

Nature of Project: Upgraded Water Line for Improved Efficiency  
Applicant: Locust Grove Public Works Authority  
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## Section A: Technical Proposal

### A.1 Executive Summary

Date: May 15, 2017  
Applicant: Locust Grove Public Works Authority  
City: Locust Grove  
County: Mayes County  
State: Oklahoma, US  
Project Completion Time: 12 months  
Located on Federal Facility: No

#### A.1.1 Project Summary

The Locust Grove Public Works Authority (LGPWA) requests funding assistance to improve approximately 2,175 linear feet (LF) of inefficient water line comprised of asbestos cement, steel, and schedule 40 PVC to NSF61 recommended C900 pipe in District Metering Area (DMA) #1 to address the 70% water loss as confirmed by the Locust Grove Water Loss Study completed in 2017. Total project cost estimate is \$149,375.

#### A.1.2 How funds will be used to accomplish specific project activities

Funds will purchase and install approximately 2,175 LF of C900 to replace the cement asbestos, cast iron pipe, and schedule 40 PVC in the worst part of DMA #1. Special care with extra bedding to provide additional flexibility during extreme weather conditions or earthquakes.

#### A.1.3 How it contributes to accomplishing the goals of this FOA

This project will allow the LGPWA to improve the water efficiency of the distribution system by addressing critical infrastructure that is the source of water loss that exceeds 70% in a targeted area of town. Successful water loss reduction will reduce the raw water draw from Hudson Lake, thus conserving this protected resource. The significantly improved efficiency of the new C900 pipe will not only improve the efficiency of the process, but the material type will hold up better to the varying degree of environmental shifts and earthquakes. LGPWA will reduce associated operations and maintenance costs of the Water Treatment Plant (WTP) and high service pumping and save related energy. Ultimately, these items will allow LGPWA to better manage and protect the water resource in a more environmentally manner while also conserving energy and financial resources associated with producing non-revenue water. This project is the first priority in the recently approved 5-year plan.

LGPWA seeks to not only be good environmental and financial stewards, but also to comply with Oklahoma *Water 2060*, the Oklahoma Comprehensive Water Plan (OCWP), which aims to use no more water in 2060 than in 2010. It is LGPWA's goals to conserve and use available water more efficiently, improve energy efficiency of the distribution system, contribute to water supply sustainability of the lake, and positively contribute to the State's water goals.

### A.2 Background Data (Appendix 3 – Geographic Location Map)

The LGPWA is the Public Water Trust for the Town of Locust Grove, located in Mayes County, Oklahoma. The town is located in the upper northeast corner of the state and falls within the Grand Planning Region for Oklahoma. The small rural town was established in 1912 and has a current population of 1423 per 2010 Census. The town's school system serves not only the families of Locust Grove, but also the communities of Rose and Peggs, OK. The LGPWA provides water to the school system.

In 2006, LGPWA was placed under consent order by the Oklahoma Department of Environmental Quality (ODEQ) for exceedances of total trihalomethanes (TTHMs) and total organic carbon (TOC) removals in the product water. Since that time, LGPWA has worked with the engineer, regulatory and funding agencies, and the Cherokee Nation to find a long-term solution for providing sustainable, safe drinking water to the town of Locust Grove. The WTP was failing due to the age and condition of the equipment and data obtained from the WTP indicates the average per capita demand for Locust Grove is 350 gallons per capita per day (gpcd), far exceeding industry accepted values of 100 – 120 gpcd. These results are summarized in a 2012 Engineering Report adopted by LGPWA and ODEQ. Due to the large per capita demand, ODEQ and other funding partners were unwilling to assist with a long-term solution until LGPWA addressed the water loss.

In 2012, LGPWA conducted an abbreviated water loss study, which evaluated the run times of the high service pumps at the WTP and how often they cycled on with various parts of the town isolated. With this procedure, the central part of town showed to contribute the greatest to water loss at that time (2012). This area of town still had remaining asbestos pipe. LGPWA systematically replaced meters and the asbestos pipe with PVC in the years 2013 - 2014. As a result, we were able to reduce water loss in these areas by approximately 50% - 60% on average.

It is unclear what the cause of this substantial water loss is. The current distribution system dates back to the 1960's with partial rehab and replacement of asbestos pipe with schedule 40 PVC in 1980, 1994, and additional rehab in 2014. The substantial increase in earthquakes over the last three years have compromised the current lines; however, because schedule 40 PVC was used instead of C900 PVC pipe, the pipe is more susceptible to issues. Schedule 40 PVC only uses glue-joints, which are less resilient to soil displacement and settlement. Other environmental factors beyond Locust Grove's control include extreme bouts of drought and unprecedented flooding (2014). These environmental factors in addition to non-ideal pipe material are contributing to distribution system's piping failures and the resultant water loss.

In 2012, House Bill 3055 (the Water For 2060 Act) was passed to support the Oklahoma Comprehensive Water Plan (OCWP) and Oklahoma became the first state in the nation to establish a bold, statewide goal of consuming no more fresh water in 2060 than was consumed in 2010. The objective of the OCWP is to ensure a dependable water supply for all Oklahomans through integrated and coordinated water resources planning and use. However, for small Oklahoma rural communities that struggle for survival, providing water has become one of the most significant and financial challenges they face. It is the LGPWA's desire to make every attempt to assist our State in its mission by contributing an improved water management plan, of which water loss reduction is a significant part.

### ***A.2.1 Current Water System***

The LGPWA owns and operates a WTP and distribution system. Built in the 1990s, the conventional WTP (flocculation, sedimentation, filtration, disinfection) has a rated design capacity of 0.49 MGD, based on current ODEQ construction standards. Surface water from Lake Hudson is the raw water supply; LGPWA has a contract with the Grand River Dam Authority (GRDA) for 1 million gallons per day (MGD) of withdrawal.

The WTP produces an average day flow of 0.39 MGD based on Monthly Operating Reports; however, during peak days this exceeds design capacity, which also contributes to the town's TTHMs issues. The WTP is located 2.5 miles north of town.

From the high service pumps, water leaves the WTP and flows in an 8-inch line that parallels Highway 82 into the distribution system, as well as a 300,000-gallon water tower on the south side of town. The majority of the distribution system is located to the west of Highway 82. Refer to Figure 1. The distribution system consists of approximately 27.5 miles of 8-in, 6-in, and 4-in diameter pipes. There are approximately 800 connections.

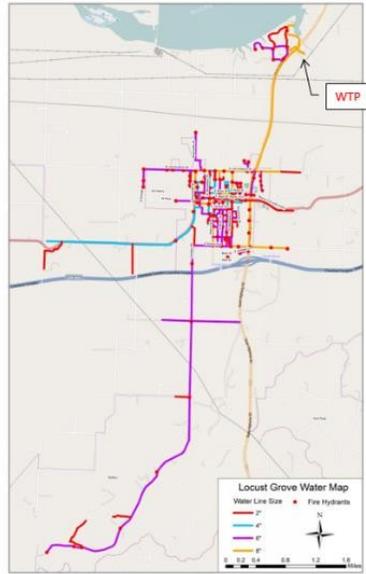


Figure 1 – Locust Grove Water Map

**A.2.2 Previous Studies**

As part of Locust Grove’s long-term water solution, a primary goal is to reduce the significant amount of water loss, which existed across the entire town. The initial water loss study in 2012 indicated water loss exceeded 70%. Given the large discrepancy between the industry-accepted per capita consumption values and Locust Grove’s per capita consumption average, a renewal and replacement (R&R) effort was initiated to address water loss in 2013 and completed in 2014 for the prematurely failing pipes.

Approximately 5,000 LF of inefficient asbestos cement pipes were replaced with PVC, largely in the central and south areas, or DMA #2 and DMA #3 respectively. Refer to Figure 2 showing the distribution system and designated DMA areas.

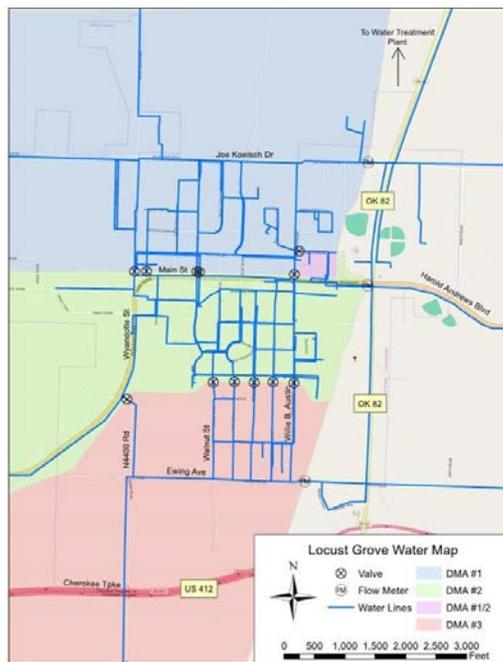
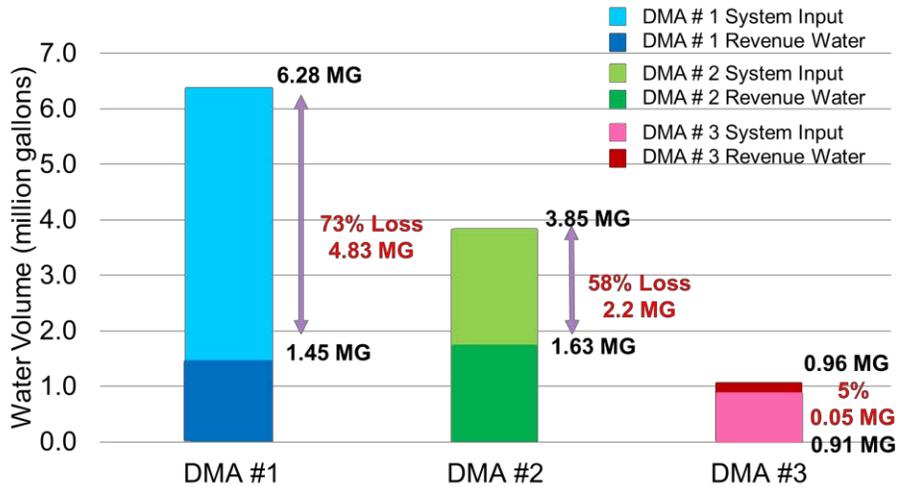


Figure 2 – Location of DMAs

Following line replacements in 2014, water loss was still in excess of 50%. Therefore, a more systematic study assessed where water loss was occurring. The town installed new valves to isolate it into three district metering areas: DMA#1, DMA#2, and DMA#3. Three flow meters were installed on each mainline servicing each DMA and a new WTP master meter was also replaced. Data was collected and compared as follows:

- WTP volumes to Sum Volume of Three DMAs
- WTP volumes to Total Billed Data
- DMA volumes to Total Billed Data

From the Water Loss Study, water loss percentages were calculated for each DMA, with the following results:



The following summarizes the results of the Water Loss Study

- DMA #1 has an average of 73% loss during the study period; DMA #1 has the highest priority for addressing water loss.
- DMA #2 has an average of 58% and is the second priority area; additional study concluded the range of loss was from 27% – 80%. A number of high leaks during the June billing period contributed to this high loss. The amount of water could not be accurately estimated and is likely skewing the overall average loss.
- DMA #3 has acceptable water loss values.
- Minimum night time flows were estimated from the data sets and indicated strong correlation to the water loss data.
- The final results of the above activities indicate estimated water losses are real losses, not apparent losses often associated with meter inaccuracies, unmetered water, or illegal water use.

Because of the Water Loss Study, a 5-year plan, which goes beyond general O&M, was developed and approved on January 9, 2017 to establish a long-term strategy to correct the severe water loss. Upgrading the pipes in DMA #1 is the highest priority.

### A.3 Project Description

#### A.3.1 Problems and Needs

The most pressing issue for the LGPWA to address at this time is the estimated 74% significant water loss in DMA #1, with an average system-wide water loss at 54%, as described in the 2017 Water Loss Study. This high water loss is affecting the town on several levels. It is clear that 73% water loss is unacceptable from a conservation perspective, particularly in this time of diminishing water resources. More than twice the amount

of water is being treated and conveyed by the WTP than is being utilized, which is an extremely inefficient use of water. The treatment of lost water directly impacts financial resources, as money is being spent to produce water to no use or other benefit. This money could otherwise be put towards other infrastructure investments. Finally, this water loss is preventing the town from realizing a long term water solution. The LGPWA is unable to fund long term improvements without a loan or other financial assistance. In order to receive any funding assistance from the state loan programs, the high water loss must first be addressed. Overall, the water loss is simply a waste of water, operations and maintenance money, and leads to unnecessary wear on an already aging WTP.

DMA#1 currently has approximately 7,000 LF of water line consisting of a mix of asbestos, cast iron and schedule 40 PVC pipe varying in 4", 6" and 8" sizes. The focus of this project will be to isolate and replace approximately 2,1750 LF of the cement asbestos, cast iron, and schedule 40 PVC pipe with upgraded C900. Water loss reduction will benefit the LGPWA financially; it will conserve pumping energy, associated water treatment chemicals and consumables, and surface water withdrawal. Water loss reduction will also support Oklahoma's state water goals as described in the adopted Oklahoma Comprehensive Water Plan, *Water 2060*.

### ***A.3.2 Project to Address Problems and Needs***

Locust Grove PWA has identified the most critical needs in the Locust Grove Water Loss Study approved 1/9/17. The highest priority project includes replacing all lines 4- in diameter and larger for approximately 20 miles of pipe, mostly focused in the DMA #1 and DMA #2 areas. This project includes cost estimates for upgrading a significant portion of the 4", 6", and 8" concrete asbestos, cast iron, and schedule 40 PVC pipes with recommended C900 for water distribution systems. An allowance for valves, fittings, and meter repairs within DMA #1 are included. Any meter replacements will upgrade to automatic meter reading (AMR) meters.

### ***A.3.3 Expected Outcomes***

C900 is designed to convey high pressured water common to distribution systems while also exhibiting a long installation life. Asbestos cement and cast iron pipes have been installed for over 50 years and have constant failures. C900 also responds better to weather and ground shifting than schedule 40 PVC, which utilizes simple glue joints. C900 will be more resilient to shifting and settling ground conditions as a result of earthquake activity and drought/flood conditions. C900 also eliminates the corrosion factor previously seen with asbestos and cast, and has a proven increased life expectancy. While we are unable to replace the entire pipe in DMA#1 at this time, we expect to see measurable improvements in DMA#1's water loss given the existing pipe materials and the drastic improvements replacements.

Upgrading the pipes, valves, fittings, and meters will create a more efficient and effective use of resources and funds. The upgraded infrastructure components (lines, valves, fittings, meters), extra bedding, and effective installation are anticipated to realize an immediate reduction in water otherwise lost.

Minimizing water loss will reduce the required water production at the WTP. Reduced production of water at the WTP will result in reduced consumption of raw water at the lake, reduced treatment costs at the WTP, and less strain on WTP and distribution system infrastructure; this in turn results in a more cost- effective, efficient water management program for the LGPWA.

The reduction in repairs in this section of town will also enable the City to divert resources to other projects in terms of staffing.

### ***A.3.4 Project Milestones and Timeline***

- Upgrade Water Lines (and related) 12 month duration

## **A.4 Evaluation Criteria**

### ***A.4.1 Evaluation Criterion A—Planning Efforts Supporting the Project***

Over the course of planning for long-term water solutions, the LGPWA has engaged the following efforts to date to identify, isolate, and correct water inefficiencies as part of the long-term water goals. These efforts are summarized below:

Activity	Date Completed
Hired Engineer for Long Term Water Solution	December 2011
Engineering Report for Water System Improvements, adopted	April 2012
Engineering Report for Water System Improvements, submitted and approved by ODEQ	June 2012
Water Loss Memorandum, 2012	April 2012
Pipe renewal and replacement	2013-14
Water Loss Study, initiated	2014
Valve and AMR Meter Installation	August 2015
Water Loss Study with 5-year improvements plan, adopted	January 2017

The planning effort for a long-term water solution evolved to include reduction of high water losses in the system. The above activities have resulted in identifying non-revenue water (water loss) in the existing water distribution system and LGPWA has already completed many efforts to address this issue. However, given the limited financial resources of the LGPWA, grants will be necessary to assist with completion of the plan. For this reason, a five-year Capital Improvements Plan (CIP) identifying specific projects beyond general O&M for each year was developed. The highest priority is to upgrade the pipes, fittings, and meters in DMA #1.

### ***A.4.2 Evaluation Criterion B—Project Benefits***

The primary benefit of this project is the removal of the cement asbestos, cast iron, and schedule 40 PVC pipe and improvement with the upgraded C900, which will positively affect water conservation by reducing high water loss DMA #1. This is substantiated by the impact of the line replacement previously performed in DMA #2 and DMA #3, where water loss as low as 5% - 27% was realized during the recently completed Water Loss Study.

Additional benefits for Locust Grove are reduced costs directly related to the decreased water production at the WTP, such as energy, chemicals and other consumables; as well as, operations and maintenance costs for DMA#1. The overall reduction of water loss will ultimately benefit the local basin, sub-basin, and regional basin by reducing the water demands on Lake Hudson and those communities and individuals who utilize the lake for municipal, personal, and commercial needs.

### ***A.4.3 Evaluation Criterion C—Project Implementation***

The ultimate goal for the project is to upgrade the existing asbestos and cast pipes with upgraded C900 or higher pipe, along with valves, fittings, and meters. This application requests assistance with LGPWA highest priority of upgraded water lines in the most critical portion of DMA#1.

It is anticipated that the installation of selected sections of upgraded lines will be complete within 12 months upon grant award.

No permits will be needed to implement the project, as the pipe upgrades will be conducted within town-owned

easements or right-of-ways. Further, ODEQ Permits to Construct will not be required as plan and profile sheets, are not anticipated; the same line diameter and alignment are anticipated.

#### ***A4.4. Evaluation Criterion D—Nexus to Reclamation***

This project is not connected to any one of the 180 listed Reclamation projects or basins where a Reclamation project exists.

### **Section B - Environmental and Cultural Resource Compliance**

No environmental review is needed - Categorically Excluded.

- Upgrades to line diameters or service populations are not anticipated
- Temporary impacts are limited to normal construction activities related to the leak repairs and line replacement. All required steps will be taken to minimize impacts such as silt fence, noise, debris, etc.
- Construction is anticipated over existing installations and city-owned easements or right-of-way.
- Federally threatened or endangered species are not known to have habitat in the project area.
- Wetlands or other surface waters within the project boundaries are known to fall under CWA jurisdiction.
- Modifications of or effects to individual features of an irrigation system are known
- Buildings, structures, or features listed on the National Register of Historic Places are known to exist or be impacted within the project area
- No known archeological sites are present within the proposed project area.
- No disproportionately high nor adverse effect on low income or minority populations will result
- No limitation of access to and/or ceremonial use of Indian sacred sites or result in other impacts on tribal lands.
- No contribution to the introduction, continued existence, or spread of noxious weeds or non-native invasive species are known to occur in the project area.

### **Section C: Required Permits and Approvals**

No local, county, regional, state, or federal issued permits are anticipated for this project. The construction area will be within town-owned easements or right-of-ways. Further, ODEQ Permits to Construct will not be required as plan and profile sheets are not anticipated when the same line diameter and alignment are maintained.

### **Section D: Official Resolution**

The Board of Trustees for the Locust Grove Public Works Authority passed Resolution 2017-01 (Appendix 1) on January 9, 2017, authorizing the Locust Grove Public Works Chairman to act on behalf of the Board of Trustees to commit the financial and legal obligations associated with receipt of a financial assistance award under BOR-DO-17-F011 and enter any and all contracts which commit funds per the funding plan provided in the grant application.

## Section E: Project Budget

### E. 1 Funding Plan and Letters of Commitment

The LGPWA commits a cash contribution of \$75,000 toward the \$149,375 project from its general operating budgets resulting in a cost share split of 50/50 requesting the remaining \$74,375 in funding from this grant program. Appendix 2 – LGPWA Letter of Commitment for Funding. No costs incurred prior to the Project start date are included as project costs for this proposal. No additional State or Federal funding assistance is requested for this project.

<b>FUNDING SOURCES</b>	<b>AMOUNT</b>
<b>Non Federal Entities</b>	
<b>1. Locust Grove Public Works Authority</b>	\$75,000.00
<b>Non Federal Subtotal</b>	<b>\$75,000.00</b>
<b>Other Federal Entities</b>	
<b>1. None</b>	
<b>Other Federal Subtotal</b>	<b>\$ 0</b>
<b>REQUESTED RECLAMATION FUNDING</b>	<b>\$74,375.00</b>
<b>TOTAL PROJECT</b>	<b>\$149,375.00</b>

### E. 2 Budget Proposal

<b>Description</b>	<b>Unit</b>	<b>Qty</b>	<b>Amount</b>	<b>Total</b>
4" C900	LF	225	\$48	\$10,800
6" C900	LF	1450	\$51	\$73,950
8" C900	LF	500	\$54	\$27,000
Existing Pipe Removal	LF	2175	\$15	\$32,625
Allowance for meters, valves, fittings	LS	1	\$5,000	5,000
<b>TOTAL 2017-2018 PROJECT</b>				<b>\$149,375</b>

### E. 3 Budget Narrative

#### *E.3.1 Purchase and Install Upgraded C900 or Higher Water Line - \$ 111,750*

It is anticipated that approximately 2,175 LF of upgraded C900 will replace existing cast iron, asbestos cement, and schedule 40 PVC in this project. Three sizes C900 will be installed: 4", 6", and 8" in DMA#1.

#### *E.3.2 Existing Pipe Removal - \$32,625*

It is anticipated that 2,175 LF of pipe will be removed when the new pipe is installed. This covers removal and disposal of old asbestos cement, cast iron, and schedule 40 PVC pipe.

#### *E.3.3 Allowance for meters, fittings, and valves - \$ 5,000*

It is anticipated that some meters, fittings, and valves will be upgraded in DMA #1. However, it is difficult to quantify the number of these fittings, valves, and meters at this time. Therefore, we have an allowance for this

amount. All purchased meters will be upgraded to the AMR meters. At approximately \$185/meter, this would amount to the replacement of over 20 meters if minimal fittings and valve upgrades are needed.

**Section F: Unique Entity Identifier and System for Award Management**

Locust Grove Public Works Authority is registered with SAM.

## Appendix 1 – LGPWA Resolution 17-01

### Resolution 2017-01

A RESOLUTION authorizing the submittal of a Bureau of Reclamation (BOR) grant application in response to announcement No. BOR-DO-17-F011 by the *PWA Chairman* and giving authority to said representative to commit the subsequent appropriation of required matching funds for the *Locust Grove Public Works Authority* for a WaterSMART: Small Scale Water Efficiency Project.

WHEREAS the *Locust Grove Public Works Authority Board of Trustees* believes itself to be qualified, and is willing and able to carry out all activities described in the grant application; and,

WHEREAS in this action the *Locust Grove Public Works Authority Board of Trustees* declares the funding commitment as specified in the funding plan of the WaterSMART: Small Scale Water Efficiency project as described in the application; and,

WHEREAS in this action the *Locust Grove Public Works Authority Board of Trustees* has declared its intent to execute the WaterSMART: Small Scale Water Efficiency Project described in the application; and,

WHEREAS in this action the *Locust Grove Public Works Authority Board of Trustees* will, upon an award and acceptance of the grant, agree to the terms of the grant;

IT IS THEREFORE RESOLVED THAT: The *Locust Grove Public Works Authority Board of Trustees* requests the funds and assistance available from the Bureau of Reclamation WaterSMART: Small Scale Water Efficiency Program and will comply with rules for the program, and,

HEREBY AUTHORIZES the authorized representative *PWA Chairman* to act on behalf of the *Locust Grove Public Works Authority* to submit and sign an application to the Bureau of Reclamation WaterSMART: Small Scale Water Efficiency Grant Program, sign related documents, work with the BOR to meet established deadlines for entering into a grant or cooperative agreement, and

HEREBY AUTHORIZES the authorized representative *PWA Project Coordinator* to act on behalf of the *Locust Grove Public Works Authority* to submit and sign an application as an *additional authority* to the Bureau of Reclamation WaterSMART: Small Scale Water Efficiency Grant Program, sign related documents, work with the BOR to meet established deadlines for entering into a grant or cooperative agreement, and

HEREBY AUTHORIZES the authorized representative *PWA Chairman* to act on behalf of the *Locust Grove Public Works Authority* to fully execute all aspects of the grant agreement and committed funds if the grant funds are awarded.

Adopted this 9<sup>th</sup> day of January, 2017

By a vote of : 3 in favor, 0 against, and 0 abstain

## Appendix 2 – LGPWA Letter of Commitment for Funding

### LOCUST GROVE PUBLIC WORKS AUTHORITY

P.O. Box 246  
Locust Grove, OK 74352

Phone (918) 479-5102  
FAX (918) 479-8876

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**Date:** 1/12/2017

**TO:** Department of the Interior  
Bureau of Reclamation  
Policy and Administration

**SUBJECT:** Commitment for Matching Funds – BOR-DO-17-F011

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As part of the Grant process, a local funding match is required. This letter serves as the Locust Grove Public Works Authority (LGPWA) Board of Trustees, commitment to meet the matching fund requirements for the WaterSMART: Small-Scale Water Efficiency Projects for Fiscal Year 2017, funding number: BOR-DO-17-F011.

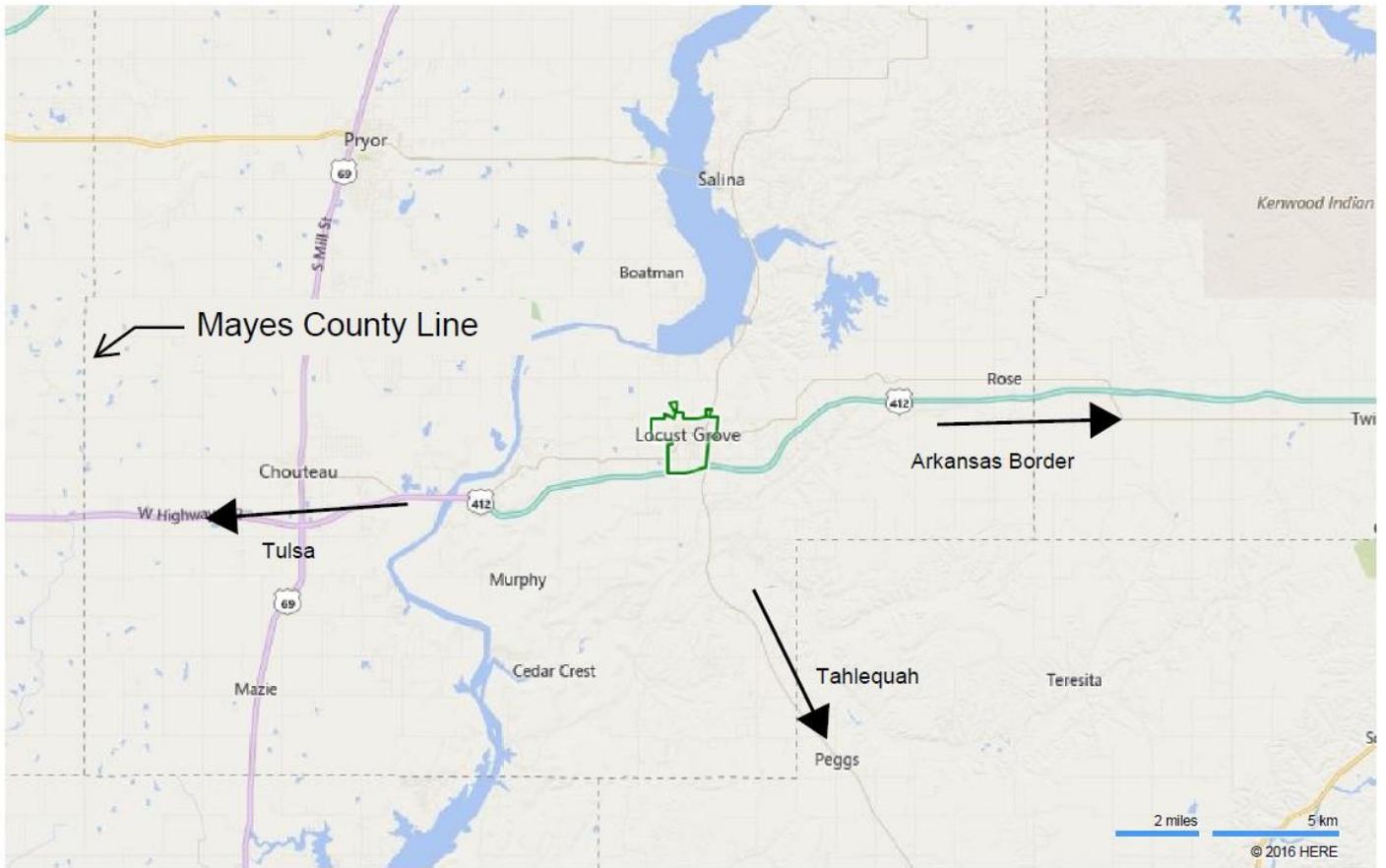
Attached is the LGPWA, Resolution (2017-01) of Commitment as authorized by the LGPWA Board of Trustees January 9, 2017. It is understood that the \$75,000 matching fund portion of the non-federal share of the WaterSMART: Small-Scale Water Efficiency project will be contributed by the LGPWA.



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Brandon Hawkins  
Chairman, LGPWA Board of Trustees

Appendix 3 – Geographic Location Map



# LOCUST GROVE PUBLIC WORKS AUTHORITY

P.O. Box 246  
Locust Grove, OK 74352

Phone (918) 479-5102  
FAX (918) 479-8876

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**Date:** 1/12/2017

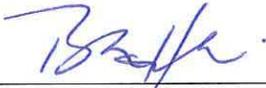
**TO:** Department of the Interior  
Bureau of Reclamation  
Policy and Administration

**SUBJECT:** Commitment for Matching Funds – BOR-DO-17-F011

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As part of the Grant process, a local funding match is required. This letter serves as the Locust Grove Public Works Authority (LGPWA) Board of Trustees, commitment to meet the matching fund requirements for the WaterSMART: Small-Scale Water Efficiency Projects for Fiscal Year 2017, funding number: BOR-DO-17-F011.

Attached is the LGPWA, Resolution (2017-02) of Commitment as authorized by the LGPWA Board of Trustees January 9, 2017. It is understood that the \$75,000 matching fund portion of the non-federal share of the WaterSMART: Small-Scale Water Efficiency project will be contributed by the LGPWA.



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Brandon Hawkins  
Chairman, LGPWA Board of Trustees