



City of Lawrence
UTILITIES

2017 UTILITIES FIELD OPERATIONS ANNUAL REPORT

The Lawrence Utilities Department Field Operations group maintains the City's water and wastewater mains, and related infrastructure, including the following:

- 556 miles of waterlines (up 6.3% from 2016)
- 15,640 valves (up 10.5%)
- 3,599 hydrants (up 1.9%)
- 33 miles of City-maintained sanitary sewer force main (same as 2016)
- 424 miles of City-maintained gravity sewers (up 0.7%)
- 10,669 manholes (up 0.9%)
- 33,952 water meters (up 0.6%)

The large increase in waterlines and valves in 2017 is primarily due to the inclusion of water service lines from the water main to the water meter which are maintained by the City. To maintain the reliability of the City's water transmission and sanitary sewer collection systems, Field Operations is responsible for the following:

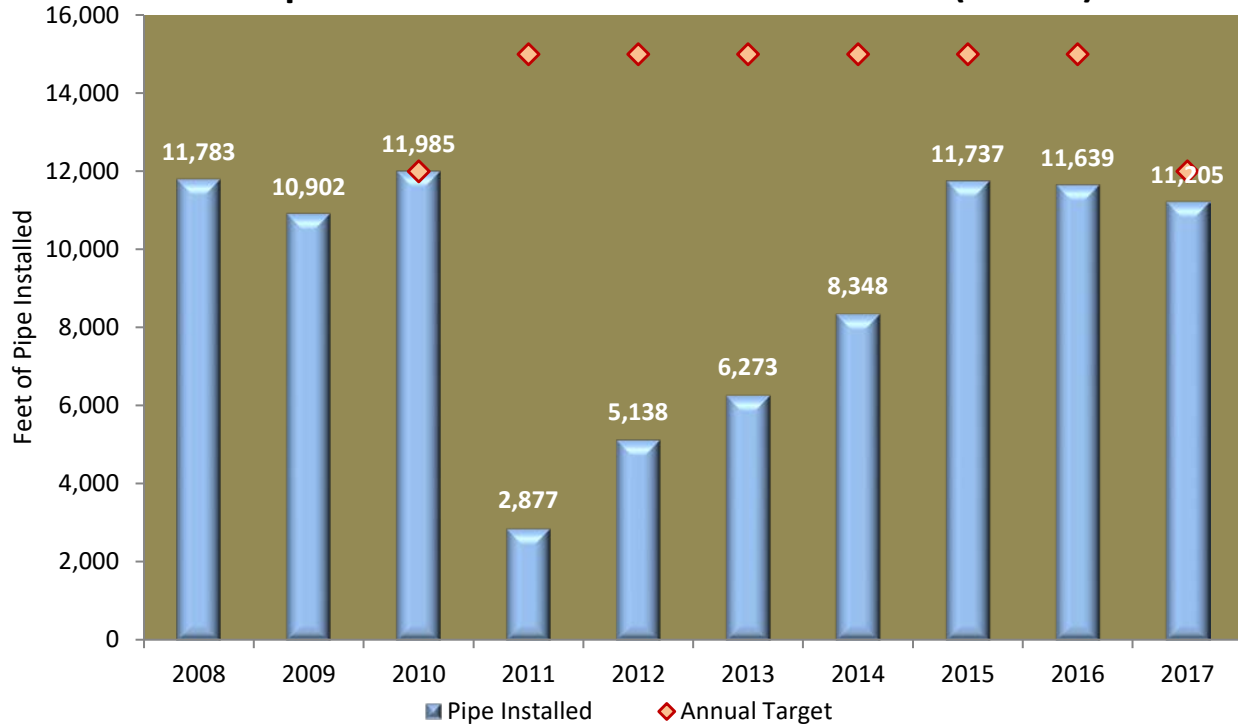
- Replace water mains, typically 8" and under. Water main replacements are based on main breaks, pipe material used, age, capacity, fire protection needs, the criticality of the water main within the system, and the number of services affected.
- Repair water main leaks as they occur, usually within 4 hours of identification and the completion of utility line locates.
- Exercise valves to keep them mobile to ensure that they will adequately isolate a leak to limit the number of customers without service during repair.
- Inspect and repair fire hydrants to ensure they are functioning and in good condition.
- Inspect sanitary sewer mains to identify cracks and breaks that may allow inflow and infiltration into the main and wastewater out of the main.
- Clean sanitary sewers to remove grease, rags, and other debris that may cause blockages and sanitary sewer overflows or basement backups.
- Locate and mark water and wastewater mains, as well as storm water and traffic signal buried infrastructure, to avoid damage from contractors and residents excavating.
- Inspect construction of water and sanitary sewer mains to ensure they meet the specifications and criteria as required by the department.
- Complete monthly readings of water meters for billing.
- Perform service shutoff and restores.
- Replace aging or defective water meters.

Water Distribution Systems

In conjunction with the water main replacement program, Field Operations staff typically replace water main on the replacement list that are 8 inches and smaller and located in low traffic areas in neighborhoods. The ability of in-house crews to replace water main provides flexibility of the program to move quickly to address changing conditions. For example, the in-house crews were able to replace water main on Louisiana St between 20th and 21st St due to a water main leak that could not be repaired because of the condition of the pipe. In 2017, Utilities Field Operations crews installed 11,205 feet of water main with in-house resources. The water main replacement program replaced existing water main due to excess leaks, critical location, or meeting specific criteria and was based on available resources. In 2011 the water main replacement program was decelerated due to funding concerns. Since then the program has ramped back up to pre-2011 levels. To obtain current levels two crews have been used intermittently, as availability allows, and productivity has improved as new staff gained experience and increased efficiency (see Graph 1 on the next page). Along with funding and

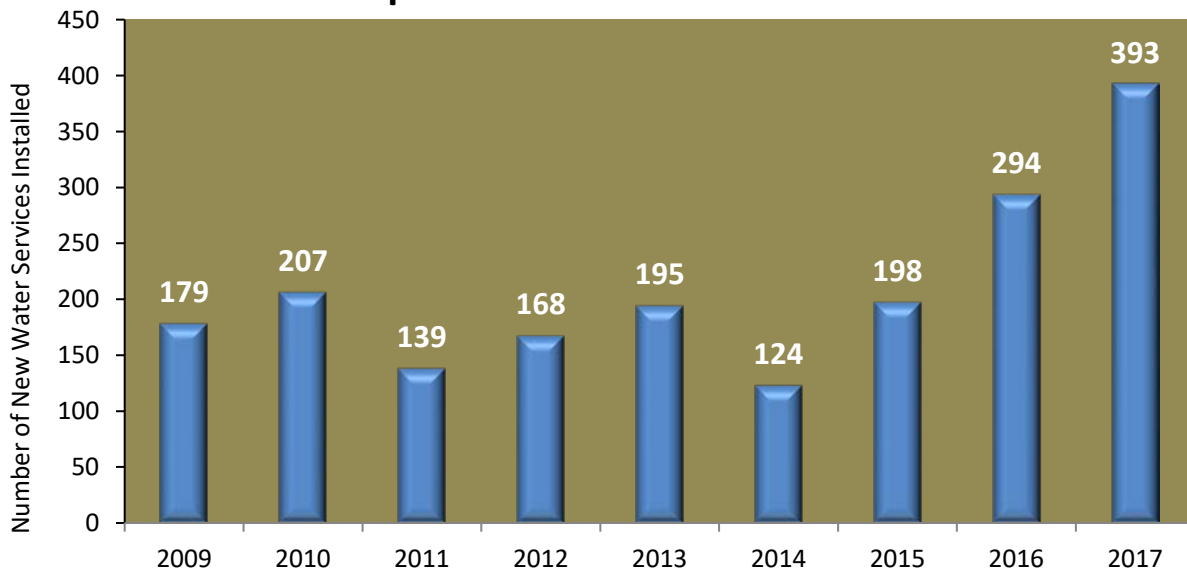
crew availability, annual footage totals will also vary due to the site conditions of specific projects, such as; work in the roadway, subsurface conditions, pipe size, number of services, etc.

Graph 1. In-House Water Main Installed (in feet)



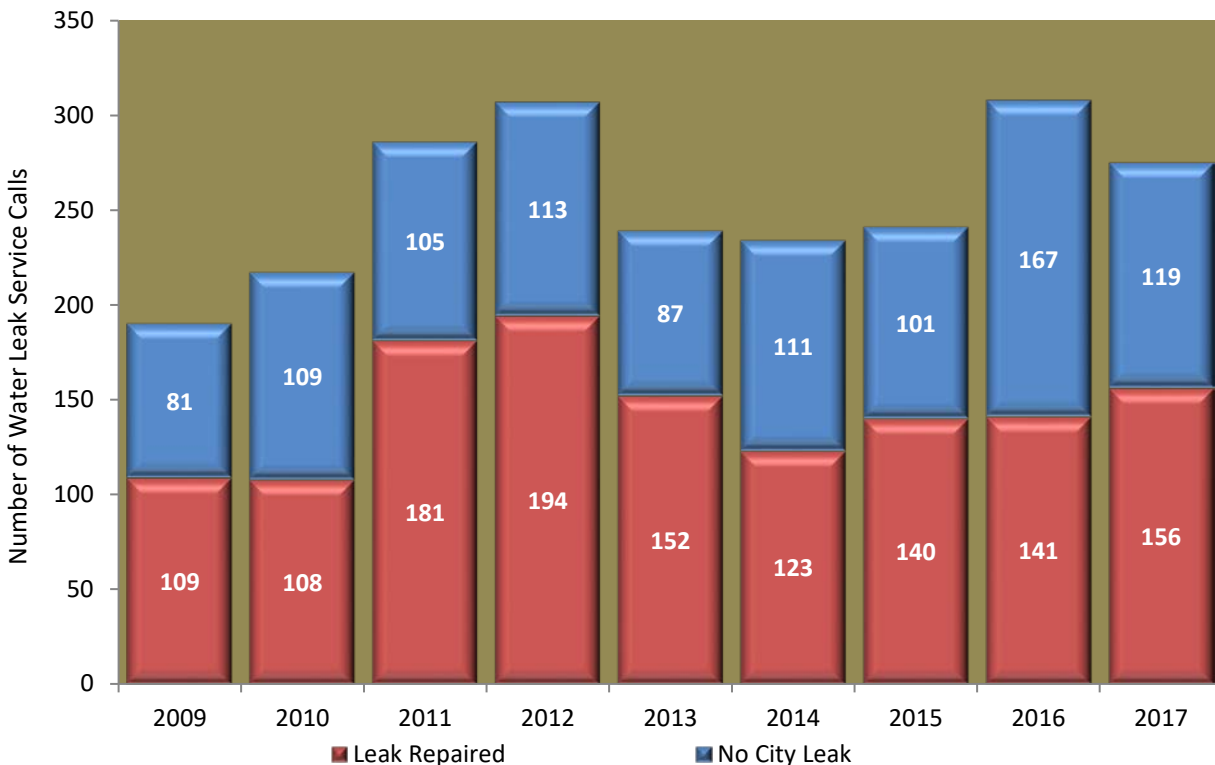
Utilities Field Operations crews currently install new 1" or smaller, generally residential, water services. The number of new service installations completed by staff is based on the number of requests received (see Graph 2 below). In 2017, 393 new services were installed, which includes service installations as well as meter sales. The increase from 2016 is related to several large apartment complexes that were completed in 2017.

Graph 2. New Service Installations

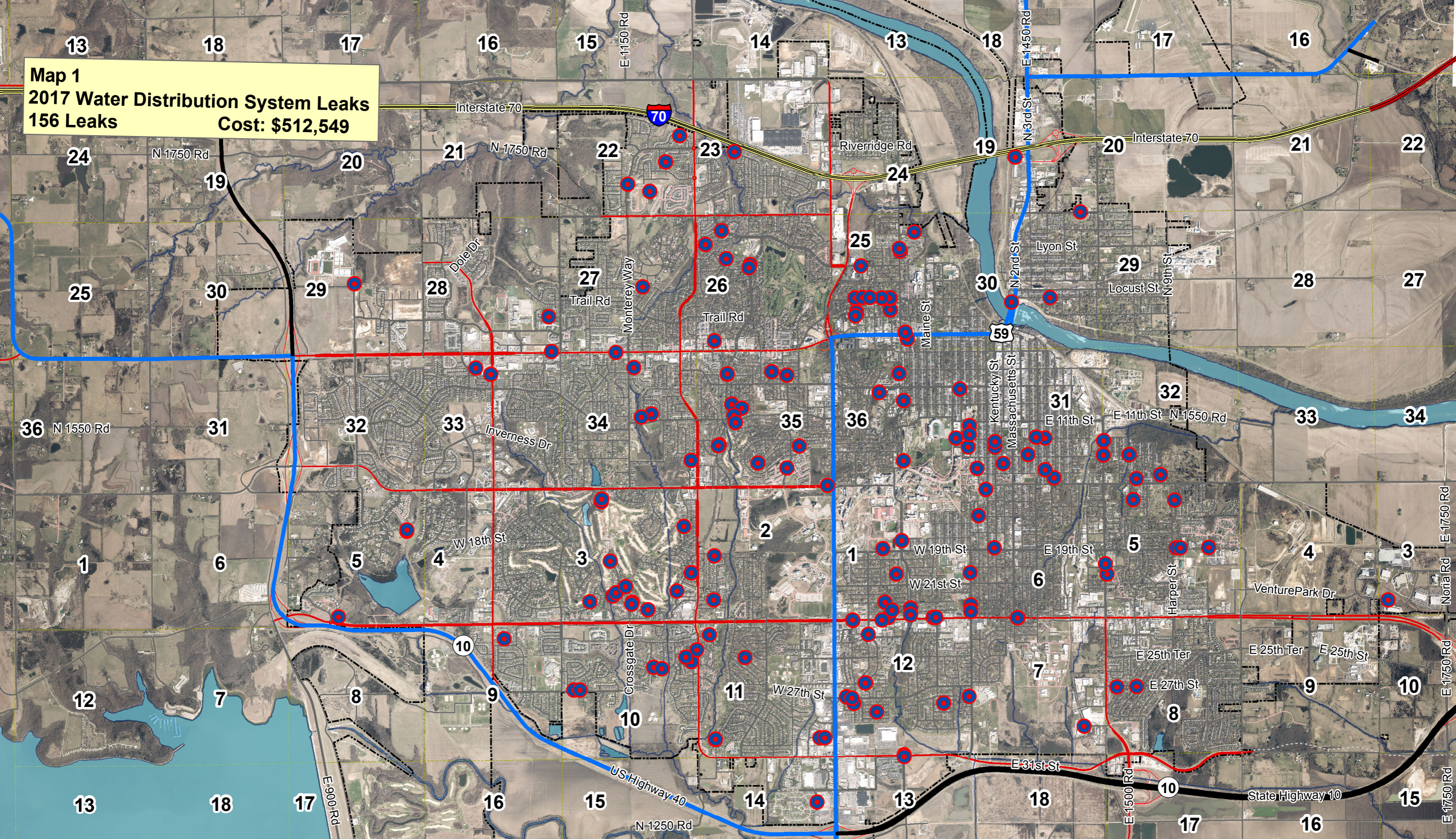


In 2017, the Utilities Field crews responded to 275 customer service calls for the water distribution system. Of these calls, 156 resulted in an identified leak, which was repaired and the main put back in service. Crews verified that the other 119 calls did not fall under City responsibility. The water distribution system leaks were located in all parts of the City with the greatest concentration of leaks on the older mains and the ductile mains where corrosive soils are present (See Map 1 on the next page for all water distribution system leaks by location). Water main leaks are attributed to a variety of causes including age of pipe, condition of the main, how the main was installed, type of soil surrounding the main, and ground movement due to freeze/thaw or drought conditions. Late 2010 is generally considered the beginning of the most recent drought, which lasted into early 2013. The increase of water main leaks in 2011 and 2012 is attributed to the dry soil conditions during that time (see Graph 3 below). The number of customer service calls has been higher the past two years. Staff will continue to monitor the number of service calls and its effect on department service levels. While the number of customer service calls decreased from 2016 to 2017, the number of leaks increased by about 10%. The larger number of leaks in 2017 can be attributed to more leaks on cast iron water mains, which increased from 28 leaks in 2016 to 46 leaks in 2017. There doesn't appear to be one specific reason for the increase in leaks on cast iron mains. This data, as well as continuous leak tracking data, is used to assist in selecting water main replacement projects by enabling the department to target known problem areas.

Graph 3. Water Distribution System Customer Service Calls/Leaks

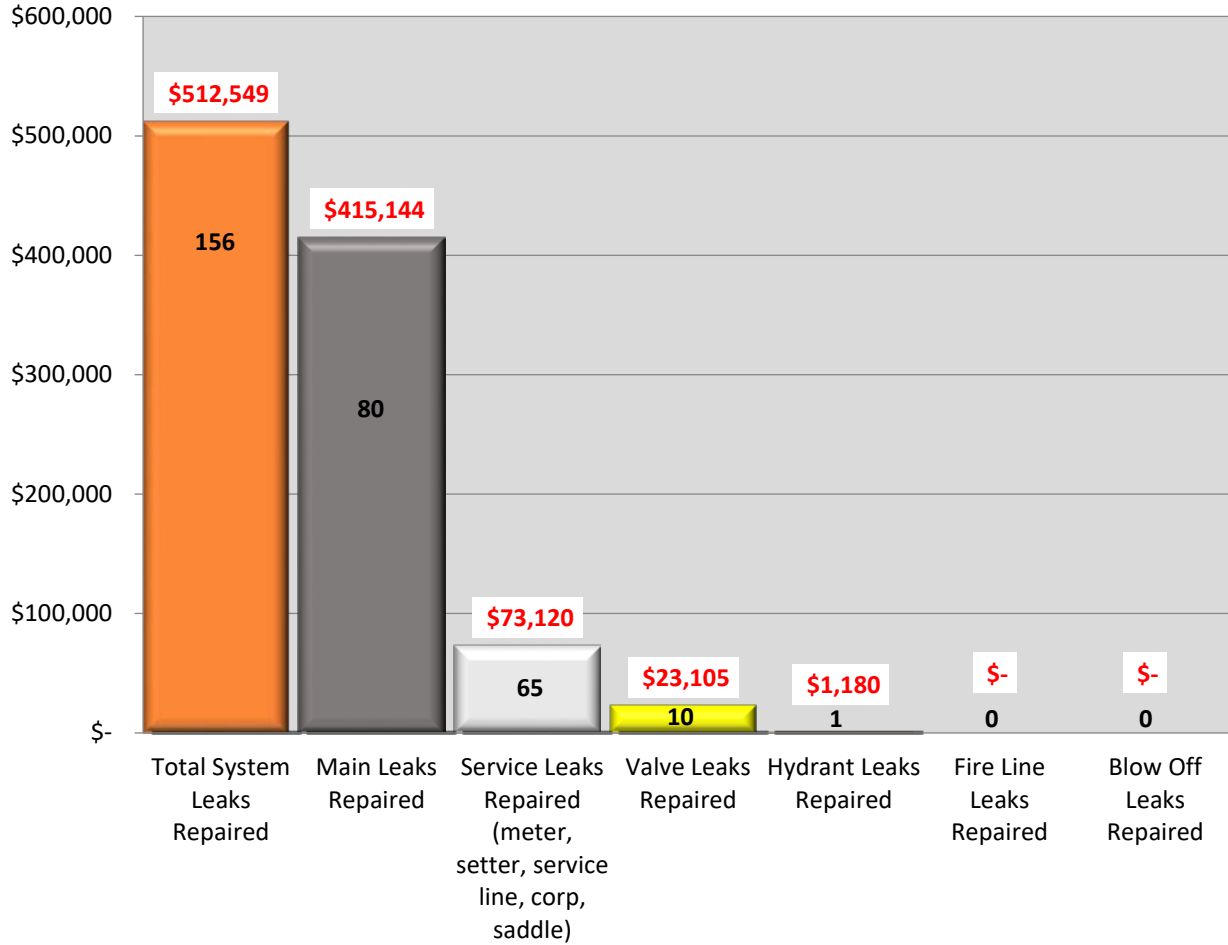


Map 1
2017 Water Distribution System Leaks
156 Leaks
Cost: \$512,549

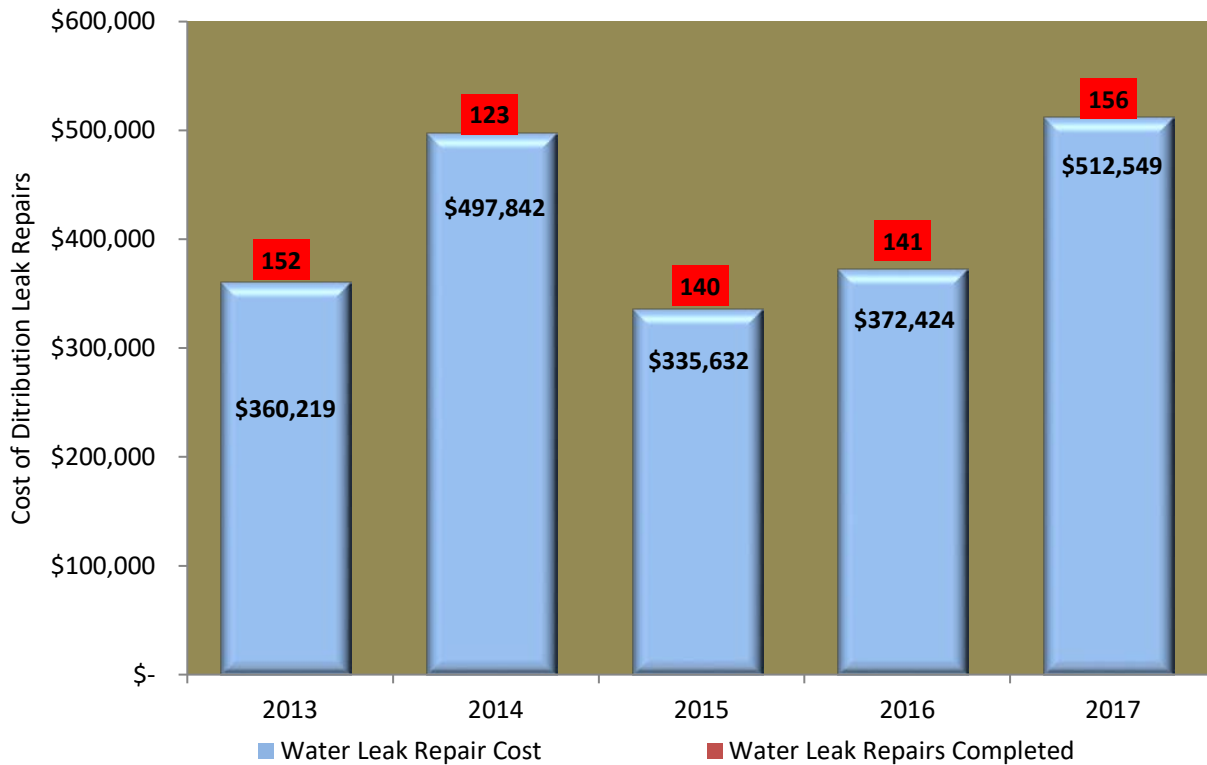


The water distribution system leaks that occurred in 2017 cost the City \$512,549 to repair. Approximately half of the leaks were caused by corrosion or splits in the water main (see Graph 4 below). The total cost of repairs in 2017 was higher than previous years due to an increase in the total number of leaks and repairs in streets, driveways, and sidewalks. (see Graph 5 on the next page).

Graph 4. 2017 Water System Leak Repair Cost and Types



Graph 5. Distribution System Leak Repairs



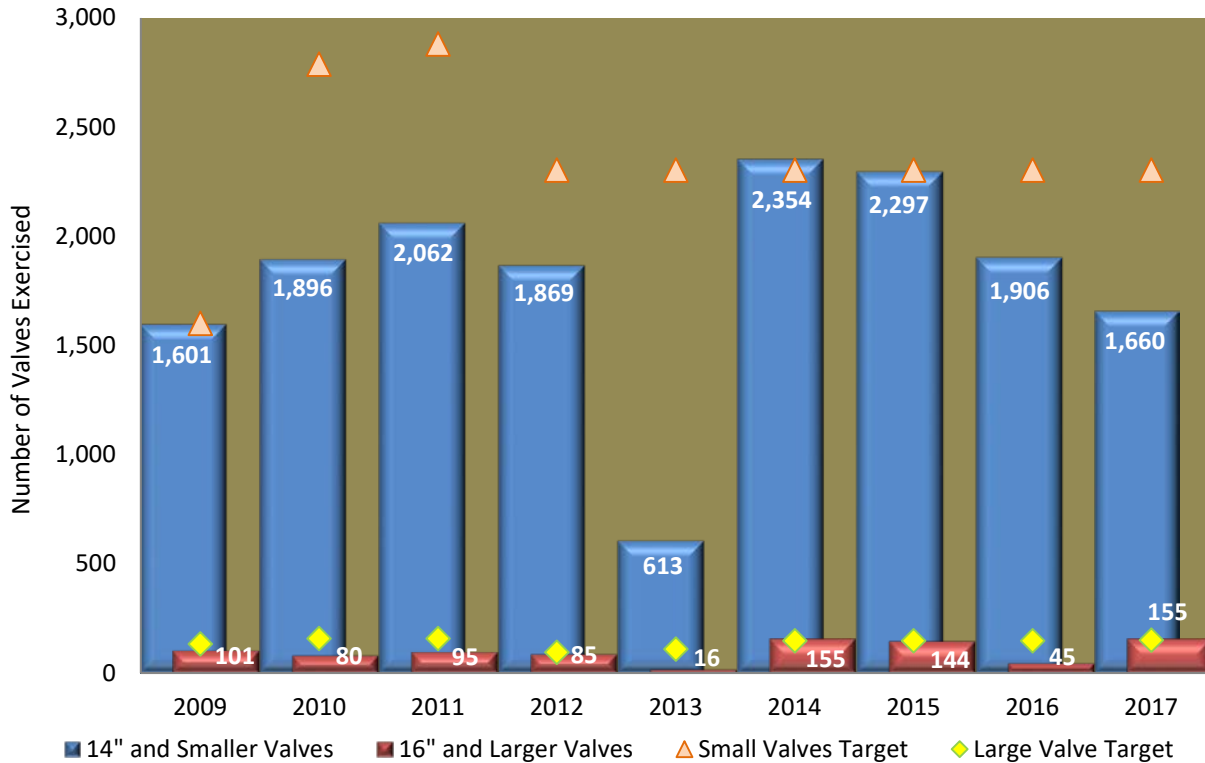
The Utilities Field group has implemented programs to systematically maintain the distribution and collections systems. One of these programs for the distribution system is the valve exercising program. All 14" and smaller valves are on a 3 year rotational exercise program. All 16" and larger valves are on a 1 year rotational exercise program. All 16" and larger valves are on an annual schedule because of the critical role they play in isolating larger areas of the distribution system. The valve exercise programs are important to the reliability of the water distribution system because unused valves can become inoperable and unable to close. This results in additional customers out of service during a repair of the main. The annual target for exercising 16" and larger valves was met in 2017. The annual target for exercising 14" and smaller valves was not met in 2017 and fewer 14" and smaller valves were exercised in 2017 than the previous three years in part due to the increase in new service installations, meter change-outs to replace aged meters and meters that will be incompatible with the advanced metering infrastructure (AMI) when it is implemented, assisting the Meter Readers/Field Services Representative staff (Meter Services) and other support work necessary to maintain daily customer service (see Graph 6 on the next page). Moving forward the number of valves exercised will continue to be monitored with the belief that targets can be reached without taking away from other necessary services, assuming full staff resources. If targets cannot be met, additional resources may need to be devoted to the valve exercising program.

Other annual programs used to maintain water distribution system reliability include:

- The Fire Hydrant Maintenance Program – tests and maintains all fire hydrants in good working condition in a 2 year rotation. This assures that the Fire Department has access to water at hydrants closest to the location needed. Similarly, during freezing weather, Field Operations crews also test for frozen fire hydrants and thaw them as needed.

- Fire Hydrant Flow Testing Program – tests and records the flow of every hydrant in a 4 year rotation to document available flow. This program was not performed in 2017 for the same reasons the target for exercising 14" and smaller valves was not met.
- Large Water Meter Testing Program – tests 6" or larger water meters, which are used for commercial and industrial customers, and wholesale water contracts, to assure that they are functioning properly.
- Large Water Meter Replacement Programs – replaces 1½ inch and larger meters on a 15 year schedule. Field operations staff coordinates with the Finance Department annually to update the list of large meters.

Graph 6. Number of Water System Valves Exercised

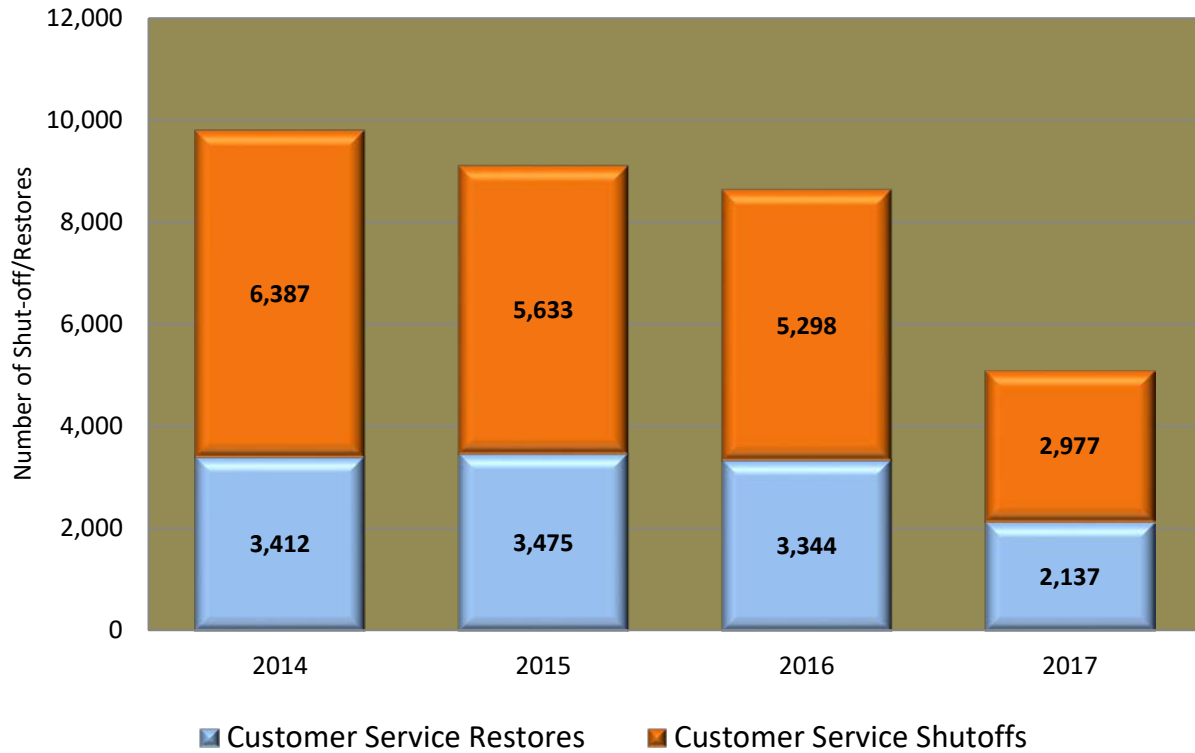


In 2016, 10 of the 11 Meter Reader/Field Services Representative FTE positions, and all of the workload previously performed by this 11-person staff, moved from Finance/Utility Billing to Utilities Field Operations (1 vacant Field Services Representative FTE remained with Finance for use in internal position reclassifications). Additional Field Operations staff support as needed, increased technical resources and other implemented operational efficiencies have enabled continued performance of this workload with improved accuracy and timeliness, as evident by the 2017 data. Full staffing is a critical component to meeting key customer service deliverables.

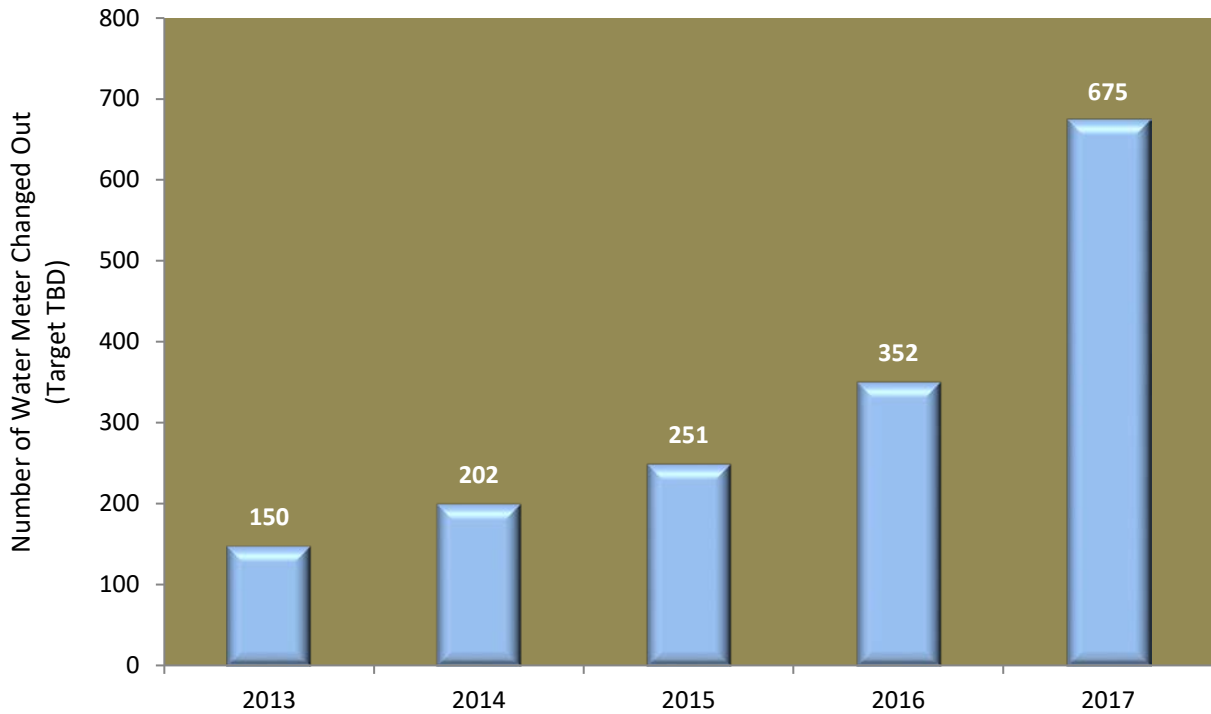
The Meter Services staff performed 2,977 meter shut offs due to non-payment of utility bills (see graph 7 on the next page). This number is much lower than the previous three years because a higher percentage of scheduled shut offs were canceled prior to shut off. There were several reasons for a higher cancellation rate, including a higher billing threshold for shut offs (\$150 vs. \$100) and delinquency notification emails that encourage more online payments. This group also performed 675 small, 5/8" and 1", meter change-outs as part of the ongoing meter replacement program. There were 323 more small meters replaced in 2017 than in 2016. The

number of small meter replacements is on an upward trend in order to reach the goal of replacing all small meters on a 20 year cycle (see graph 8 on the next page). In 2017 there were 1,028 meter rereads necessary because of incorrect initial reads, questions from utility billing, or customer requests for rereads (see graph 9 on the next page). Data is limited prior to 2014 but the 2017 rereads are much lower than the previous three years due to improved communications, education and training between Field Operations and Utility Billing.

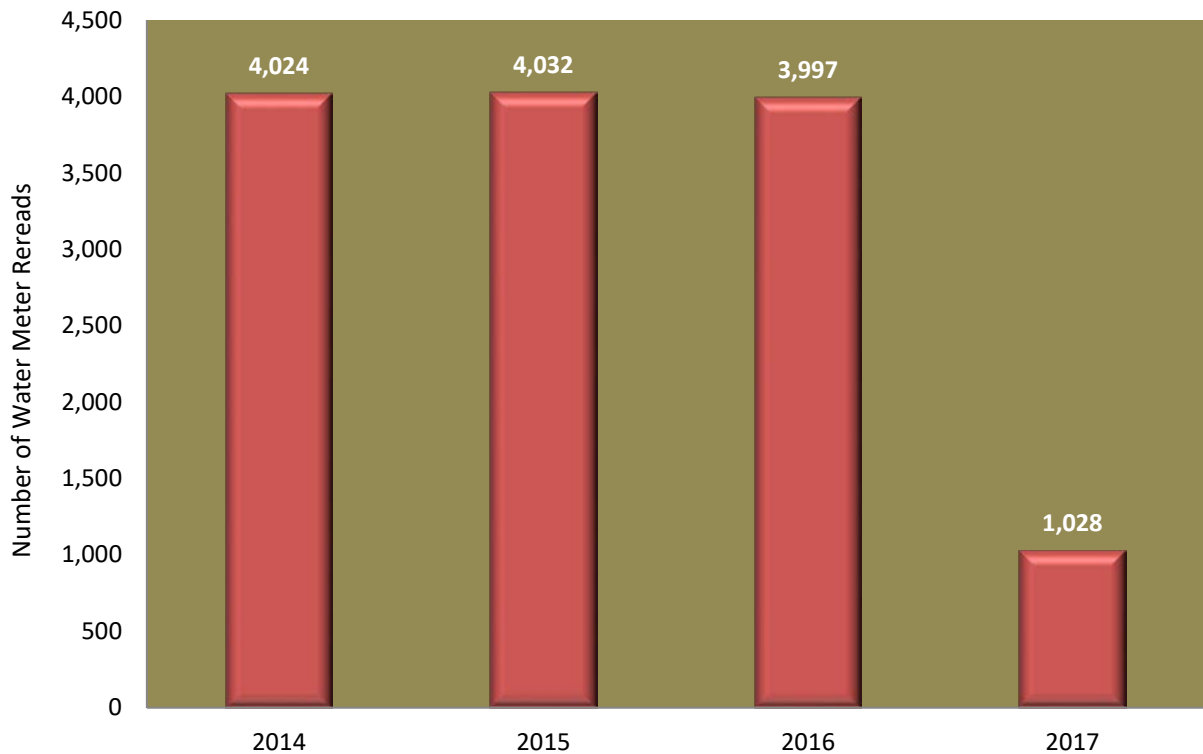
Graph 7. Customer Service Shut-off/Restores



Graph 8. Small Water Meter Change-Outs



Graph 9. Meter Service Meter Rereads

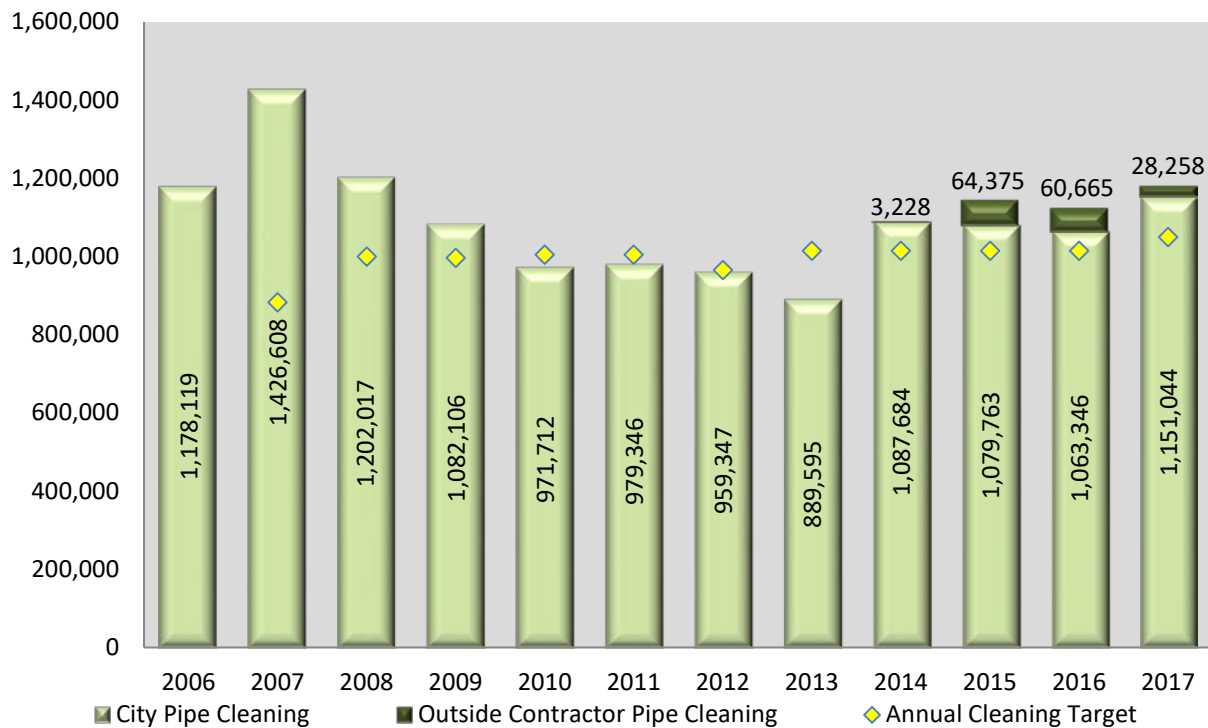


Wastewater Collection System

Utilities Field crews clean the sanitary sewer mains to remove any debris or items that may become lodged in the main and restrict wastewater flow, resulting in a back-up. Utilities Field crews use preventive maintenance programs to ensure the reliability of the sanitary sewers (see Graph 10 below). These programs include:

- Section Cleaning Program – cleans all city sewer lines 18" or smaller once every 4 years, or 538,591 feet annually. In 2017, the department continued the 5th cycle of section cleaning. Specific sections of the collection system may be placed on a routine maintenance program (described below), recommended for lining with the CIPP (Cured-in-Place-Pipe) Program, or placed on the Chemical Root Control Program.
- Preventive Maintenance Program – scheduled cleaning of sewer mains due to specific targeted problems such as grease, roots, or paper into monthly, 3-month, 6-month, or annual cleaning.
- Outside contractors associated with the Ecoflow Rapid Rainwater Reduction Program and the CIPP Program cleaned an additional 28,258 feet of sanitary sewers in 2017.

Graph 10. Sanitary Sewer Main Cleaned (in feet)

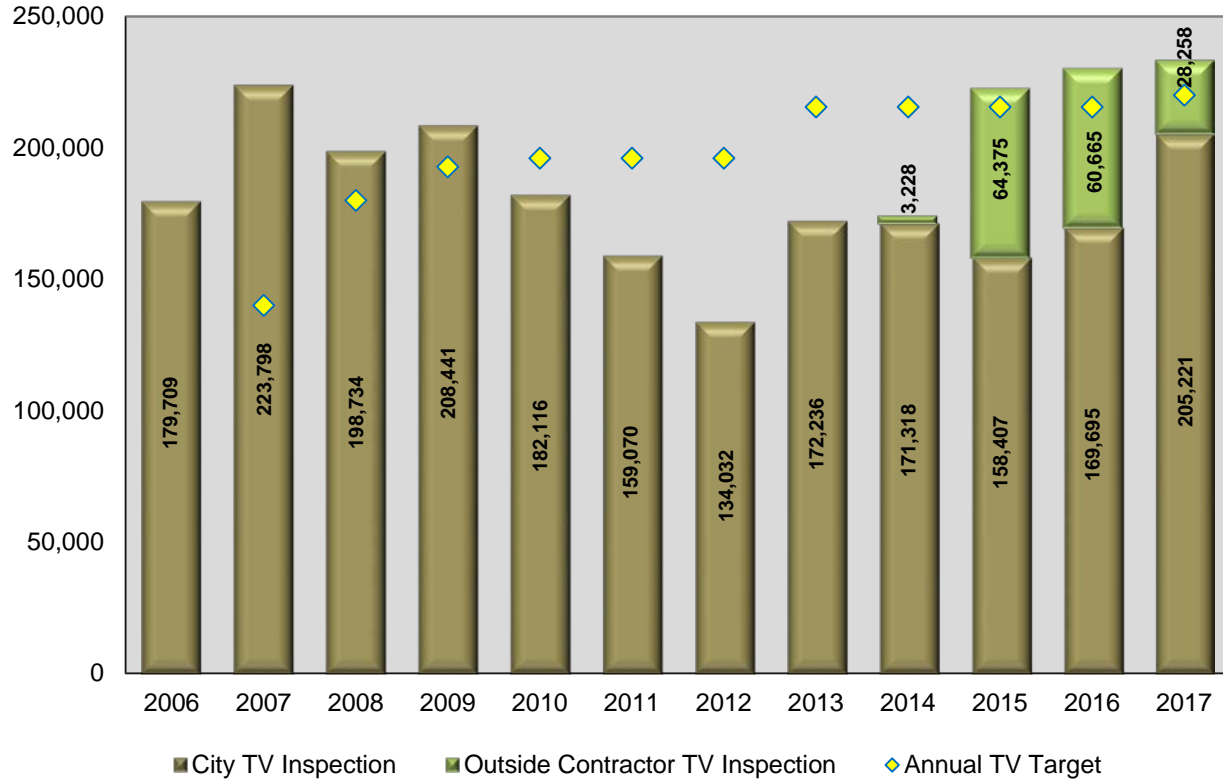


The Utilities Field crews use closed circuit cameras (CCTV) to inspect the sanitary sewer lines to locate areas of defects, inflow and infiltration, blockages, and assess pipe condition (see Graph 11 on the next page). The inspection programs include:

- 10 year Vitrified Clay Pipe TV Inspection Program – inspects and assesses the condition of vitrified clay pipe, at least 100,000 feet annually. This program was started in 2009.
- Sewer Main Backup TV Inspection Program – inspects the sanitary sewer main after a backup to determine the cause.
- CIP/PIP Bond TV Inspection Program – inspect new sewer main construction prior to the end of the warranty period.

In addition to the above in-house inspection programs, outside contractors use CCTV to inspect unlined clay pipe in the Ecoflow area and sanitary sewer main before and after CIPP installation. In 2017, the Ecoflow and CIPP programs completed TV inspection on 28,258 feet of sanitary sewer. The annual TV inspection target for all programs is 220,000 feet.

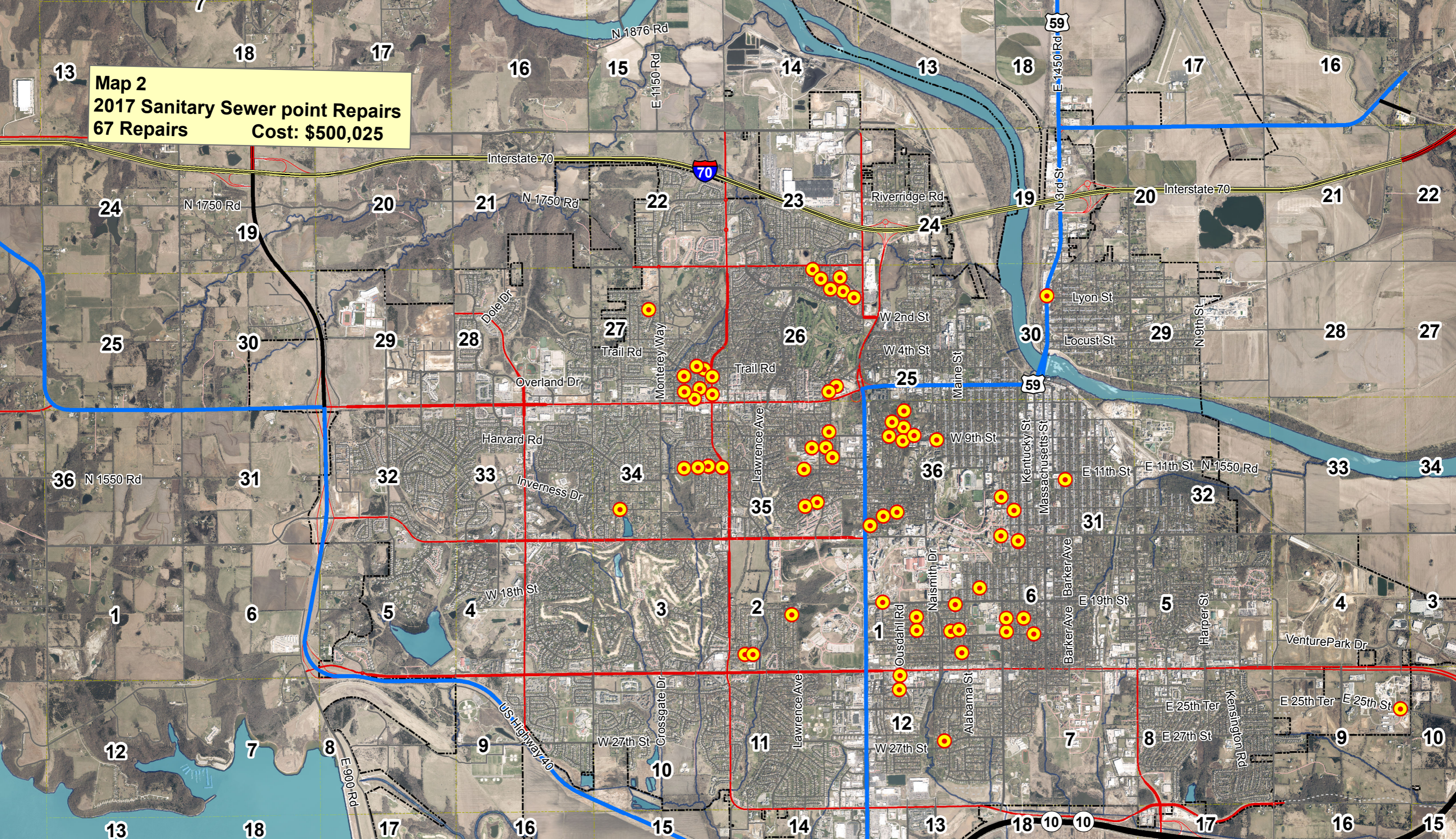
Graph 11. Sanitary Sewer Main TV Inspection (in feet)



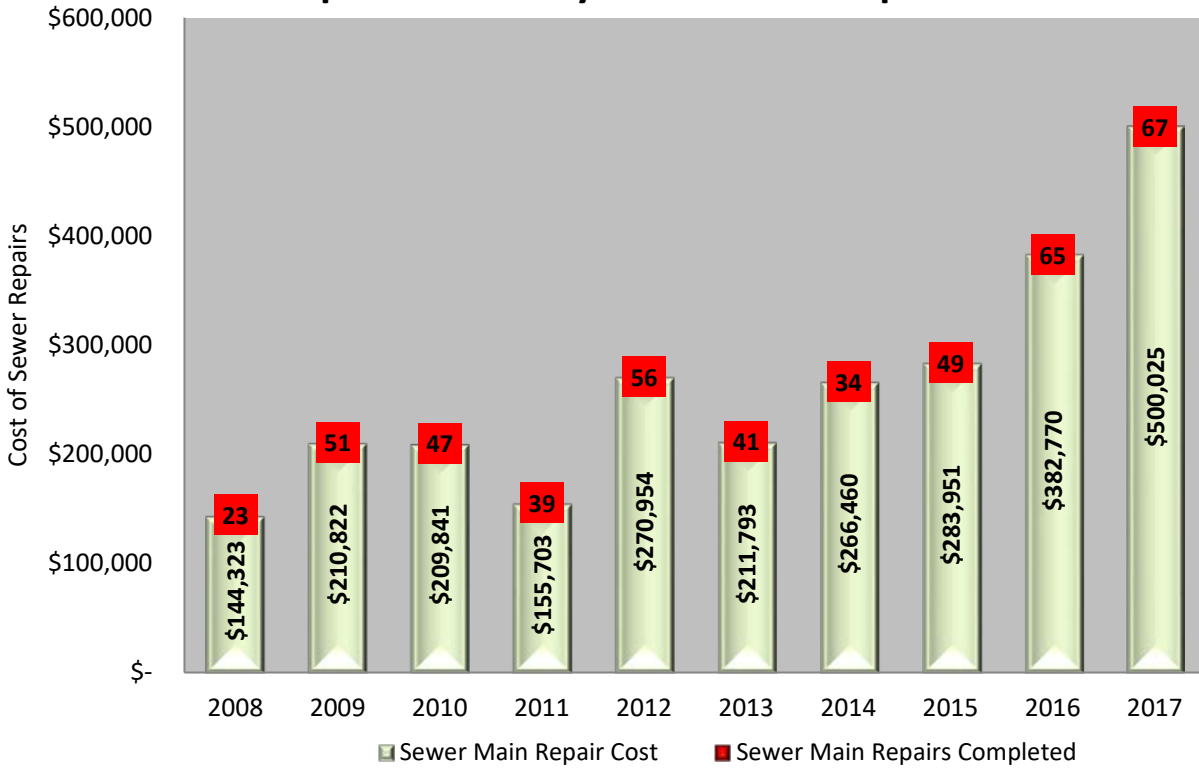
CCTV inspections are used to determine the condition of the sanitary sewer lines. Point repairs that are identified with the CCTV inspection are repaired within 30 days. The sanitary sewer point repairs were located generally on the east side of the City. Many of the repair locations were identified through the 10 year Vitrified Clay Pipe TV Inspection Program, as well as from inspections related to the Ecoflow Rapid Rainwater Reduction Program (See Map 2 for all wastewater collection system repairs by location). The 67 sanitary sewer point repairs in 2017 cost the City \$500,025 (see Graph 12 on page 14). The 67 point repairs were 2 more than 2016; however, the total cost of point repairs was \$117,255 more than 2016. This can be partially attributed to repairs in three locations that cost \$75,000 due to being in challenging working locations and/or needing to replace the sewer main from manhole to manhole.

In 2017, the Utilities Field crews responded to 155 customer service calls for the wastewater collection system. Of those 155 calls, 16 resulted in an identified blockage of the City main, which crews removed. Crews verified that the remainder of the customer calls had a clear City main. The decrease in customer calls and City main blockages over the past 15 years and ability to maintain the current low level of City main blockages is attributed to the planned Sewer Preventive Maintenance Programs and schedules discussed previously. The planned sewer Preventive Maintenance Programs were implemented by the department in 1998 (see Graph 13 on page 14). The number of main blockages in 2017 was similar to the previous two years. The number of sewer customer service calls requiring staff response, while lower than 2016, is still elevated for 2017 relative prior years. Staff will continue to monitor the number of service calls and its effect on department service levels.

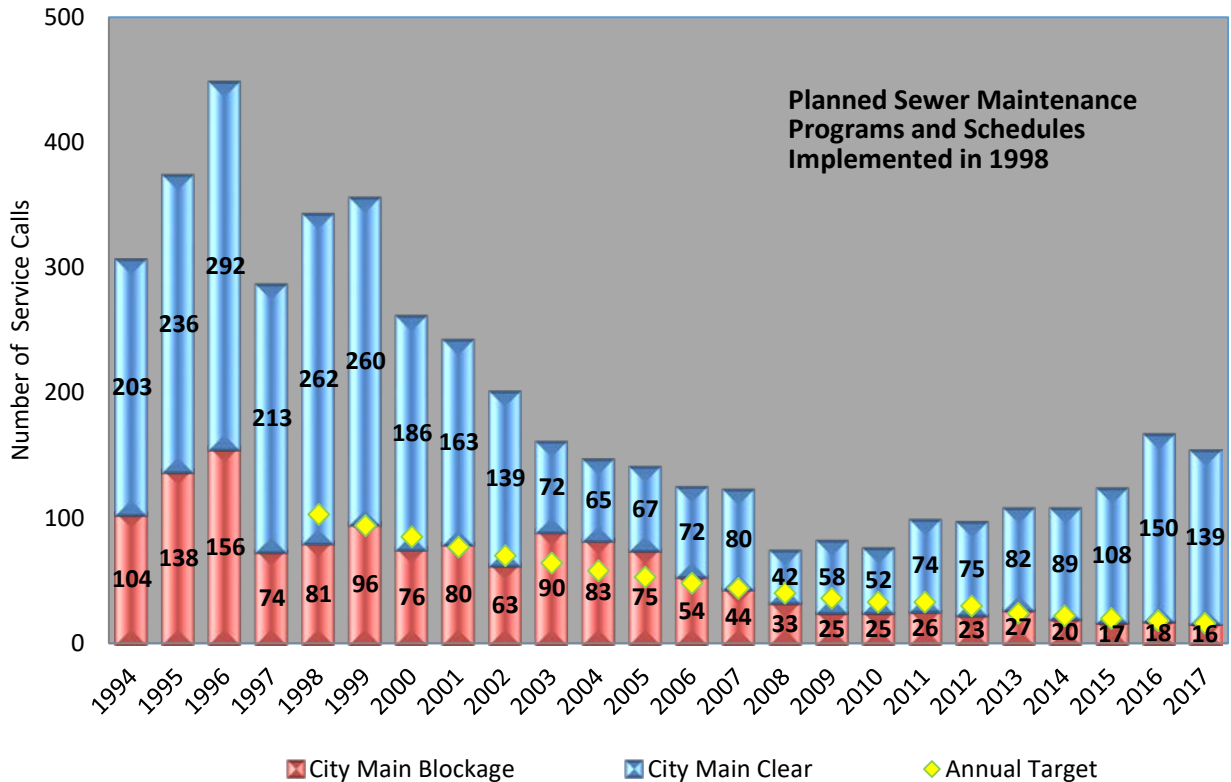
Map 2
2017 Sanitary Sewer point Repairs
67 Repairs
Cost: \$500,025



Graph 12. Sanitary Sewer Main Repairs

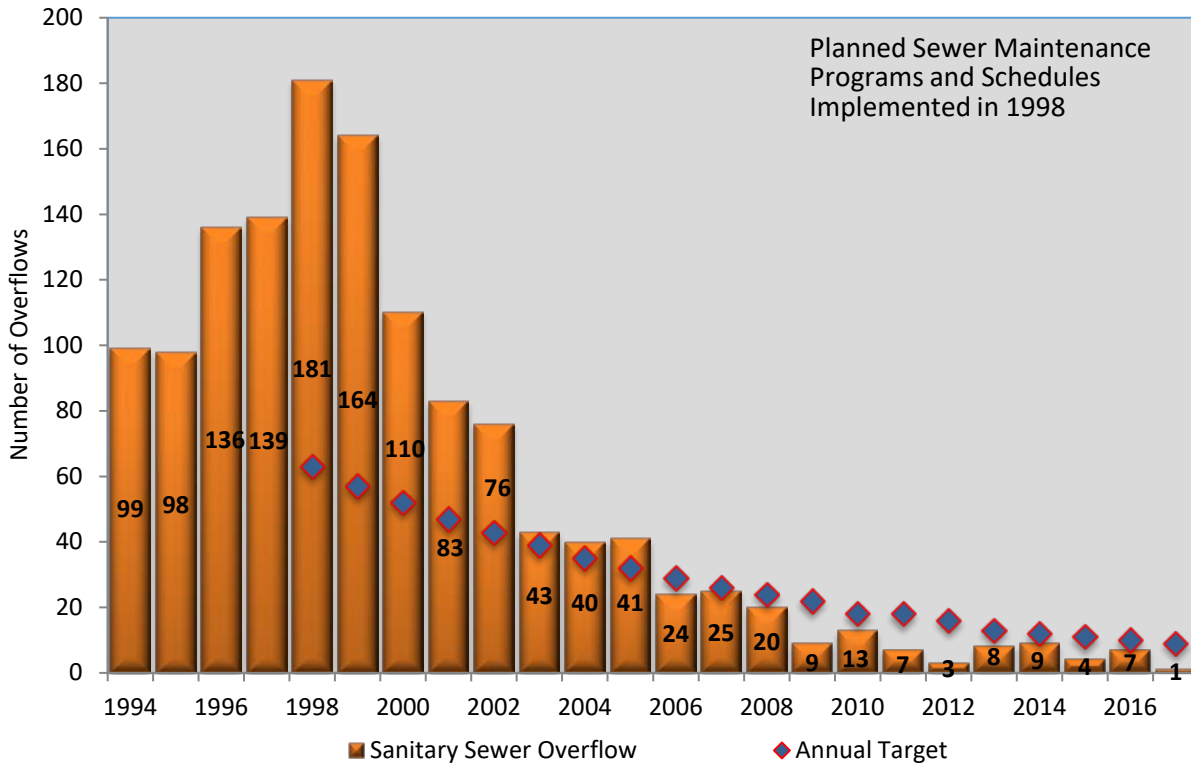


Graph 13. Sanitary Sewer Service Calls



Sanitary Sewer Overflows (SSOs) are when wastewater leaves the collections system. This can be overflowing manholes, which can lead to environmental degradation by flowing from the manhole into nearby streams or storm sewers, or basement back-ups, which can cause significant property damage. Either scenario may contribute to a public health concern. In addition, SSOs also require notification to the Kansas Department of Health and Environment (KDHE). It has been a Department goal to reduce SSOs. Preventive maintenance programs have played a major part in reduction of SSOs and the leveling off to the current level, where they will likely remain with continued attention to sanitary sewer maintenance. In 2017 the department had 1 SSO (see Graph 14 below), which was caused by grease in the sewer line.

Graph 14. Number of Sanitary Sewer Overflows



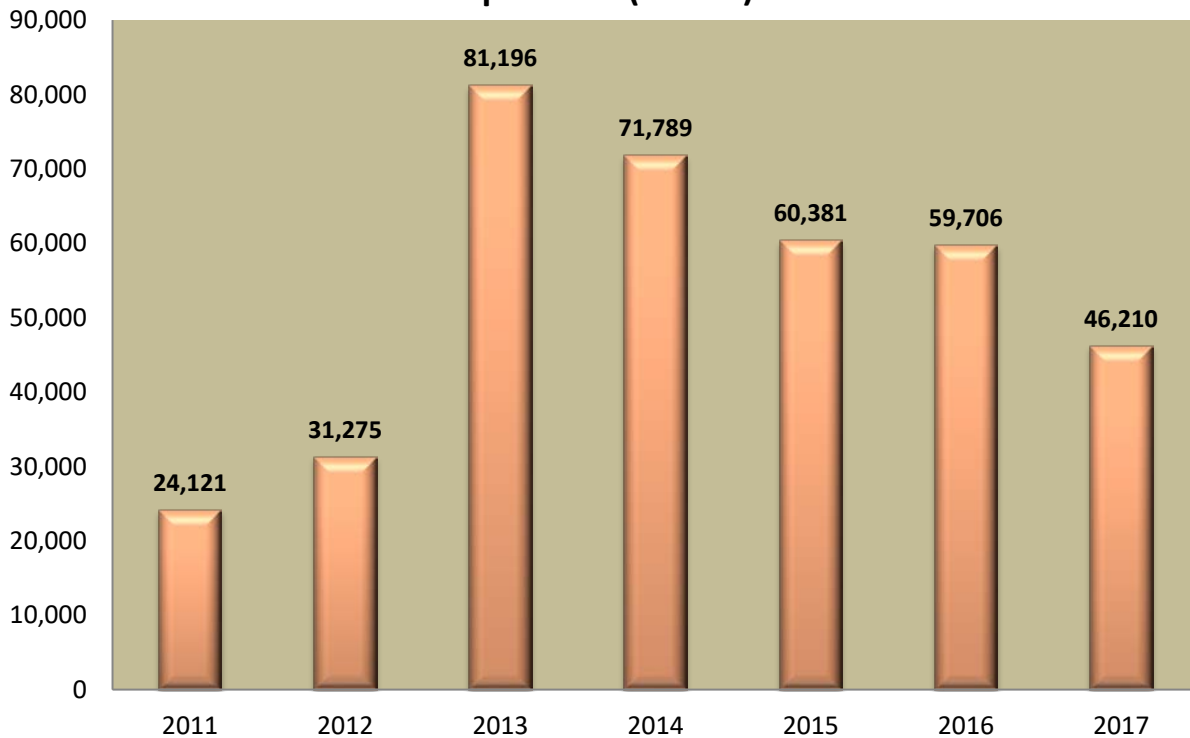
Field Operations Support

The Utilities inspectors, which are part of the Field Operations group, remain on site for capital and public improvement projects that are installing new water or sewer mains. For these projects, utilities inspectors observe, inspect, and test these new lines to make sure the new infrastructure meet all specifications, criteria, and requirements for materials and installation methods. The total footage of new water or sewer mains has declined over the previous five years from a high in 2013 (see Graph 15 on the next page). Although the footage inspected decreased in 2017, the number of tests on inspected projects is higher than the previous two years. Inspectors also assisted with site and structure inspections for the Wakarusa Wastewater Treatment Plant and Pump Station 10 project. Water services that are not installed by the City and fire lines are inspected as well.

Inspectors are also responsible for various other tasks that include:

- coordinating with contractors on demolition projects to verify that abandonment of existing utilities meets the requirements of the City of Lawrence and to ensure protection of the public infrastructure.
- delivering, picking up, and maintaining the fire hydrant meters used by contractors for water during construction.
- using an R10 Trimble GPS unit to get GPS coordinates and elevations of Utilities' infrastructure to be updated in the department GIS map.

Graph 15. New Water/Sewer Main Installed Under Utilities Inspections (in feet)



Two full-time Utilities Field staff provide locates for the department’s underground infrastructure, as well as provide the same service for Public Work’s storm sewers and first call for traffic signals. These locates are provided whenever residents or contractors call 1-800-DIG-SAFE to request these locates before excavation can occur. The accurate location of City infrastructure is critical to avoid excavators from hitting and damaging the City’s water and sewer mains, as well as other underground infrastructure. Staff are allowed up to 3 days to complete routine locate requests. Emergency locates must be completed within 2 hours. Increases in buried infrastructure locates are due to communications projects such as the installation of fiber lines and a general increase in the total number of construction projects within the City (see Graph 16 on the next page). In 2017 two Utilities Field staff were able to complete locates within the time requirements; however, if locate requests continue to increase additional staff may be required.

Graph 16. Infrastructure Locate Totals

