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March 2, 2022

Ms. Linda C. Bridwell, P.E.
Executive Director
Kentucky Public Service Commission
P.O. Box 615
Frankfort, KY 40602-0615

RECEIVED
MAR 03 2022
PUBLIC SERVICE COMMISSION

Re: ***Cases No. 2018-00429 and No. 2019-00347***
Graves County Water District

Dear Ms. Bridwell:

Enclosed for filing in the above-referenced matters is Graves County Water District's annual report on the progress of its water loss detection and repair program

Sincerely,

Stoll Keenon Ogden PLLC

Gerald E. Wuetcher

GEW
Enclosure

ANNUAL PROGRESS REPORT OF GRAVES COUNTY WATER DISTRICT'S WATER LOSS DETECTION AND REPAIR PROGRAM (OCTOBER 1, 2020 – SEPTEMBER 30, 2021)

On September 30, 2019, the Public Service Commission ("Commission") in Case No. 2018-00429[1] authorized Graves County Water District ("Graves District") to collect a monthly surcharge of $5.00 per customer for service rendered on and after October 1, 2019 and continuing for 72 months or until the total amount of the surcharge assessed equaled $1,721,600, whichever occurred first, subject to certain conditions. These conditions included the submission of a yearly report containing a schedule of the estimated and actual progress of Graves District's water loss detection and repair program and the estimated and actual expenditures made with surcharge proceeds.[2] The Public Service Commission indicated that this yearly report will be used to evaluate the need for prospective adjustments to the water loss detection and repair program and the authorized surcharge.

This report addresses Graves District's water loss and detection program for the period from October 1, 2020 to September 30, 2021 ("Review Period"). It compares the results of the program's second year to the assumptions and estimates contained in Graves District's program proposal and the program's first year of operations. As Graves District noted in its proposal, the accuracy of the original cost estimates and the program's results cannot be gauged until the program has operated for a minimum of two years.[3] When submitting its proposal, however, Graves District could not have foreseen the significant challenges that confront the program's implementation, including a global pandemic, supply chain shortages, a significant increase in

[1] *Application of Graves County Water District for An Alternative Rate Adjustment*, Case No. 2018-00429 (Ky. PSC Sep. 30, 2019).
[2] *Id.* at 14.
[3] Case No. 2018-00429, Supplemental Proposal of Graves County Water District for a Water Loss Detection and Repair Surcharge at 5 (filed Aug. 19, 2019).

material costs and a destructive tornado that struck Graves County, Kentucky in December 2021. Despite these challenges the water loss program continues to move forward. Given these challenges and the uncertainty that has followed, however, Graves District believes that no adjustments in the surcharge amount or other program features should be made at this time.

Program Implementation

In its Order of September 30, 2019, the Commission directed Graves District to submit a comprehensive unaccounted-for water loss reduction plan that established priorities and a time schedule for eliminating each source of unaccounted-for water loss and provides a detailed spending plan for the surcharge proceeds.[4] On December 20, 2019, Graves District submitted its comprehensive plan.[5] Appendix A to this report compares the original schedule for implementing the program with the program's current status.

During its first year, the proposed plan's implementation generally proceeded according to schedule. In December 2019 Mayfield Electric and Water Systems ("MEWS") hired an employee whose principal responsibility was leak detection on Graves District's system.[6] Although Graves District originally proposed to assign two persons who would each perform 20 hours of leak detection activity weekly, Graves District determined that assigning one person whose sole duty was leak detection would be more effective. Other MEWS employees continued to perform leak detection assignments when necessary. In January 2020, Graves District entered into a lease agreement for a hydro-excavator truck. In May 2020 it purchased a Mikron 3 listening device to better locate leaks. It, however, elected not to purchase 20 noise logger devices and related

[4] Order of Sept. 30, 2019 at 12.

[5] A detailed spending plan for the surcharge proceeds had been contained in the surcharge proposed submitted in Case No. 2018-00429 on August 19, 2019.

[6] Graves District contracts with Mayfield Electric and Water Systems for all operation and maintenance services. MEWS performs these services in consultation with Graves District's Board of Commissioners.

equipment as originally proposed. MEWS agreed to purchase the devices and to share the equipment with Graves District at no cost.

Beginning in February 2020, installation of additional magnetic water meters throughout Gravers District's distribution system to establish district metered areas ("DMAs") began. Water usage for each DMA is metered with a meter connected to MEWS' s Automated Meter Infrastructure ("AMI"). MEWS monitors water usage within each zone and can quickly identify excessive water usage in a DMA. Once excessive water usage is identified, leak sensors are deployed in the DMA. These sensors significantly narrow the area in which the leak is located. The leak detection specialist then pinpoints the exact leak location and a work crew is deployed to repair the leak.

Graves District originally proposed to establish 35 DMAs by the end of the second year of the program. As of September 30, 2020, 19 DMAs existed. In its report on the program's first year, Graves District stated its intention to have 53 DMAs in operation by September 30, 2021.[7] With a greater number of DMAs, Graves District asserted, water leaks could be detected earlier, and the volume of lost water further reduced. In addition to the savings from lower water losses, reducing the search area for a leak through the creation of additional DMAs was expected to lower water loss detection expense since fewer manhours will be spent searching for a leak.

Graves District was not able to meet its goal of establishing 53 DMAs by September 30, 2021. As of that date, only 26 DMAs were operational. The installation of DMAs in the Review Period was slowed due to supply chain problems. Suppliers were unable to fill Graves District's orders for metering equipment. Only four additional meters were delivered to Graves District

[7] Annual Progress Report of Graves County Water District's Water Loss and Repair Program (Jan. 4, 2021) at 3.

during the review period.[8] In December 2021, ten additional meters were delivered. Two of these meters, however, were damaged in the December tornado. The remaining meters have not yet been installed as service restoration efforts following the tornado have taken precedence over all other activities. Graves District will resume the establishing DMAs in the current program year. It still intends to establish 53 DMAs in its distribution system, but the completion date for these DMAs is uncertain. Graves District expects to review its plans for DMAs later in this year to determine if adjustments are necessary.

As new metering equipment is acquired and installed, MEWS is integrating that equipment into its AMI infrastructure. The real-time information is being used to assign the leak specialist and other MEWS employees to locate and repair leaks on Graves District's system. Graves District is continuing to review predictive analysis software and currently plans to purchase such software in the fourth year of the program.

Finally, the December 10 tornado significantly disrupted Graves District's operations. While most areas of Graves District experienced only limited damage, approximately 40 residences in the area formerly known as Hardeman Water District were destroyed. The City of Mayfield suffered extensive damage. MEWS's offices were significantly damage. MEWS has concentrated its efforts on service restoration and clean up. Leak detection efforts were halted for approximately two months, but recently resumed in February and are expected to return to normal March.

Surcharge Revenue

During the Review Period, Graves District collected $289,740 in surcharge revenues, or an average of $24,145 monthly. In the prior review period, during which the surcharge was billed for

[8] At the start of the Review Period, Graves District had seven meters in inventory that had been purchased during the first year of the surcharge.

only eleven months, $264,215, or a monthly average of $24,019 of surcharge revenues were collected. In the first two years of the surcharge, Graves District has collected $553,995 in revenue from the surcharge.

In its proposal, Graves District calculated surcharge revenue assuming 4,781 customers and expected annual revenues from the surcharge of $286,860. As shown in Table 1 below, Graves District's customer base has exceeded that level for much of the time the surcharge has been in effect. Based upon the average monthly number of customers paying the surcharge in the Review Period (4,829), Graves District now estimates annual surcharge revenue of $289,740 and expects the District to reach the total authorized amount in 72.3 months. The last month that the surcharge will be billed will likely be October 2025.

TABLE 1

	YEAR 1		**YEAR 2**	
Month	**Customer Bills**	**Surcharge Revenue**	**Customer Bills**	**Surcharge Revenue**
October			4,841	$24,205
November	4,778	$23,890	4,827	$24,135
December	4,813	$24,065	4,838	$24190
January	4,794	$23,970	4,830	$24,150
February	4,796	$23,980	4,815	$24,075
March	4,793	$23,965	4,818	$24,090
April	4,774	$23,870	4,819	$24,095
May	4,783	$23,915	4,826	$24,130
June	4,816	$24,080	4,830	$24,150
July	4,825	$24,125	4,829	$24,145
August	4,834	$24,170	4,818	$24,090
September	4,837	$24,185	4,857	$24,285
TOTAL	52,843	$264,215	57,948	$289,740

Overall Expenditures

Table 2 reflects projected expenditures in the program's second and third years and actual expenditures in the program's first two years. It also shows the total amount estimated for each category as set forth in Graves District's proposal. The discussion below and Appendix B to this report provide additional details regarding the actual and projected amounts.

Table 2

	Proposed Total	Year 1 Actual	Year 2 Projected	Year 2 Actual	Year 3 Projected
Establishment of DMAs	$383,285	$109,832	$ 179,792	$ 45,092	$ 151,146
Hydro-Excavator Truck	$300,000	$ 52,084	$ 78,125	$ 78,125	$ 78,125
Purchase of Leak Detection Equipment	$ 22,825	$ 4,400	$ 18,425	$ 0	$ 18,425
Loss Detection	$541,710	$ 57,936	$ 90,675	$ 83,917	$ 66,800
Leak Repair	$200,000	$ 28,311	$ 36,220	$ 6,818	$ 32,953
Total	$1,447,820	$252,563	$403,237	$213,952	$347,449

Establishment of DMAs

During the Review Period, 7 DMAs were established, bringing the total number of DMAs in operation as of September 30, 2021 to 26. Total cost to establish these DMAs was $145,548, which results in an average DMA installation cost of $5,598.[9] Graves District had originally estimated the cost of a DMA at $10,951 or approximately $4,663 greater than the average cost to establish a DMA in the Review Period. The principal reason for the significant difference in expected and actual cost lower than expected meter costs. In its proposal, Graves District estimated the average meter cost to be $5,295. In the first year of the surcharge's operation, Graves District was able to procure six-inch magnetic meters with encoder at a cost of $3,949.50. Additionally, the fifteen percent contingency (or $1,428) included in the original estimate proved unnecessary. The lower cost of a DMA enables Graves District to install additional DMAs.

[9] At the close of the Review Period, Graves District had one meter remaining in inventory. The cost of this meter was not considered when determining the average cost of a DMA.

During the second year of the surcharge, however, the price for meters has increased approximately four percent.

Graves District still plans to establish a total of 53 DMAs. Given supply chain problems, it is unclear whether this goal can be met by September 30, 2022. To reach this goal 27 DMAs must be established at a projected cost of $151,146.[10]

Hydro-Excavator Truck

In its original proposed, Graves District proposed to acquire a hydro-excavator truck at an estimated cost of $300,000. In January 2020, Graves District entered an agreement to a lease a hydro-excavator truck. The monthly lease payment on this truck is approximately $6,510.39. Annual cost of the lease is $78,125.

Leak Detection Equipment

In May 2020 Graves District acquired at a cost of $4,400 a Mikron 3 listening device to locate leaks. This cost is equal to the estimated cost contained in Graves District's proposal. Graves District has not purchased 20 noise logger devices and related equipment as originally proposed. Instead it uses similar devices that MEWS has acquired and agreed to share at no charge. Graves District originally budgeted $18,425 in the Review Period for the purchase pressure sensors and pressure release valve monitors and their connection to MEWS monitoring system. This purchase did not occur during the Review Period but is expected to occur in the current period.

Loss Detection

Graves District originally proposed to assign two persons working 20 hours weekly to leak detection. After additional consideration, it determined one person devote his or her entire attention to leak detection was preferable. MEWS hired a leak detection specialist in December

[10] 27 DMAs x $5,598 per DMA = $151,146. These cost projections are estimates. Should costs increase, adjustments to the number of installations will be necessary.

2019. For the period ending September 30, 2020, approximately 1,233 regular manhours and 68 overtime manhours were devoted to leak detection.[11] These totals reflect not only the leak detection specialist's time, but that of other MEWS employees who were occasionally assigned leak detection tasks. During the next review period, MEWS employees worked approximately 1,899.5 regular manhours and 26 overtime manhours and traveled approximately 10,181 miles as part of Graves District's leak detection efforts. The most hours were devoted to the areas that were formerly South Graves Water District (840 hours, 5,260 miles) and Consumers Water District (547 hours, 2,469 miles). Total sum expended on leak detection was $83,917.

Graves District expects that a reduction in number of hours devoted to leak detection in the current year as a result of the tornado. Leak detection efforts were halted in December 2021 as MEWS devoted all efforts to restoring water service. Normal leak detection efforts, however, are expected to resume in March 2022.

Graves District expects to spend approximately $66,800 on its leak detection efforts for the year ending September 30, 2022. This estimate assumes that MEWS employees will work 1,560 regular hours and will travel approximately 7,500 miles as part of that effort.[12] Graves District intends to continue to focus its leak detection on the South Graves Water District and Consumers Water District areas, which are currently experiencing the highest water loss rates.

Loss Repair

Graves District originally assumed 200 leaks would be located and repaired in the first year of the program, 100 leaks would be located and repaired in the second year, and 50 leaks would be located repaired in each of the remaining four years. It estimated the costs associated with labor

[11] MEWS vehicles travelled approximately 7,854 miles in support of leak detection assignments.
[12] This estimate is based upon the current IRS mileage rate of $0.585 per mile.

and materials to repair a leak at $400.[13] During the first review period, only 68 leaks were repaired at a cost of $28,310, or an average repair cost of $416.32 per leak. In its last report, Graves District estimated that over the remaining five years of the surcharge eighty-seven leaks annually would be discovered and repaired. During the Review Period, however, only 18 leaks were detected. The cost to repair these leaks was approximately $6,817.52 or an average repair cost of $378.75.

Graves District has no explanation for the lower number of reported water leaks. It is reviewing its records and reporting procedures to determine if additional leaks were discovered but the repair work was reported as normal maintenance and incorrectly funded through operation and maintenance funds. If such reporting errors are found, Graves District will take steps to ensure that future work is properly recorded to the surcharge account. Graves District assumes that a larger number of leaks will be discovered in the current year and estimates that $32,953 will be needed for leak repair.[14]

Water Loss Results

It is still too early to draw any conclusions regarding the success of Graves District's water loss detection and repair program, but the program has succeeded in reducing water loss. During calendar year 2019, Graves District reported an unaccounted-for water loss of 34.1 percent. For the first year of the program, Graves District's water loss was only 26.7 percent.[15] At the end of the second year, water loss had fallen to 20.74 percent. Table 3 compares the water loss for each area of Graves District's system for the first and second years of the program. All but two of these areas reflected a reduction in water loss.

[13] Total leak repair cost = (200 leaks x $400) + (100 leaks x $400) + (4 years x (50 leaks x $400)) = $200,000.
[14] This estimate assumes a total of 87 leaks will be discovered and repaired. This level of leak discovery was used to prepare the estimated leak repair expense for the Review Period.
[15] This period covers the ten months (December 2019 – September 2020) for which Graves District submitted a monthly water loss report to the Public Service Commission.

Table 3			
	December 2019	**Year 1 (Dec.-Sep.)**	**Year 2 Oct.-Sep.)**
Consumers	29.75	22.50	18.57
Fancy Farm	26.77	14.89	5.74
Hardeman	44.19	45.87	45.00
Hickory	0.31	10.57	14.01
Sedalia	43.35	28.93	15.35
South Graves	8.89	12.83	18.15
Total	34.66	26.7073	20.75

APPENDIX A

WATER LOSS CONTROL PLAN IMPLEMENTATION SCHEDULE

Action	Original Proposal	Status
Procure Hydro-Excavator	NLT 12/01/2020	Lease Agreement Executed 01/15/2020; Hydro-Excavator in use
Hire Leak Specialist	12/01/2019	Hired 12/01/2019; Because detection activities 01/01/2020
Determine Appropriate Meters for District Meter Areas ("DMAs")	NLT 02/01/2020	Selected Honeywell Electromagnetic Flow Meter for DMAs 02/2020; purchases began in 03/2020
Establish DMA Sites	Establish 35 DMA sites NLT 12/31/2021	Graves District has established 26 sites as of 9/30/2021; As of 1/4/2021, Graves District announced its intention to establish an additional 18 sites for a total of 53 sites by 9/30/2021. Supply chain issues have prevented that goal from being met.
Install meter equipment at DMA sites	Install metering equipment at 35 DMA sites NLT 12/31/2021	As of 9/30/2021, metering equipment established at 26 DMA sites
Install Pressure Sensors and Pressure Release Value Monitors	NLT 02/28/2023	As of 10/31/2021, two pressure sensors and pressure release valves have been installed; Graves District is studying alternatives to connect these devices to its monitoring network
Establish Internet of Things for interface with advanced metering infrastructure ("AMI") meters, DMAs, SCADA water tank	Establish NLT 01/01/2021	Interface established; information being received and processed
Establish workflow for DMA information to field crews	Establish NLT 01/01/2021	Information from DMA sites currently being used to determine surveillance areas for Leak Specialist

APPENDIX A

Establish infrastructure for long-term leak predictive analysis and response	Establish NLT 01/01/2023	Examining predictive analysis software but no purchase as of 3/1/2022
Systemwide monitoring established	12/01/2026	Target Date remains 12/01/2026

APPENDIX B

Total Expenditures:

Labor:	$ 93,040.00
Materials:	55,739.10
Vehicle Expense:	6,162.39
Equipment:	742.39
Hydro-Excavator Truck Lease	78,124.68
Total:	$233,808.56

Labor (Hours:)

Activity	Regular Hours	Overtime Hours
DMA	223	21
Leak Repair	63	47
Leak Detection	1,899.5	26

Materials:

DMA Activity	$ 91,124.21
Leak Repair	0.00
Leak Detection	4,400.00
Total:	$106,865.99

Vehicle Mileage:

DMA Activity	430.0 miles
Leak Repair	266.0 miles
Leak Detection	10,181.0 miles