

Special Research Study

Comparison of 8” and 12” Water Main Pipe Installation Lengths and
Costs in Closed Competition and Open Bidding Arkansas Communities

Client: American Chemistry Council

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INTROUCTION

Purpose

The primary objective of this study was to investigate and compare pipeline cost, diameter, type of material, and installation lengths in open and restricted bidding communities in Arkansas. Hot Springs and Springdale use a closed competition process for pipeline materials, while Fayetteville allows open competition for some materials. Central Arkansas Water indicates that PVC may be used in small portions of the regions it serves but appears to be closed in practice given all projects consist solely of ductile iron pipe. Central Arkansas Water is by far the largest district which serves the cities Little Rock, North Little Rock, Sherwood, Maumelle and other surrounding communities.

The study reports the following data for the aforementioned communities from 2013 to 2015 where data was available:

- Linear feet of water pipeline installed
- Pipeline size
- Pipeline material
- Pipeline cost

Methodology

Information and data collected through the completion of the project was gathered using a combination of primary and secondary research methods. Primary research methods included direct phone and email contact with city employees in the water and utilities department as well as FOI (Freedom of Information Act) requests filed with city agencies. Secondary data was collected by researching publicly available bid notice and acceptance documentation, city utility budget plans, city council meeting minutes, city water and sewer codes, and other available documentation that contained data relevant to water main pipeline length, size, cost, and installation.

Assumptions and Limitations

The collected data included pipe diameter, length, material, and published cost. However, the published cost was most often the full installation cost of the waterline, not simply the cost of the pipe material itself. The installation cost may include, but is not limited to labor, heavy equipment purchase or rental and operation, fuel, fill material, hand tools, and other materials related to the laying of waterline. Also, given that Central Arkansas Water services a metropolitan population the costs to replace or install new water lines may differ from the other smaller water systems.

City of Hot Springs Pipeline Installation and Cost Data: Closed Competition

The city of Hot Springs Water Utilities uses a closed competition process for pipeline materials and pipeline projects and services customers inside the city limits of Hot Springs, AR. This service area has a population of slightly over 35,000. The Hot Springs area of the state has experienced an overall decline in population and development in recent years. The city’s population is down from just over 39,000 in 2009. The city has used ductile iron exclusively for waterline projects from 2013 to 2015. The city of Hot Springs Water Construction Specifications and Standards stipulates that all pipe 10” in diameter and larger be ductile iron water main, while all fittings on pipe 6” in diameter and larger be ductile iron fittings. This construction code resulted in the exclusive use of ductile iron pipe over this period of time.

Data for Hot Springs Water Utilities was collected by the submission of a Freedom of Information Act request fulfilled by Hot Springs Water Utilities. They provided waterline information consisting of overall linear feet, diameter, material, and installation cost for the years 2013-2015. It is worth noting that Hot Springs did add minimal amounts of water line to the city’s capital assets, likely due to the acquisition of existing water lines given that 62% of all new connections were outside of city limits during the period April 1, 2013 through February 28, 2015.

Table 1 summarizes the length and diameter of pipelines installed by Hot Springs Water Utilities from 2014 - 2015. Table 2 summarizes the pipeline cost based on the information provided by Hot Springs Water Utilities from 2014-2015. Table 3 provides an average cost per linear foot based on diameter.

Table 1: Hot Springs, AR: Linear Feet of Water Pipe Installed, 2013 – 2015,

Pipe Diameter (inches)	Linear Feet Installed (All DIP)		
	2013	2014	2015
8”	2,565	-	2,714
12”	-	1,040	-
Total	2,565	1,040	2,714

Table 2: Hot Springs, AR: Total Pipe Cost, 2013 – 2015

Pipe Diameter (inches)	Pipe Cost		
	2013	2014	2015
8” DIP	\$62,090	-	\$108,560
12” DIP	-	\$127,520	-

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Total	\$62,090	\$127,520	\$108,560
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Table 3: Hot Springs, AR: Average cost per LF*

Pipe Diameter (inches)	Average Pipe Cost per Linear Foot
8" DIP	\$32.33
12" DIP	\$122.60

*While not specifically noted in the information provided by Hot Springs, this cost is assumed to include installation costs after comparison with current DIP material prices. For example, a recent Central Arkansas Water bid tabulation sheet shows the average cost of 8-inch ductile iron pipe is approximately \$17.00 a linear foot and 12-inch ductile iron pipe is approximately \$29.00 a linear foot.

Central Arkansas Water Pipeline Installation and Cost Data: Closed Competition

Central Arkansas Water is essentially a closed competition water district that services several communities in the central Arkansas area including Little Rock, North Little Rock, Sherwood, Maumelle, and the surrounding areas. This constitutes a service area of over 450,000 customers. This is a rapidly expanding area of the state, and is not bound by geographical encumbrances to growth.

The CAW uses only ductile iron inside its major service area and allows PVC for water supply in some ancillary service regions. However, the Central Arkansas Water Standard Pipeline Materials and Constructions Specifications states in code 3.5.9 that ‘4” through 12” PVC pipe is only allowed in designated locations outside the “Extra Territorial Jurisdiction” areas of Pulaski County.’ This code excludes the larger communities of Little Rock, North Little Rock and Sherwood (est. tot. pop. 285,000+) from using 4” to 12” PVC for waterline installation. PVC sizes larger than 12” are prohibited in all cases. In practice, all new water main lines and replacement main lines were constructed using ductile iron pipe.

Data for Central Arkansas Water was collected through phone and email communications, publicly available city code documents, and Comprehensive Annual Reports for the study years. The data was available for pipe material, length, and diameter. However, the specific installation cost data was not made available for the data. Instead a budgetary allowance of \$175 per linear foot was quoted as the guideline for replacement and new installation of both 8” and 12” pipe. However, after evaluating actual installations costs listed in the annual reports the average actual costs were computed and used in the tables.

Table 4 summarizes the linear feet of pipeline installed by material and diameter from 2013–2015. Table 5 summarizes the pipeline cost based on the information obtained from annual reports compiled by Central Arkansas Water from 2013-2015. Table 6 provides the average cost per linear foot of the installed ductile iron pipe.

Table 4: Central Arkansas Water: Linear Feet of Ductile Iron

Ductile Iron	Linear Feet		
	2013	2014	2015
Diameter (inches)			
8”	2,048	2,592	1,188
12”	3,225	11,009	4,333
Total	5,273	13,601	5,521

Table 5: Central Arkansas Water: Total Pipeline Cost, 2013 – 2015

Pipe Diameter (inches)	Cost		
	2013	2014	2015
8"	\$370,960	\$222,981	\$102,002
12"	\$550,370	\$1,662,116	\$789,910
Total	\$921,330	\$1,885,097	\$891,112

Table 6: Central Arkansas Water: Average cost per LF

Pipe Diameter (inches)	Average Pipe Cost per Linear Foot
8" DIP	\$119.41
12" DIP	\$161.71

City of Springdale Pipeline Installation and Cost Data: Closed Competition

The city of Springdale Water Utilities is a closed competition city that services customers inside the city limits of Springdale, AR. This service area has a population of over 75,000. This is an expanding area of the state that experienced a significant decline in building after the 2007-2008 Financial Crisis. The city uses only ductile iron for water mains due to city code requirements. See section T15 B1 of the “Specification Requirements for the Construction of Water and Sewer Facilities – Springdale Water Utilities.” Data specific to pipe size and installation cost was only available for 2014 and 2015. The information obtained from Springdale Water Utilities did not show any water main installation or replacement for 2013. Searches of secondary sources also did not indicate any 2013 water main installation.

Data for Springdale Water Utilities was collected by the submission of a Freedom of Information Act request fulfilled by Springdale Water Utilities in November 2016. They provided a schedule of bids, bid awards, and capital expenditure documents for the years 2014 and 2015.

Table 7 summarizes the length and diameter of pipelines installed by Springdale Water Utilities from 2014 - 2015. Table 8 summarizes the pipeline cost based on the information provided by Springdale Water Utilities from 2014-2015. Table 9 provides an average cost per linear foot based on diameter.

Table 7: Springdale, AR: Linear Feet of Pipe Installed, 2014 – 2015

Pipe Diameter (inches)	Linear Feet Installed	
	2014	2015
8” DIP	1,600	3,605
12” DIP	620	4,050
Total	2,220	7,655

Table 8: Springdale, AR: Pipeline Cost, 2014 – 2015

Pipe Diameter (inches)	Pipe Cost	
	2014	2015
8” DIP	\$47,332	\$138,850
12” DIP	\$24,539	\$247,090
Total	\$71,871	\$385,940

Table 9: Springdale, AR: Average cost per LF

Pipe Diameter (inches)	Average Pipe Cost per Linear Foot
8" DIP	\$35.77
12" DIP	\$58.16

City of Fayetteville Pipeline Installation and Cost Data: Open Competition

The city of Fayetteville Water Utilities allows open competition and services customers inside the city limits of Fayetteville, AR. This service area has a population of over 78,000. This is an expanding area of the state, and is not bound by geographical encumbrances to growth. The city uses both ductile iron and PVC for waterlines in the area with a mandate to use primarily PVC for lines up to 12”. Ductile iron is used only for road crossings and other uses where additional strength is deemed necessary. Data specific to pipe size, material, and installation cost was available for installation that required only 8” and only 12”.

Data for Fayetteville Arkansas was collected by the submission of a Freedom of Information Act request fulfilled by City of Fayetteville Water Department. They provided a breakdown of all 8” and 12” water line installation from 2013 to 2015. The information provided for installation that required a variety of pipe sizes was not specific enough to be considered for use in the study.

Table 10 summarizes the length and diameter of pipelines installed by the City of Fayetteville Water Department from 2013 - 2015. Table 11 summarizes the pipeline cost based on the information provided by City of Fayetteville Water Department from 2013-2015. Tables 12a and 12b summarize the linear feet of pipeline installed by material and diameter from 2013–2015. Table 13 provides an average cost per linear foot based on diameter, material, and diameter and material. It is worth noting that the 2012 Edition of the “Standard Specifications For Design and Construction of Water Lines and Sewer Lines,” for Fayetteville Arkansas mandates using PVC for water line mains up to and including 12” in diameter. Ductile iron is mandatory for all lines over 12” in diameter. (See section 1100, Part I, 1.02 – Water Line Materials).

Table 10: Fayetteville, AR: Linear Feet of Pipe Installed, 2013 – 2015

Pipe Diameter (inches)	Linear Feet Installed		
	2013	2014	2015
8”	4,382	2,660	625
12”	1,501	2,425	1,200
Total	5,883	5,085	1,825

Table 11: Fayetteville, AR: Pipeline Cost, 2013 – 2015

Pipe Diameter (inches)	Total Project Pipe Cost		
	2013	2014	2015
8"	\$193,383	\$85,184	\$15,837
12"	\$66,301	\$169,699	\$93,232
Total	\$259,684	\$254,883	\$109,069

Table 12a: Fayetteville, AR: Linear Feet of Ductile Iron

Ductile Iron Diameter (inches)	Linear Feet		
	2013	2014	2015
8"	-	-	-
12"	483	-	-
Total	483	-	-

Table 12b: Fayetteville, AR: Linear Feet of PVC

Plastics (PVC) Diameter (inches)	Linear Feet		
	2013	2014	2015
8"	4,382	2,660	625
12"	1,255	2,425	1,200
Total	5,637	5,085	1,825

Table 13: Fayetteville, AR: Average cost per LF

Pipe Diameter (inches) / Material	Average Pipe Cost (linear foot)
8" DIP	-
12" DIP	\$65.12*
8" PVC	\$38.40
12" PVC	\$61.02
8" Combined	\$38.40
12" Combined	\$61.39

*Based on 483 LF in a job with 535 LF of PVC where costs were divided equally.

Key Findings

One finding of note is that the use of ductile iron or plastics is driven by construction code requirements for each water utility, and not by material and installation costs. Hot Springs, Central Arkansas Water (CAW), and Springdale water utilities all essentially mandate the use of ductile iron pipe in almost all installations. Fayetteville Water District mandates the use of PVC in water main installation and replacement up to 12" in diameter.

For the following observations please refer to Table 14. The lowest overall costs for waterline installations occur in the Northwest region of the state. Both Springdale and Fayetteville have substantially lower costs for 12" pipe, regardless of whether DIP or PVC. Both of these districts likely benefit from a concentration of construction firms in this region due to high growth rates in the past 30 years. Given the slowdown in growth over the past 8 years the competition for projects during the period 2013-2015 could be quite intense.

Central Arkansas Water is essentially a closed competition district that has a higher cost for waterline installation regardless of pipe size. All CAW projects using 8" and 12" pipe in the past three years use only ductile iron pipe. This water district services one of the oldest metropolitan region of the state with the cities of Little Rock and North Little Rock and waterline replacement in this urban area is potentially costlier than the other districts due to the aging infrastructure and the presence of the Arkansas River.

As Table 15 demonstrates, the average cost of waterlines in areas of closed competition is significantly greater than in the studied area of open competition (Fayetteville). The averages are city-wide and not weighted by length of pipe installed, which would bias the results towards even greater savings due to Central Arkansas Water higher costs and larger installation base in the study years. Translating from a linear foot basis to a per mile basis, in 8" pipe we estimate open competition could result in average savings of \$127,248/mile or \$278,625/mile in 12" pipe. This amounts to between 39% and 46% savings.

In general, we find that greater levels of contractor competition appear to lower average costs for waterlines, particularly for 12" pipe. A logical extension is that competition based on pipe material will also push costs lower, particularly for large projects, as materials suppliers reduce margins to win projects.

Table 14: Arkansas Waterline Installation Cost Comparison

Pipe Diameter (inches)	Average Pipe Cost per Linear Foot			
	Hot Springs	Central Arkansas	Springdale	Fayetteville
8"	\$32.33	\$119.41	\$35.77	\$38.40
12"	\$122.60	\$161.71	\$58.16	\$61.39

Table 15: Average Cost Savings From Competition

Pipe Diameter (inches)	Average Pipe Cost per Linear Foot	
	Average of Closed Locations (Hot Springs, Central Arkansas, Springdale)	Average of Open Location (Fayetteville)
8"	\$62.50	\$38.40
12"	\$114.61	\$61.39
	Savings per Mile	Percent Savings
8"	\$127,248.00	39%
12"	\$278,625.00	46%

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Links to City Water Codes

Hot Springs, AR

<http://www.cityhs.net/DocumentCenter/Home/View/14>

Central Arkansas Water

<http://www.carkw.com/pipeline-specifications/>

Fayetteville, AR

<http://www.fayetteville-ar.gov/DocumentCenter/View/6031>

Springdale, AR

http://www.springdalewater.com/?page_id=217