



City of Rockville

# Briefing on Rockville's Water System Department of Public Works



Mayor and Council Presentation  
February 11, 2008

# Presentation Agenda

- ◆ Introduction.....Craig Simoneau
- ◆ Water Treatment Plant.....Susan Straus
- ◆ Water Distribution System.....Craig Simoneau
- ◆ Conclusion and Next Steps.....Craig Simoneau



# Introduction

## *Purpose of Briefing*

### ◆ **Issues impacting City's Water System Infrastructure**

- **Increasing stringent federal water regulations**
- **Aging infrastructure**
- **Degrading pipe conditions**
  - **Fire flow**
  - **Pipe breaks**
  - **Water quality**

### ◆ **Infrastructure plan to address issues**

- **Water Treatment Plant (WTP) Upgrades**
- **15-Year Water Line Replacement Program**



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# Introduction

## *City Charter*

- ◆ **Article X—Designates Mayor & Council as Water and Sewer Board**
  - ➔ **Construct, operate and maintain water system and water plant**
  - ➔ **Provide fire hydrants for fire flow protection**
  - ➔ **Borrow money**
  - ➔ **Charge and collect fees**
  - ➔ **Purchase and condemn property**



# Introduction

## *Mayor and Council's Vision Areas*

### ◆ **Quality Built Environment**

- ▶ **Reliable water system infrastructure**

### ◆ **Exceptional City Services**

- ▶ **Provide clean, safe drinking water**
- ▶ **Restore water service quickly**

### ◆ **Green City**

- ▶ **Comply with environmental regulations**

### ◆ **Economic Development and Sustainability**

- ▶ **Provide sufficient capacity to accommodate growth and development**



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# Introduction

## *Purpose of Public Water System*

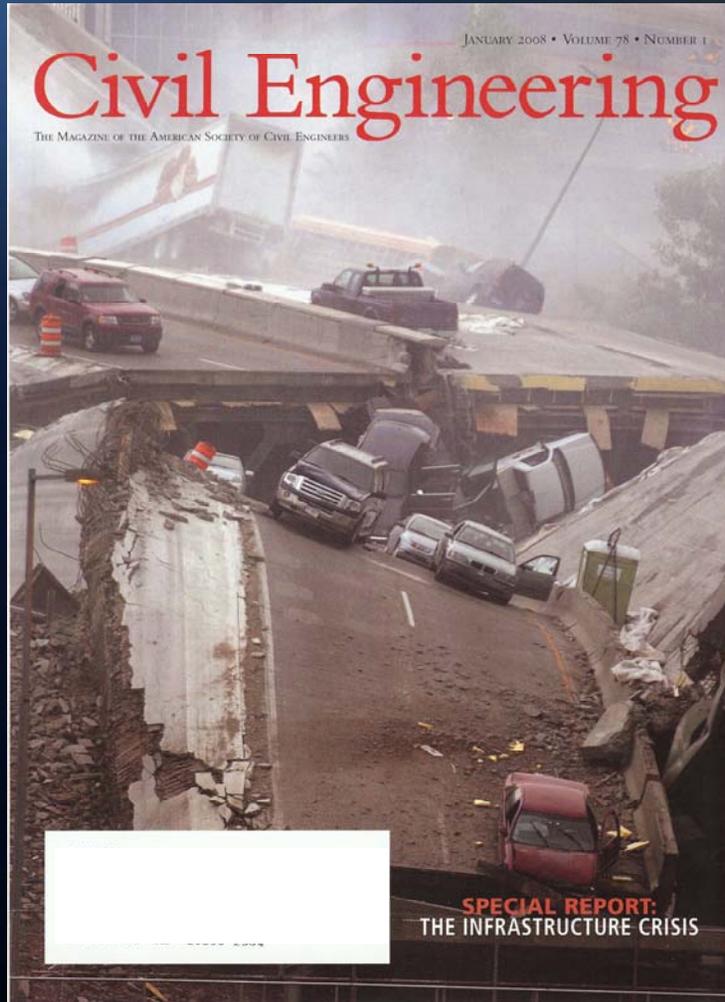
- ◆ **Clean and safe drinking water**
- ◆ **Washing, laundering**
- ◆ **Watering lawns, washing cars**
- ◆ **Heating and air conditioning**
- ◆ **Industrial and commercial**
- ◆ **Fire suppression**



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# Introduction

## National Infrastructure Crisis



### SPECIAL REPORT

National Drought Mitigation Center, which is based at the University of Nebraska at Lincoln.

Water shortages are possible despite the overall abundance of U.S. water resources because of variability in rainfall across the continental United States as well as the difficulty of transferring water between America's 352 river basins. These dangers can be reduced, the 2003 GAO report noted, by ensuring that the necessary infrastructure of canals, pipelines, and other facilities is in place. Population growth, global climate change, and other factors also contribute to the problem. Indeed, 36 state water managers surveyed by the GAO anticipated freshwater shortages locally and even statewide within a decade, the report noted.

David G. Mongan, P.E., F.ASCE, ASCE's president and the president of Whitney, Bailey, Cox & Magnani, LLC, of Baltimore, personally faced drought-induced water restrictions last summer. But he sees the drought itself as only a symptom of the fact that "this country does not have a drinking water supply system to meet the demands that are being placed upon it."

Mongan believes that the United States needs "adequate federal funding for the expansion of water treatment facilities and to explore for and develop new water sources—from reservoirs to wells—coupled closely with better land use planning and design."

That need is dramatically demonstrated by the fact that more than 1.7 million people in the United States—more than 670,000 households—still lack full indoor plumbing, the "basic plumbing facilities that most of us have come to take for granted," according to an April 2004 report, *Still Living without the Basics in the 21st Century: Analyzing the Availability of Water and Sanitation Services in the United States*, prepared by the Rural Community Assistance Partnership, of Washington, D.C. Homes without adequate plumbing are concentrated among the poorest Americans in 10 states—California, New York, Texas, Florida, Pennsylvania, Illinois, Arizona, Virginia, Ohio, and North Carolina—but can be found anywhere from Alaska (which has the most, at 6.32 percent of all households) to Nebraska (which has the least, at 0.36 percent), the 2004 report stated.

Jack Hoffbuh, the executive director of the Denver-based American Water Works Association (AWWA), concedes that the nation's drinking water systems face considerable challenges. But Hoffbuh's organization disputes the D<sup>+</sup> that the drinking water category received in ASCE's 2005 assessment, in part because of the significant investments that water and wastewater utilities have been making to upgrade their facilities. Indeed, the U.S. Environmental Protection Agency (EPA) has calculated that more than \$1 trillion has been invested in drinking water and wastewater treatment facilities over the past two decades.

Both the EPA and the AWWA acknowledge that much of this water infrastructure is aging and will be reaching the end of its useful life within the next 20 years or so. It was installed

"Without significant assistance from the federal government, there's a point at which it will be impossible to ensure that public health and the environment are being protected."

in three great phases, Hoffbuh notes: near the start of the 20th century, in the years following the Great Depression, and soon after World War II. A May 2001 report from the AWWA, *Dawn of the Replacement Era: Reinvesting in Drinking Water Infrastructure*, examined the capital needs of 20 utilities over the next three decades and projected expenditures of \$250 billion for the replacement or repair of drinking water pipes and associated structures. For most large systems, this investment would require rate increases that would charge each household an additional amount ranging from \$550 to \$2,300 over the next three decades; smaller systems would impose even higher bills, ranging from \$1,490 to \$6,200 per household over a 20-year period, the report noted.

A 2003 EPA study, *Drinking Water Infrastructure Needs Survey and Assessment: Third Report to Congress*, predicted the need for an investment of \$276.8 billion to ensure clean drinking water over the next 20 years.

Since 1997 the EPA's Drinking Water State Revolving Fund has helped to finance water infrastructure improvements—especially in small and poorer communities—by distributing nearly \$13 billion over its first decade. But whereas ASCE's 2005 infrastructure assessment urged federal appropriations of at least \$1 billion a year for the fund, the Bush administration's FY 2008 budget for the EPA envisions annual appropriations of approximately \$84.5 million through 2018.

America's wastewater system earned a D<sup>-</sup> in ASCE's 2005 *Report Card for America's Infrastructure* "principally due to the poor physical condition of many of the nation's 16,000 wastewater treatment systems caused by a lack of investment in plant, equipment, and other capital improvements over the years," according to a statement that ASCE submitted to the Senate Committee on Environment and Public Works' Subcommittee on Transportation Safety, Infrastructure Security, and Water Quality. At hearings held on September 19, 2007, to consider how to meet the country's wastewater infrastructure needs in the 21st century, ASCE noted that many wastewater treatment systems have reached the end of their useful lives. Even a well-maintained system, it noted, generally lasts only 20 years, and many systems today are "plagued by equipment malfunctions and by chronic overflows during major rain storms and heavy snowmelt that, intentionally or not, result in the discharge of raw sewage into U.S. surface waters."



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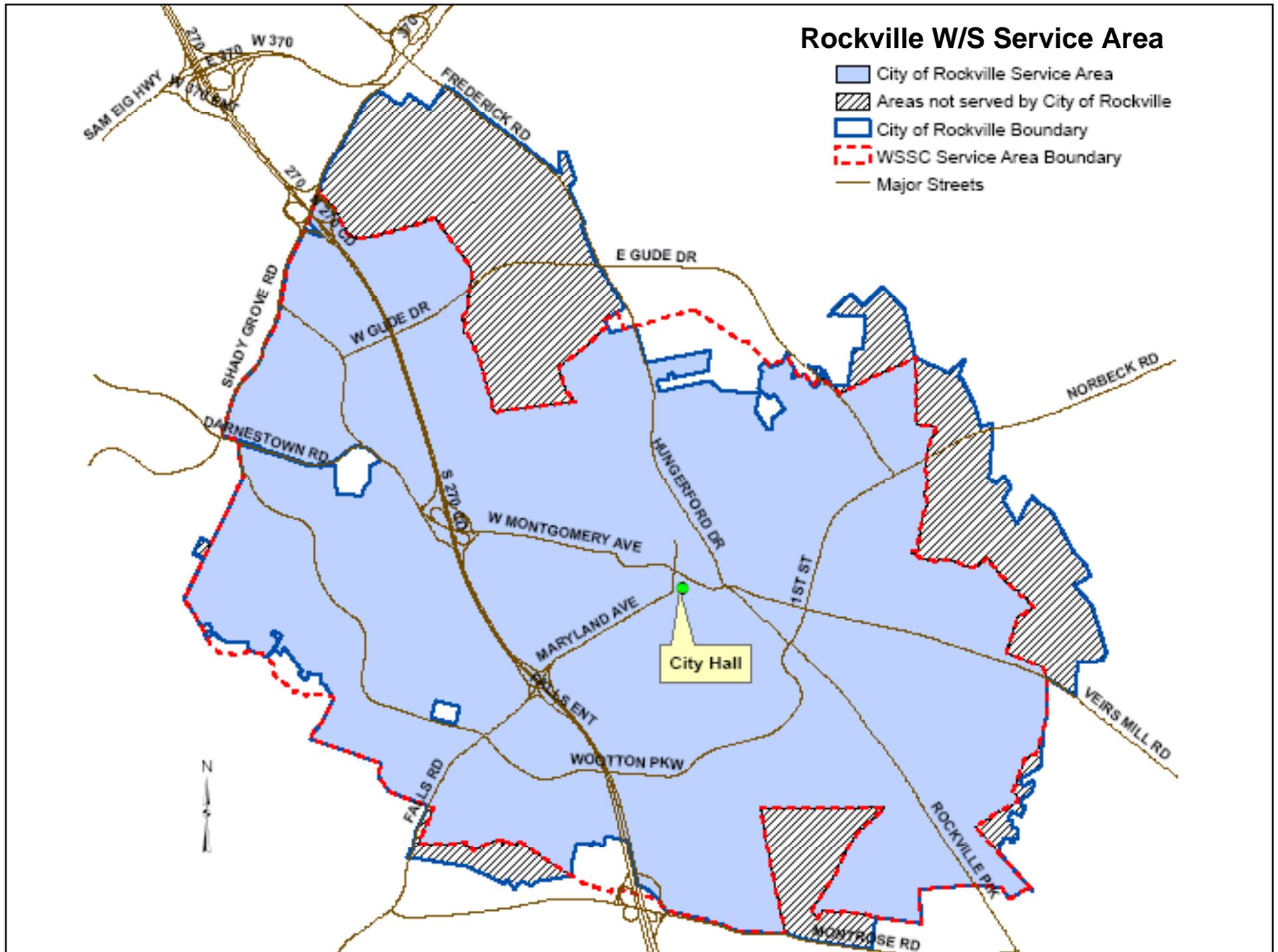
ASCE Magazine, January 2008

# Introduction

## *National Water System Challenge*

	Drinking Water
Congressional Budget Office (20 years)	\$232B - \$402B
EPA (20 years)	\$178B - \$475B
WSSC (10 years)	\$4.8B (Water and Sewer)





# ◆ Water System Components

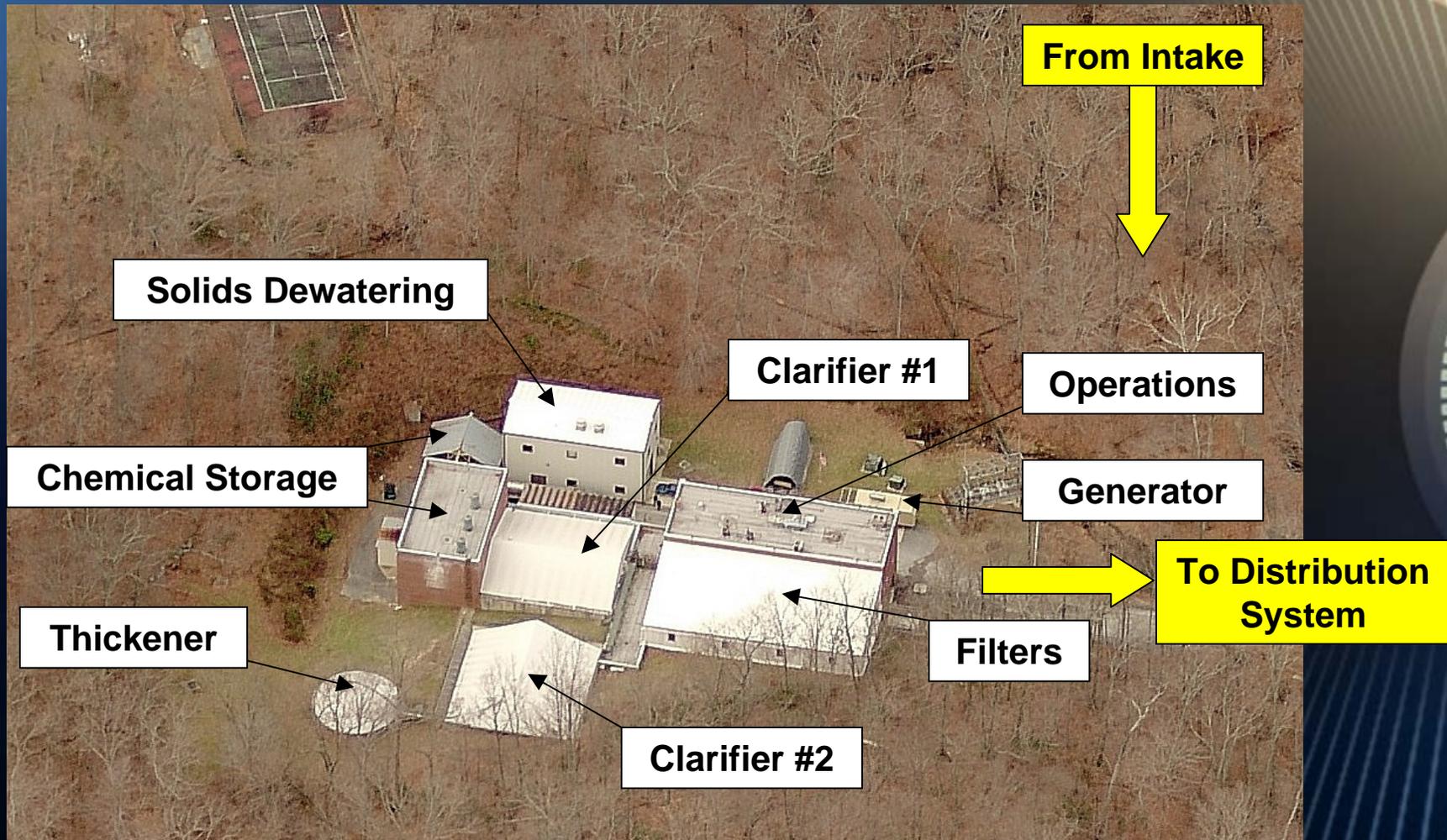
- ▶ Water Treatment Plant

- ▶ Water Distribution System



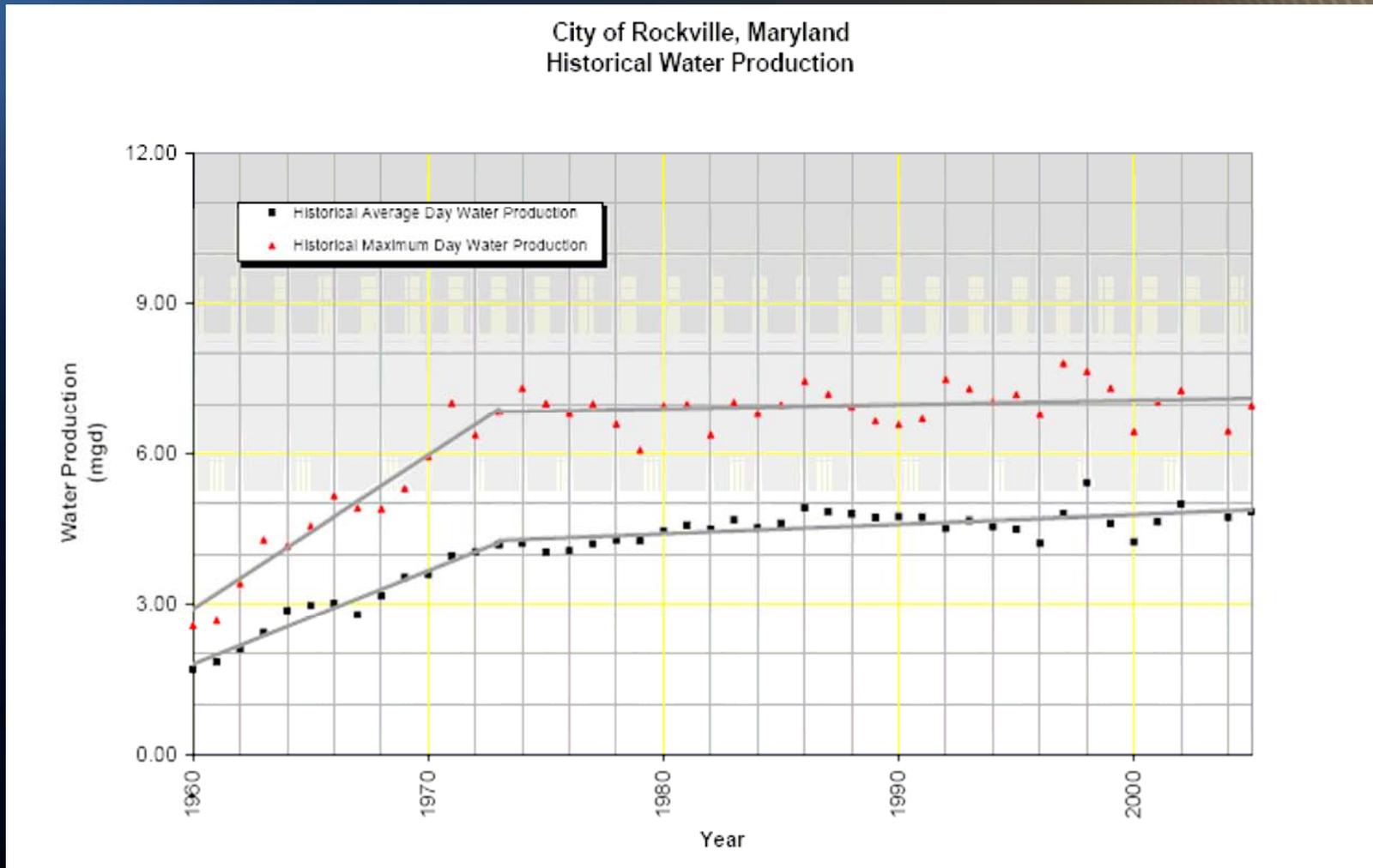
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# Water Treatment Plant *Plant Components*



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# Water Treatment Plant *Production History*



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# Water Treatment Plant

## *Historical Studies*

### ◆ **1965 “Report on Water Treatment Facilities for the City of Rockville”**

- ➔ Increased capacity from 4 to 8 mgd in 1969

### ◆ **1992 “Water System Facility Study”**

- ➔ Recommended capacity increase from 8 to 14 mgd

### ➔ **Initiated WTP Rehabilitation Program in 1993**

- \$3M solids handling process operational in 1996 to comply with 1992 MDE Consent Decree
- Increased many plant components to 14 mgd



# Water Treatment Plant

## *1993 WTP Rehabilitation Program*

### **Projects Implemented from 1993-2006**

**Solids Handling**

**Raw Water Intake Improvements**

**Clarifier and Filter Upgrades**

**High Service Pump Replacement**

**Clearwell Upgrades**

**Clarifiers/Filter/Thickener Covers**

**Glen Mill Pumping Station**

**Total Cost of Improvements Listed: \$13,500,000**



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# Water Treatment Plant *Challenges*

- ◆ **EPA issued more stringent regulations**
- ◆ **Solids handling**
- ◆ **Future capacity needs**
- ◆ **Aging components**
- ◆ **Power outages**



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# Water Treatment Plant

## *EPA and MDE Regulatory Changes*

### ◆ Long Term 2 Enhanced Surface Water Treatment Rules (LT2 Rule)

- ▶ Process improvements to reduce disease incidence associated with *Cryptosporidium* and other pathogenic microorganisms in drinking water

### ◆ Disinfectants and Disinfection By-Products Rule (Stage 2 DBPR)

- ▶ Process improvements to protect health by limiting exposure to disinfection by-products



# Water Treatment Plant

## *EPA and MDE Regulatory Changes*

### ◆ **Backwash Recycle Rule—MDE Internal Guidance Policy**

- ▶ **More stringent than 2001 EPA Filter Backwash Recycle Rule**
- ▶ **Requires relocation of backwash line and additional treatment**



# Water Treatment Plant

## *Current Studies*

### ◆ Phase A Report, June 2007

- Evaluated regulatory compliance and solids handling
- Assessed plant capacity
- Recommended further analysis and component testing
- Preliminary \$14.6M for upgrades included in FY2008 CIP

### ◆ Phase B Study to be completed by Fall 2008

- Current demand projection of 11 mgd by 2030
- Alternative Analysis to Meet Regulations and Capacity
- Detailed upgrade plan to revise \$14.6M CIP cost estimate



- ◆ **Water Treatment Plant**
- ◆ **Water Distribution System**



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# Water Distribution System

## *System Components*

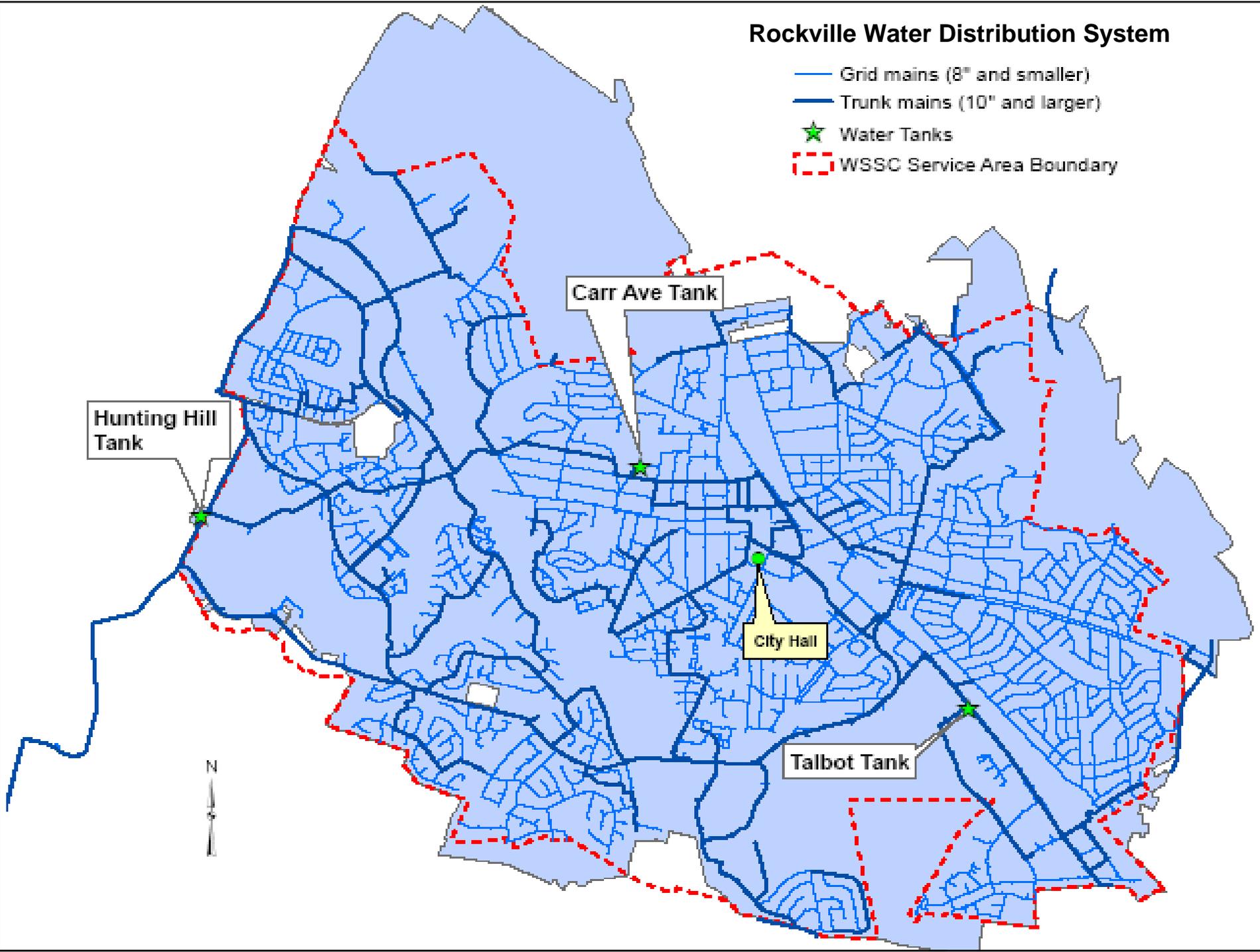
- ◆ Serves 46,500 residents
- ◆ 13,445 accounts (12,817 res, 628 com)
- ◆ 180 miles of pipe ranging from 4" to 24"
- ◆ 3 water storage tanks
- ◆ 1 water booster pump station
- ◆ 4,177 valves
- ◆ 1,369 fire hydrants
- ◆ 6 pressure regulating valves (PRVs)
- ◆ 30 air release valves
- ◆ 9 interconnections with WSSC



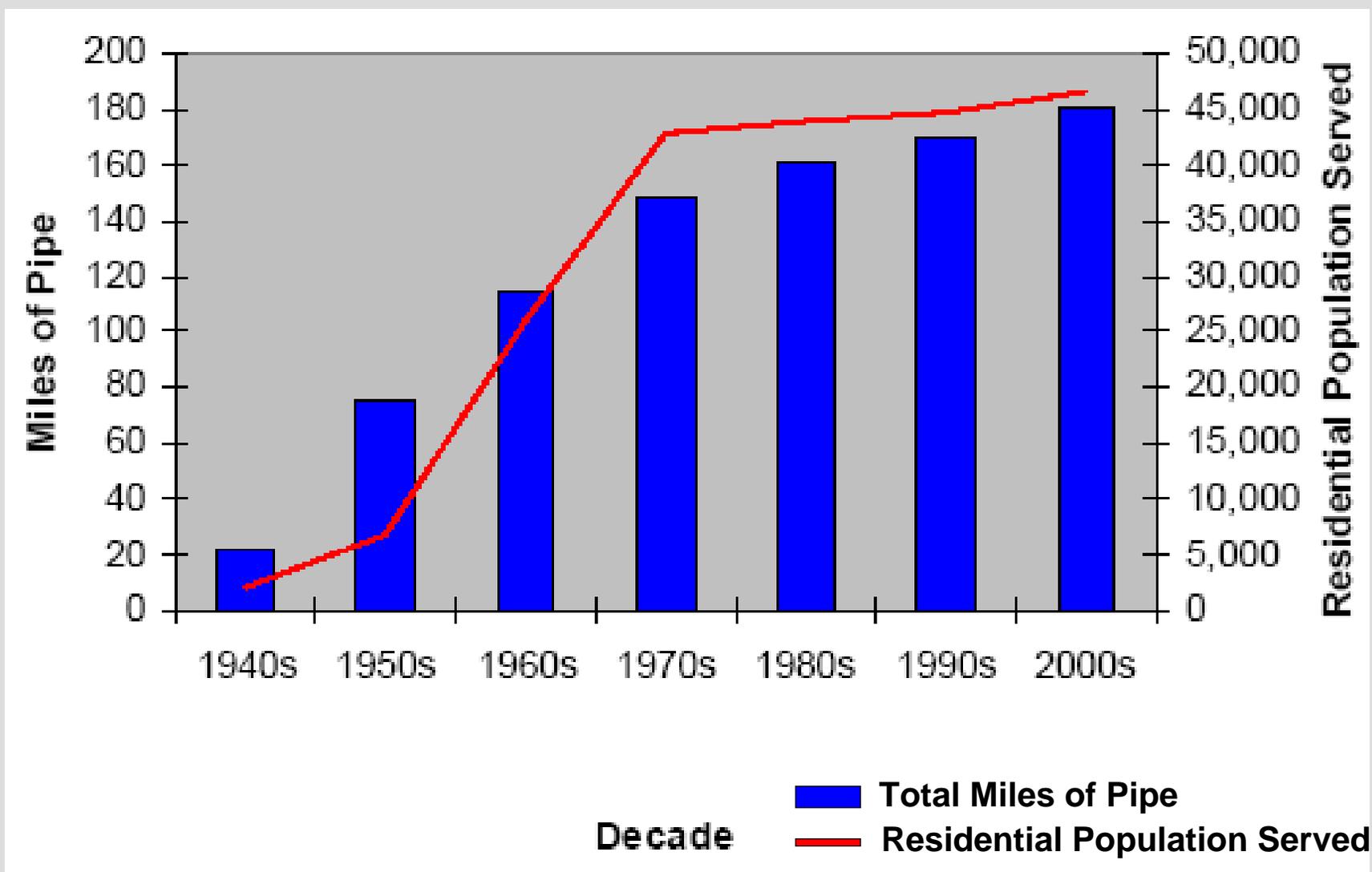
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# Rockville Water Distribution System

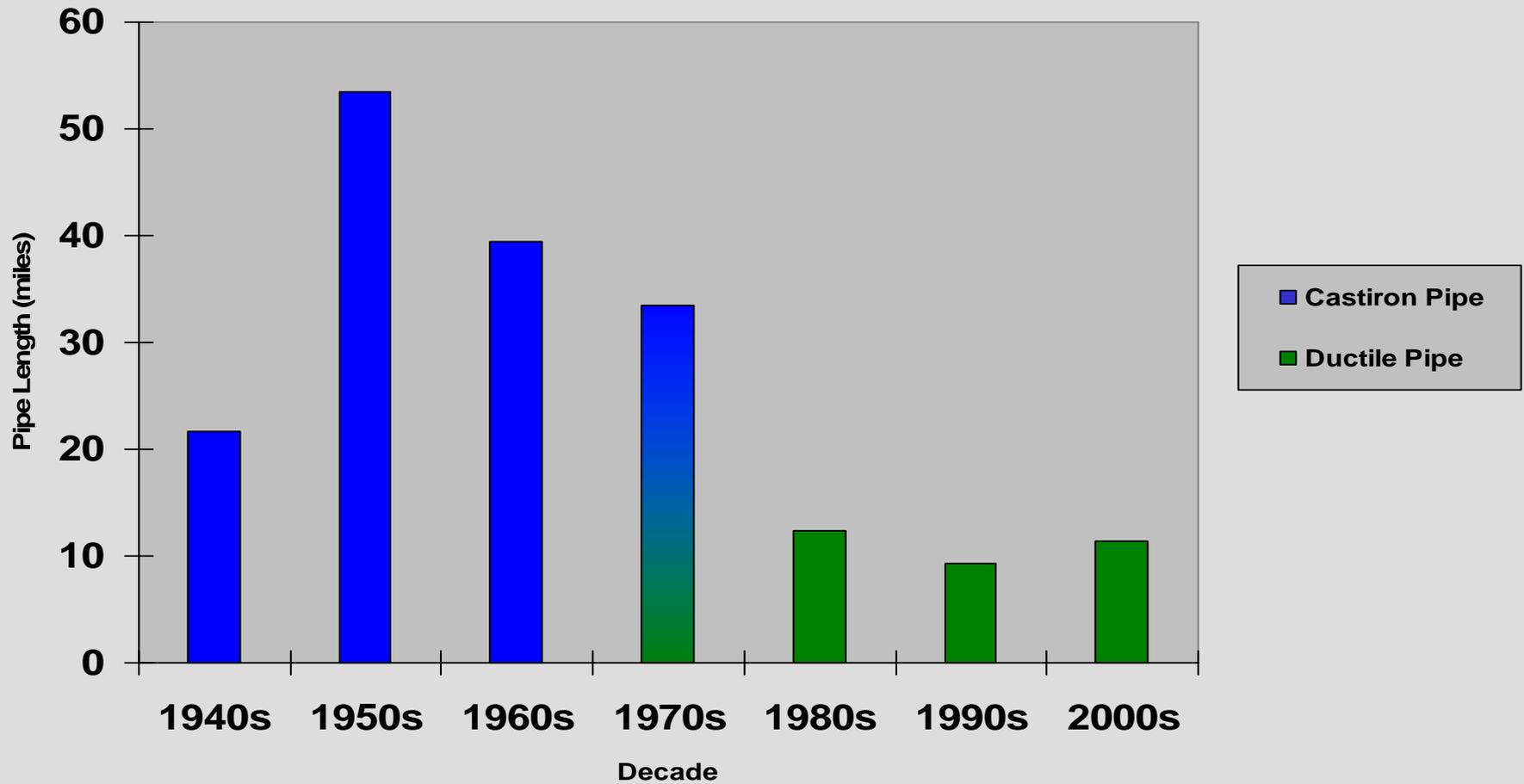
- Grid mains (8" and smaller)
- Trunk mains (10" and larger)
- ★ Water Tanks
- ⋈ WSSC Service Area Boundary



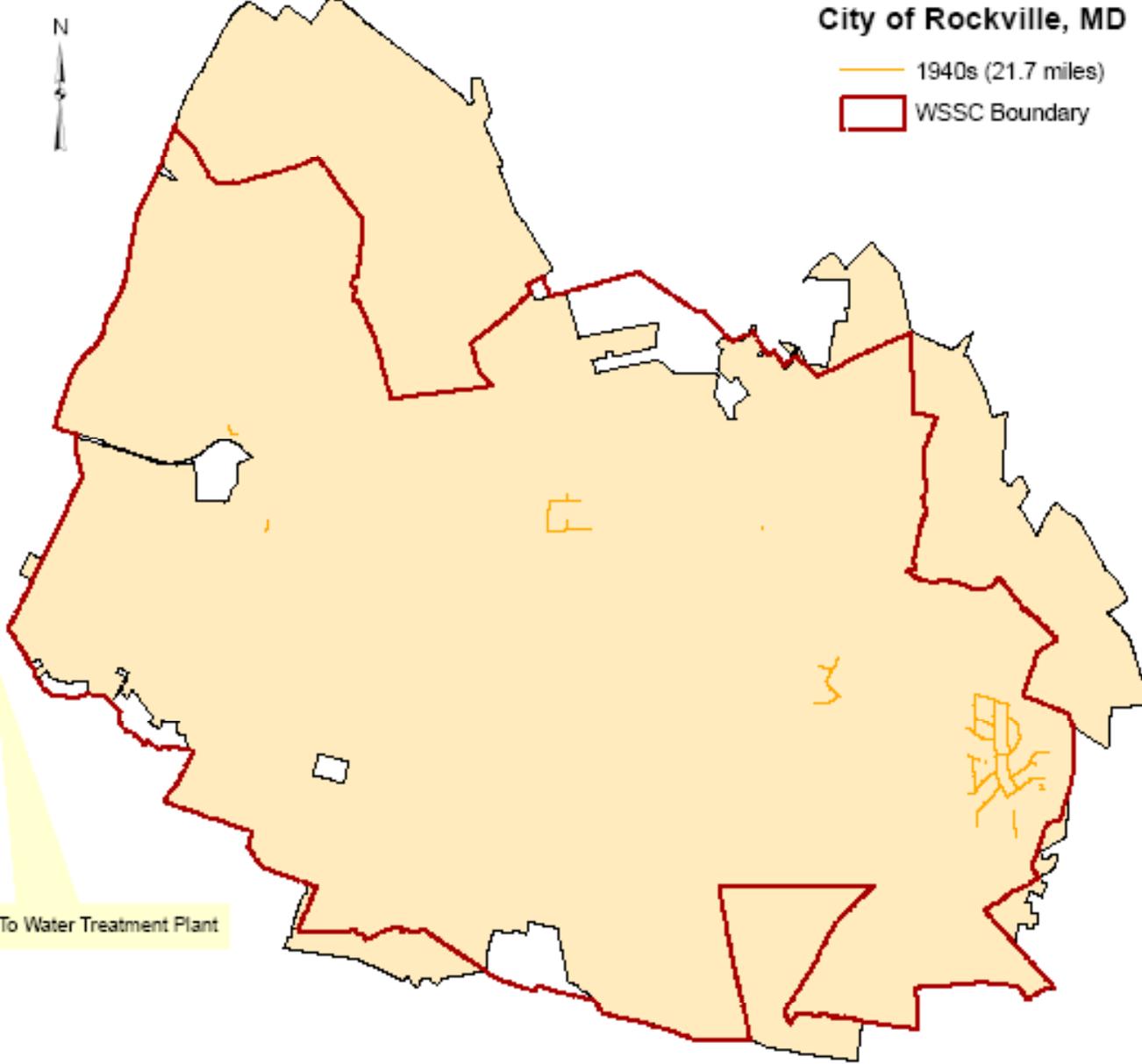
## Residential Population and Miles of Pipe



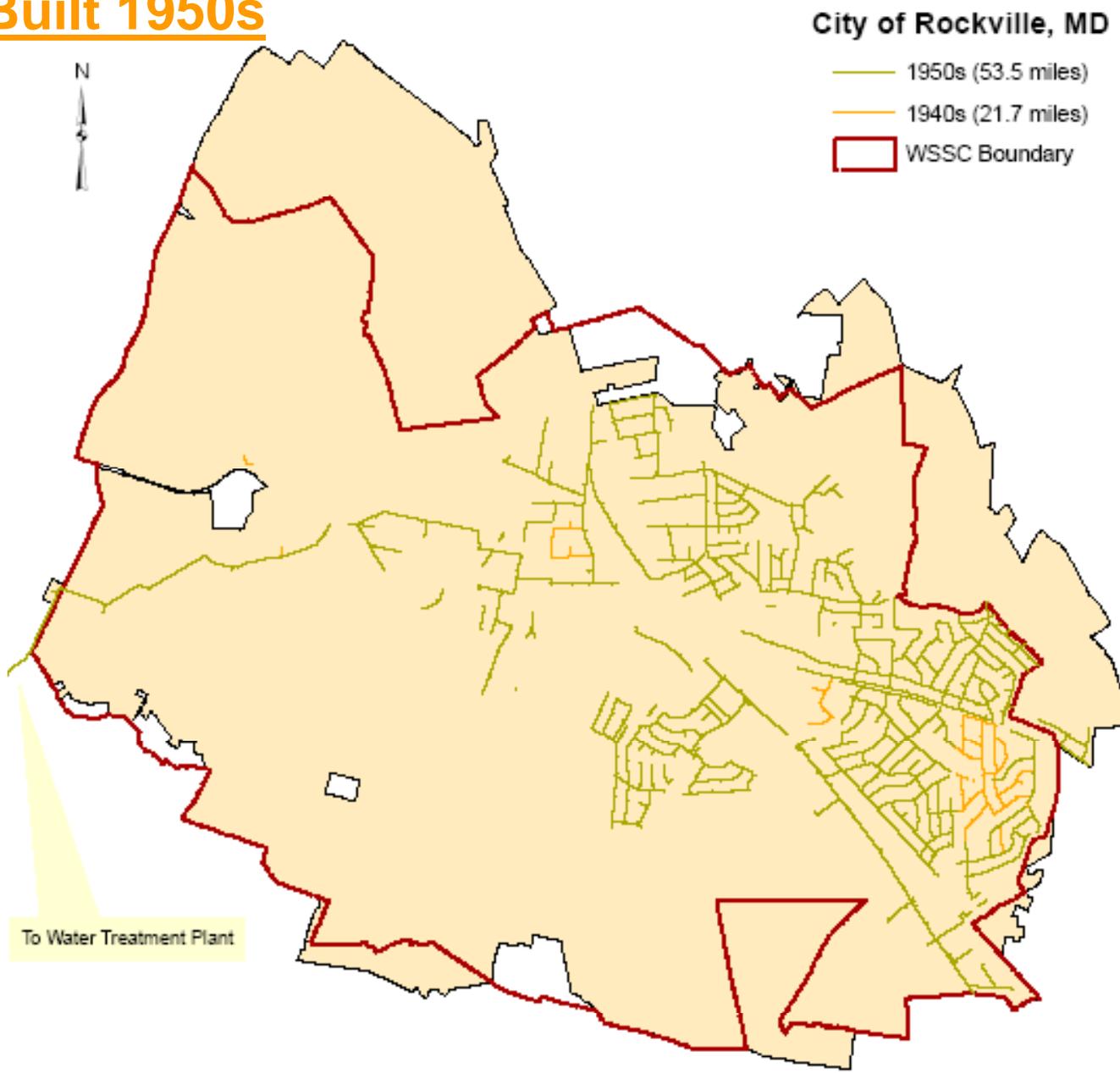
## *Miles of Pipe Built and Pipe Material Transition*



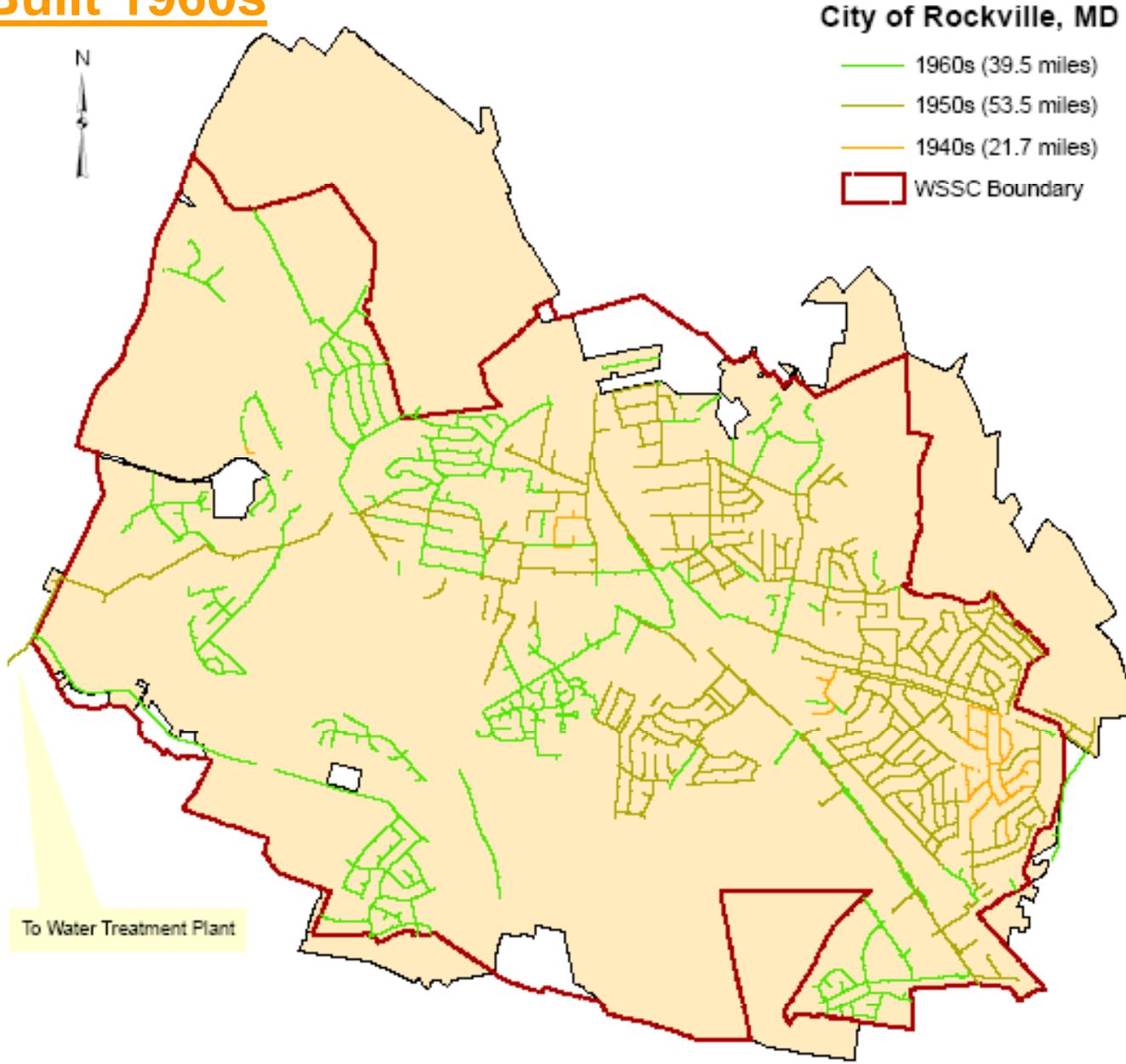
# Pipes Built 1940s



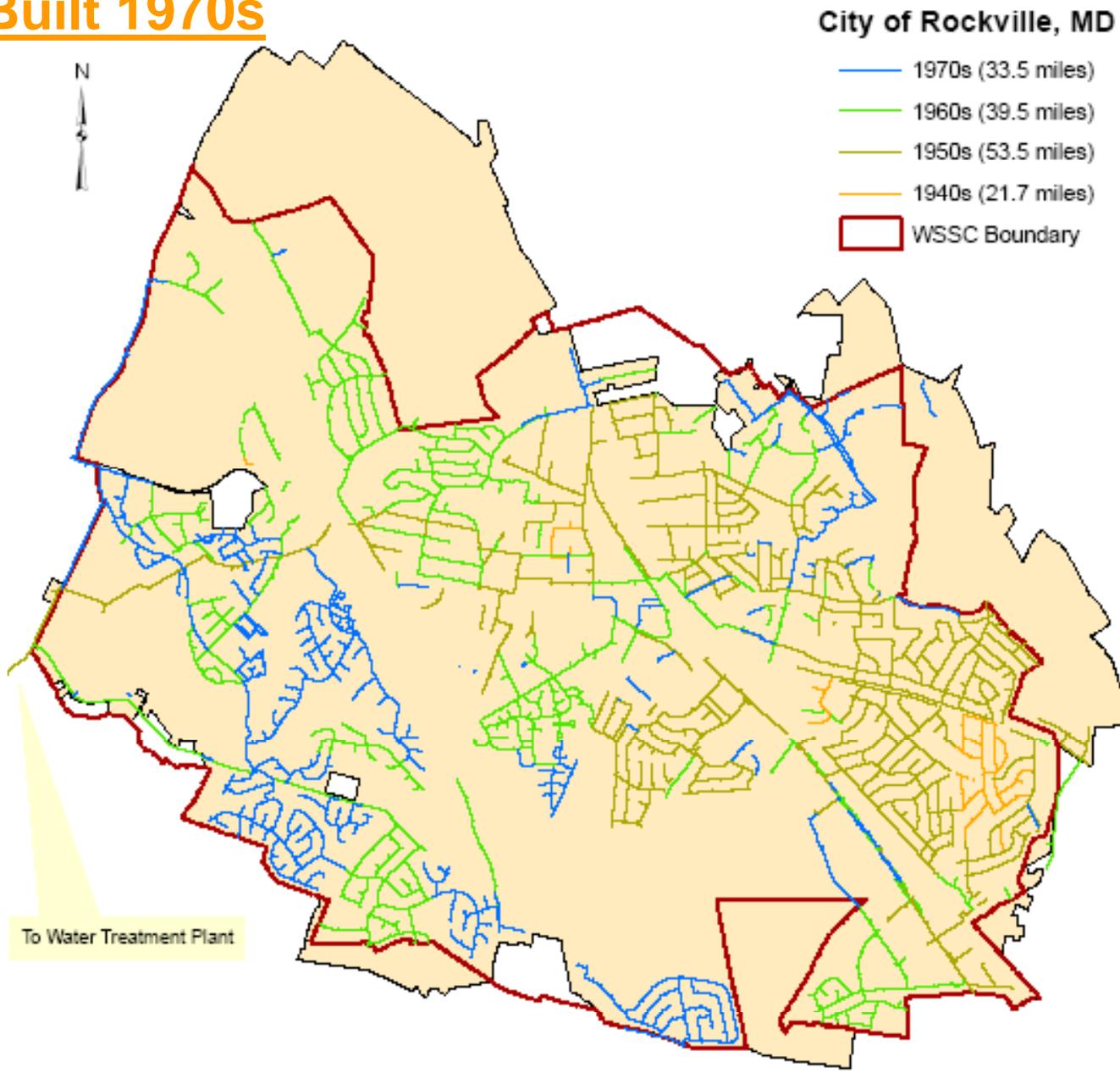
# Pipes Built 1950s



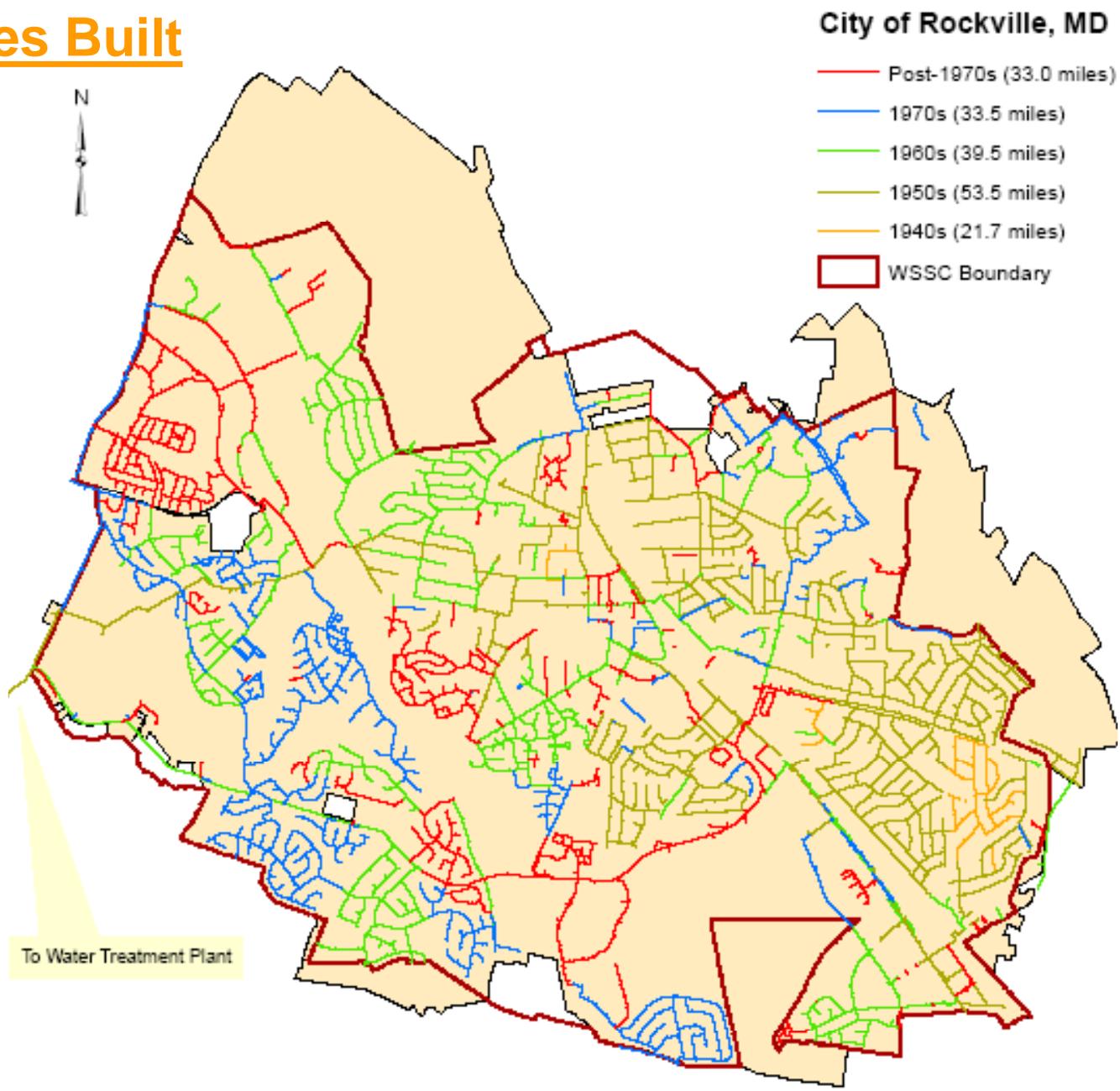
# Pipes Built 1960s



# Pipes Built 1970s



# All Pipes Built



# Water Distribution System

## *Water Meter Replacement*

- ◆ **Replace aging water meters that under-register**
- ◆ **Radio Read technology to increase efficiency of data collection**
- ◆ **\$5M project to be completed Fall 2009**



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# Water Distribution System

## *Water Tank Rehabilitation*

- ◆ **Removed two water tanks**
- ◆ **Rehabilitated three water tanks between 1996-2000**
  - ➔ **Repaired and painted to protect against corrosion**
  - ➔ **Added cathodic protection**
  - ➔ **Cost \$3.5M**
- ◆ **Need to analyze water age in tanks to address water quality**



# Water Distribution System

## *Glen Mill Pump Station*

- ◆ **Constructed to boost water volume over 8 mgd**
- ◆ **Not yet routinely operated**
- ◆ **New CIP Projects to resolve operational issues:**
  - ➔ **Hydraulic surge suppression**
  - ➔ **Air release valves**



# Water Distribution System

## *Historical Studies*

Year	Study
1966, 1978 & 1994	City-Wide
2000	Fallsgrove Development
2001-2006	Small Studies to Support Developments: <ul style="list-style-type: none"><li>◆ Lincoln Terrace</li><li>◆ Twinbrook Station</li><li>◆ Rockville Town Square</li></ul>



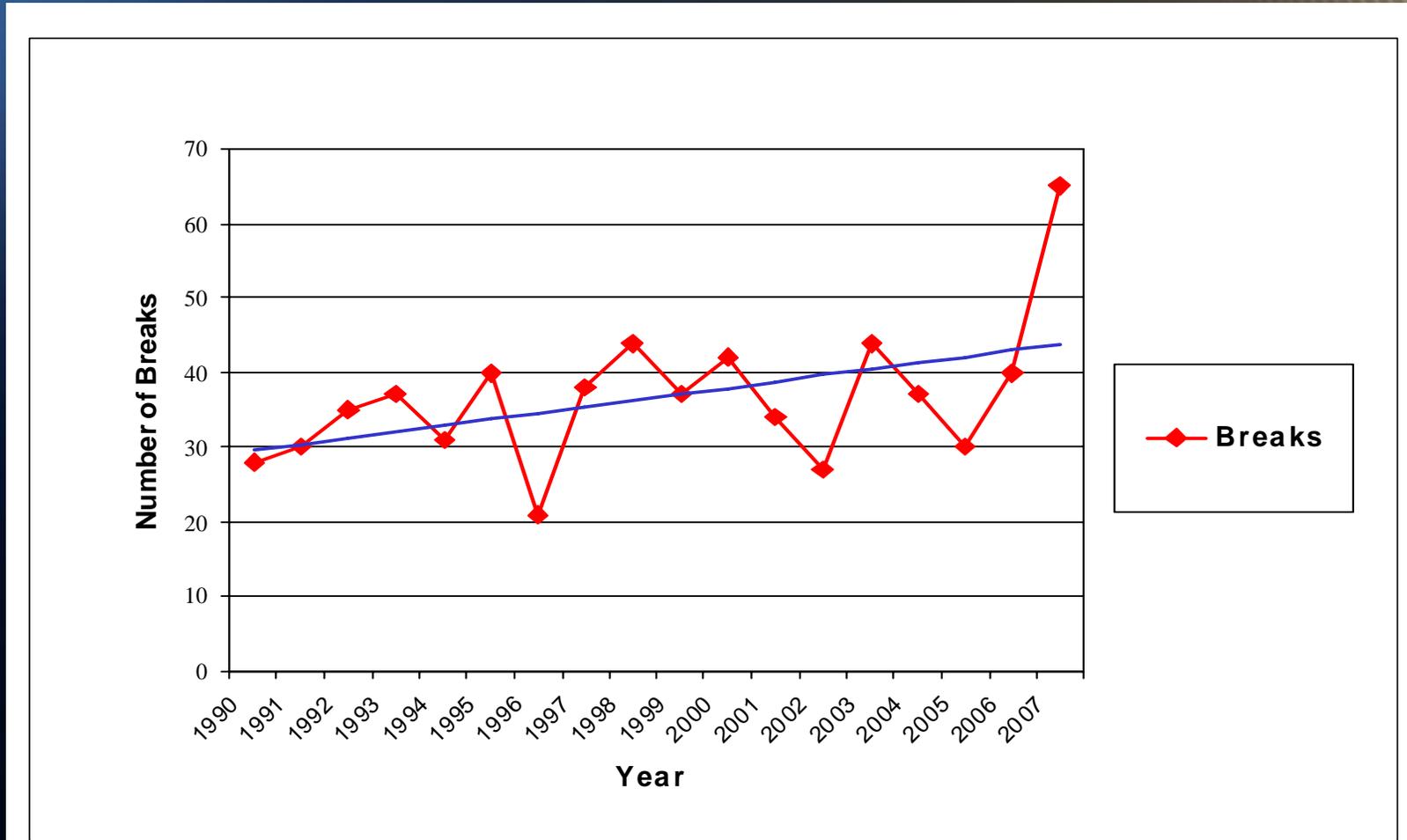
# Water Distribution System *Challenges*

- ◆ **Increased frequency of pipe breaks**
- ◆ **Water quality-tuberculation**
- ◆ **Restricted flow-tuberculation**
- ◆ **Limited asset management resources**



# Water Distribution System

## *Water Line Breaks*



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# Water Distribution System

## *Water Line Breaks*

### Average Annual Breaks/100 miles

	<u>2005</u>	<u>2006</u>	<u>2007</u>
Miami-Dade Water & Sewer	9.54	8.56	N/A
Massachusetts Water	6.30	3.33	5.00
Dallas Water Utilities	40.39	57.25	29.01
Philadelphia Water	21.82	20.06	21.61
East Bay MUD	21.94	16.76	13.57
WSSC	27.30	26.30	33.40
City of Rockville	16.55	22.06	35.85



# Water Distribution System

## *Water Line Breaks*



**West Montgomery Ave, January 2008**



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# Water Distribution System

## *Water Line Breaks*



**Rockville Pike, July 2007**



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# Water Distribution System *Tuberculation*

**Tuberculation is internal corrosion  
caused by water reacting with  
metal in unlined pipe**



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# Water Distribution System

## *Tuberculation Affects Water Quality*

- ◆ **Water discoloration**
- ◆ **Decreased chlorine residual for disinfecting**
- ◆ **Routine hydrant flushing**
  - ➔ **Preventive maintenance to address discoloration and low chlorine residuals**
  - ➔ **Test mechanical operation of hydrants**



# Water Distribution System

## *Tuberculation Restricts Flow*

- ◆ **Over time tuberculation builds up**
  - ▶ **Lowers flow rate**
  - ▶ **After many years, flow is restricted to a point where it impacts ability to meet fire flow demand**



# Water Distribution System

## *2008 Water Distribution Study*

◆ **Hazen and Sawyer contracted to conduct study**

### ◆ **Study Scope**

➤ **Field testing and computer modeling**

- Fire flow tests (C-factor test)
- Water district measurements
- Water loss (leakage)
- Water age study

➤ **Analyze water demands up to 2030**

➤ **Recommend system improvements**

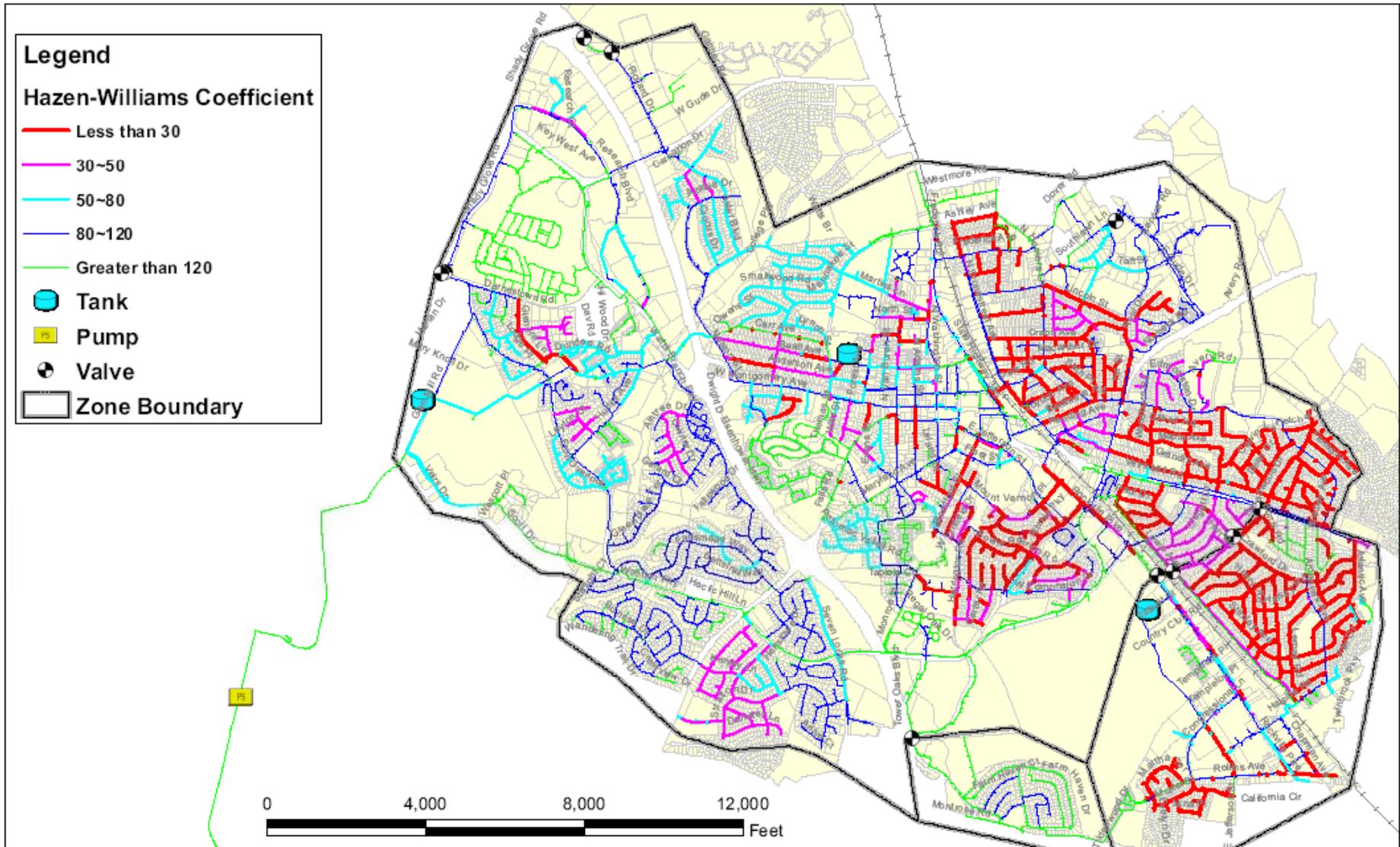
➤ **Developed Water System Master Plan**



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# 2008 Water Distribution Master Plan

# Existing System C Factors



# Water Distribution System

## *Fire Flow Guidelines*

### ◆ Insurance Services Office (ISO)

- ▶ 1,000 gpm for residential single family
- ▶ 1,000-1,500 gpm for residential multi-family
- ▶ 2,000-2,500 gpm for commercial
- ▶ 2,500-3,500 gpm for industrial

### ◆ American Water Works Association (AWWA)

- ▶ Minimum fire flow at a hydrant: 500 gpm



# Water Distribution System

## *Fire Flow Results*

Rockville Has 1,369 Total Fire Hydrants

### Fire Hydrants with Less than Optimal Flow

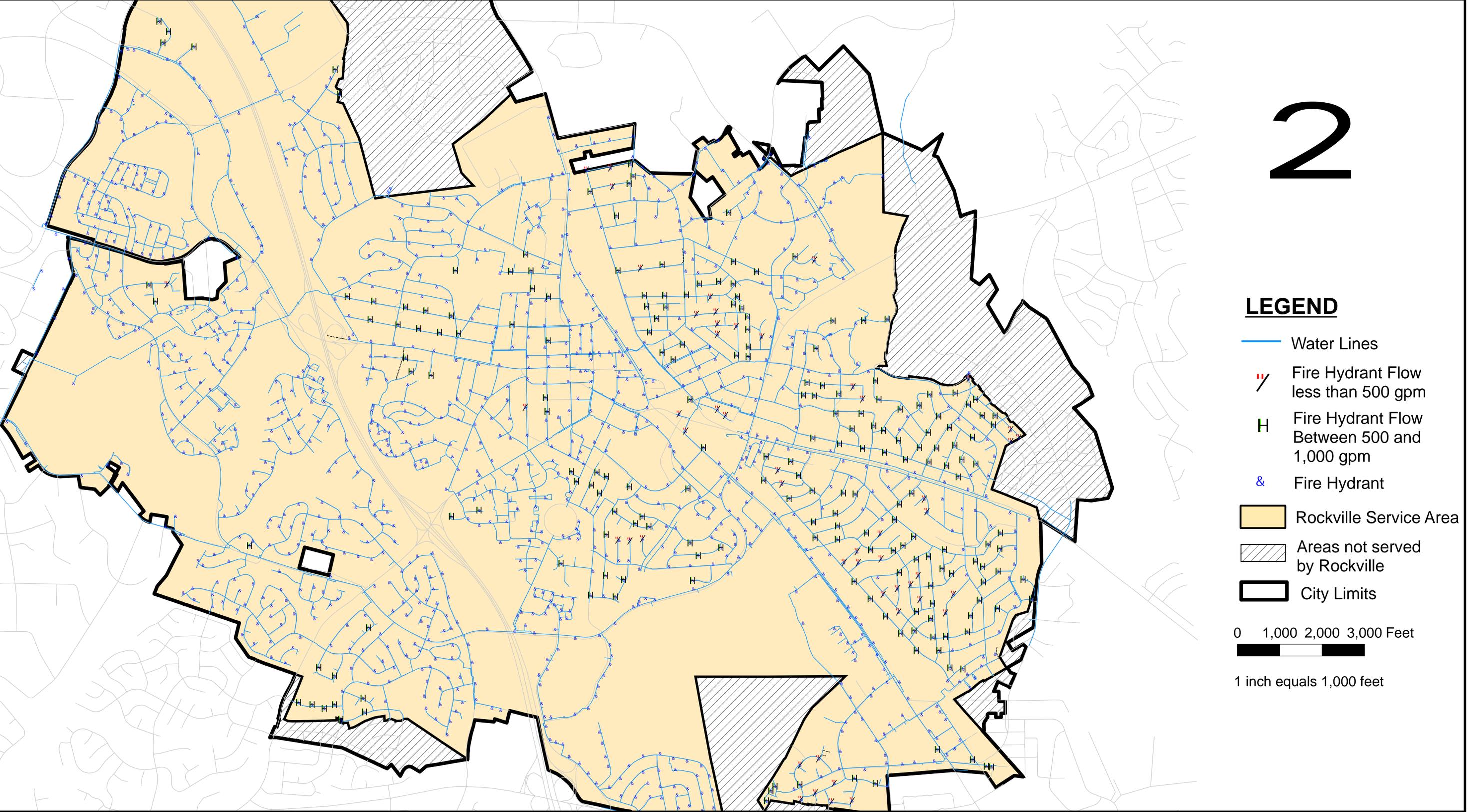
Flow Rate	# of Hydrants
<500 gpm	Approx. 51
>500 and <1,000 gpm	Approx. 208
<b>TOTAL</b>	<b>Approx. 259</b>



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# City of Rockville Fire Hydrants

# 2



### LEGEND

- Water Lines
- Fire Hydrant Flow less than 500 gpm
- Fire Hydrant Flow Between 500 and 1,000 gpm
- Fire Hydrant
- Rockville Service Area
- Areas not served by Rockville
- City Limits

0 1,000 2,000 3,000 Feet



1 inch equals 1,000 feet

# Water Distribution System

## *Montgomery County Fire & Rescue*

- ◆ **Initiated coordination and shared preliminary study results**
- ◆ **Develop and implement marking plan for hydrants < 1,000 gpm**
- ◆ **Share mapping with Montgomery County Fire and Rescue**
- ◆ **Coordinate priorities and design with Montgomery County Fire and Rescue**



# Water Distribution System

## *2008 Study Recommendations*

- ◆ **Implement 15-year Water Line Replacement Program - Dig and Replace**
  - ➔ **Replace pipes in areas based on greatest need**
  - ➔ **Replace 33 miles of pipe**
  - ➔ **\$67 million**
  - ➔ **Replacement of service connections, valves and hydrants, as well as increase size of various pipes**



# Water Distribution System

## *Why Not Clean and Line?*

- ◆ Does not improve the structural integrity of pipe
- ◆ May cause damage to the pipe
- ◆ WSSC has discontinued clean and line program; now dig and replace
- ◆ Dig and Replace represents a more complete renewal of the system
- ◆ Life cycle cost lower for dig and replace



# Water Distribution System

## *15-year Program Prioritization*

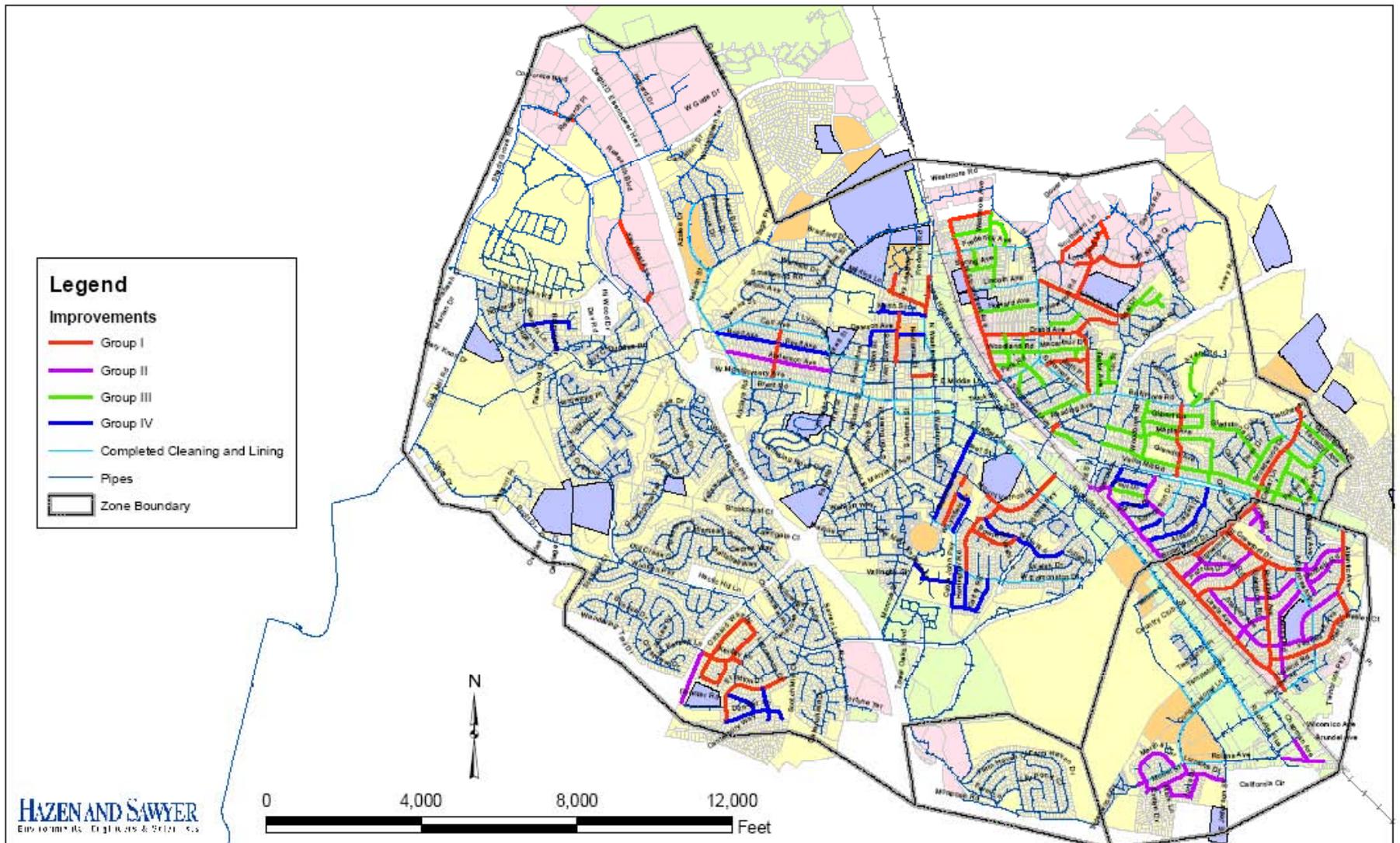
- ◆ **Program schedule will adjust based upon:**
  - ➔ **Fire hydrants delivering less than optimal flow**
  - ➔ **Increase fire flow on an area basis**
  - ➔ **Water pipe breaks**
  - ➔ **Water quality**
  - ➔ **Further field testing and modeling**
- ◆ **Actual schedule will be finalized before each fiscal year**



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# 2008 Water Distribution Master Plan

## Recommended Improvements



# Water Distribution System

## *Proposed FY2009 Work*

- ◆ **Construct water main upgrades on the following streets:**
  - ◆ Crawford Drive, Thornden Rd, Kersey Lane, Orchard Way South, Broadwood Dr and Rockland Ave
- ◆ **Replace 16-inch steel water main along Rockville Pike and Park Road, existing CIP project**
- ◆ **Design projects to be constructed in FY2010**



# Conclusion

## ◆ Water Treatment Plant Upgrade CIP project (existing):

- ▶ Meet new EPA regulations
- ▶ Increased capacity and facility improvements
  - Program cost will be included in Phase B Study
  - Current estimate is \$14.6 million

## ◆ Bring Glen Mill Pump Station on-line

- ▶ Hydraulic Surge Suppression CIP project (new)
  - Estimate \$760,000
- ▶ Coordinate with existing Air Release Valve CIP project



# Conclusion

- ◆ **Water Line Replacement CIP project (new)**
  - ▶ 15-year, \$67 million
  - ▶ Improve fire flow, reduce water main breaks and ensure good water quality
  - ▶ Initiate a sustainable water infrastructure program to address our generational problem ensuring clean, safe and reliable water for years to come
- ◆ **Implement Asset Management Program**
- ◆ **Increase staffing to implement these projects**



# Next Steps

- ◆ **Present funding and rate recommendations to Mayor & Council**
- ◆ **Conduct public outreach**
- ◆ **Continue coordination with Montgomery County Fire and Rescue**
- ◆ **Finalize Phase B Water Treatment Plant Study**
- ◆ **Finalize 2008 Water Distribution Master Plan**





**City of Rockville**

**Initiate a sustainable water  
infrastructure program to address  
our generational problem ensuring  
clean, safe and reliable water for  
years to come**

**Mayor and Council Presentation  
February 11, 2008**