegations

Without addressing the validity, sampling method or testing method used by Mr. Kennedy on the field samples—Ohio American will address in Section III below the factors that must be taken into consideration when reviewing the Documents—Ohio American considered Mr. Kennedy's letter and the attachments as indications of a potential issue at the LDWTP.

The design of the LDWTP requires the high service pumps ("HSP") to be used to feed water to the two softeners. The plant was originally constructed with a single hard water blend supply pipe line. The three water streams—from the two softeners and from the single hard water supply line—flow directly into the water distribution system to constitute the finished water.

The LDWTP has a normal finished water output of approximately 350 gallons per minute ("gpm") and is operated to produce finished water within a 120 milligrams per liter ("mg/L") to 150 mg/L finished water hardness range. The target is 140 mg/L hardness.[1]

[1] The primary components of hardness are calcium and magnesium, although other polyvalent metal ions may contribute if present in sufficient concentrations. Hardness is expressed as an equivalent to calcium carbonate ($CaCO_3$).

There are several factors that potentially can impact the natural variability of the finished sample tap's water hardness. These include:

1) Plant Start-up / Shut–down cycles.

2) The lack of a finished water clearwell resulting in no buffering of water to dampen typical process variability.

3) A fixed proportioned blend water line. As a result, when one of the two softeners is in regeneration the finished water hardness rises because the ratio of the blended water flow rate to the one (1) on-line softener flow rate is higher thus increasing the finished water hardness. This condition only occurs during softener regeneration.

4) Finished water from the softeners and blend line is discharged directly into the water distribution system. As a result, there is little, if any, opportunity for the finished water to mix with the network water to create uniform water chemistry before the first couple of customers. The Prairie Township Fire Station is located next to the LDWTP and the first customer on the water distribution main.

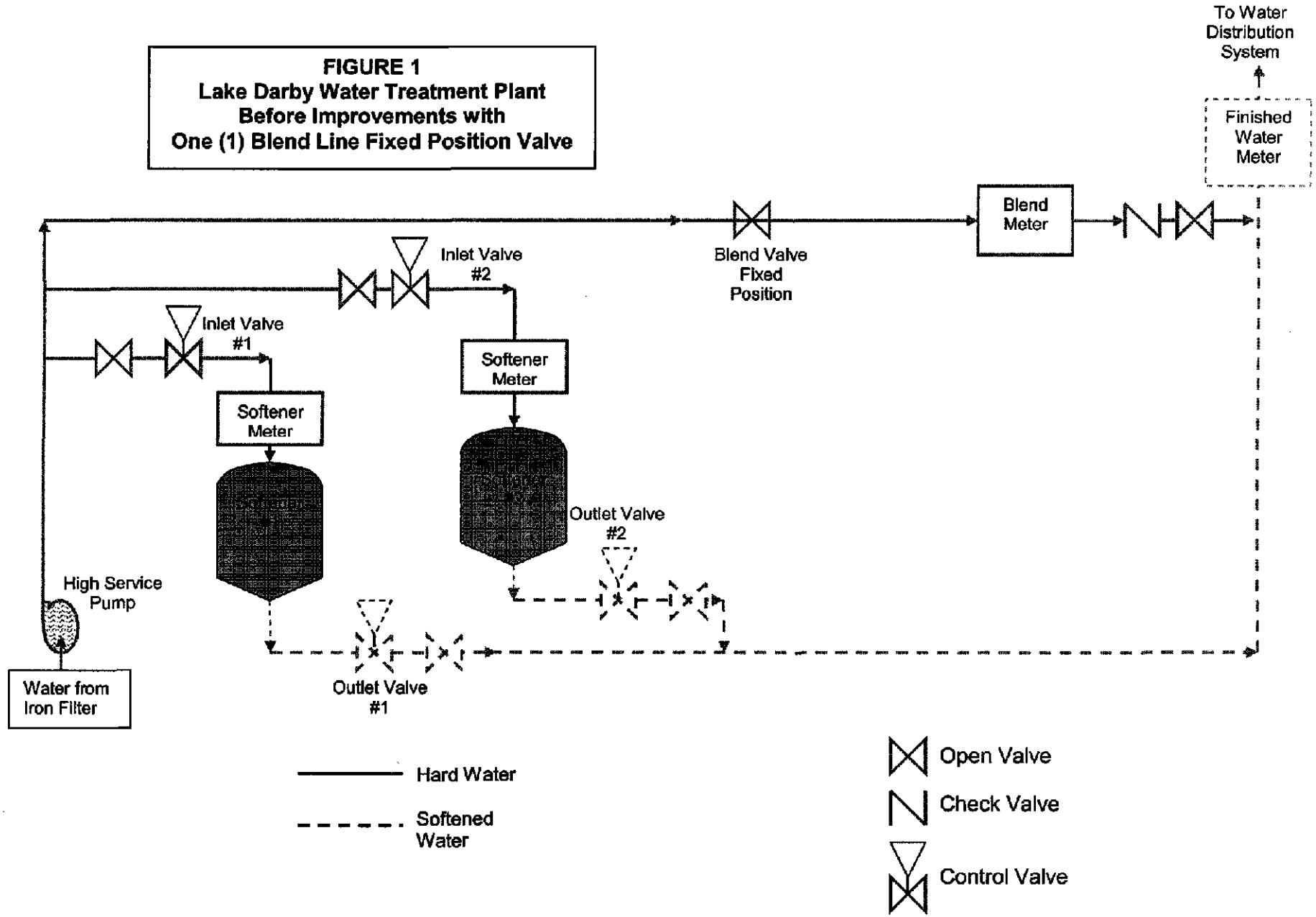
When a water treatment plant with multiple softeners has a single softener go into the regeneration cycle, the effluent flow from that softener stops. This results in the fixed flow rate of the hard water blend supply becoming a larger percent of the finished water, resulting in a temporary elevated hardness during softener regeneration. In contrast to the design of the LDWTP (built and placed into operation circa 1973), most water treatment plants have clearwells that store the finished water. Clearwells are large tanks typically adjacent to, or underneath, a water plant, which receive the treated water prior to the finished water being pumped into the water distribution system for delivery to customers.

The volume of water in the clearwell buffers any short-term, elevated water hardness that may occur during the water softener regeneration process. However, because the LDWTP does not have a finished water clearwell, any variation in the water hardness is pumped into the water distribution system causing short term water hardness variation. As an example, the Company's

Worthington Hills water treatment plant has a 300,000 storage tank that receives the ion exchanged softened water and then it is discharged to a 35,800 gallon finished water clearwell.

Moreover, in the original construction of the LDWTP 35 years ago, there was a single fixed position valve that established a hard water blend flow rate to generate a finished water hardness based on a formula that assumed both water softeners in operation. This same piping configuration was in place when Citizens Utilities Company of Ohio placed the water softening units into service in 1994, 14 years ago. Undoubtedly Ohio American personnel were the first managers since 1973 to evaluate the design and certainly they were the first to implement an improvement in the design of the LDWTP. Figure 1 shows the single blend control valve arrangement before the improvements were installed in January 2008 in response to the December 21, 2007 meeting and Mr. Kennedy's first letter.

**FIGURE 1**
**Lake Darby Water Treatment Plant**
**Before Improvements with**
**One (1) Blend Line Fixed Position Valve**



When one softener is removed from operations for regeneration, the total soft water volume decreases. This causes the finished water hardness to temporarily increase because the blend volume was fixed based on a formula that contemplates two water softeners in operation. The data presented in Table I shows normal operations, while Table II shows the problem created with a single hard water blend line, as is the case with the LDWTP.

**TABLE I**
**Case #1 – Normal Operation**
**Two Softeners in Service with Single Blend Line**

| | Flow Rate | Flow Contribution | Hardness |
|---|---|---|---|
| Softener #1 | 125 gpm | 35.7% | 0 mg/L |
| Softener #2 | 125 gpm | 35.7% | 0 mg/L |
| Single Blend Line | 100 gpm | 28.5% | 490 mg/L |
| Finished Water | 350 gpm | 100% | 140 mg/L |

**TABLE II**
**Case #2 – One Softener in Regeneration**
**Only One Softener and a Single Blend Line**

| | Flow Rate | Flow Contribution | Hardness |
|---|---|---|---|
| Softener #1 | 0 gpm (regeneration) | 0% | N/A |
| Softener #2 | 125 gpm | 56% | 0 mg/L |
| Single Blend Line | 100 gpm | 44% | 490 mg/L |
| Finished Water | 225 gpm | 100% | 217 mg/L |

Ohio American staff evaluated this phenomenon and performed several in-field tests to determine the magnitude, frequency and potential solutions. Both Ohio American's in-plant process control testing and Water Quality's monitoring testing has confirmed that the finished

water tap is consistently within the 120 and 150 mg/L range under normal operating conditions. These results have been reported to the Ohio EPA and to the Commission in monthly reports.

During normal operations (two softeners on-line and blend line properly proportioned) the finished water tap consistently measures within the specified range. However, after the investigation spurred by Mr. Kennedy's letter, Ohio American management recognized that during regeneration, due to the original design and construction deficiencies of the LDWTP, it *was possible* that the finished water hardness may be outside of the specified range during a softener regeneration cycle.

Ohio American management considered that in order to assure that the finished water hardness remained less than 150 mg/L during softener regeneration, the LDWTP's operating units would have to be modified. Three (3) relatively simple modifications were considered:

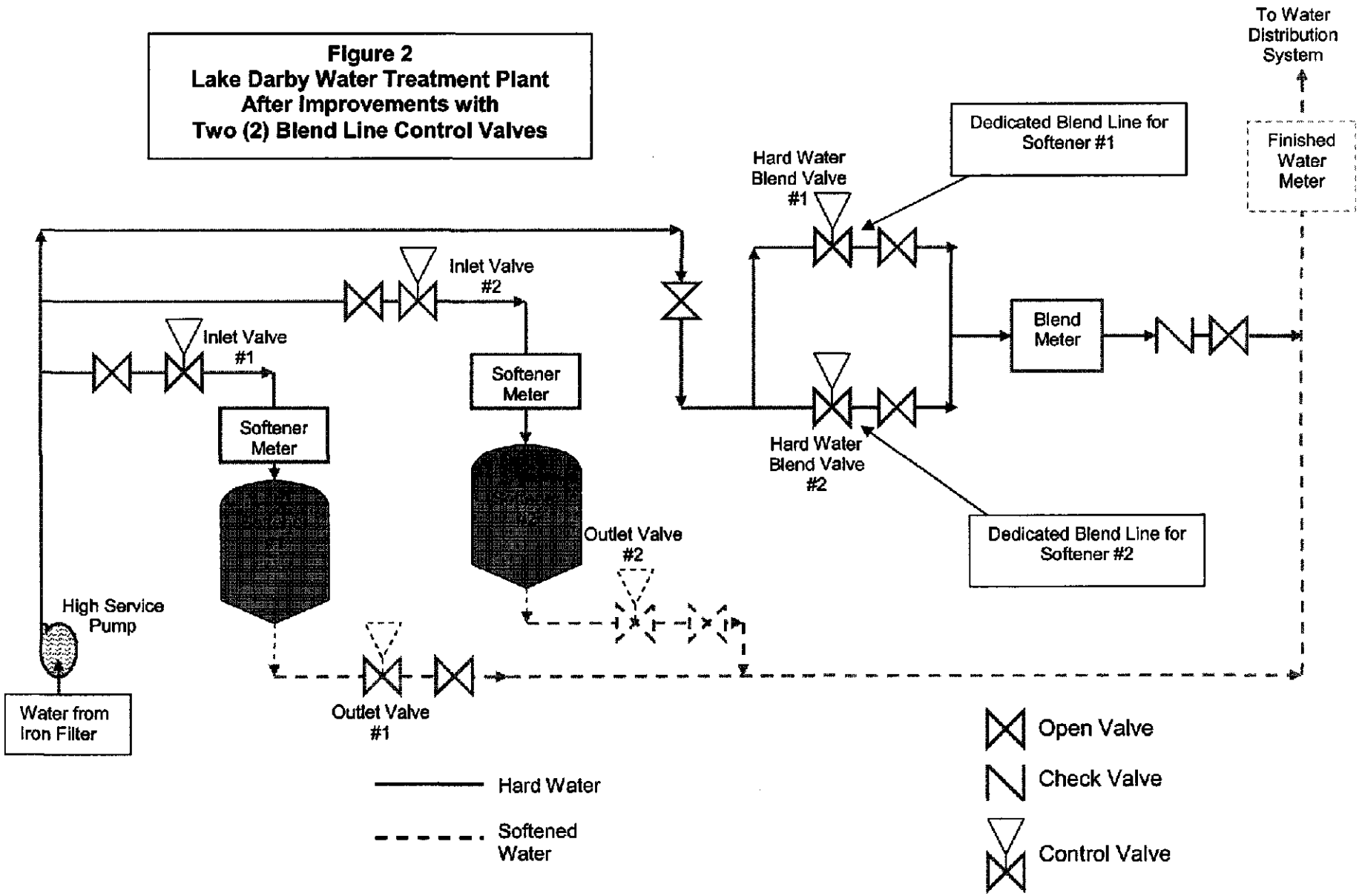
1) Installation of a Rate-of-Flow valve and programmable logic controller on the blend line. This system would automatically proportion the blend water flow rate to the softened water flow rate to maintain a preprogrammed hardness. This would compensate for one or two softener flow rates depending on regeneration cycles at an estimated cost of $12,500.

2) Construction of a clearwell, which would allow finished water to buffer treated water under all operating conditions. A preliminary estimated cost would be $850,000.

3) Installation of an on/off flow control valve on a hard water blend line dedicated to a specific softener unit. The dedicated blend line and control valve would stop the hard water blend flow when its softener was regenerating. This may cause a temporary low hardness water to enter into the water distribution system, but it is siding on a lower hardness rather than the higher hardness which has been stated by Steve Kennedy, Prairie Township trustee, as the preference. This modification would be the quickest to implement and the lowest cost, but would require in-situ adjustments to establish the proper flow rate for each blend line control valve. The estimated cost is $1,500.

Ohio American implemented the on/off flow control valve on a hard water blend line dedicated to a specific softener modification to address the issue. Figure 2 shows the two (2) hard water blend control valves and piping arrangement after the improvements were installed.

**Figure 2**
**Lake Darby Water Treatment Plant**
**After Improvements with**
**Two (2) Blend Line Control Valves**



Tables III and IV show the predicted operational results using two hard water blend control valves, each controlling a dedicated hard water blend line coupled to a specific softener.

**TABLE III**
**Case #3 – Normal Operation**
**Two Softeners in Service with Two Blend Lines**

| | Flow Rate | Flow Contribution | Hardness |
|---|---|---|---|
| Softener #1 | 125 gpm | 35.7% | 0 mg/L |
| Softener #2 | 125 gpm | 35.7% | 0 mg/L |
| Blend Line #1 | 50 gpm | 14.2% | 490 mg/L |
| Blend Line #2 | 50 gpm | 14.2% | 490 mg/L |
| Finished Water | 350 gpm | 100% | 140 mg/L |

**TABLE IV**
**Case #4 – One Softener in Regeneration**
**Two Blend Lines**

| | Flow Rate | Flow Contribution | Hardness |
|---|---|---|---|
| Softener #1 | 0 gpm (regeneration) | 0% | N/A |
| Softener #2 | 125 gpm | 71.4% | 0 mg/L |
| Blend Line #1 | 0 gpm | 0% | N/A |
| Blend Line #2 | 50 gpm | 28.5% | 490mg/L |
| Finished Water | 175 gpm | 100% | 139.5 mg/L |

Tables I and II demonstrate that the finished hard water hardness concentration becomes highly variable when there is only a single hard water blend line. In contrast, as shown on Tables III and IV, with two hard water blend lines (each operating ***only*** when its respective water softener is on-line) the finished water hardness is more stable within the desired range.

After the December 21 meeting and two days prior to Mr. Kennedy's letter being filed, Ohio American ordered materials to implement the modifications of two parallel but independent

hard water blend lines, each with its own control valve whose operation is directly connected to its respective softener unit. The installation of these two new hard water blend lines was completed on January 24, 2008; the new lines and valves were placed into service on the next day, January 25th; and today the lines and valves are operational and are controlling the finished water hardness. Ohio American operational personnel continue to fine tune the adjustments of the control valves to hone in a stable hardness in the finished water in the 125 to 130 mg/L range.

The original design and construction deficiencies of the LDWTP created the system and operating conditions that caused hardness instability during regeneration. Ohio American will continue to develop cost effective responses to design and construction deficiencies as they are identified. As stated in the past, Ohio American is committed and continues to address hardness concerns of its customers in the Lake Darby service area. The above improvements are an example of implementing appropriate changes when issues are brought to the Company's attention: Ohio American investigates, defines the issue and addresses the issue in a cost effective and timely manner.

## III. Problems with the Sample Analysis in Mr. Kennedy's Documents

### A. Sample site

There are a number of problems with the validity of the sampling and testing methods presented in Mr. Kennedy's Documents. The Stipulation specifies the hardness at the ***sample tap at LDWTP*** (note the requirement is for the sample to be taken at the plant, not in the distribution system) shall be in the 120 mg/L to 150 mg/L range for 95% of the samples measured. Stipulation paragraph 13 D. No sample time or operating conditions were specified in the Stipulation.

The primary goal of proper sampling is to ensure that the sample collected represents the flow stream being analyzed. To collect representative samples, both proper sample site selection and sampling technique are critical. Good operating practices require that process control or performance monitoring sampling be conducted at times that represent the treatment process operating normally under stable conditions (*See* American Water Works Association's *Water Treatment Operator Handbook*, 2002, Chapter 12). Therefore, Ohio American's sampling program was conducted at the LDWTP during normal, stable operation. The LDWTP is only staffed for approximately two hours per day. Sampling is predicated on the collection of the output of the plant when the plant is in full operation and is producing water under normal operating conditions, which typically occurs during the two hours when the LDWTP is staffed.

Ohio American's data indicated a consistent performance (except for the period of September 28, 2007 to December 1, 2007 during the Lake Darby water tank painting and use of temporary water tanks).

Mr. Kennedy arranged for samples to be taken, not at the LDWTP as specified in Stipulation paragraph 13D, but at the distribution system. Sampling from the water distribution system allows other variables to enter into the sample's results. Spatial and temporal relationship to the water treatment plant and/or water storage tank can impact the validity and comparability of the distribution sample compared to the characteristics of the water actually being produced and measured at the designated sampling tap in the LDWTP.

**B. Mr. Kennedy's sample testing**

Mr. Kennedy's hardness measurements were made using a test method that required the addition of a chemical reagent that is added to the sample by a "dropper." Due to the test method's resolution of accuracy, each drop of chemical reagent equates to a minimum of 17.1

mg/L of hardness. Even assuming that the sampling technique, sample preservation and sample storage were perfect, the "dropper" test method used by Mr. Kennedy would only be accurate plus or minus 17.1 mg/L of hardness. In contrast, the Company's analytical test method's accuracy is plus or minus 1 mg/L of hardness. The chemical reagent "dropper" testing is more appropriate for preliminary or crude measurement of hardness, but not for a precise hardness measurement. Indeed, because of its low accuracy, Ohio EPA does not approve of Ohio American's using the "dropper" test method for reporting its hardness results to the Ohio EPA.

### C. Issues presented by taking the samples to the Consumer Analytical Laboratory

If a sample is not collected or preserved properly, it will yield erroneous information. The collection technique at the Prairie Township Fire Station sample fixture—including, how long the water ran from the fixture before sample collection, was the water hot or cold, use of a sample preservative, and storage of the same after collection prior to deliver to the laboratory—all can impact the reliability of the data produced from the sample analysis.

In his Documents, Mr. Kennedy submitted data to the Commission, both from his own sampling and analytical testing as well as from sample results from the Department of Agriculture's Consumer Analytical Laboratory. This data is presented in Table V.

**TABLE V**
**Hardness Samples from Prairie Township Fire Station on Hubbard Road**

| Date | Time | Day of Week | Mr. Kennedy's Reported Value (mg/L) | Consumer Analytical Laboratory Value (mg/L) | Difference |
|---|---|---|---|---|---|
| 12/3/2007 | 12:30 PM | Monday | 188 | 182 | 3.3% |
| 12/31/2007 | 8:10 AM | Monday | 171 | 165 | 3.6% |
| 1/14/2008 | 9:41 AM | Monday | 188 | 165 | 13.9% |
| 1/20/2008 | 6:33 PM | Sunday | 188 | 169 | 11.2% |
| 1/21/2008 | 7:00 AM | Monday | 188 | 167 | 12.5% |
| 1/21/2008 | 7:15 PM | Monday | 171 | 160 | 6.8% |
| 1/26/2008 | 5:13 PM | Saturday | 171 | 156 | 9.6% |

The data presented in Table V illustrates the infirmities of Mr. Kennedy's samples:

1) The analytical test results reported by Mr. Kennedy are always higher than the analytical results reported by the Consumer Analytical Laboratory, no doubt because of the "dropper" testing methodology he employed.

2) The sampling technique, sample preservation and sample storage is unknown, therefore the comparability of the analytical results to the actual finished water sample tap cannot be determined.

3) The samples reported in Table V are water distribution samples and therefore do not reflect the finished water hardness value without the interference of the water storage tanks, water distribution system mixing or water retained in the piping to and inside of the Prairie Township fire station.

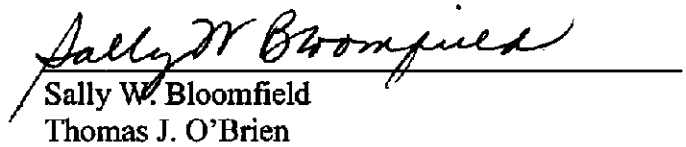
## IV. Conclusion

Upon learning of the discrepancy of the hardness values between Ohio American's samples and the results of samples reported by Mr. Kennedy, Ohio American representatives, taking the information at face value, immediately investigated the potential cause of the discrepancies. Their investigation revealed that while Ohio American's sampling was accurate, improvements to the LDWTP's original design could be made to assure a more reliable and

consistent finished water hardness even during abnormal process operations occurring during softener regeneration. Approximately one month after the meeting with the Staff and Mr. Kennedy, Ohio American had decided upon an improvement, ordered the parts and installed improvements to the LDWTP even though it had properly measured and reported the hardness values for the periods in dispute.

Mr. Kennedy's samples should be disregarded as they did not meet any of the criteria for appropriate hardness sampling: (1) the samples were taken from sites on the distribution system, not the LDWTP as specified in the Stipulation; (2) the samples do not reflect the finished water hardness value without the interference of the water storage tanks, water distribution system mixing or water retained in the piping to and inside of the Prairie Township fire station; (3) the sampling technique, sample preservation and sample storage methods were not disclosed and therefore could not be shown to be valid; and (4) the sample "dropper" testing methodology is flawed. For all these reasons, the information provided by Mr. Kennedy in the Documents should be disregarded.

Respectfully submitted on behalf of
OHIO AMERICAN WATER COMPANY



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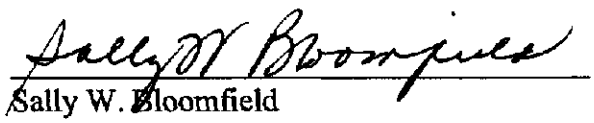
## CERTIFICATE OF SERVICE

The undersigned hereby certifies that the Ohio American Water Company Response to Documents Filed by Steve Kennedy, Prairie Township Trustee, was either served by electronic mail or regular U.S. Mail this 13th of February 2008.



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