Water Line Infrastructure Survey

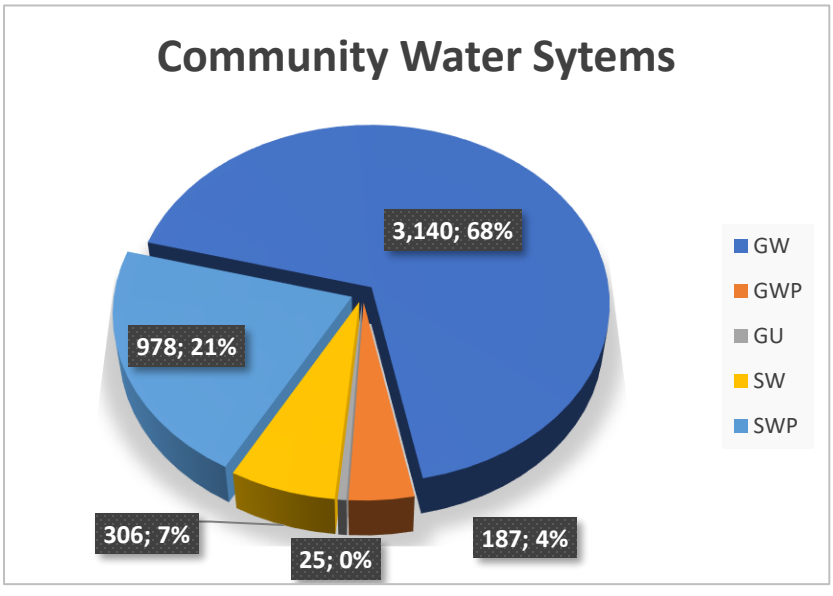
Texas Rural Water Association (TRWA) conducted an infrastructure needs survey with a direct focus on Public Water System (PWS) water lines. The demographic surveyed includes small to mid-sized rural water systems and small cities with a population of 50,000 or less. The survey included three primary factors; length, age, and type of material. This survey targeted Community Water Systems (CWS) across the state to capture a geographically representative sample set. The survey was conducted via direct phone contact, online survey, GIS information captured by TRWA projects, and information collected through the 2021 EPA Needs Survey for mid-size systems 3,000 to 50,000 in population.

The information captured through this project was intended to provide an estimated amount of water lines within the state that are currently in need of replacement or will need replacing within 20 years. This voluntary survey information was derived from best estimates from water system representatives. The analysis of the data was calculated based on industry professional cost estimates and online research of projected costs.

Water System Types

Texas Commission on Environmental Quality (TCEQ) defines a community water system as a public water system which has a potential to serve at least 15 residential service connections on a year-round basis or serves at least 25 residents on a year-round basis [30 TAC §290.38(15)].

Community water systems (CWS) in Texas make up the largest footprint of water infrastructure networks in the state. The other two types of water systems labeled by TCEQ are nontransient noncommunity water system (NTNC) and transient noncommunity water system (TNC). These types are generally small networks of water lines and service facilities such as RV parks, hotels, commercial facilities, and fuel stations. Due to the smaller designs of NTNC and TNC water systems, community water systems were the target audience of the survey conducted by TRWA.



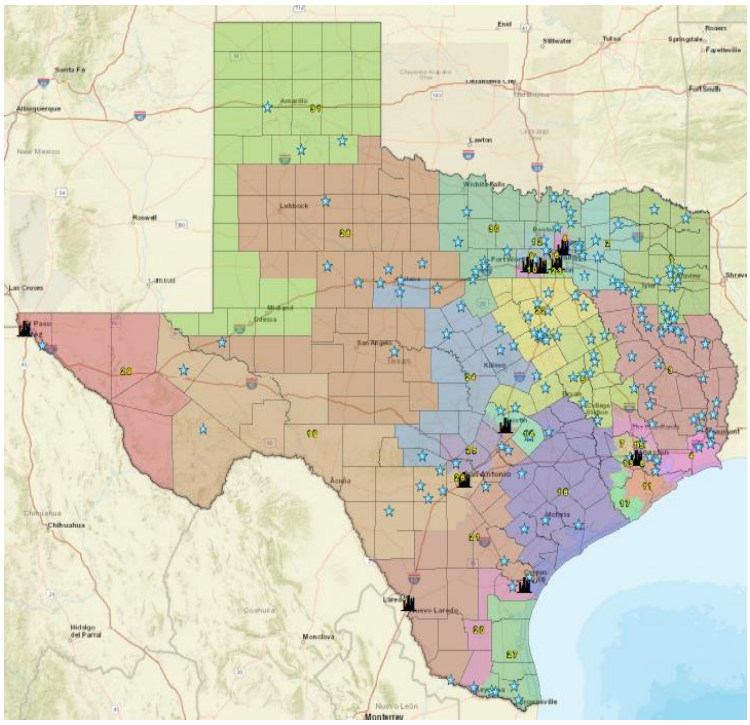
TCEQ's Drinking Water Watch database records a total of 4,717 CWS in the state as of March 2022. Due to the focus of the survey being on small to mid-sized water systems, TRWA

deducted the water systems larger than 50,000 and narrowed the scope to 4,642 community water systems.

Water line infrastructure integrity can vary depending on multiple factors including chemical makeup of the water, soil conditions, installation, and pipe material. Of the 4,642 rural CWS, 72% utilize groundwater as their source through either direct pumping or purchasing from a wholesale entity. Groundwater quality varies across the state with mineral conditions such as calcium, iron, and manganese that can impact the internal lining of the pipe. For materials subject to corrosion or oxidation such as galvanized and/or iron pipe, chlorine disinfectant and pH play a part in the longevity of the material. In addition, 28% of the state's CWS utilize surface water from reservoirs, lakes, streams, and rivers as the primary source of water. As with groundwater, surface water treatments and the varying organics from the supply can impact the water line infrastructure over time creating a variation in life expectancies of the pipe.

SOURCE TYPE	LABEL	TOTAL
Groundwater	GW	3,140
Groundwater - Purchased	GWP	187
Groundwater Under the Influence of Surface Water	GU	25
Surface Water	SW	306
Surface Water - Purchased	SWP	978

In the survey taken from February 21, 2022, through March 11, 2022, 116 responses were received with information on pipe length, age, and type. Information from 38 additional water systems were also integrated into the survey to create a larger amount of infrastructure information resulting in a total dataset of 154 community water systems. The map below illustrates a geographical representation of information received for this survey from around the state.



To provide our estimates and analysis, we used our sample data set to calculate the cost ranges for replacing water lines for the 4,642 community water systems in our population range. Our data set is 3.3% of that total number, and we used a multiplier of 30.1.

Amount of Water Lines for Rural Water Systems

Data recorded from the survey showed there are 147,140,305 feet of cumulative pipe for the 154 surveyed water systems. This equates to 27,867

miles of water line infrastructure used to transfer potable water to communities. Calculating to estimate the total amount of water lines, Texas has approximately 838,797 miles, or 4.4 billion feet, of water line owned and operated by community water systems in the state. This would make the overall length of the water infrastructure network in Texas more than 155,000 miles longer than the total amount of roadway miles in the state, according to information provided by SidmartinBio.org.

Water Line material and size

Each water system varied in responses to the known material type for their water lines. Most water systems currently have some form of PVC water lines throughout their system. Unless a more rigid material is required, we can assume that most of the future pipe replacements would be using PVC.

The water systems surveyed reported the following combinations of material types.

Material	Total
PVC	120
Ductile Iron	9
Cast Iron	26
Asbestos Concrete	42
Galvanized	7
Other	13
Unknown	30

Statistics on the pipe sizes of a water system proved more difficult to gather as most of that information was not readily available. Only 21 water systems answered "yes" to having a Geographic Information System (GIS) software in use that allows for quick, accurate breakdowns of water line data and mapping. This is an area of concern throughout the state as a workforce that has operated on experience and memory of pertinent information related to the system's water lines prepares to retire.

The average range of water lines in our rural water areas of the state range from 0.75" to 12" water mains. The size of lines needing to be replaced or upgraded heavily impacts the overall cost of the project in regard to pipe cost, amount of bedding material needed, equipment needed to install, and labor costs.

Age and life expectancy of infrastructure

Aside from the water quality, other factors impact the life expectancy of water lines. One major conditional aspect impacting useful life of water lines are the soil conditions. The type of soil varies across the state from sand and clay to limestone and flint rock. Improper installation without consideration of the soil type can negatively impact the pipe integrity. Moisture content or lack of moisture in the soil can cause pipes to be put under stress and make them unable to move as the ground shifts when we experience seasons of drought. The type of soil also impacts the cost of replacing lines as discussed on page 3.

Pressure and temperature also impact the life expectancy of water lines. Texas has various pockets of warm water that when pumped from the ground requires cooling towers. The topography in parts of the state can create excessive distribution pressures in the water distribution system. Both of these factors can limit the overall longevity of the water line to some degree.

From the survey, water systems reported that 70% of the water lines in their system are over 20 years old and 57% of the water lines are over 40 years old. The average date of installation of the water systems surveyed is 1966, making some of the infrastructure nearly 60 years old. Based on the chart provided to the right, Transmission Structures (pipes) in the distribution system have a life expectancy of 35 years. Comparing our survey data and estimates to the included life expectancy chart, 587,158 miles (70%) of water line infrastructure for community water systems are at or near the end of their anticipated useful life, with 478,114 miles (57%) currently exceeding it. Though there are factors to be considered such as the ones previously mentioned and varying expectancies depending on water line material, water lines exceeding 30 years in use tend to result in a higher probability of breakdown and needed repairs.

How Long Will it Last?

Typical Life Expectancies of Water System Equipment

Component	Worksheet	Useful Life
Wells and Springs	Drinking Water Source	25 years
Intake Structures		35 years
Pumping Equipment		10 years
Disinfection Equipment	Treatment System	5 years
Hydropneumatic Tanks	Tanks	10 years
Concrete and Metal Storage Tanks		30 years
Transmission Structures (Pipes)	Distribution System	35 years
Valves	Valves	35 years
Mechanical Valves		15 years
Computer Equipment/Software	Electrical Systems	5 years
Transformers/Switchgears/ Wiring		20 years
Motor Controls/Variable Frequency Drives		10 years
Sensors		7 years
Buildings	Buildings	30 years
Service Lines	Service Lines	30 years
Hydrants	Hydrants	40 years

Note: These expected useful lives are drawn from a variety of sources. The estimates assume that assets have been properly maintained. The adjusted useful life of an asset will be equal to or less than typical useful life.

Water Line replacement costs

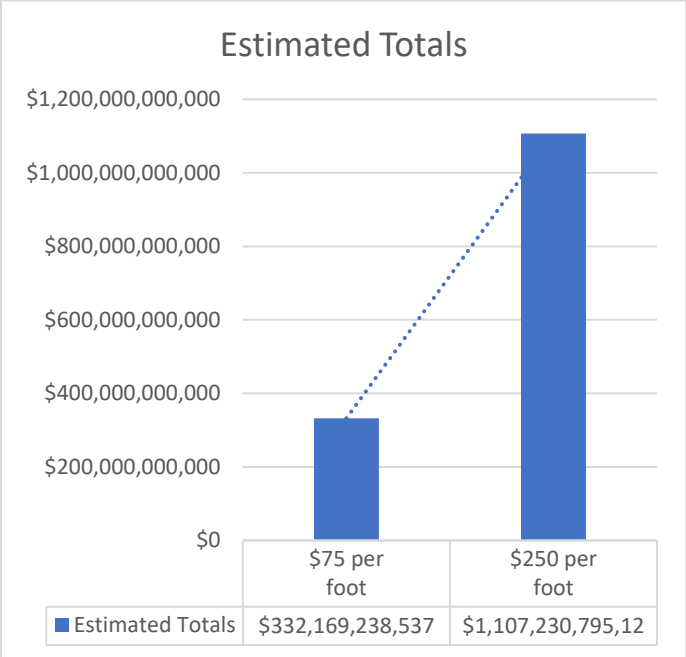
In addition to line size factors mentioned above, the cost for replacing water lines varies greatly from one geographic area of the state to the next due to the soil conditions or underlying material. For example, many parts of East Texas have sandy or clay soil, whereas Central Texas commonly has a rock base and requires more expensive equipment to excavate. The expense to install or replace water lines also depends on a variety of additional factors such as if the service is to a rural farm or subdivision, whether the area is paved or landscaped, the cost of obtaining easements, supply chain issues, labor availability, the size of components, upsizing for future population growth, and regulatory requirements.

Based on information provided by industry engineers and additional research, we can conservatively estimate the cost of water line installations at $75 per foot or more, depending on the conditional factors mentioned. While for some systems able to do it in-house the number may be cheaper, others who face additional factors like those mentioned above could find their costs significantly

higher. Utilizing this estimate, replacing all water line infrastructure that is in current need of replacement or will need replacement in the next 20 years is expected to cost approximately $332 billion.

Considering the survey responses for water lines over 40 years old, 57% of water systems in Texas are in dire need of replacement and upgrades. Even addressing only the water lines 40 years or older could still make a significant impact to our state's infrastructure needs. These would cost, conservatively, approximately $190 billion to replace the 480,000 miles of water line in our estimates.

We agree that now is the time to allocate funding to replace aging water lines in Texas. With the rapid rate of inflation of goods and services the industry is seeing today, the cost of these types of projects will continue to increase dramatically.



Resources

Water System Types - https://www.tceq.texas.gov/drinkingwater/pws.html

Road Miles - https://www.sidmartinbio.org/how-many-miles-of-roadway-are-in-the-texas-highway-system/

Texas Water Infrastructure Needs 2021 - https://texaspluswater.wp.txstate.edu/2021/08/23/opinionswater-texas-water-utilities-provide-a-snapshot-of-financial-conditions-and-prospects-for-addressing-texas-water-infrastructure-needs-in-2021-and-2022/