

**STATE OF CONNECTICUT**  
DEPARTMENT OF PUBLIC HEALTH

Raul Pino, M.D., M.P.H.  
Commissioner



Dannel P. Malloy  
Governor  
Nancy Wyman  
Lt. Governor

## Drinking Water Section

Drinking Water State Revolving Fund  
Green Project Reserve Business Case  
Federal Fiscal Year 2011 Capitalization Grant

Loan Date: 5/24/2013

Green Amount: \$2,074,023.50

This business case was prepared by Drinking Water Section staff with information and input provided by The Metropolitan District.



Phone: (860) 509-8000 • Fax: (860) 509-7184  
410 Capitol Avenue, P.O. Box 340308  
Hartford, Connecticut 06134-0308  
[www.ct.gov/dph](http://www.ct.gov/dph)

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DWSRF FFY 2011 Green Project Reserve (GPR) Business Case (water efficiency)

PWS: Metropolitan District Commission

PWSID: CT0640011

Project: Water Main Replacement – Capitol Ave, Linden Pl., Broad St., Hartford, CT

Funding Agreement #: 2013-7013-1

The Metropolitan District (MDC) serves parts of 12 towns around Hartford, CT, which includes approximately 1,570 miles of water main with an average age of 56 years.

The MDC has established a Water Asset Management Program (AMP) which includes a state-of-the-art modeling tool to systematically develop predictive replacement projects. With the use of improved technologies, this model identifies existing water delivery infrastructure that is approaching or has exceeded its useful life and will be the basis for new, improved practices. The AMP also includes short- and long-term master plans and budgeting. The AMP is reviewed annually and updated as necessary.

Within the AMP, an Asset Model calculates a priority ranking for water main rehabilitation and replacement projects. Conditions such as pipe characteristics (including location, material, installation year, length and diameter) and water distribution information (including pressure, consumption and fire flow requirements), along with break history, soil conditions and town pavement schedules are all analyzed to determine prioritization for improvements. Other conditions, including critical populations (schools and medical facilities), other infrastructure work, and the physical condition of a pipe based on field sampling, are also reviewed. The conditions analyzed produce three indices: Physical Integrity Index (PII), Function Integrity Index (FII), and Socioeconomic Integrity Index (SII), on which project prioritization is based. These indices produce a value from 0 to 1, with 0 being most critical and 1 being not critical.

At the time the AMP was developed, in 2009, the majority of pipe in the distribution system was cast iron, accounting for approximately 77% of the pipe, and ~95% of all main breaks. This translates to approximately 1.5 breaks for every mile of cast iron pipe.

Looking more closely at these segments of pipe, cast iron pipe installed around 1930 averages 13.8 to 16.1 breaks per 100 miles of pipe per year and pipe installed prior to 1925 averages 8 breaks per 100 miles of pipe per year. These rates are higher than pipe installed during all other time periods, with the exception of 1925-1929.

The Capitol/Linden/Broad water main project replaces segments of main on Capitol Avenue, Linden Place, and Broad Street in Hartford. The segment on Capitol Avenue has a significant history of recent water main breaks and scored critical on the Physical Integrity Index scale and in need of replacement. The new ductile iron water transmission main that was installed under this project provides piping with smooth interiors which offer less friction for water flow, new fittings to eliminate leaks and prevent contamination, and other equipment (as required) such as gate valves which provide a more efficient and dependable open and close operation in order to deliver equal or better services with less water loss.

The MDC keeps a log of water main breaks. Prior to the replacement of the water main on Capitol Avenue, there had been 14 water main breaks in that section since 2000. In 2013 alone there were 4 breaks, even as the new main was under construction. The new water main was placed into service on 9/11/2013.

The estimated volume of water lost as a result of breaks in 2013 is calculated as follows:

| <u>Date</u> | <u>Duration (hours)</u> | <u>Flow rate (gpm)</u> | <u>Total Volume from leak (gal)</u> |
|-------------|-------------------------|------------------------|-------------------------------------|
| 1/1/2013    | 3 hours                 | 163.1                  | 29,358                              |
| 1/11/2013   | 3.25 hrs                | 1,233.4                | 238,563                             |
| 6/18/2013   | 2                       | 118.8                  | 14,256                              |
| 7/22/2013   | 1                       | 163.1                  | 9,786                               |

Total volume of water lost: 291,963 gallons

Capitol Avenue:      1,950' of 8" cast iron main installed in 1930  
                             600' of 6" cast iron installed in 1854  
                             14 main breaks since 2000  
                             PII of 0.0114 to 0.020 (varies by individual pipe segment)