

# 2014 Water Infrastructure Report

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Municipal Services Department

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## Introduction

The Municipal Services Department is aiming to provide residents improved information regarding the Village's overall water infrastructure, which comprises the Village's largest single and combined local assets apart from the roadway system.

Over the past several years the Village has implemented significant capital infrastructure projects to improve the Village's aging production and distribution system, some of which dates back to the early 1920's. The largest of these projects was the construction of the Village's new LPRO water treatment plant. Other significant projects however included the installation of new water main on several streets in town and the reconditioning of two of the Village's three wells.

Previous iterations of this report were designed to address questions pertaining to the increased number of water main breaks over the past several years. Moving forward, the purpose of this report will be to highlight future infrastructure improvements for the water production and distribution system.

## Age of the Village's Infrastructure

Water and sewer systems are one of the most important pieces of infrastructure that a municipal government usually manages.

The Village has over 52 miles of water main, of which approximately 26 miles or 46% is over 60 years old. An additional 17 miles is more than 40 years old resulting in approximately 77% of the Village water main system that is more than 40 years in age.

The Village is served by three wells. Well #1 was constructed and put into operation in approximately 1928 and is currently utilized as the Village's emergency well. The Village's two primary deep wells, #3 and #4 were each placed into operation in 1956 and 1965 respectively.

The Village's distribution system is also serviced by an elevated tank at Spring Rock Park and a standpipe located near Garden Market. The elevated tank was erected in 1961 and the standpipe in 1977.

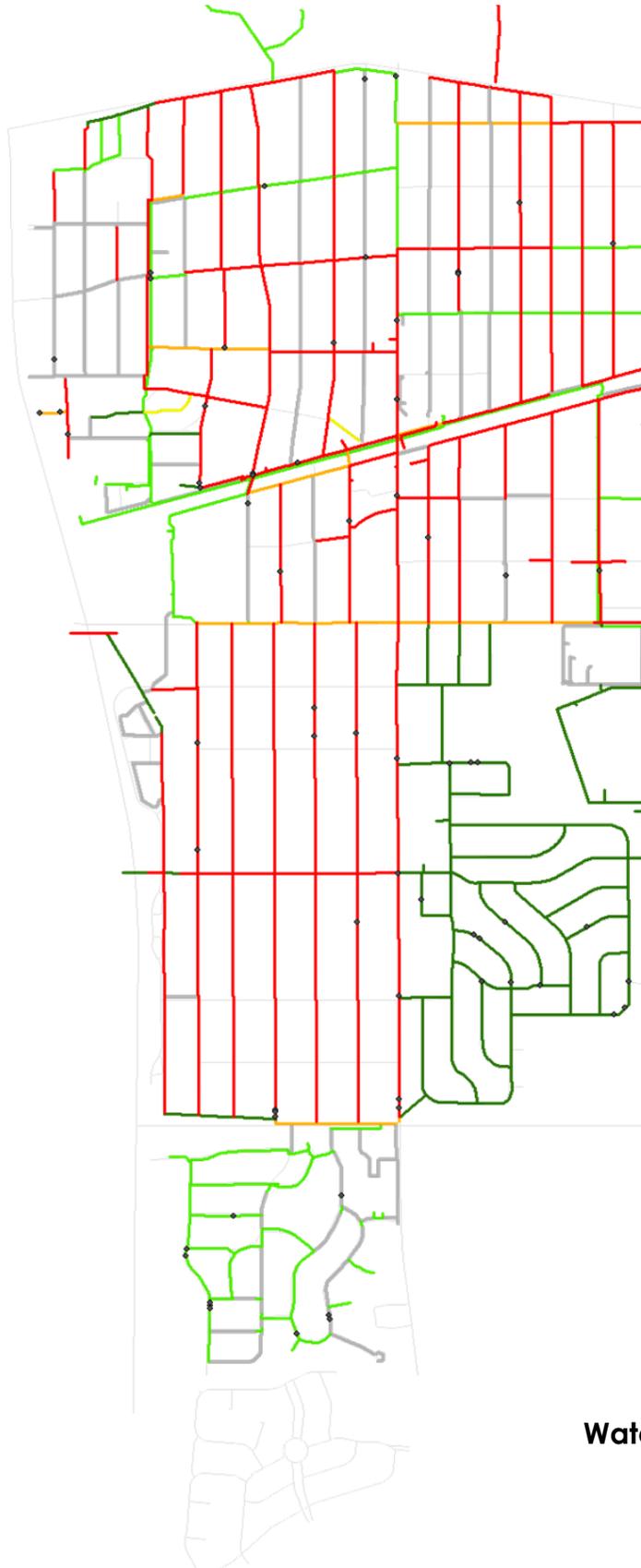
Since the late nineteen-nineties the Village during its roadway construction projects has installed new water main in most cases. The goal was to eliminate the old 4" water main in the Village and that project has mostly been completed. There is however still a large portion of the Village's infrastructure that is beginning to reach the end of life.

### Age of Distribution Pipe

Age (yrs)	Miles
>60	26.33
40-59	16.58
20-39	5.91
<20	5.36



# Village Infrastructure Grouped by Age



### Legend

- WaterMainBreak
- 2014
  - >90 Years Old
  - 80-89 Years Old
  - 70-79 Years Old
  - 60-69 Years Old
  - 50-59 Years Old
  - <50 Years Old

Water Main Pipe Age Distribution by 10 Year Increments

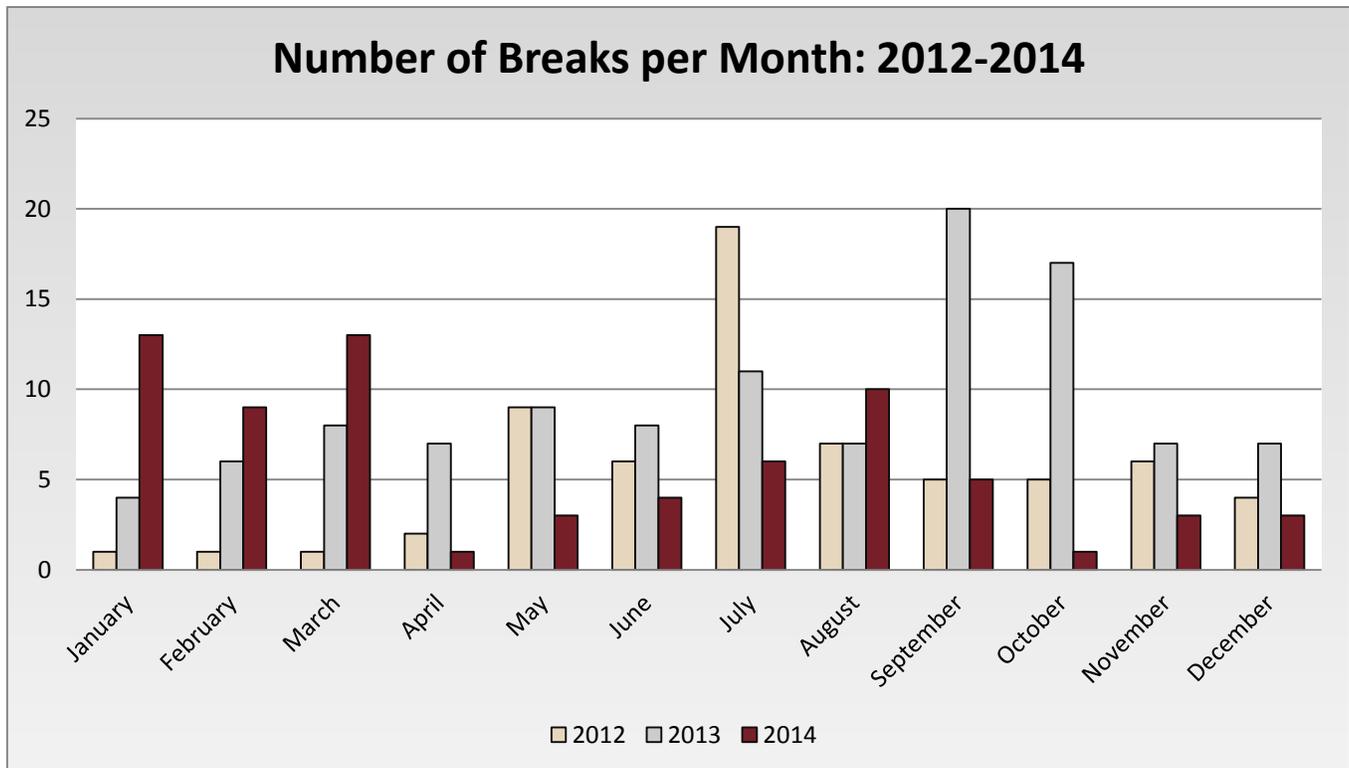


## 2014 Water Main Breaks

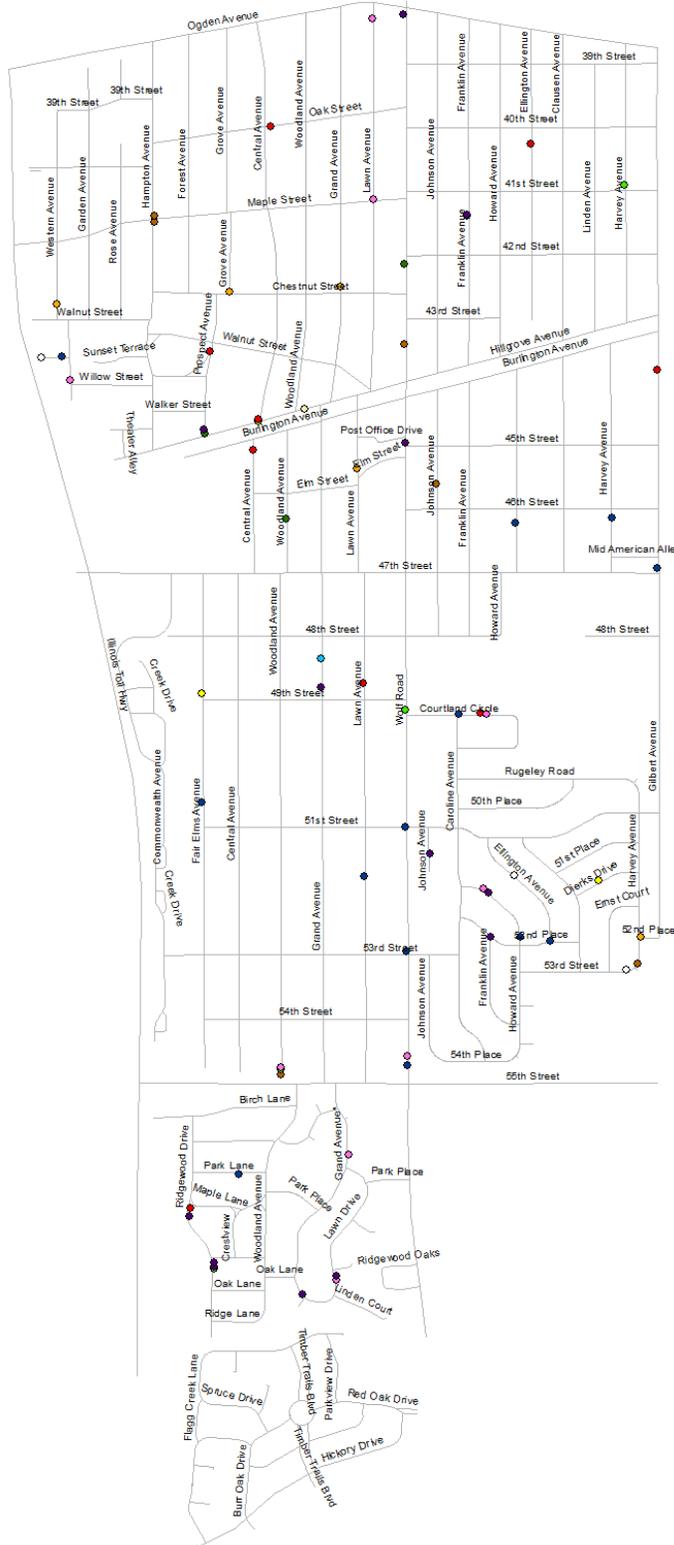
Over the past several years the Village has experienced an increase in the number of water main breaks throughout the distribution system. The [2012](#) and [2013](#) water main break reports looked at these break trends in extensive detail and concluded that the breaks were likely a result of the age of the pipes in the distribution system and the change in the water chemistry as a result of the new water treatment facility.

Village staff continues to track breaks throughout the distribution system to help identify future capital improvement projects in those areas that show increased frequency or clusters of occurrences. To the right is a table comparing the last three years of data through each month of the year. Below is a table showing the break trends for the past three years. 2014 showed indications that the number of breaks was beginning to taper off. January of 2014 was an active year as was the summer demand period, but both the spring and fall of 2014 showed decreasing numbers of incidents compared to previous years.

Month	2012	2013	2014
January	1	4	13
February	1	6	9
March	1	8	13
April	2	7	1
May	9	9	3
June	6	8	4
July	19	11	6
August	7	7	10
September	5	20	5
October	5	17	1
November	6	7	3
December	4	7	3
<b>Totals</b>	<b>66</b>	<b>111</b>	<b>71</b>



# 2014 Breaks by Location



## Legend

- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December
- Roadway Centerline

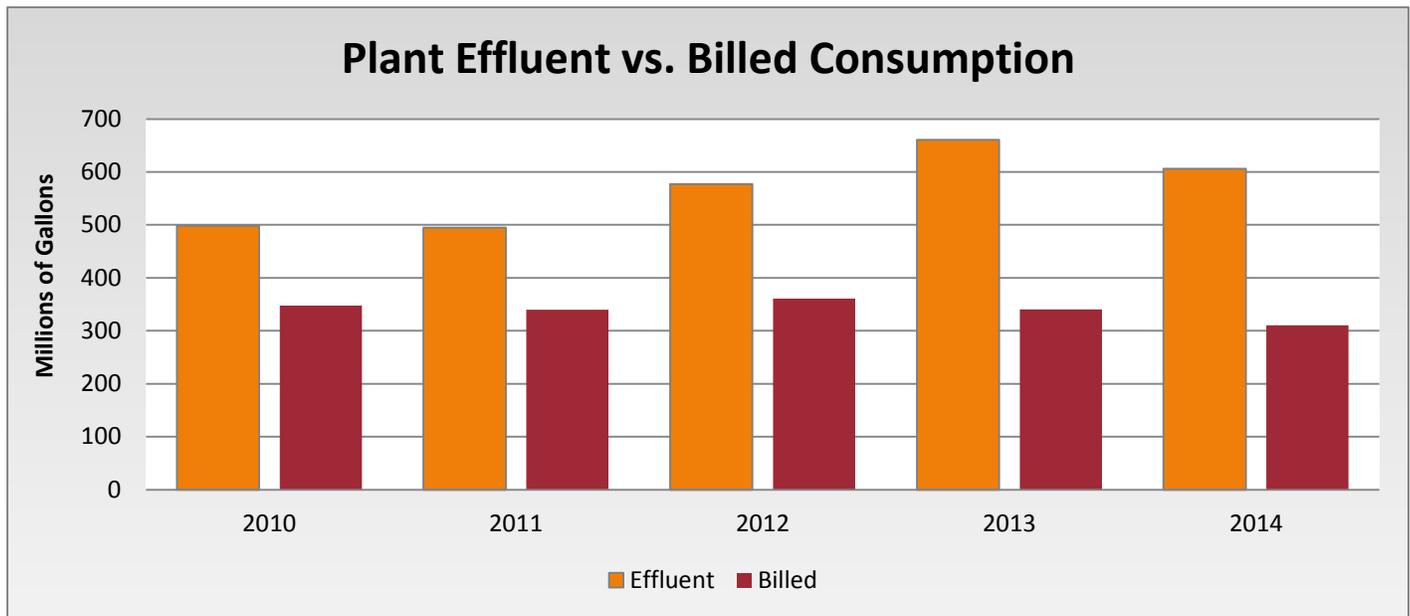


## 2014 Plant Effluent and Water Loss

The Village annually tracks the amount of water that is produced from the water treatment plant and the amount of water that is billed to residents. Due to a variety of factors including water main repairs, the age of the meters in resident's homes, unmetered usage and small leaks in the distribution system, a percentage of water that is pumped to distribution is never billed or accounted for.

Users of Lake Michigan water are required to fill out an annual water form known as a LMO-2 for to attempt to audit for the unaccounted for water. This form allows for municipalities to identify and estimate potentially unmetered uses such as firefighting, water main flushing or street cleaning. The form also prescribes for an estimated acceptable leakage rate for various ages of pipe within the community. These leaks are generally identified as "hairline cracks" that would not normally show up on leak detection surveys. While the Village does not submit this form to the Illinois Department of Natural Resources because it does not utilize a lake water allocation, the form does serve as a useful mechanism to estimate and track for unaccounted water.

Please note that many of the unmetered use calculations are estimates based upon observed flow times and flow capacities of the distribution pipes observed. The numbers should not be used as definitive numbers for the volumes of water used or unaccounted for.



The concerning trend in this graph is the trending increase in the amount of water output from the water treatment plant and the trending decrease from the billed water recorded for consumption. At this point the Village does not have a definitive answer to these trends. One possible factor could be the age of the residential meters located in most homes. The last major change in resident meters occurred in 1994, which would put the age of the residential meters at over twenty years. The old Sensus meters utilize an impeller that rotates with the flow of water to record the volume. Those moving parts may degrade over time and low flows through the meters may not be recorded. A decrease in accuracy of merely 5% of the flow through the residential meters in town could account for nearly 30 million gallons annually.

The replacement of the meters however is a large undertaking in terms of scope and cost. Replacement meters range from approximately \$400 to \$1,100 depending upon their size and the Village wide replacement of the meters in town is estimated to cost between \$3.3 - 4 million.



# 2014 LMO-2 Form

Pumpage Data	Annual	MGD
Lake Michigan Pumpage	0	0.000
Shallow Aquifer Pumpage	2,940,000	0.008
Deep Aquifer Pumpage	722,773,000	1.980
<b>Total Pumpage</b>		<b>1.988</b>
Water Treatment Use	116,924,000	0.320
<b>Gross Annual Pumpage</b>		<b>1.668</b>
Water Sold to other Systems		
...	0	0.000
Estimated Loss to Main Breaks	0	0.000
...	17,268,620	0.047
<b>Total Sold</b>		<b>0.047</b>
<b>Net Annual Pumpage</b>		<b>1.621</b>
<b>Uses</b>		
Residential	310,541,000	0.851
Commercial/Manufacturing	0	0.000
Municipal	1,687,928	0.005
Construction	0	0.000
<b>Total Uses</b>		<b>0.855</b>
<b>% Total Use to Net Annual Pumpage</b>		<b>53%</b>
<b>Hydrant Uses (Estimated)</b>		
Firefighting	125,000	0.000
Water Main Flushing	0	0.000
Sewer Cleaning	0	0.000
Street Cleaning	200,000	0.001
Construction	0	0.000
Other	300,000	0.001
<b>Total Hydrant Use</b>		<b>0.002</b>
<b>% Hydrant Use to Net Annual Pumpage</b>		<b>0%</b>
Department Requirement for Hydrant Use		1%
Excessive Hydrant Use		-0.89%
<b>Unavoidable Leakage/Unaccounted for Flow</b>		
Cast Iron pipes with lead joints		
Age	Miles	Leakage Rate (g/d/mi)
>60	26.33	3000
40-60	0.875757576	2500
20-40	0	2000
<20	0	1500
All Other Pipes & Joints		
>60	0.588825758	3000
40-60	16.58565	2500
20-40	5.91333764	2000
<20	5.3620894	1500
<b>Total Miles</b>	<b>55.65566037</b>	<b>Total MUL</b>
		<b>144,279.81</b>
		<b>Total MUL in MGD</b>
		<b>0.144</b>
Maximum Unavoidable Leakage		0.144
% Maximum Unavoidable Leakage to Net Annual Pumpage		9%
Total Accounted for Flow		1.001
% of Total Unaccounted for Flow to Net Annual Pumpage		62%
<b>Total Unaccounted for flow</b>		<b>0.619</b>
<b>% Total Unaccounted for flow to net annual pumpage</b>		<b>38%</b>



## Key Future and Out-Year Capital Initiatives

The Village as part of its annual budget process identifies near-year and out-year projective initiatives for its capital improvement planning. Below is a list of currently identified 2015 and out-year capital improvement initiatives.

### 2015 Capital Initiatives

- Pull and recondition pipe from well #3
- Conduct infrastructure study for Ridgewood subdivision
- Conduct ice pigging (cleaning) in Ridgewood subdivision
- Dive and inspect elevated tank
- Partial repainting of standpipe
- Implement automation system at water treatment plant
- Continue review and revision of Village's water/sewer atlas
- Complete leak detection survey

### Out-Year Capital Initiatives

- Continue monitoring for unaccounted for water
- Continue planning for residential meter replacement program
- Paint standpipe and elevated tank exteriors
- Paint standpipe and elevated tank interiors
- Research well #5 locations
- Rebuild reservoir roof
- Implement water main lining program

## Key Future and Out-Year Capital Initiatives (cont.)

### Reconditioning of well #3 pipe

Reconditioning of the Village's deep wells is recommended to occur every ten years. The Village last reconditioned well #3 in 2003 and the maintenance is currently overdue. The work that will be done will be similar to the work that was completed on well #1 in 2013 and on Well #4 in 2010. The scope of the work includes the inspection and reconditioning of the 8" column pipe for the well and an inspection and rebuild of the Byron Jackson motor and bowl assembly. Because the project requires the removal of the column pipe this the well will be unavailable for use during the duration of the reconditioning project.

### Ridgewood Infrastructure Study

In response to several infrastructure concerns related to the Ridgewood subdivision the Village has commissioned Baxter & Woodman to conduct a complete infrastructure study for the Ridgewood subdivision. The scope of this study will include the water main, sanitary and storm sewers, and roadway/pedestrian infrastructure. For the purposes of this report, the review of the water infrastructure will focus on the examination and potential options for eliminating several of the "dead end" locations in the distribution pipe in the subdivision's cul-de-sacs. The Ridgewood subdivision is the only subdivision that features such a high number of cul-de-sacs and "dead end" sections. These dead end locations create water taste and quality issues since the water sits in the pipes at these locations for extended periods.

### Ice Pigging

The Village will be conducting a pilot program for water main cleaning in 2015 called ice pigging. Ice pigging is the process of injecting a slurry of ice and water into the water main to clean the inside of the main. This process is less stressful on the pipe than a traditional mechanical pig and does not require the depressurization of the water main to be done. The Village will target the pilot program for the Ridgewood subdivision due to the existing taste and water quality issues. If the ice pigging program is successful the Village will consider expanding its use to other portions of the community as part of a more comprehensive cleaning program. More information on Ice pigging can be found online at the Village's website at the following brochure: [Utility Services Group – Ice Pigging](#)