

# Public Service Commission of West Virginia

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January 4, 2024

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RE: Case No. 23-0555-W-GI  
General Investigation into Maintenance and Testing of Fire Hydrants

Gentlemen:

Staff Memorandum issued today was served via email on the above-listed parties. If you wish to respond to Staff Memorandum, you may do so in writing, within 10 days, unless directed otherwise, of this date. You will not receive a copy of the Staff Memorandum by regular mail.

Your failure to respond in writing to the utility's answer, Staff's recommendations, or other documents may result in a decision in your case based on your original filing and the other documents in the case file, without further hearing or notice.

Documents submitted to the Public Service Commission of West Virginia may be 1) uploaded to its public website, 2) subject to public disclosure under the West Virginia Freedom of Information Act, and/or 3) subject to disclosure under the West Virginia Open Governmental Proceedings Act. Do not submit personal information with your filings. The Commission is not responsible for confidential or personal information included with your submission. A list of personal information is available here: [http://www.psc.state.wv.us/Privacy\\_Policy/WhatisPII.htm](http://www.psc.state.wv.us/Privacy_Policy/WhatisPII.htm)

If you have provided an email address you will automatically receive notifications as documents are filed in this proceeding. The email notifications allow recipients to view a document within an hour from the time the filing is processed. The Commission will serve all Orders electronically on those parties that provide an email address. If you have not provided your email address, please send an email to [caseinfo@psc.state.wv.us](mailto:caseinfo@psc.state.wv.us) and state the case number in the email subject field.

Sincerely,

A handwritten signature in blue ink that reads "Karen Buckley".

Karen Buckley  
Executive Secretary

KB/jt



**COVER SHEET FOR JOINT STAFF MEMORANDUM**

**TO: KAREN BUCKLEY  
Executive Secretary**

**RE: CASE NO. 23-0555-W-GI  
GENERAL INVESTIGATION INTO THE MAINTENANCE AND  
TESTING OF FIRE HYDRANTS**

Commission Staff is providing this cover sheet introducing a joint Staff memorandum in excess of twenty pages, in compliance with General Order 262.8. Staff is providing the Table of Contents for this memorandum as follows:

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**FINAL JOINT STAFF MEMORANDUM**

**TO: KAREN BUCKLEY** **DATE: JANUARY 4, 2024**  
**Executive Secretary**

**FROM: CHRIS HOWARD**  
**Staff Attorney**  
**And**  
**TIMOTHY GIBSON**  
**Staff Attorney**

**RE: CASE NO. 23-0555-W-GI**  
**GENERAL INVESTIGATION INTO THE MAINTENANCE AND**  
**TESTING OF FIRE HYDRANTS**

Staff believes the recommendations of Engineering Staff are reasonable, as it would be advantageous to establish a funding program specifically for fire hydrant replacement for non-profit water utilities. Using the data developed during this investigation, Staff has developed a preliminary estimate of the costs for such a state-wide Hydrant Replacement Grant ("HRG") program. The estimate is based on the data developed in this investigation and also relies upon assumptions based on professional experience and knowledge of the utility industry. The assumptions and the preliminary cost estimate are provided as Attachment E which gives a total estimated cost for the HRG program at \$70-million. Further, Staff recommends the Commission amend the Water Rules to add rules concerning the testing and maintenance of fire hydrants.

On June 30, 2023, the Commission by Order and acting on their own motion opened a general investigation into the maintenance and testing of fire hydrants throughout the State. Attached to the Order was a two-page questionnaire designed to secure essential, initial information from all of the three hundred and one public water utilities operating in West Virginia. The quality of these individual responses varies greatly among the respondents with some (a few) providing substantially complete responses while many others provided a bare minimum response.

On September 28, 2023, Staff filed a Further Joint Staff Memorandum. Staff stated it was continuing its review on this large investigation in order to better understand the state-of-the-industry with respect to fire hydrant maintenance and testing across West Virginia. Staff would provide final substantive recommendations within the time frame established by the Commission.

*Final Recommendation of the Commission's Utilities Division Staff*

On January 4, 2024, Jonathan M. Fowler, P.E. of the Commission's Engineering Division (Engineering Staff), issued a Final Memorandum. Engineering Staff states the investigation clearly shows significant issues with the way fire hydrants are being inspected and flow-tested. But just as importantly, Engineering Staff also found that a significant percentage of the state's nearly 50,000 hydrants are fifty-years of age or older and that the replacement cycle for fire hydrants is unsustainably long at almost three-quarters of a century. Across all water utilities there are more than 5,300 hydrants in need of prompt replacement, based on age alone. This includes more than 4,000 hydrants operated by non-profit utilities. The cost to replace these hydrants is significant.

To most effectively address this need, Engineering Staff believes it would be advantageous to establish a funding program specifically for fire hydrant replacement for non-profit water utilities. Using the data developed during this investigation, Engineering Staff has developed a preliminary estimate of the costs for such a state-wide Hydrant Replacement Grant ("HRG") program. The estimate is based on the data developed in this investigation and also relies upon assumptions based on professional experience and knowledge of the utility industry. The assumptions and the preliminary cost estimate are provided as Attachment E which gives a total estimated cost for the HRG program at \$70-million.

Based on the foregoing, Engineering Staff recommends the following:

1. The Commission should revise the Water Rules (150CSR07) to address hydrant inspection, testing and marking. The pertinent national standards are NFPA 291 and AWWA M17 and these should be adopted into the revised Water Rules by reference.
2. All water utilities operating fire hydrants should be required to report and certify, in their Annual Report, the number of fire hydrants inspected for the year and the number of fire hydrant flow tests completed for the year.
3. Funding should be provided to provide for the replacement of aged and nonfunctional hydrants. A Hydrant Replacement Grant (HRG) grant program may be established to provide for this critical need.

*Final Recommendation of the Commission's Legal Division Staff*

Legal Staff has reviewed the filings including the pleadings and the Final Memorandum of Engineering Staff. Legal Staff agrees with the findings and recommendations of Engineering Staff. Legal Staff notes there are significant issues with the way fire hydrants are being inspected and flow-tested. But just as importantly, it was determined there are a significant percentage of the state's nearly 50,000 hydrants are fifty-years of age or older and that the replacement cycle for fire hydrants is unsustainably long at almost three-quarters of a century. Across all of our water utilities there are more than 5,300 hydrants in need of prompt replacement, based on age alone. This includes more than 4,000 hydrants operated by non-profit utilities. The cost to replace these hydrants is significant.

Legal Staff believes the recommendations of Engineering Staff are reasonable, as it would be advantageous to establish a funding program specifically for fire hydrant replacement for non-profit water utilities. Using the data developed during this investigation, Staff has developed a preliminary estimate of the costs for such a state-wide Hydrant Replacement Grant ("HRG") program. The estimate is based on the data developed in this investigation and also relies upon assumptions based on professional experience and knowledge of the utility industry. The assumptions and the preliminary cost estimate are provided as Attachment E which gives a total estimated cost for the HRG program at \$70-million. Further, Staff recommends the Commission amend the Water Rules to add rules concerning the testing and maintenance of fire hydrants.

CLH/TG/jt  
Attachment

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**PUBLIC SERVICE COMMISSION OF WEST VIRGINIA****ENGINEERING DIVISION**  
**Final Internal Memorandum**

**TO:** Christopher Howard, Esq, Staff Attorney  
Legal Division.

**FROM:** Jonathan M. Fowler, P.E.  
Engineering Division

**DATE:** January 5, 2024

**SUBJECT:** CASE NO. 23-0555-W-GI  
General Investigation Into  
Maintenance and Testing  
Of Fire Hydrants

On June 30 2023, the Commission opened a state-wide general investigation into the maintenance and testing of fire hydrants. In that Order the Commission stated as follows.

*"The Commission has jurisdiction over water utilities in the State, many of which own fire hydrants and serve private fire hydrants. It is the responsibility of the owner of fire hydrants to identify and mark fire hydrants that are inoperable or unavailable for use by an entity providing fire suppression services in a fire emergency (W.Va. Code § 8-19-22). Further, water utilities are required to "establish and maintain adequate and suitable facilities, safety appliances or other suitable devices, and shall perform such service in respect thereto as shall be reasonable, safe and sufficient for the security and convenience of the public, and the safety and comfort of its employees, and in all respects just and fair, and without any unjust discrimination or preference" (W.Va. Code § 24-3-1). Thus, whether a fire hydrant is owned by a public utility or served by a utility, the utility has responsibilities to assure that the hydrants will perform adequately."*

As part of the June 30, 2023 Order, the Commission required that all public utilities owning fire hydrants and all public utilities that serve private fire hydrants provide information relative to fire hydrants as detailed in a two-page form attached to the Order and which is attached to this memorandum as Attachment A.

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### Introduction

Fire hydrants are essential components of public safety infrastructure, providing a reliable and dependable source of water for firefighters. While hydrants may seem like an ordinary feature of the community, they play a crucial role in protecting lives, homes and businesses from the devastating consequences of fire. Further, while the acknowledged primary purpose of a fire hydrant is to provide water for fighting fires, hydrants have additional secondary uses<sup>1</sup> that are essential to the operation and maintenance of a water distribution system.

The regular, systematic inspection and testing of fire hydrants together with prompt maintenance is essential to preserving the function and reliability of these key pieces of utility infrastructure. The testing of hydrants not only addresses individual hydrant functionality but also provides important engineering and operational information regarding the performance of the entire water supply system. Hydrant tests can identify and thus, help to rectify, any issues within the distribution system, such as low pressure, low flow, or malfunctioning or improperly-positioned main line valves. The efficiency and effectiveness of the entire water system will be improved by regular inspection, maintenance and flow testing of all fire hydrants. This regular inspection & testing also helps maintain compliance with local fire codes and insurance regulations and helps to ensure that the water system meets the necessary standards for both domestic water needs and firefighting.

The importance of hydrant inspection, maintenance and testing is established by national consensus standards including those issued by the National Fire Protection Association (NFPA) as Standard 291 "*Recommended Practice for Water Flow Testing and Marking of Fire Hydrants*" and the American Water Works Association (AWWA) in Manual M17 "*Fire Hydrants, Installation, Field Testing and Maintenance*". Quoting from the AWWA Manual at chapter 5, "*Hydrant owners [utilities] have a **moral obligation** to see that adequate fire flow can be delivered from **every hydrant** ...*" (emphasis added). Note the deliberate use of the term **moral obligation** - a term rarely found in an engineering standard.

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<sup>1</sup> Hydrants may be used for water system flushing, to provide temporary water supplies under controlled circumstances and similar non-critical functions but, their primary purpose is always to provide water for the control and extinguishment of fires.

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This industry standard further notes that "... *[the presence of a hydrant] signifies ... that **water for fighting fires is available***". The AWWA manual specifies, in no uncertain terms, that a nonfunctioning hydrant must be removed. In other words, the simple presence of a fire hydrant establishes that water to fight fires is available and that the fire department can rely on that hydrant. The last thing any first responder needs is to be surprised by hydrant troubles while trying to extinguish a fire and provide aid to others. Clearly, hydrants must be reliable and it is best to be proactive versus reactive where lives and property are at risk. A requirement to mark nonfunctional fire hydrants (by painting them black or by temporary "black-bagging") is included in current WV Code at §8-19-22 however, this section is incomplete in that it does not address hydrant inspection, testing or marking - other than for a nonfunctional condition.

There are no shortcuts taken when it comes to manufacturing and installing fire hydrants because they have a critical function and must perform reliably on a moment's notice. The most common cause of hydrant failure is the lack of regular inspections, periodic testing and a proactive preventive maintenance program. Unfortunately, many utilities across our State do not inspect, test and maintain their hydrants regularly and in conformance with established standards. This failing is caused by many reasons but, it is an unacceptable situation which must be corrected.

To address this issue, Staff recommends the Commission establish and codify requirements for the inspection and testing of utility operated fire hydrants and for the annual reporting of information related to such inspection and testing. We also recommend that a program to fund hydrant replacement via state grants be established for the non-profit utilities (see Recommendations section.).

### Data Overview

The information requested of the water utilities in this General Investigation was intended to allow the Commission to determine the overall state of hydrant inspection and testing practices across our State. This information was gathered, organized and evaluated and has been used, along with our professional experience and knowledge of water utilities, to guide Staff in the preparation of the conclusions and recommendations presented later in this memorandum.



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A total of two-hundred fifty-seven water utilities reported operating fire hydrants throughout our State. Complete or partial responses to our data request were obtained from all but one of these utilities. A table giving a summary of key hydrant data is provided as Attachment B and graphics depicting some important data is provided in Attachment C.

The ownership of a utility impacts funding availability for many aspects of renewal and replacement (R&R) including that for hydrant replacement. Water utilities are either owned by for-profit corporations or they are owned by non-profit utilities. These non-profit water utilities make up the vast majority of systems regulated by the Commission and include; water utilities that are political subdivisions of the State (like Public Service Districts) and Municipalities and some Not-for-Profit Water Associations.

The types of capital funding available to non-profit utilities is significantly different from the capital funding mechanisms used by for-profit utilities – non-profit utilities have access to beneficial funding through various government programs. Therefore, to better estimate the hydrant R&R needs of the non-profit utilities it was necessary to develop hydrant statistics for the non-profit systems separate from the data base containing information from all responding utilities. Accordingly, we developed and analyzed a separate subset of data including only non-profit entities. This was done by removing the for-profit utilities<sup>2</sup> from the original data base. As we discuss the results of our analysis, we will provide metrics for the non-profit subgroup following a discussion of metrics for the larger all-utilities group.

A brief summary of the key information collected along with descriptive statistics is presented in the following several paragraphs. Note that the data request attached to the Order contained twenty-seven requests however, we will not address every request in detail since many of the requests are self-explanatory (utility name, contact information, etc.) or were deemed to be possibly unreliable<sup>3</sup>.

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<sup>2</sup> The for-profit utilities removed to create the non-profit data subset were; WV American Water Company, Beckley Water Company, Jefferson Utilities, Inc., West Logan Water Company and the Newell Water Company.

<sup>3</sup> A review of the responses to several questions related to labor expended on hydrant maintenance (request 11) and the costs of hydrant maintenance (request 12) were inconsistent, internally contradictory or clearly in error and were not included.

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### Hydrant Population

First, we will discuss the number of hydrants in service and the delineation of hydrants. For purposes of this report, hydrants were divided into two overall classes by; first, utility-owned hydrants (captured by question 1 of the data request) and; second, non-utility-owned hydrants, also called private hydrants. A further subdivision was then made within the category of non-utility-owned hydrants based on the mains to which they are immediately connected. For instance, a business may have installed a private hydrant at their expense near their premises on private property and this hydrant may be connected to a nearby utility-owned main located in the road right of way adjacent to the building. This would be captured by question 2. Similarly, question 3. was designed to capture private hydrants not directly connected with a utility-owned main but which are served with water from the utility system. These could include hydrants located, for instance, within a large industrial facility, chemical plant or warehouse complex or within a campus. Such hydrants would be directly connected with the privately-owned water lines within the facility, complex or campus and those lines, at some point upstream of the hydrant, would be supplied with water by the utility.

Two hundred fifty-seven utilities<sup>4</sup> were incorporated into the data base with two-hundred fifty-six providing responses and one being represented by limited data from their last Annual Report (Gary Water Works). The data shows that there are 47,614 utility-owned hydrants and 2,292 privately-owned hydrants. The total of all hydrants across the State is 49,906 with 95% of these being utility hydrants and 5% being private hydrants. The number of hydrants operated by an individual utility varied from one hydrant (Hughes River Water Board) to 10,548 hydrants (WV American Water Company). The average number of hydrants per utility was 194; the median was 80 (representing the mid-point of values) and the mode (representing the most common value) was 24.

The data for the non-profit subset shows that they operate 36,026 utility-owned hydrants and 2,126 privately-owned hydrants. The total of all non-profit operated hydrants across the State is 38,152 with 94% of these being utility hydrants and 6% being private hydrants. The number of hydrants operated by an individual non-profit utility varied from one hydrant (Hughes River Water

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<sup>4</sup> The Commission regulates more than 257 water utilities however, not all water utilities operate fire hydrants.

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Board) to 2,363 hydrants (Berkeley County Water District). The average number of hydrants per utility was 151; the median was 80 (representing the mid-point of values) and the mode (representing the most common value) was 24. These population statistics comport with our experience that most utilities in West Virginia operate a fairly small number of hydrants.

#### Undersized (Small) Mains

The next key data collected concerned the number of hydrants which were installed on undersized or "small diameter mains" - with such designation being based on Bureau for Public Health design standards (64CSR77). This standard does not allow the installation of new fire hydrants<sup>5</sup> on water lines less than 6" diameter. The data show that there is a total of 2,247 hydrants installed on mains less than 6" diameter. This represents about 5% of the total number of hydrants and was significantly less than anticipated - especially when one considers the number of older, rural water systems in our State. For the non-profits, a total of 1,917 hydrants were reported to be on small mains representing 5% of that subgroup.

It was common practice in the early days of the development of rural water distribution systems to utilize the smallest size main capable of conveying only domestic water demand; funding agency guidelines of that time (circa 1950's thru the early-1970's) did not generally include fire flows for rural systems. This was done to stretch the available funds to install as much main line as possible and thus, to serve as many customers as possible with the funds available. This practice ceased in the 1970's and the older, rural systems that have been rebuilt over the last five decades have generally been redesigned to provide fire flow; this may account for the lower-than-anticipated number of hydrants found on small diameter mains.

We note that the size of the water main is not the only factor which determines if any particular hydrant can supply fire flows, the entirety of the water system must be evaluated and flow testing must be completed in order to determine if hydrants on smaller mains or, on any main for that matter, can or cannot provide adequate fire flow. As noted, a key recommendation of this investigation will be for regular flow testing of hydrants – which will allow for a

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<sup>5</sup> Existing fire hydrants that were installed on lines smaller than 6" diameter were "grandfathered in" at the time that the Health Department enacted this rule and were not required to be removed.

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better determination of a water systems actual capacity. This testing should be conducted on a regular basis and complete records of these tests should be maintained and made available to interested parties. Such data is essential to the design of water system improvement or replacement projects; unfortunately, this data is not readily available across all water utilities in our State at the present time. Standardized and codified requirements for flow testing and associated record keeping will address this lack of data (see Recommendations section).

### Age

The next piece of information relates to the age of our fire hydrants. Five requests in the survey related to the age, replacement, retirement and the installation of fire hydrants. Questions relative to the age of hydrants included questions 6 & 7 which requested the number of hydrants older than 50-years and the age of the oldest hydrant on a system, respectively. Questions 13-15 gathered information relative to the removal and installation of hydrants. This information provides a high-level overview of the age and renewal rate (replacement cycle) for the hydrants in our communities.

Many of our fire hydrants are of advanced age and this was captured by the total number of hydrants that are 50-years or older with this total being 5,340 or, 11% of the hydrant population. The subsequent question (number 7) provides some interesting information about the oldest hydrants in-service; with the oldest reported by the Parkersburg Utility Board at 138 years. But, many other water utilities reported having hydrants 100-years or older. The range of hydrant age varied from 1-year<sup>6</sup> to 138-years.

For the non-profits, the oldest was the 138-year-old "Methuselah" listed by the Parkersburg water board while the number of hydrants 50-years or older was 4,015 which was 11% of that population. As we will explain below, although a fifty-year old hydrant may be acceptable, utilities should plan on replacing hydrants as they approach this age.

Next, the data shows the rate that our fire hydrant population is being replaced and expanded. Items 13 and 15 of the survey provide information on the number of hydrants which have been replaced over the previous 5-year

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<sup>6</sup> The Town of Mill Creek reported all new hydrants as they recently completed a water system replacement project.

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period and on the number of new hydrants (including replacements) installed in the last ten years. Over the previous five-year period, 2,228 hydrants were replaced in-situ while a total of 6,828 new or rebuilt hydrants (including the in-situ replacements) were added in the last ten-years. Using this data, we calculate a theoretical hydrant replacement cycle<sup>7</sup> of the all-utility group of seventy (70) years. This far exceeds the recommended lifespan of a fire hydrant by any standard and is unsustainable.

For the non-profit group, over the previous five-year period, 1,579 hydrants were replaced in-situ while a total of 5,317 new hydrants were added in the last ten-years. Using this data, we calculate a theoretical hydrant replacement cycle for the non-profit subgroup of sixty-eight (68) years. Again, this far exceeds, by any measure, the recommended lifespan of a fire hydrant and is simply not unsustainable.

Although fire hydrants are robust devices they do have a finite life and, like any mechanical device may be rendered nonfunctional or obsolete due to a variety of factors. The basic form and function built-into every modern fire hydrant is literally centuries old and remarkably, many firms have been manufacturing essentially the same style of hydrants for over a century – while adapting their product to advances in materials, such as by using polymers in lieu of leather in valve seats or by using O-rings instead of stuffing boxes and so forth. (A typical cross-sectional drawing of a fire hydrant showing design features is provided as Attachment D.)

This having been said, eventually a hydrant must be replaced owing to many reasons such as the unavailability of parts, corrosion, physical damage a lack of maintenance, lack of lubrication and so forth. In general, the utility industry has not set a firm guideline for the replacement of hydrants based on age. We believe, based on our research and experience, that fifty (50) years represents a reasonable lifespan for planning purposes and would encourage utilities to plan for the replacement of hydrants at fifty years of age.

Using this lifespan, the data shows that our State has a total of 5,340 hydrants in need of prompt replacement based on age with 4,015 of those belonging to non-profit utilities. Of course, not all 50-year old hydrants will need

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<sup>7</sup> Replacement cycle (RC) is a calculated figure indicating how long (years) it would take to replace all fire hydrants at the current rate of replacement.  $RC = \text{Total number of hydrants} / \text{number replaced annually}$ .

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immediate replacement and other hydrants of lesser age may need more urgent replacement than their older counterparts. This is one further reason to implement a well-planned hydrant inspection program which will define replacement needs and establish replacement priorities.

Finally, question 14 shows that very few hydrants have been completely removed from service. A state-wide total of 175 hydrants were removed and not replaced, representing less than one-half of one percent of the total. For the non-profit group, the total was 159 which is also less than one-half of one percent of the total non-profit hydrant population. These relatively low numbers may be viewed as acceptable in-light of many circumstances which may result in a hydrant being removed and when further considering the number of new hydrants that have been installed.

#### Maintenance & Inspections

Request 8 asked the utility if they had a written procedure for hydrant maintenance (maintenance procedures include inspection). This is a basic operational procedure for water systems. Only 109 utilities (42%) indicated that they have a written procedure for hydrant maintenance & inspections. For the non-profit subgroup, the number having written hydrant inspection procedures is 105 which is also 42% of that subgroup.

Both of these metrics indicate an unacceptable situation with respect to hydrant practice. **ALL** water utilities operating hydrants must have a written procedure for the maintenance and inspection of these essential components therefore; anything less than 100% is not acceptable. Further, written hydrant procedures are readily available throughout the industry and may be obtained at no cost from trade associations and from hydrant manufacturers; there are just no excuses for any utility to lack this critical procedure.

Request 9 asked the utility to provide information on the average number of hydrants that they inspect per year based on the past 5-years (the number of inspections would be anticipated to vary annually but, a five-year average should even out these variations). The utilities reported a total of 34,574 hydrant inspections took place annually, giving an annual inspection rate of 73% per year - exclusive of private hydrants<sup>8</sup>. For the non-profits subgroup, a

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<sup>8</sup> Public utilities are usually not responsible for inspecting, testing or maintaining private hydrants.

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total of 23,604 hydrant inspections were reported giving an annual inspection rate of 62% - again exclusive of private hydrants.

Both of these figures are subpar and are indicative of a critical problem in our water industry. As is the case with the use of written procedures, anything less than a 100% annual inspection rate is unacceptable. Considering the importance of fire hydrants to public safety and the standards established by the NFPA and AWWA – **ALL** fire hydrants should be inspected at least annually<sup>9</sup>. To correct this serious deficiency in utility operations, we recommend that all water utilities inspect every hydrant under their jurisdiction at least annually, in accordance with NFPA 291 and AWWA M17, and to report and certify the number of hydrants inspected as part of their Annual Report (see Recommendations section). The written results of these inspections will provide a valuable planning tool and should be maintained in the utility's records for regulatory review upon request.

### Flow Testing

Flow testing of fire hydrants is an essential part of water utility operations yet, it is often neglected or dismissed altogether. The data regarding flow testing were posed as questions 16 through 21 with perhaps the most important question (request 16) being "*Do you routinely conduct flow tests on hydrants?*" Only 175 utilities, slightly more than two-thirds, reported conducting this critical testing on a routine basis. Within the non-profit subgroup, a total of 171, or again just over two-thirds, reported completing flow tests on their hydrants.

Once again, the data shows the performance of our water utilities with respect to hydrant practice is unacceptable. As with annual hydrant inspections, **ALL** fire hydrants should be flow tested on a regular schedule<sup>10</sup> in accord with national standards. It is incomprehensible, considering the importance of fire hydrants to public safety, that so many of our water utilities fail to complete this

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<sup>9</sup> The inspection of hydrants should be accomplished annually in accordance with established standards. As part of the annual inspection, hydrants should be thoroughly flushed to remove possible obstructions and verify flow. This flushing may be accomplished by a concurrent flow test but, flow testing is not required during annual inspections.

<sup>10</sup> The flow testing of hydrants should be completed on a regular 5-year schedule pursuant to the requirements of NFPA 291.

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essential testing. This further highlights the need for a standard, codified requirement for flow testing. To remedy this deficiency, we recommend that the Commission require all water utilities to perform periodic flow tests on hydrants and to report and certify the number of hydrants actually flow tested each year as part of their Annual Report (see Recommendations section). The written results of these tests provide an essential tool to evaluate the health & condition of a water distribution system and are critical for engineering & planning purposes. Written records of flow testing should be maintained in the utility's records and made available to regulatory and rating-agencies upon request.

Question 17 was intended to capture the general types of flow testing completed. The answers showed that the majority of utilities that actually test hydrants do so (at least most of the time) by using a physical, on-site method. Some utilities also reported using a combination of on-site testing, hydraulic modeling and other methods to test their systems. The only acceptable testing method recognized by the national standards (and by the insurance companies and rating agencies) is a physical, on-site test. While hydraulic models and other kinds of tests may provide useful information about a water system they are not to be used in-lieu of physical, on-site hydrant tests conducted in accordance with NFPA 291 and AWWA M17.

Question 18 asked for the minimum available fire flow and, as expected, the answers varied widely - from a low of less than twenty gallons-per-minute (gpm) to a high of 14,000 gpm. The average minimum flow was 500 gpm while the median (mid-point of data) was 370 gpm and the mode (most common value) was 250 gpm; these statistics confirm a wide variability in the data. For the non-profit subset, the average minimum flow was 507 gpm while the median (mid-point of data) was 380 gpm and the mode (most common value) was 250 gpm; these statistics again confirm a wide variability in the data. We note that current WV design standards for public water systems (64CSR77) does not require that a water system be designed to provide fire flows but, if fire flow is to be provided then the minimum flow rate for design purposes is 250 gpm. The wide knowledge of this standard may or may-not have subjectively skewed the self-reported data provided in response to our requests.

Questions 19-21 requested information on testing of hydrants by agencies other than the utility. Only thirty-two (32) utilities reported that flow



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tests had been conducted by the ISO<sup>11</sup> while fifty-four (54) utilities reported having flow testing conducted by “other agencies”. These low numbers tend to confirm our experience in that the ISO and other rating agencies do not routinely visit the hundreds of small rural & municipal water utilities located across our State. (This data for both the total-utility group and the non-profit subset regarding type of flow tests completed were similar.)

Our investigation of hydrant testing practices demonstrates that an unacceptably large portion the hydrants protecting our communities are not regularly flow tested. To remedy this problem, we recommend that the Commission require all water utilities to conduct periodic flow testing of fire hydrants in accord with the methodology and frequency-of-test requirements established by NFPA 291 and AWWA M17. We further recommend that all water utilities operating hydrants be required to report and certify the actual number of hydrants flow tested each year in accord with these national standards as part of their Annual Report. As with all utility records, the written results of these tests must be maintained and made available for review upon request.

### Complaints

Questions 22-25 collected information regarding complaints related to fire hydrants. There have been very few formal complaints filed related to hydrants, with only two utilities listing a combined total of four formal cases<sup>12</sup>. The grand total (formal and informal) was eight complaints, including the four formal cases.

### Self-rating & Issues

Finally, questions 26 and 27 asked the utilities to rate themselves on a scale of 0 (poor) to 10 (very good) and then to provide a description of serious issues or problems that they believe may be impacting fire hydrants on their

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<sup>11</sup> ISO refers to the “Insurance Services Office” which is a national entity supported by the insurance industry to assist insurers in identifying and quantifying risks. Since fire is a major property risk, firefighting capabilities, including the supply of water to a community, are important in determining risks and thus, in setting insurance rates.

<sup>12</sup> Only one of the four reported formal cases could be confirmed to involve fire hydrants; this was Case No. 21-0752-PWD-C, Robinson v. Nettie-Leivasy PSD.

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systems. The self-ratings ranged from 0 to 10 with the most common rating being 8. The average rating was 5.9, the median was 6.0 and the mode was 8.0 with these statistics indicating variability in the reported values – as would be anticipated for subjective criterion. Interestingly, several utilities self-reported a rating of zero which perhaps shows a certain level of self-consciousness concerning their own remiss hydrant practices.

Finally, few utilities bothered to attach comments concerning their hydrant concerns and those that did cited common issues including; hydrant age, traffic damage to hydrants, unacceptable system pressure (both high and low pressure), historic poor maintenance of hydrants, lack of manpower, lack of funds and similar matters.

### Regulation

Our review of applicable WV Code provisions relative to fire hydrants found only two Code sections speaking substantively to fire hydrants. First, WV Code Chapter 8 - Municipal Corporations at paragraph §8-19-20 sets forth requirements for the installation and spacing of fire hydrants on new water mains which are “*specifically intended to provide fire protection*” and which are installed after July 1, 2007 and which further requires that mains to which hydrants are attached are “*not less than six inches in diameter*” and that such water system “... *has sufficient hydraulic capacity ...*” to support fire flows. These requirements are consistent with the design standards established by the Health Department in 64CSR77. Next, Code section §8-19-22 sets forth a requirement to identify fire hydrants that are “*inoperable or unavailable for use*” by painting the hydrant black or by covering them with a black tarp. We found no corresponding CSR regulation speaking to this requirement.

We also conducted a review of pertinent sections of the Code of State Regulations (CSR) and also found no substantive regulation that pertains specifically to hydrants operated by water utilities<sup>13</sup>. Although the State Fire Code (87CSR01) does reference one national standard citing hydrants (NFPA 25), this NFPA standard only incidentally speaks to hydrant inspection and

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<sup>13</sup> Fire hydrants are mentioned incidentally but, no standards related to their inspection, testing or marking are provided, in the WV DEP’s “Waste Tire Management Rule” 33CSR05 and in the State Fire Commission’s Rule for “Volunteer Firefighters’ Training, Equipment and Operating Standards” 87CSR08.

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testing and then only in the context of hydrants which are part of private fire protection systems such as would be seen on a large industrial site, a chemical plant or a campus. Historically, this standard, which is referenced in an appendix to the fire code has not been interpreted to apply to the tens-of-thousands of hydrants operated by public utilities.

Next, we looked to those specific administrative rules relative to public water utilities, the Commissions Water Rules (150CSR07) and the WV DHHR's Public Water Systems Design Standards (64CSR77). Nothing within these two regulations specifically address requirements for the inspection, flow testing and marking of fire hydrants. Neither of these rules nor any other rule or code provision which we were able to locate contained reference to the two national standards specific to fire hydrants operated by public utilities (i.e. NFPA 291 and AWWA M17).

Thus, we conclude that no existing provision of either State Code or Regulations specifically addresses the important need to conduct annual fire hydrant inspections, periodic flow testing of hydrants and the need to mark hydrants to clearly indicate their capacity to first responders.

### **Hydrant Replacement Grant Program**

This investigation clearly shows significant issues with the way fire hydrants are being inspected and flow-tested. But just as importantly, we also found that a significant percentage of our nearly 50,000 hydrants are fifty-years of age or older and that the replacement cycle for our fire hydrants is unsustainably long at almost three-quarters of a century. Across all of our water utilities there are more than 5,300 hydrants in need of prompt replacement, based on age alone. This includes more than 4,000 hydrants operated by non-profit utilities. The cost to replace these hydrants is significant.

Owing to the critical role which fire hydrants play in public safety and the large need for hydrant investment we believe that it would be prudent to accelerate the replacement of old and nonfunctional hydrants. However, the high costs of such a program would place a large financial burden on smaller utilities and many of these utilities simply cannot afford to increase spending on hydrants without significant rate increases. This is particularly true for the non-profit utilities which have generally smaller customer bases and limited access to capital for investment. These utilities nearly always rely upon government

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subsidized funding for significant capital expenditures. This limitation must be recognized and carefully considered in any proposal to accelerate the replacement of fire hydrants.

To most effectively address this need, we believe that it would be advantageous to establish a funding program specifically for fire hydrant replacement for non-profit water utilities. Using the data developed during this investigation, we have developed a preliminary estimate of the costs for such a state-wide Hydrant Replacement Grant ("HRG") program. The estimate is based on the data developed in this investigation and also relies upon assumptions based on professional experience and knowledge of the utility industry. The assumptions and the preliminary cost estimate are provided as Attachment E which gives a total estimated cost for the HRG program at \$70-million.

Note that this estimate is an "order-of-magnitude" estimate using preliminary data and assumptions and the actual cost would be expected to vary somewhat. But, we believe that this estimate is appropriate for planning purposes. Further, due to the large amount of funding that would be required, this program would need to be spread across multiple fiscal years to be manageable. Spreading the cost of this program over ten-years gives an estimated cost for the hydrant replacement program of \$7,000,000 annually.

The key tenants of the Hydrant Replacement Grant (HRG) program, as now envisioned include the following.

- HRG funds would be appropriated by the Legislature and then administered and disbursed by the WV Infrastructure & Jobs Development Council (IJDC) under program guidelines established by that agency.
- The HRG program will be available to only non-profit, regulated water utilities.
- HRG funding would be made to eligible water utilities following proper application, review and approval of the IJDC.

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- Costs for the inspection of all of the utility's fire hydrants and the preparation of a report documenting the condition of all hydrants would be a project-eligible expense.

### **Findings**

Based upon the results of the data request, professional experience, a review of pertinent literature, a review of State Code and Administrative Regulations and discussions with water utility managers and operators and other interested parties, we offer the following findings.

1. Functioning, reliable fire hydrants are an essential component of the public safety infrastructure; they are critical to insuring the safety of the general public and to the protection of life and property. The presence of a fire hydrant signifies water is available for fighting fires.
2. Public water utilities have a moral obligation to maintain fire hydrants under their control; they are the logical entity to undertake hydrant inspection, testing, marking and maintenance.
3. The State of West Virginia is home to nearly 50,000 fire hydrants operated by two-hundred fifty-seven public water systems regulated by the Commission.
4. Fewer than half (42%) of public water utilities have written maintenance & inspection procedures for fire hydrants and on-average nearly one-third of the hydrants in our State are not inspected annually.
5. Only two-thirds of our public water utilities flow test hydrants regularly.
6. Neither current WV Code nor the Code of State Regulations contain specific provisions requiring the annual inspection, periodic flow testing and marking of fire hydrants in accord with national standards.

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7. The appropriate national standards for fire hydrant inspection, testing and marking are NFPA 291 and AWWA Manual M17.
8. A substantial number of fire hydrants (5,340) are over fifty years old and will need of replacement soon. Many utilities have hydrants that are more than one-hundred years old.
9. A program replacing older and nonfunctional hydrants for non-profit water utilities would cost approximately \$70,000,000. Spreading this over ten fiscal years would require \$7,000,000 in annual funding.
10. The benefits of mandatory hydrant inspection and flow-testing programs when coupled with increased hydrant replacement include; enhanced public safety, improved water system operations, better firefighting capabilities and lower fire-insurance premiums.

### **Conclusions**

Fire Hydrants are essential pieces of public safety infrastructure and they are not properly regulated in conformance with established national standards. The testing, inspection and marking of fire hydrants should be defined by Code and established by regulation. The Public Service Commission, by virtue of existing jurisdiction over water utilities is the logical entity to promulgate regulations for fire hydrant practices. Such regulations should adopt the pertinent national consensus standards which establish that all fire hydrants are to be inspected annually, flow tested periodically and clearly marked to indicate water flow capacity. A significant financial need was found related to replacement of our fire hydrants and funding should be appropriated to fill this need.

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### Recommendations

1. The Commission should revise the Water Rules (150CSR07) to address hydrant inspection, testing and marking. The pertinent national standards are NFPA 291 and AWWA M17 and these should be adopted into the revised Water Rules by reference.
2. All water utilities operating fire hydrants should be required to report and certify, in their Annual Report, the number of fire hydrants inspected for the year and the number of fire hydrant flow tests completed for the year.
3. Funding should be provided to provide for the replacement of aged and nonfunctional hydrants. A Hydrant Replacement Grant (HRG) grant program may be established to provide for this critical need.

**ATTACHMENT A**

**DATA REQUEST**



## Attachment A

Public Service Commission of West Virginia (PSC) Questionnaire on Fire Hydrants			
Name of Utility			
Person responding or person to contact for questions or additional information			
Name			
Phone			
Email			
Date			
Please answer the following questions and, where required, attach explanations or separate reports			
1	Total number of utility owned public fire protection hydrants?		
2	Total Number of privately owned hydrants located on utility owned mains and service lines?		
3	Total number of privately owned hydrants located on customer service piping?		
4	Provide the tariff rate for public fire protection hydrants.		
			Check Whichever is Applicable
	Fixed total rate	\$ _____	per Month _____ Year _____
	Rate per hydrant	\$ _____	per Month _____ Year _____
	Other rate structure (explain)		
	Annual public fire service revenue	\$ _____	
	Annual private fire service revenue	\$ _____	
5	Provide the number of hydrants on mains smaller than six-inches.		
6	Provide the number of hydrants older than fifty years.		
7	Provide the age of oldest hydrants on your system.		
8	Do you have written hydrant maintenance practices? (If "Yes" Provide an attachment describing your hydrant maintenance practices.)		
9	On average, over the last five years, how many hydrants do you inspect per year?		
10	Attach reports for your hydrant inspections for the past five years.		
11	How many person-hours are spent per year (on average over the last five years) on hydrant inspections and maintenance?		
12	What is the last five-year average annual internal and external cost of hydrant maintenance & replacement?		
13	What is the total number of existing hydrants removed and replaced over the last five years?		

<b>Public Service Commission of West Virginia (PSC) Questionnaire on Fire Hydrants</b>			
Name of Utility			
14	What is the total number of existing hydrants removed and NOT replaced over the last five years?		
15	What is the total number of new hydrants (factory new or rebuilt) installed over the last ten years (include new locations AND replacements)?		
16	Do you routinely conduct flow tests on hydrants?		
17	How do you perform flow tests or determine flow rates?	Check All That Apply	
		Physical On-Site Flow Testing	
		Hydraulic Model	
		Other (If checked, provide an attached explanation)	
18	What is the minimum flow rate available from hydrants in your system?		
19	Has ISO flow tested any hydrants on your system in the past year?		
20	Has a fire department or other agency flow tested any hydrants on your system in the past year?		
21	Attach copies of flow test reports over the last year from ISO, Fire Departments or other Agencies.		
22	Have there been any formal fire service complaints filed over the last ten years with the Public Service commission?		
23	If there have been any formal complaints filed over the last ten years with the Public Service Commission, provide the PSC case numbers for the complaints.		
24	Have there been any complaints other than formal PSC complaints regarding fire service filed with you, or any fire department or other agency?		
25	If there have been any such complaints filed over the last ten years, provide a description of the complaint and resolution.		
26	On a scale of 0 to 10, with 0 being very poor and 10 being near-perfect, how do you rate your hydrant actual inspection and testing programs and practices?		
27	Provide on a separate attachment a general description of any serious issues or problems that you believe are affecting fire hydrants on your system.		

**ATTACHMENT B**

**DATA SUMMARY**

**ATTACHMENT B****Summary of Key Hydrant Data**

Parameter	All Utilities		Utility Subgroup				Notes
	(A.)	(B.)	Non-Profit		For-Profit		
	(A.)	(B.)	(C.)	(D.)	(E.)	(F.)	(F.)
Number of Utilities	257		252	98%	5	2%	
Total Number of Hydrants	49,906	100%	38,152	100%	11,754	100%	
Utility Operated Hydrants	47,614	95%	36,026	94%	11,588	99%	
Private hydrants	2,292	5%	2,126	6%	166	1%	
Hydrants on Small Mains	2,247	5%	1,917	5%	330	3%	(i.)
Hydrants >50 yrs old	5,340	11%	4,015	11%	1,325	11%	(i.)
Oldest Hydrant			138	Years	116	Years	
Written Maint. Practices	109	42%	105	42%	4	80%	
Number Inspected	34,574	73%	23,604	66%	10,970	95%	(i.)
Routine Flow Testing	175	68%	171	68%	4	80%	
Total New Hydrants (10 yrs.)	6,828		5,317		1,511		
Average new hyd, per year	683		532		151		
Theoretical Replacement Cycle	70	Years	68	Years	77	Years	(ii.)
Reported Minimum Fire Flow							
Average	500	GPM	507	GPM	213	GPM	
Median	370	GPM	380	GPM	250	GPM	
Mode	250	GPM	250	GPM	250	GPM	

**Notes:** (i.) Percentages are based on number of utility-owned hydrants

(ii.) Replacement Cycle is based on number of utility-owned hydrants

**ATTACHMENT C**

**GRAPHICS**



# **Public Service Commission of West Virginia**

## **General Investigation into Maintenance and Testing of Fire Hydrants**

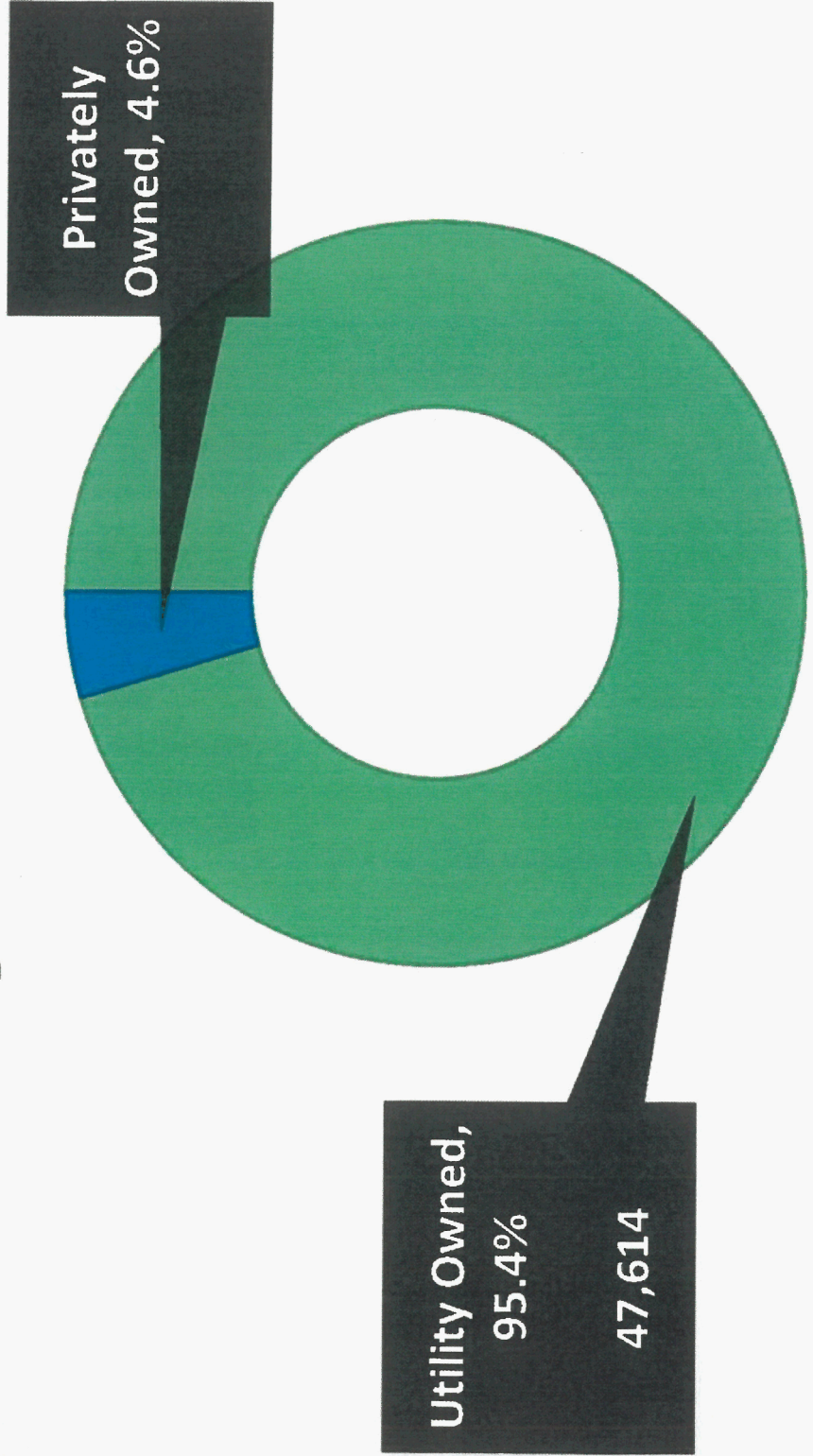
**Case No. 23-0555-W-GI**



**There are 49,906 fire hydrants in West Virginia.**

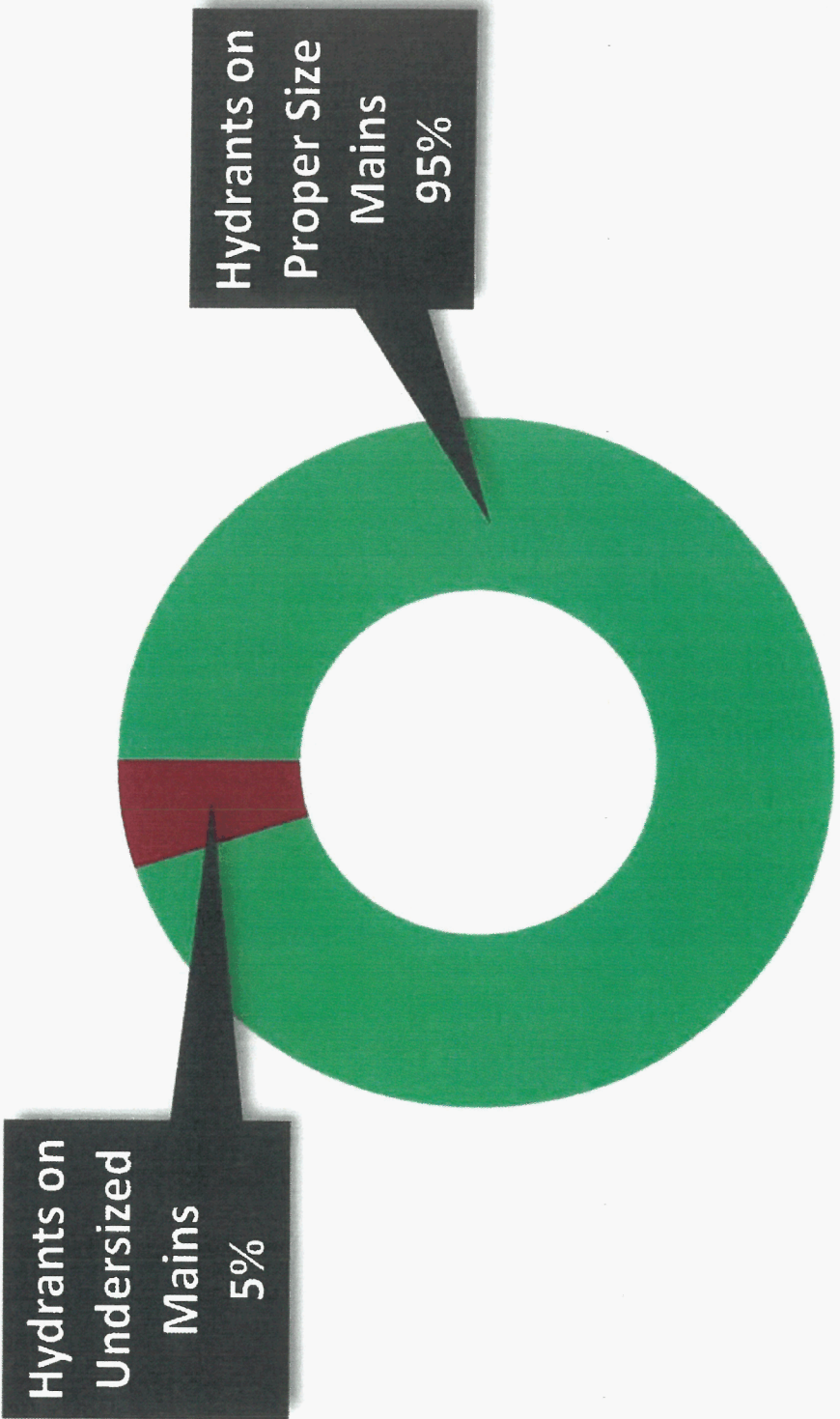
**Utility owned      95.4%**  
**Privately owned    4.6%**

## **By the Numbers**



# Hydrants on Undersized Mains

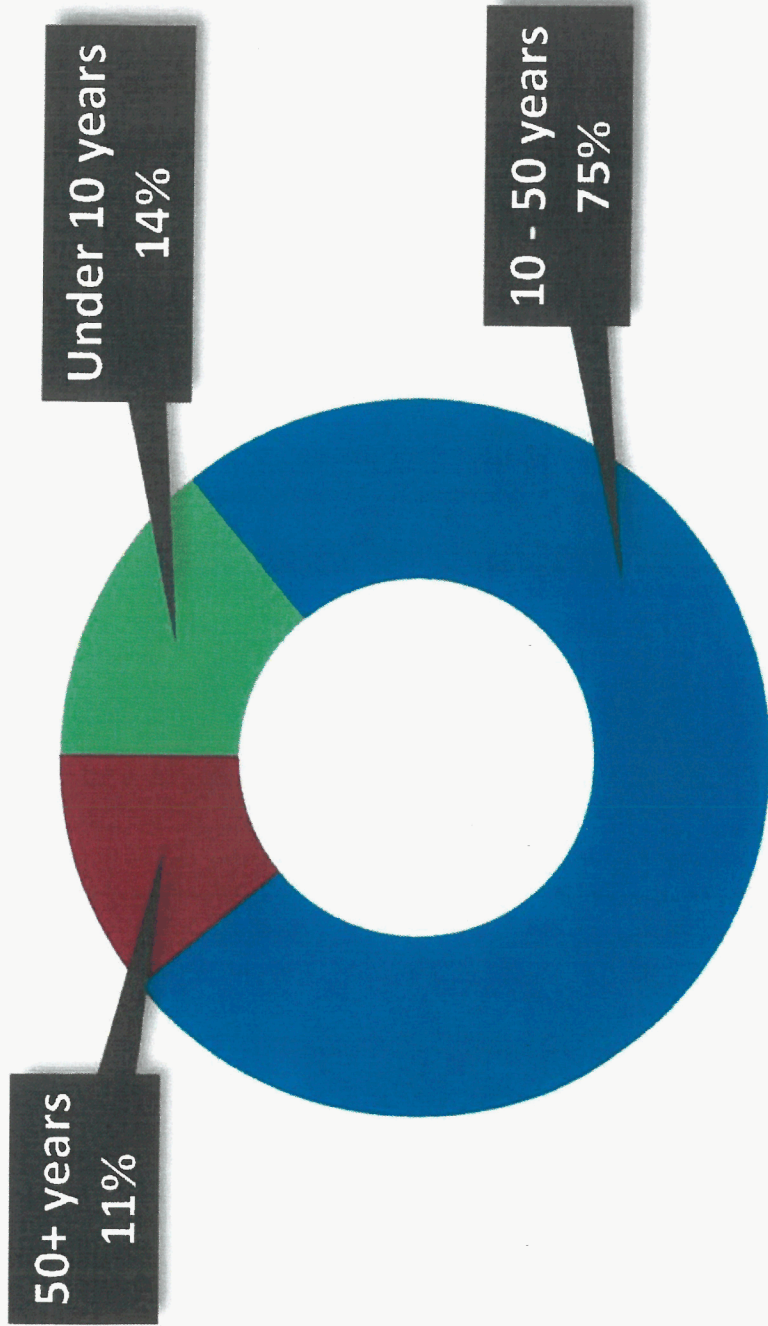
## Size of Water Mains





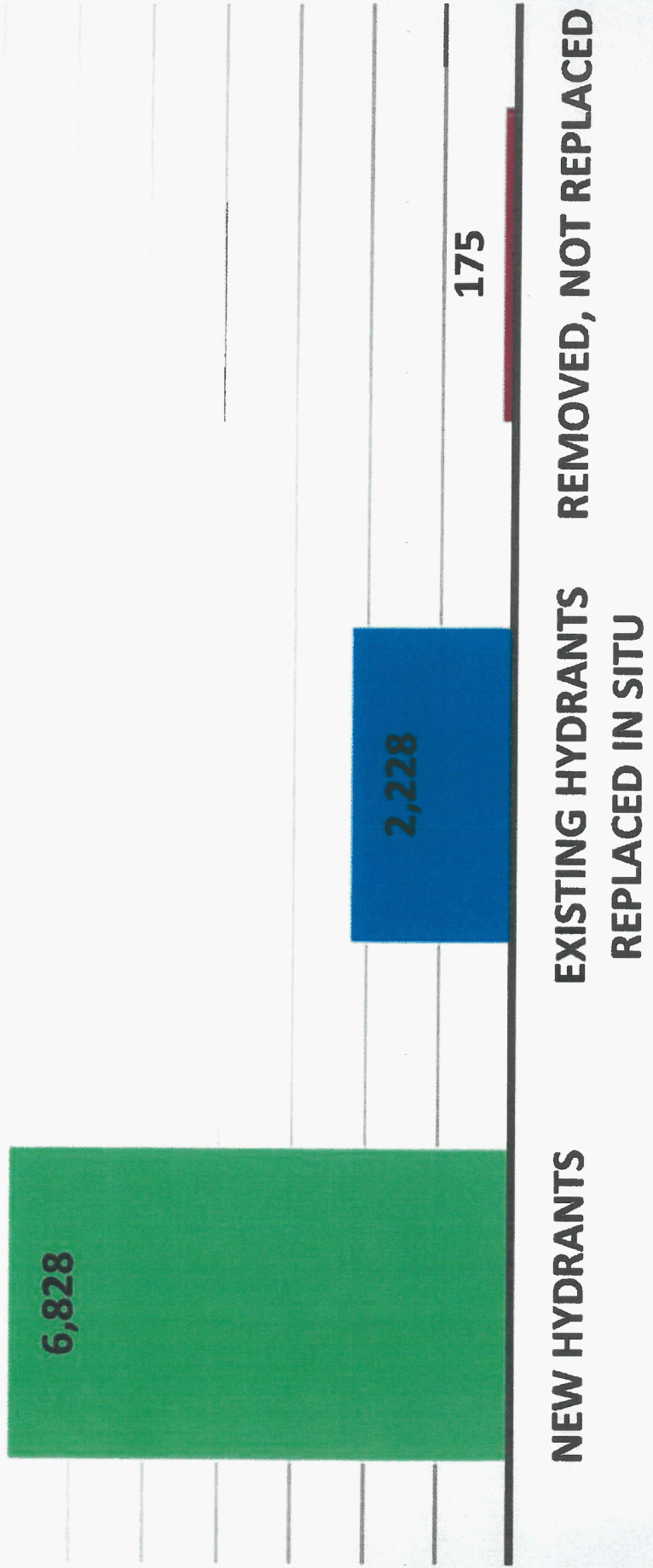
**The oldest hydrant in West Virginia is 138 years old.  
Hydrants aged 50+ years should be replaced.**

## Hydrant Age



# West Virginia's hydrant replacement cycle is 70 years.

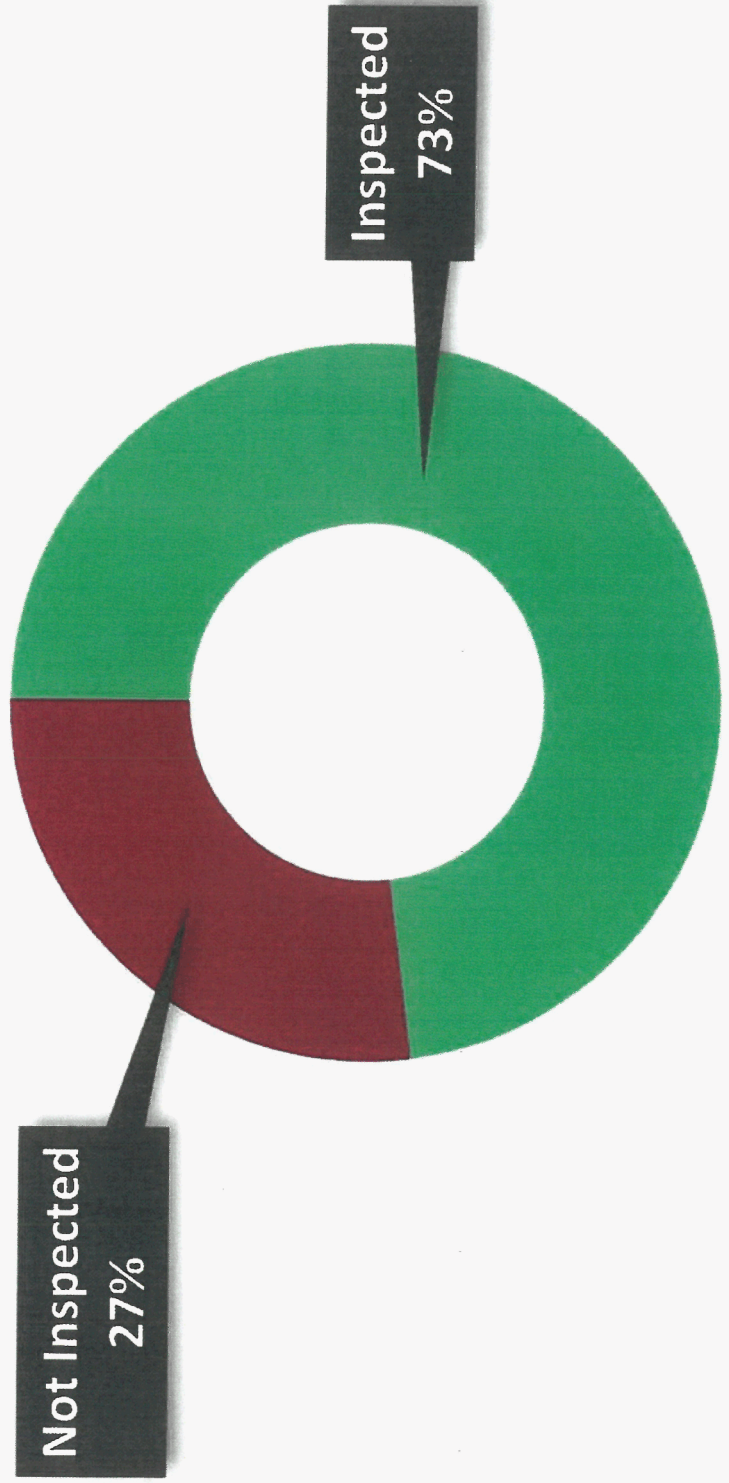
## Hydrant Renewal & Replacement



**Only two-thirds of hydrants in West Virginia are inspected every year.**

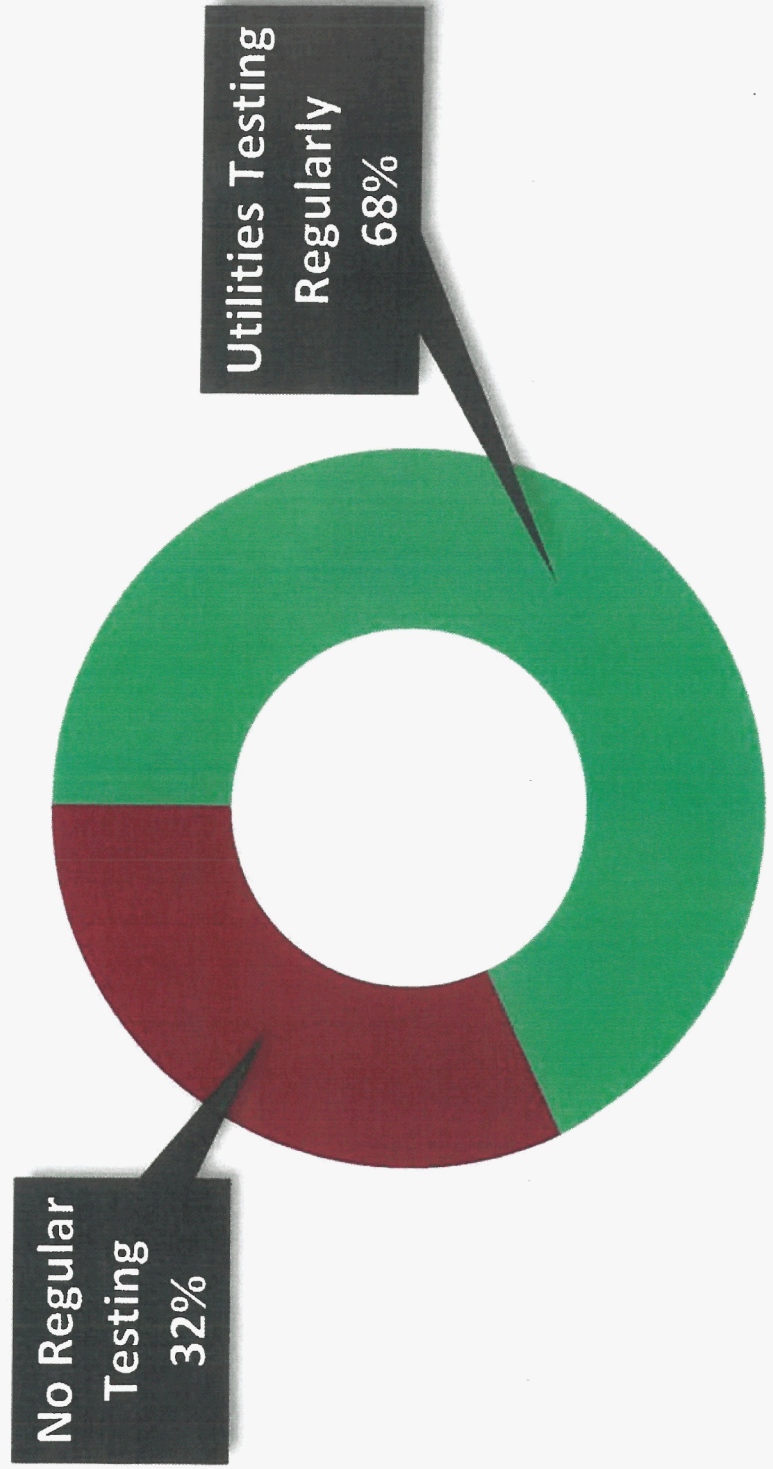
**All hydrants should be inspected every year.**

## **Hydrants Inspected per Year**



**Hydrants should be regularly flow tested.  
All utilities should have written test procedures.**

## Flow Testing



**ATTACHMENT D**  
**HYDRANT DRAWING**

# ATTACHMENT D

## ENGINEERING FEATURES

**MOISTURE PROTECTION** Durable cast iron weather cap combines with one piece copper alloy operating nut and O-rings to provide reliable, corrosion-resistant operation under all weather conditions.

**LUBRICATION RESERVOIR** O-ring sealed reservoir may be filled easily without disassembly.

**TGIC**  
Coating provides a longer-lasting, more durable finish.

**STAINLESS STEEL SAFETY STEM COUPLING SYSTEM**  
Breakaway parts shear cleanly below the top of the barrel, reducing nozzle section damage or opening of the main valve.

**COPPER ALLOY UPPER VALVE PLATE**  
Designed for strength and durability.

**COPPER ALLOY TO COPPER ALLOY** Copper alloy seat ring threads into copper alloy drain ring for corrosion-resistant protection.

**COMPRESSION SEATING**  
High-durometer rubber valve closes with the water pressure for a positive seal.

**PADS** Pads on hydrant shoe give large surface areas for standing and blocking hydrant.

### ANTI-FRICTION

Thrust bearings above and below the copper alloy thrust collar provide low-torque operation even at 250 PSI working pressure.

### BONNET SEALS

Standard O-rings secure mating flanges and sealing throughout the Medallion. All O-rings are dependable and easy to replace.

### COPPER ALLOY NOZZLES

Mechanically locked, corrosion-resistant, field-replaceable copper alloy nozzles have O-ring seals for water-tight connections.

### DRAIN VALVE

Thermoplastic valve facing provides tight, life-long seal. Copper alloy seat ring has 360 degree drain channel. Double ports flush with each use.

### LOWER VALVE PLATE

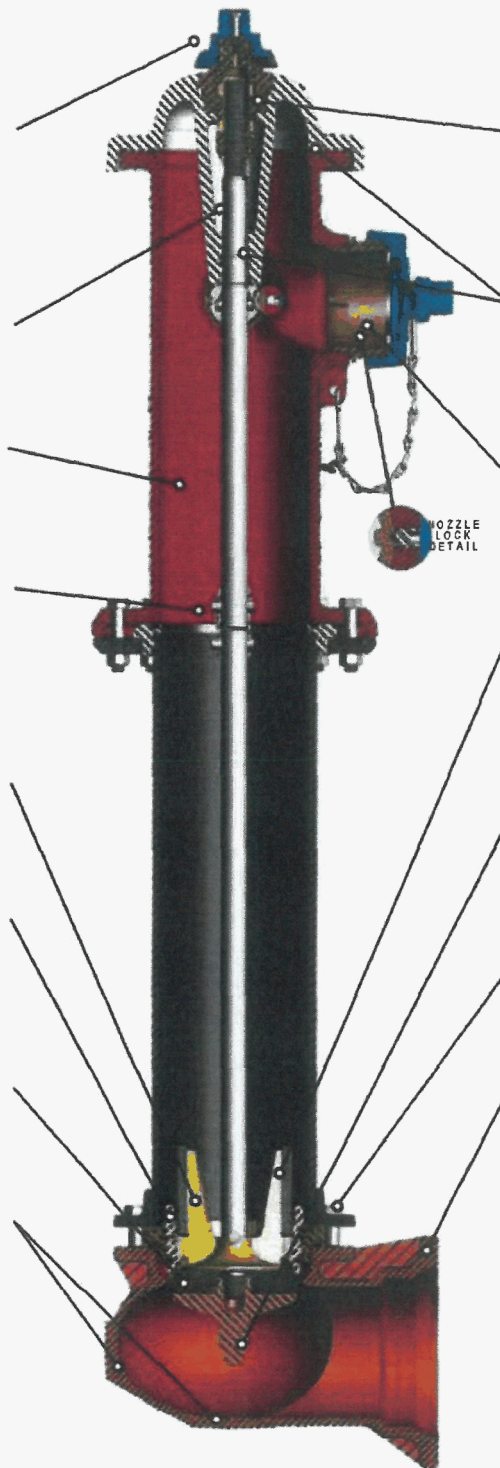
Bottoms out in the ductile iron shoe. Prevents seat from falling below the seat ring.

### NUTS & BOLTS

All fasteners below grade are stainless steel.

### DUCTILE IRON HYDRANT SHOE

Shaped for low turbulence and maximum flow, the shoe is offered in a variety of end connections. Comes standard with epoxy coating inside and out.



Courtesy of the Clow Corporation.

**ATTACHMENT E**

**COST ESTIMATE**

**ATTACHMENT E****Nonprofit Utilities Hydrant Replacement Program (HRP)****I. Inspection Costs:**

36,026 hydrants at \$ 100 each  
 Subtotal: \$ 3,602,600

**II. Construction Costs:**

4,015 aged hydrants  
 721 nonfunctional hyd.  
 4,736 total replaced at \$ 10,000 each  
 Subtotal: \$ 47,355,200

**III. Project (Soft) Costs**

At 20% of Repl. Cost \$ 9,471,040

**Program Cost**

Inspection & Testing:	\$ 3,602,600
Construction:	\$ 47,355,200
Project (Soft) Costs:	\$ 9,471,040
Contingency at 15%	\$ 9,064,326
Total:	\$ 69,493,166

**SAY \$70,000,000**

**Assumptions:**

- 1 All hydrants must be inspected to develop a scope of work.
- 2 All hydrants 50-years and older will be replaced.
- 3 Following inspection, an additional two-percent of hydrants will be found to also require replacement.