Massachusetts Water Resources Authority

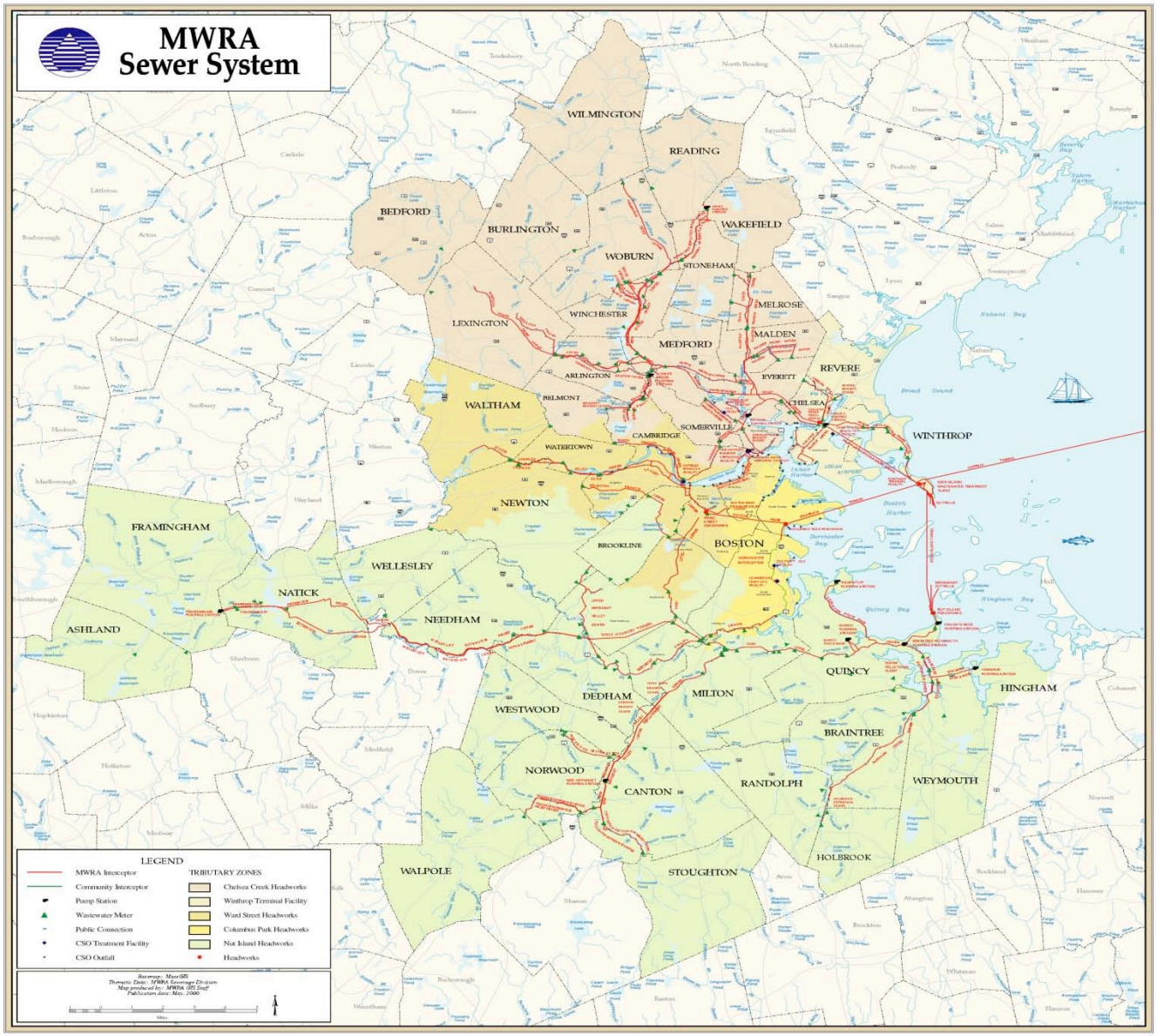
Wastewater Advisory Committee Meeting

May 6, 2011

Agenda

- **Wastewater Metering System Overview**
- MWRA Rate Assessment Methodologies
- I/I Local Financial Assistance Program Update
- Long-Term Regional Flow Data
- Community Flow Component Estimates
- North System Hydraulic Study

Massachusetts Water Resources Authority



Wastewater Meter Overview

Wastewater Collection System

- 43 Communities
- 221 Metering Sites, 185 of which are rates meters to communities

Brief History of Wastewater Metering

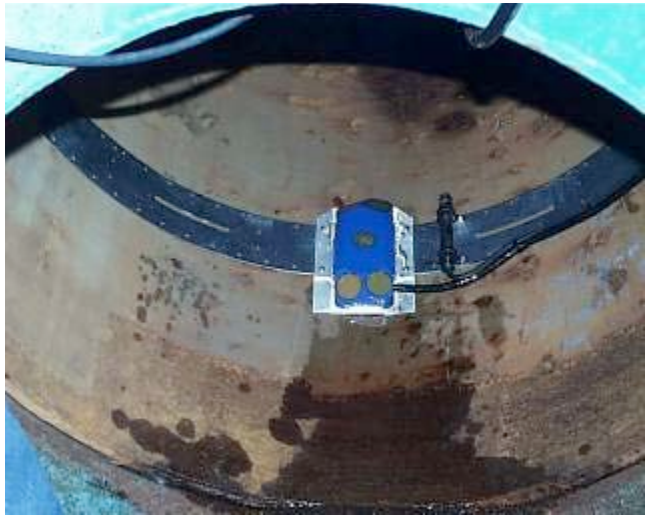
- Interim Metering System – completed December 1991
- Permanent Metering System – completed January 1994
- Used as part of wastewater rates development since FY1996
- Replacement of the wastewater meters and data processing system was deemed necessary in 2002
- The Wastewater Meter Replacement Project was begun in 2003 and completed in spring 2005
- Meters have run consistently since 2005 and are being replaced individually when appropriate
- Meter Data for CY04 and CY05 was not used for sewer rates
- Conversion to wireless data transmission made during meter replacement

Wastewater Meter types

- 134 Marsh McBirney Flo-Dar Radar/velocity Flow meters for most sites
- 53 MGD ADFM – Acoustic Doppler Flow Meters for larger conduits
- 26 Existing meters at local facilities reported to MWRA via Remote Telemetry Units
- 5 Marsh McBirney Flo-Totes for extremely low flow sites
- 3 Flume Remote Telemetry Units with depth sensors

Note: The Meter types were chosen based on demonstrated superior accuracy during head to head testing at a flow laboratory during vendor selection

Flo-Dar



ADFM

Water System

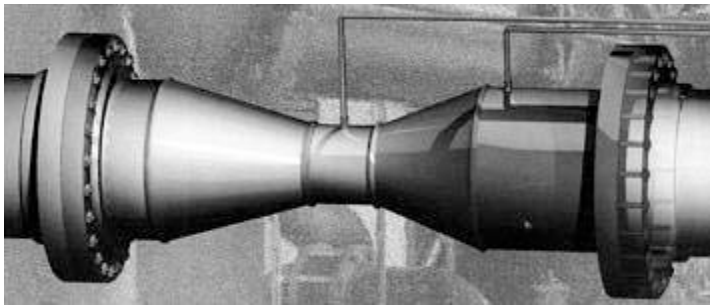
- 50 Communities
- 230 Metering Sites, 192 of which are rates meters to communities

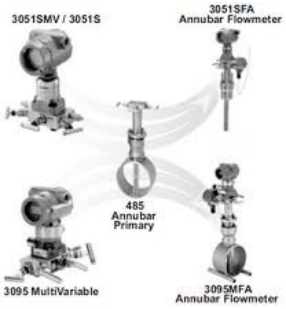
Brief History of Water Metering

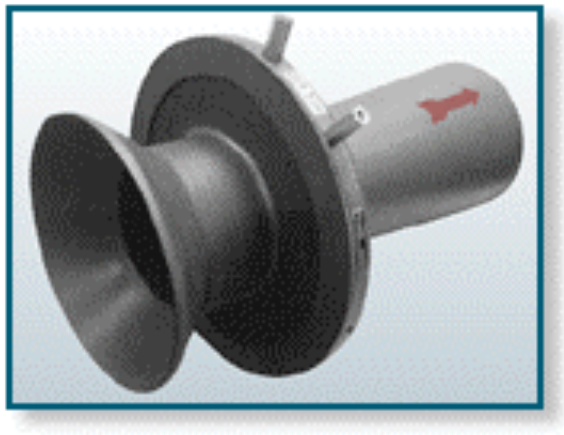
- Metropolitan system was metered from 1900 using Venturi tubes
- Phase 1 Water Meter rehabilitation took place in early 1980's
- Phase 2 Meter rehabilitation took place in late 1980's
- Remaining old venturi tubes are being replaced during pipe rehabilitation projects.
- Planning 2011 replacement of transmitters and switching to wireless data transmission to reduce costs.

Venturi Meter layout

- Differential producing devices
- Transmitters and data recorders at site send flows to central







Meter Maintenance

MWRA staff provide:

Corrective Maintenance when needed, such as:

- Sensor scrubs
- Equipment replacement as needed
- Communication repairs
- Silt removal

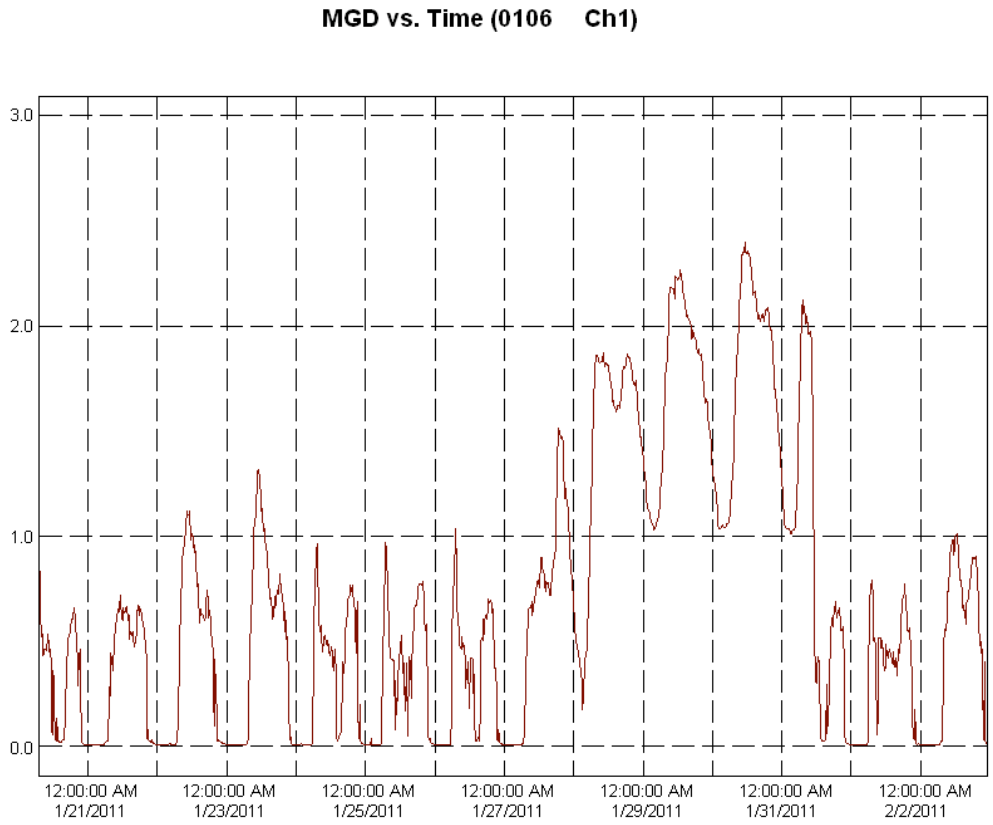
Preventative Maintenance, e.g.

- Quarterly calibrations
- Battery replacement when needed, (typically 6 Months)
- Silt measurements
- Venturi sensing line rodding

Independent Checks

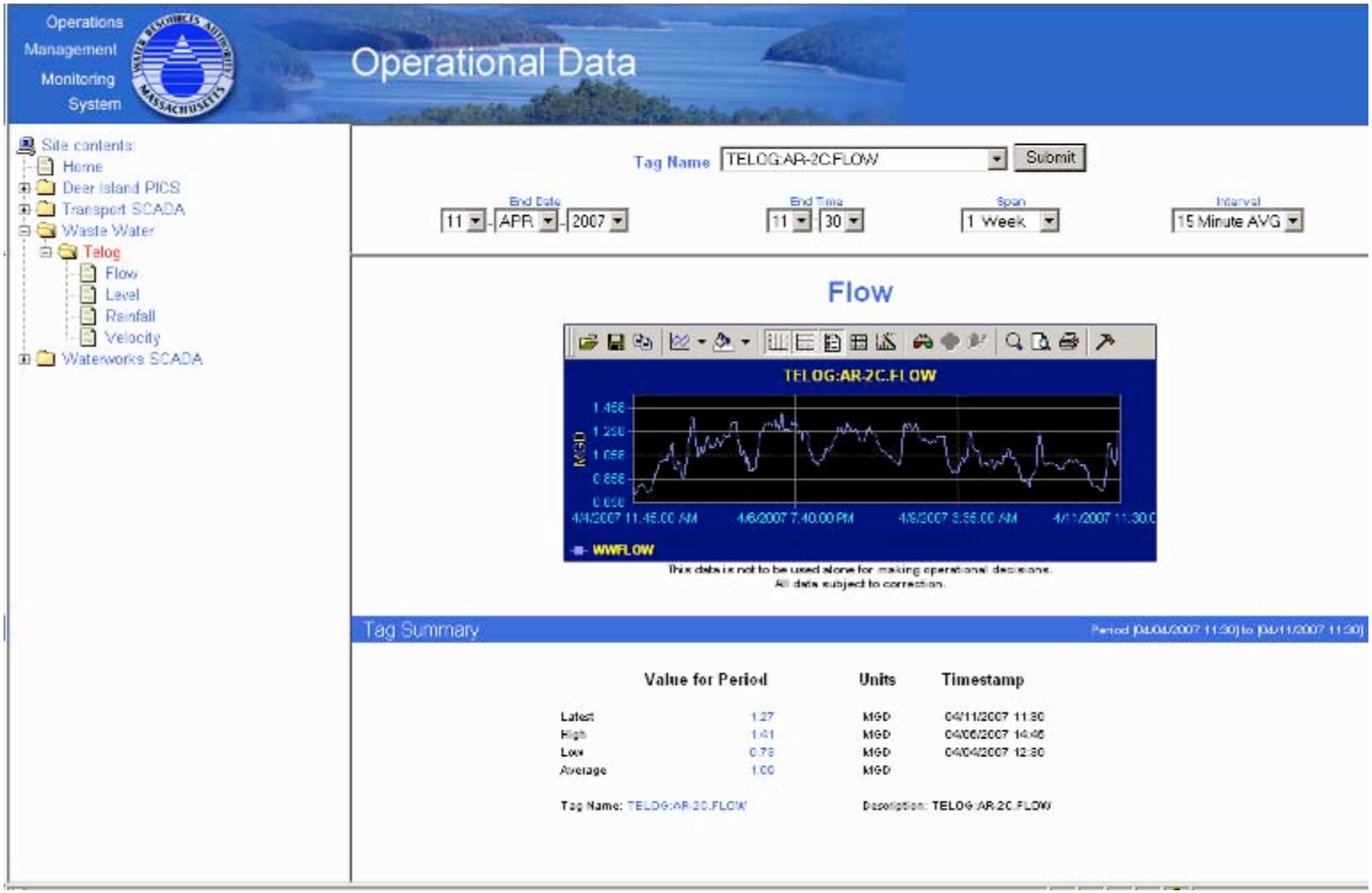
- Pitot testing of venturis
- Flow testing of wastewater sites

Use of data for System Operation



Operations staff looks at community flow and advises when an unusual situation occurs

Web access to Wastewater Meter Data



Upon request, MWRA can set up an account so that communities can access current wastewater meter data via the internet

Agenda

- Wastewater Metering System Overview
- **MWRA Rate Assessment Methodologies**
- I/I Local Financial Assistance Program Update
- Long-Term Regional Flow Data
- Community Flow Component Estimates
- North System Hydraulic Study

MWRA Rate Assessment Methodologies

MWRA assessment methodologies allocates the annual (fiscal year) rate revenue requirement to the 57 communities and local bodies served by MWRA's metropolitan water and sewer utilities.

Proposed Fiscal Year 2012 Current Expense Budget

EXPENSES (000's)	TOTAL	WATER	SEWER
Direct Expenses	$209,581	$62,442	$147,139
Indirect Expenses	$40,166	$28,526	$11,640
Capital Expenses	$371,918	$111,209	$260,708
Total Expenses	$621,664	$202,177	$419,488
Other Revenue/Offsets	$29,464	$19,543	$9,921
Rate Revenue Requirement	**$592,200**	**$182,634**	**$409,566**

How is the Rate Revenue Requirement allocated to MWRA communities?

WATER UTILITY ASSESSMENT

The Rate Revenue Requirement (RRR) for the MWRA Water Utility is allocated to member communities using the amount of metered water provided to each community relative to the system as a whole.

Example:

$$\frac{\text{Community's Total Water Use}}{\text{Total System-Wide Water Use}} = \text{Community's System Share}$$

Water Utility RRR x Community's System Share = Assessment

WATER UTILITY ASSESSMENT

Community	CY2010 Water Use	System Share	PFY2012 Assessment[1]
Boston (BWSC)	66.048 mgd	36.17%	$66,078,017
Quincy	9.232 mgd	5.06%	$9,236,681
Newton	8.873 mgd	4.86%	$8,872,649
Waltham	7.640 mgd	4.18%	$7,643,524
Framingham	6.805 mgd	3.73%	$6,807,815
SYSTEM TOTAL[2]	**182.600 mgd**	**100%**	**$182,633,768**

[1] Includes prior-year adjustments

[2] Includes only the rates-based communities in the metropolitan water system.

SEWER UTILITY ASSESSMENT

- MWRA's Sewer Assessment Methodology was developed by a 13-member community-based committee, assisted by MWRA staff, the MWRA Advisory Board and independent rate consultants.
- The methodology was approved by the MWRA Advisory Board, MWRA Board of Directors, MA DEP, and was implemented in FY1996.
- The methodology allocates the annual rate revenue requirement to the 43 communities and local bodies served by MWRA's sewer utility.

SEWER UTILITY ASSESSMENT

The sewer utility rate revenue requirement is allocated to member communities based primarily on each community's respective share of:

- **Wastewater Flow** (Average Daily Flow and Peak Month Flow)
- **Population** (Sewered and Total Population)

On average 53% of the PFY2012 sewer assessment was allocated based on flow and 47% based on population.

SEWER UTILITY ASSESSMENT

There are different allocation basis used for:

- Operating and Maintenance Expenses
- Capital Expenses

SEWER UTILITY ASSESSMENT

Operating and Maintenance Expense Allocation

- 100% of operating and maintenance expenses are allocated using average daily metered wastewater flow (3-year average) and corresponding strength of flow.

- 3-year flow averaging smooths the impact of year-to-year fluctuations in community wastewater flow.

SEWER UTILITY ASSESSMENT

Capital Expense Allocation

- 75% of capital expenses are allocated based on share of system-wide population
- 25% is allocated using maximum monthly wastewater flow (3-year average)

MWRA Rate Assessment Methodologies

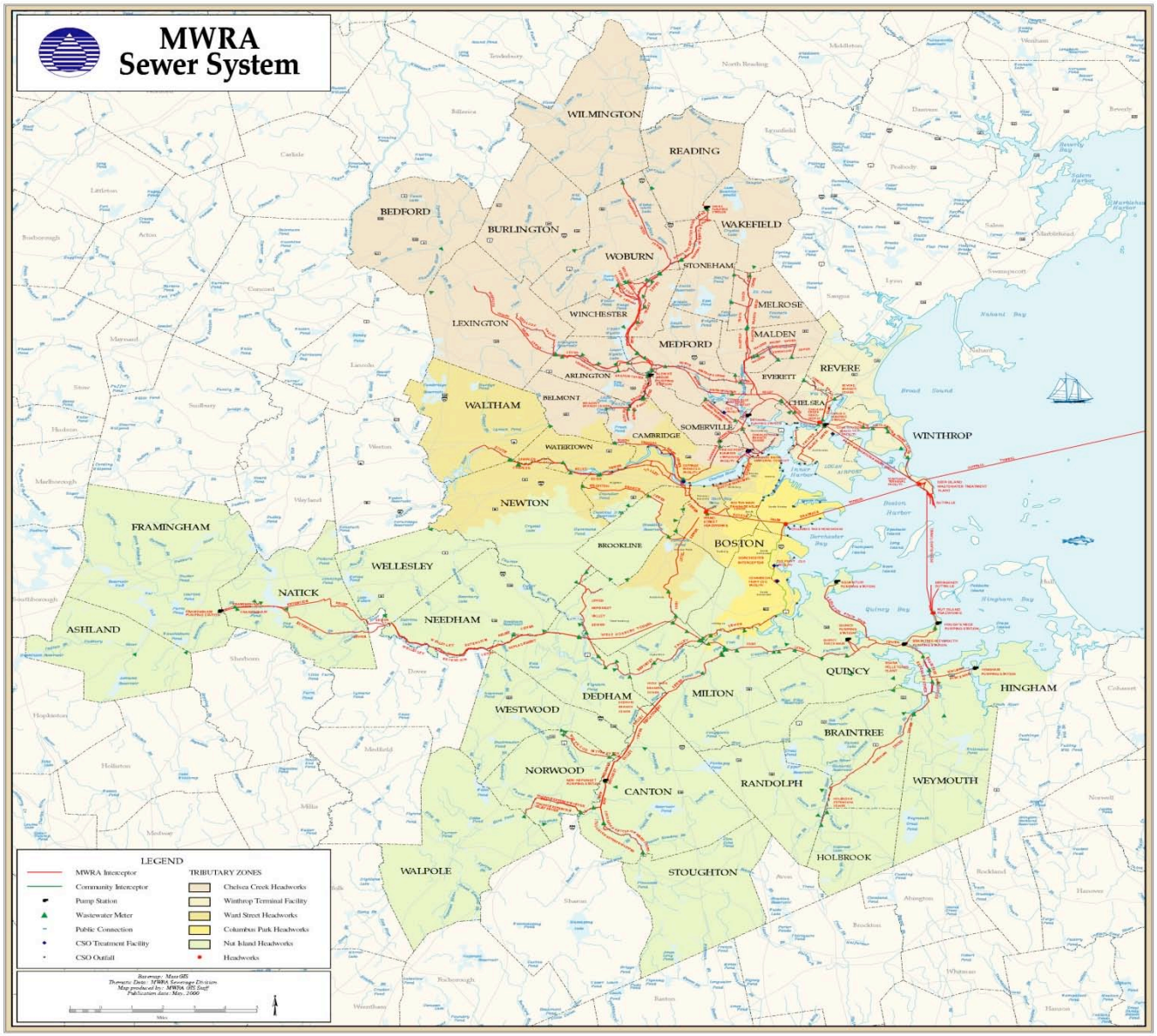
SEWER UTILITY ASSESSMENT

Community	Share of Average Daily Sewer Flow	Population Share	PFY2012 Assessment	Share of System Assessment
Boston (BWSC)	28.15%	29.22%	$116,181,319	28.37%
Cambridge	5.81%	4.93%	$21,699,797	5.30%
Newton	5.44%	3.83%	$19,722,652	4.82%
Quincy	4.44%	4.12%	$17,816,425	4.35%
Somerville	3.30%	3.46%	$13,951,648	3.41%
SYSTEM TOTAL	**338.74 mgd**	**2.2M**	**$409,566,232**	**100%**

Agenda

- Wastewater Metering System Overview
- MWRA Rate Assessment Methodologies
- **I/I Local Financial Assistance Program Update**
- Long-Term Regional Flow Data
- Community Flow Component Estimates
- North System Hydraulic Study

Massachusetts Water Resources Authority



MWRA Regional Collection System

- 43 Wholesale Customer Communities
- Average 360 MGD flow collected at over 1800 Connections
- Over 240 miles of Interceptors
- Over 4,000 Manholes
- 13 Pump Stations
- 5 CSO Facilities
- 6 Headworks Facilities
- Peak Transport/Treat Capacity is 1.3 Billion GPD - more than 3.5 times the ADF
- Additional Peak Flow Capacity at CSOs

43 Community Collection Systems

- Over 5,000 Miles of Public Sewers
- 370 Pump Stations
- Over 100,000 Manholes
- Over 5,000 Miles of Private Laterals Connecting Over 400,000 Sewer Services
- Over 2 million Retail Sewer Customers
- Over 1,800 Connections to MWRA Interceptors
- Average 360 MGD flow discharged to MWRA

Wastewater Flow Components

Groundwater INFILTRATION

Manhole INFLOW

Wastewater Flow Components

Sump Pump Inflow

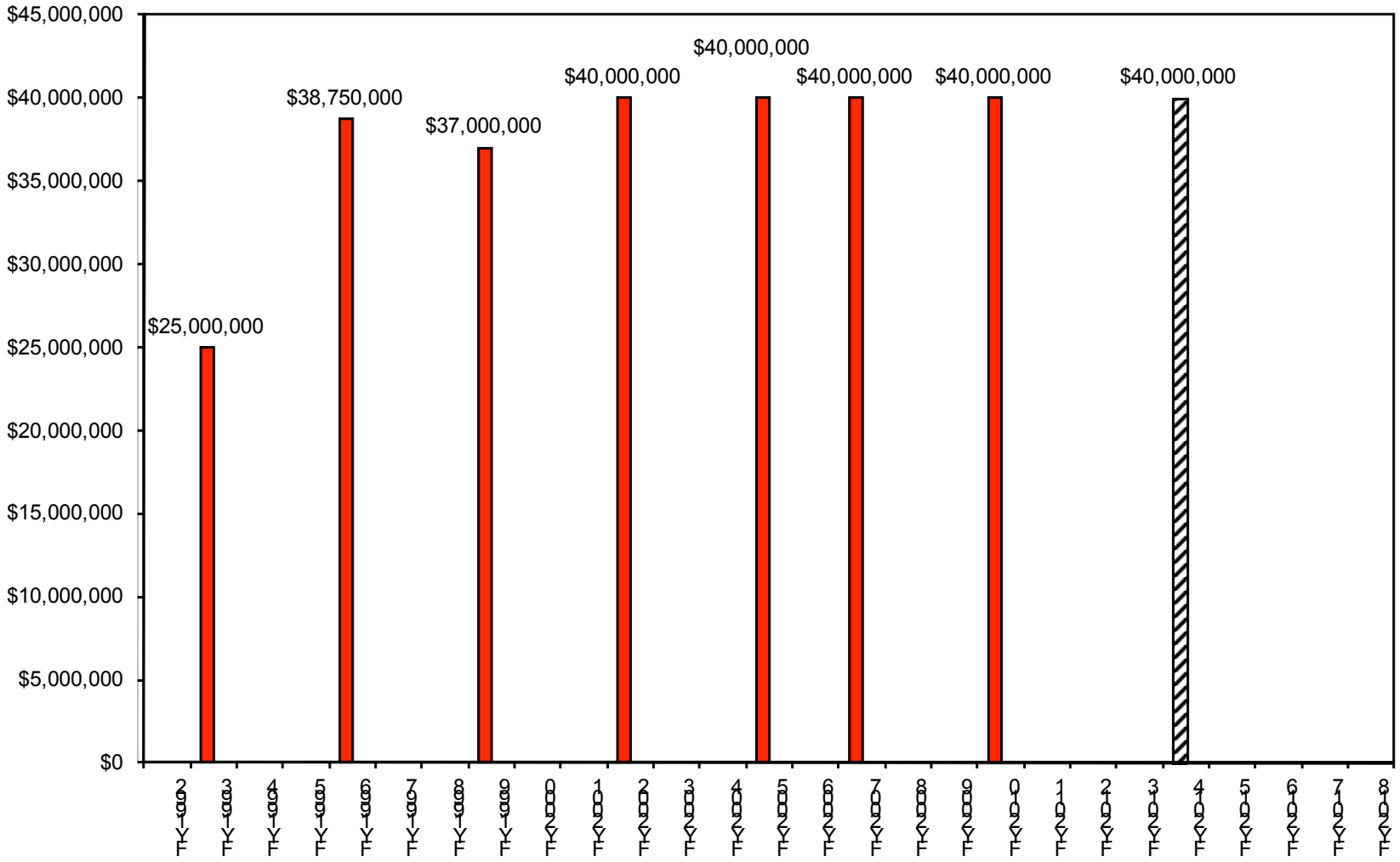
Downspout Inflow

I/I Local Financial Assistance Program

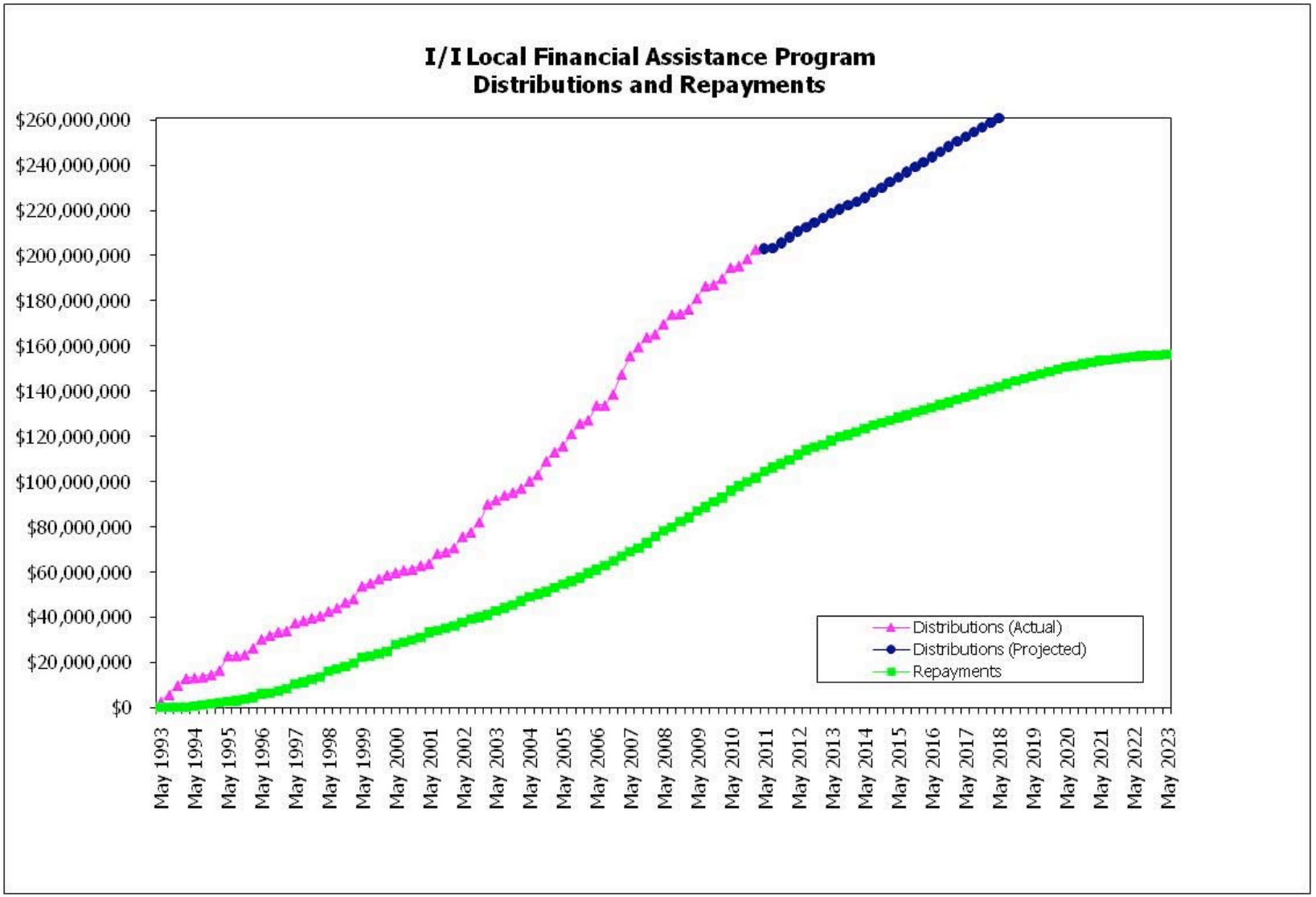
- Program began May 1993 at $25 million
- MWRA Board has approved 6 additional fundings totaling $235 million
- Total funding to date is $260 million approved through FY18
- $40 million additional MWRA funding budgeted in FY14
- $60 million additional community investment in I/I reduction projects
  - $51 million local project costs
  - $9 million in interest earned on MWRA funds
- Additional community investment in I/I reduction from SRF funded projects

I/I Local Financial Assistance Program

I/I Local Financial Assistance Program - Funding Phases
Continued Commitment by MWRA to Fund Local Projects



I/I Local Financial Assistance Program
Distributions and Repayments



I/I Local Financial Assistance Program

- Community allocation based on percent sewer charge
- $203M distributed through February 2011
- 45 percent grant / 55 percent interest-free loan
- Loan repayment over 5 years
- All 43 communities participating – over 400 projects funded
- 73% of funds to construction projects
- 27% of funds to planning and design projects

I/I Local Financial Assistance Program

MWRA I/I LOCAL FINANCIAL ASSISTANCE PROGRAM
FUNDING SUMMARY AS OF FEBRUARY 2011

Community	Total Allocations (Phases 1/2/3/4/5/6/7)	Total Distributions (Phases 1/2/3/4/5/6/7)	Percent Distributed	Funds Remaining
Arlington	$4,893,000	$4,707,400	96%	$185,600
Ashland	$1,126,500	$930,500	83%	$196,000
Bedford	$1,999,600	$1,691,600	85%	$308,000
Belmont	$2,992,100	$1,974,999	66%	$1,017,101
Boston	$74,278,200	$56,211,401	76%	$18,066,799
Braintree	$4,581,000	$2,483,127	54%	$2,097,873
Brookline	$7,400,200	$4,730,200	64%	$2,670,000
Burlington	$2,845,800	$2,389,800	84%	$456,000
Cambridge	$13,547,100	$9,777,055	72%	$3,770,045
Canton	$2,353,900	$1,645,900	70%	$708,000
Chelsea	$3,605,100	$2,878,100	80%	$727,000
Dedham	$3,441,000	$3,441,000	100%	$0
Everett	$4,525,500	$3,141,500	69%	$1,384,000
Framingham	$7,015,000	$4,230,395	60%	$2,784,605
Hingham	$885,500	$589,500	67%	$296,000
Holbrook	$920,600	$496,600	54%	$424,000
Lexington	$4,159,300	$4,159,300	100%	$0
Malden	$6,725,900	$4,593,900	68%	$2,132,000
Medford	$6,914,600	$4,794,600	69%	$2,120,000
Melrose	$3,385,300	$2,845,300	84%	$540,000
Milton	$3,251,500	$3,251,500	100%	$0
Natick	$3,194,600	$1,912,700	60%	$1,281,900
Needham	$3,746,600	$2,490,350	66%	$1,256,250
Newton	$11,925,400	$10,519,400	88%	$1,406,000
Norwood	$3,939,400	$3,355,399	85%	$584,001
Quincy	$11,125,000	$9,373,000	84%	$1,752,000
Randolph	$3,370,800	$2,810,900	83%	$559,900
Reading	$2,520,100	$2,116,100	84%	$404,000
Revere	$5,502,900	$5,502,900	100%	$0
Somerville	$8,767,800	$5,723,790	65%	$3,044,010
Stoneham	$2,867,900	$2,451,900	85%	$416,000
Stoughton	$2,696,900	$2,636,400	98%	$60,500
Wakefield	$3,396,900	$2,850,000	84%	$546,900
Walpole	$2,083,000	$1,759,000	84%	$324,000
Waltham	$7,808,400	$7,808,400	100%	$0
Watertown	$3,653,800	$2,041,800	56%	$1,612,000
Wellesley	$3,275,700	$2,069,747	63%	$1,205,953
Westwood	$1,425,300	$1,039,300	73%	$386,000
Weymouth	$6,505,900	$4,712,400	72%	$1,793,500
Wilmington	$1,388,000	$1,388,000	100%	$0
Winchester	$2,424,000	$1,731,000	71%	$693,000
Winthrop	$1,926,400	$1,264,800	66%	$661,600
Woburn	$6,358,500	$6,358,500	100%	$0
Totals	$260,750,000	$202,879,463	78%	$57,870,537

Community Support Program On the Web

Community Support Programs
Massachusetts Water Resources Authority

WATER SYSTEM TOPICS

Local Pipeline Assistance Program (LPAP)
Loan program to fund local water distribution system improvements for member water communities.

Local Water System Assistance Program (LWSAP)
Loan program to fund local water system improvement projects for member water communities.

Water Conservation and Efficiency
Information for member communities, local businesses and residents; free educational brochures and low-flow fixtures; case studies.

Leak Detection Task Order Contract
This contract provides member communities access to high quality leak detection service at a reasonable cost. Services peformed under the task order contract are paid by MWRA; communities are billed the following year.

The MWRA Water System
Information about our water system, including drinking water quality and recent improvement projects.

SEWER SYSTEM TOPICS

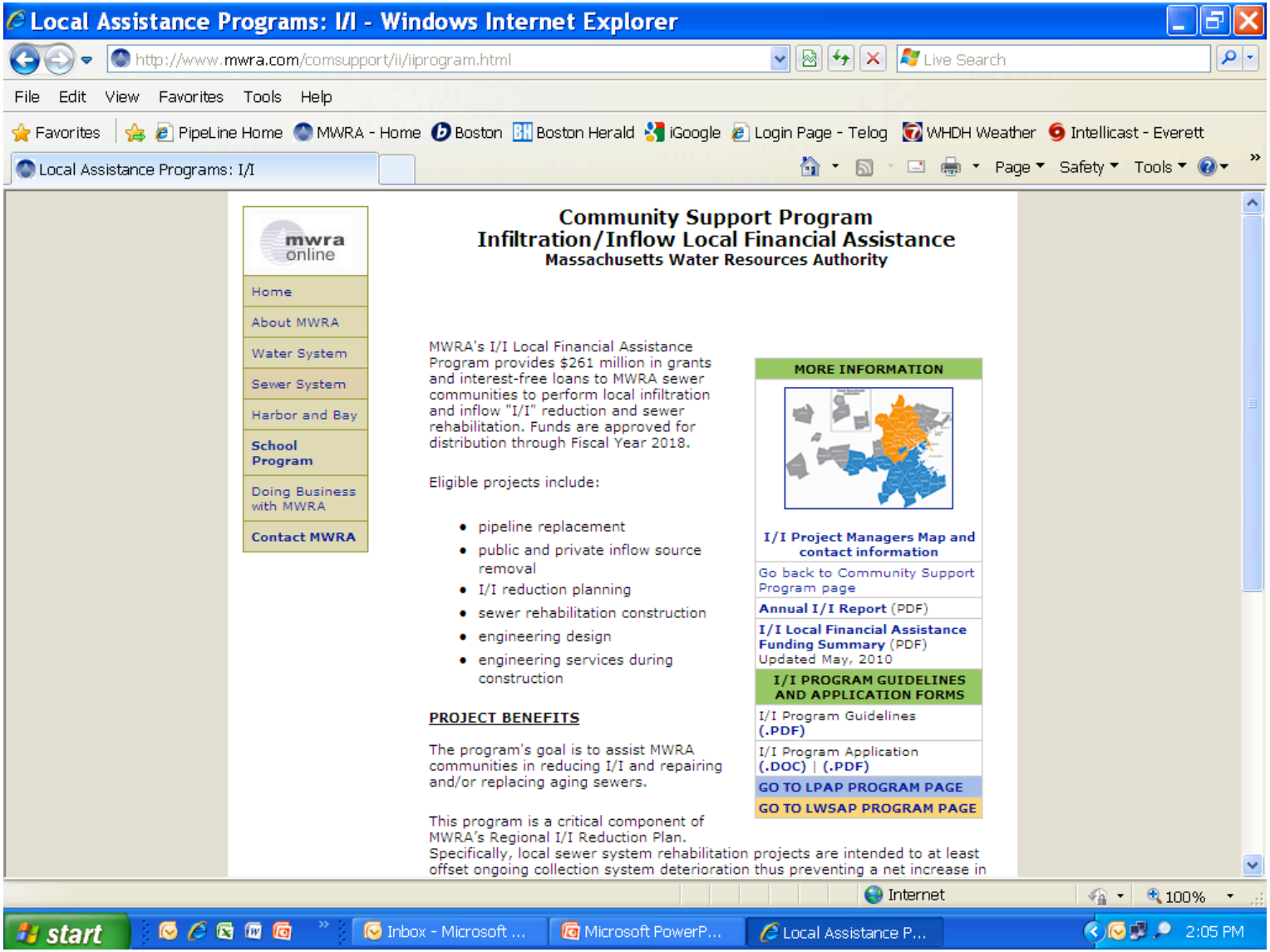
Infiltration/Inflow (I/I) Local Assistance Program
Grant and loan program to fund local I/I reduction and sewer system rehabilitation projects for member sewer communities.

Annual Infiltration/Inflow Reduction Report (PDF)
A progress update on regional I/I reduction accomplishments by fiscal year as required by MWRA's NPDES Permit.

Regional Infiltration/Inflow Reduction Plan, September, 2002 (PDF)
Plan as approved by the MWRA Board of Directors on May 23, 2001. MWRA submitted the plan to the US EPA and MA DEP as required under MWRA's NDES Permit. It was approved by MA DEP on November 19, 2002.

The MWRA Sewer System
Information about our sewer system, wastewater treatment, and our state of the art facilities.

I/I Financial Assistance On the Web



I/I Local Financial Assistance Program
Funding Process

- Marketing the Program – Letters, Meetings, Advisory Board Coordination
- Community Vote to Borrow Funds, City or Town Requirements
- Community Financial Assistance Application to MWRA
- Community Signs Financial Assistance and Loan Agreements
- Community Bond Counsel Drafts Sewer Bond
- Quarterly Fundings (February, May, August, November)
- Electronic Transfer of funds to MMDT Account
- Five Annual Loan Repayments

I/I Local Financial Assistance Program
Project Management

- Copies of Community Contracts
- Monitoring of Monthly MMDT Account Statements
- Periodic Progress Reports with Copies of Invoices
- Project Tracking Spreadsheets
- Project Document/Field Inspection Review
- Project Closeout – Community Certification
- Use of MMDT Interest and Any Underspent Funds

I/I Local Financial Assistance Program

Results for Planning/Inspection

- 1,215 miles of sewer TV inspected
- 875 miles of sewer flow isolated
- 1,000 miles of sewer smoke tested
- 33,100 sewer manholes inspected
- 58,000 buildings inspected
- 20,000 dye tracing of connections

I/I Local Financial Assistance Program

Results for Infiltration Reduction Construction

- 60 miles sewer replaced
- 70 miles sewer CIP lined
- 125 miles sewer tested/chemical sealed
- 2,000 sewer spot repairs
- 6,100 service connection repairs
- 5 miles underdrains sealed

I/I Local Financial Assistance Program

Results for Inflow Reduction Construction

- 1,180 catch basins disconnected
- 35 miles storm drains new or replaced
- 9,600 manholes rehabilitated/sealed
- 1,500 manhole covers replaced/inflow seals installed
- 415 sump pumps redirected
- 10,100 downspouts/area drains disconnected
- Above does not include stormwater removed from CSO separation projects

I/I Local Financial Assistance Program

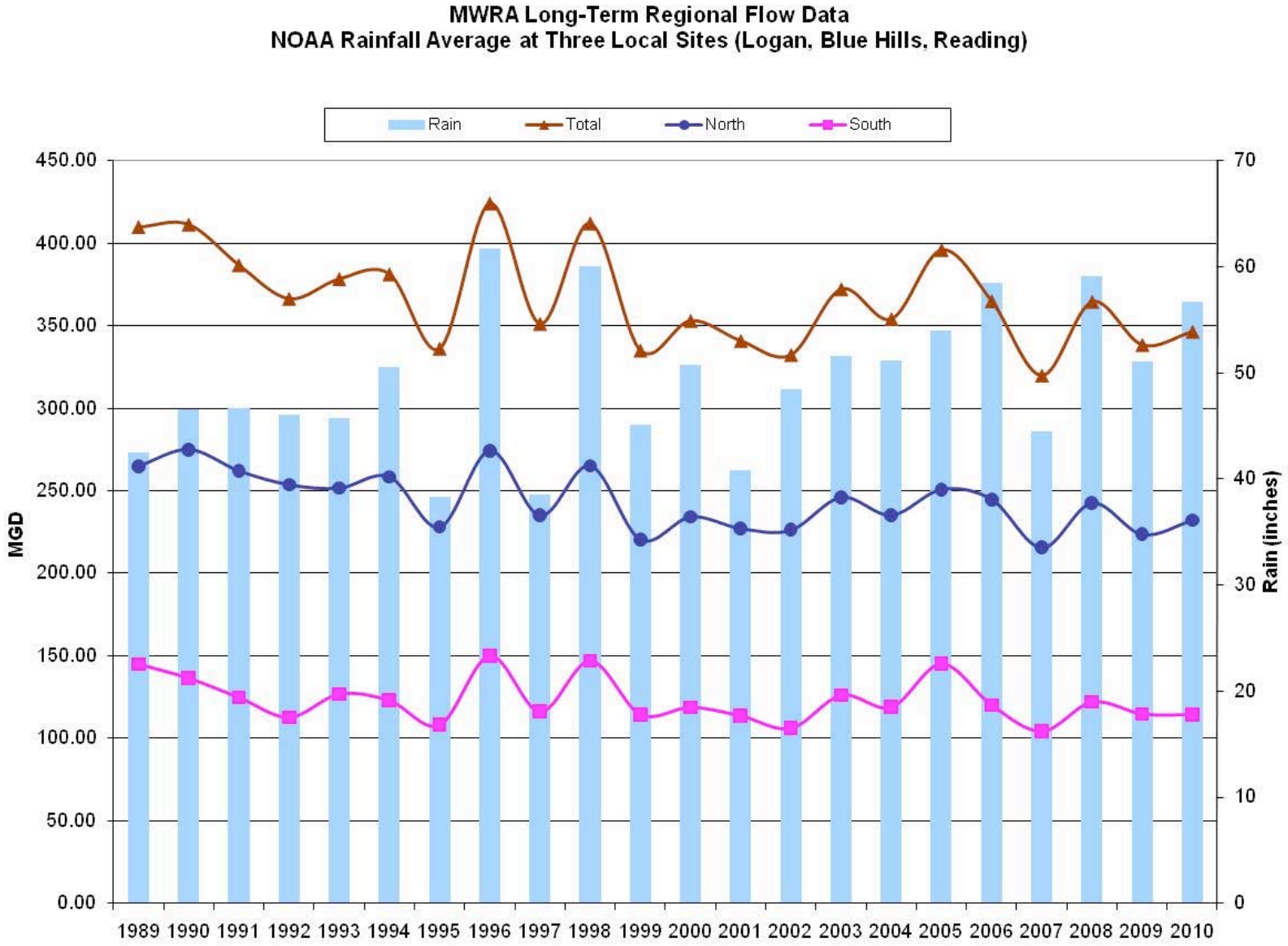
Results Summary – All 43 Sewer Communities

- $203 million grant/loan funds to local projects over 18 years (1993-2011)
- Over $11 million per year invested in local systems
- Over 400 local I/I projects undertaken
- Estimated 79 mgd average daily flow of I/I reduced at point of completed projects
- End of pipe (at Headworks) reduction is less
  - Annual variation in precipitation and wastewater flows
  - System pipeline and pump station capacity increases
  - Infiltration migration
  - CSO Program optimization of capture and treatment

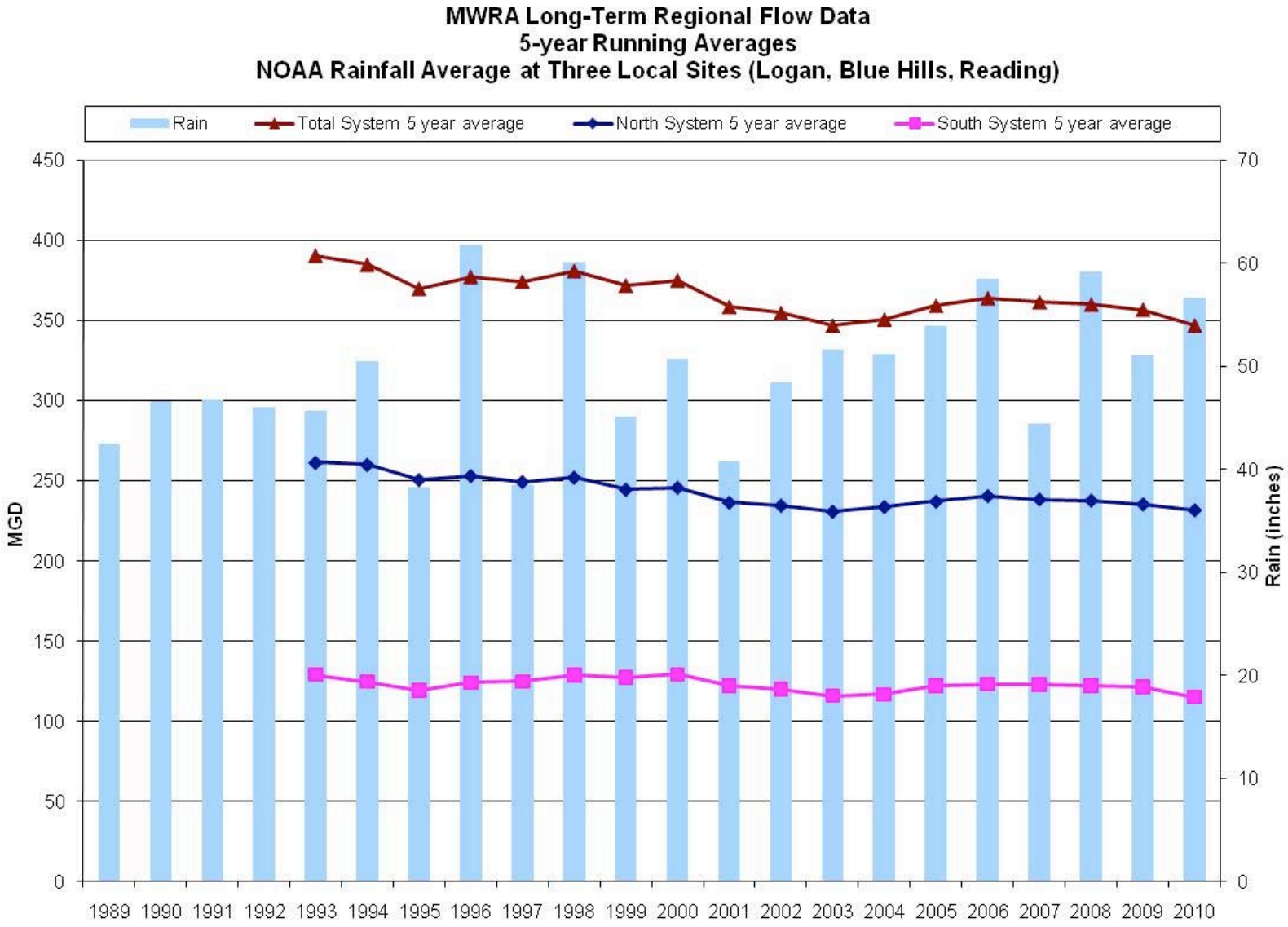
Agenda

- Wastewater Metering System Overview
- MWRA Rate Assessment Methodologies
- I/I Local Financial Assistance Program Update
- **Long-Term Regional Flow Data**
- Community Flow Component Estimates
- North System Hydraulic Study

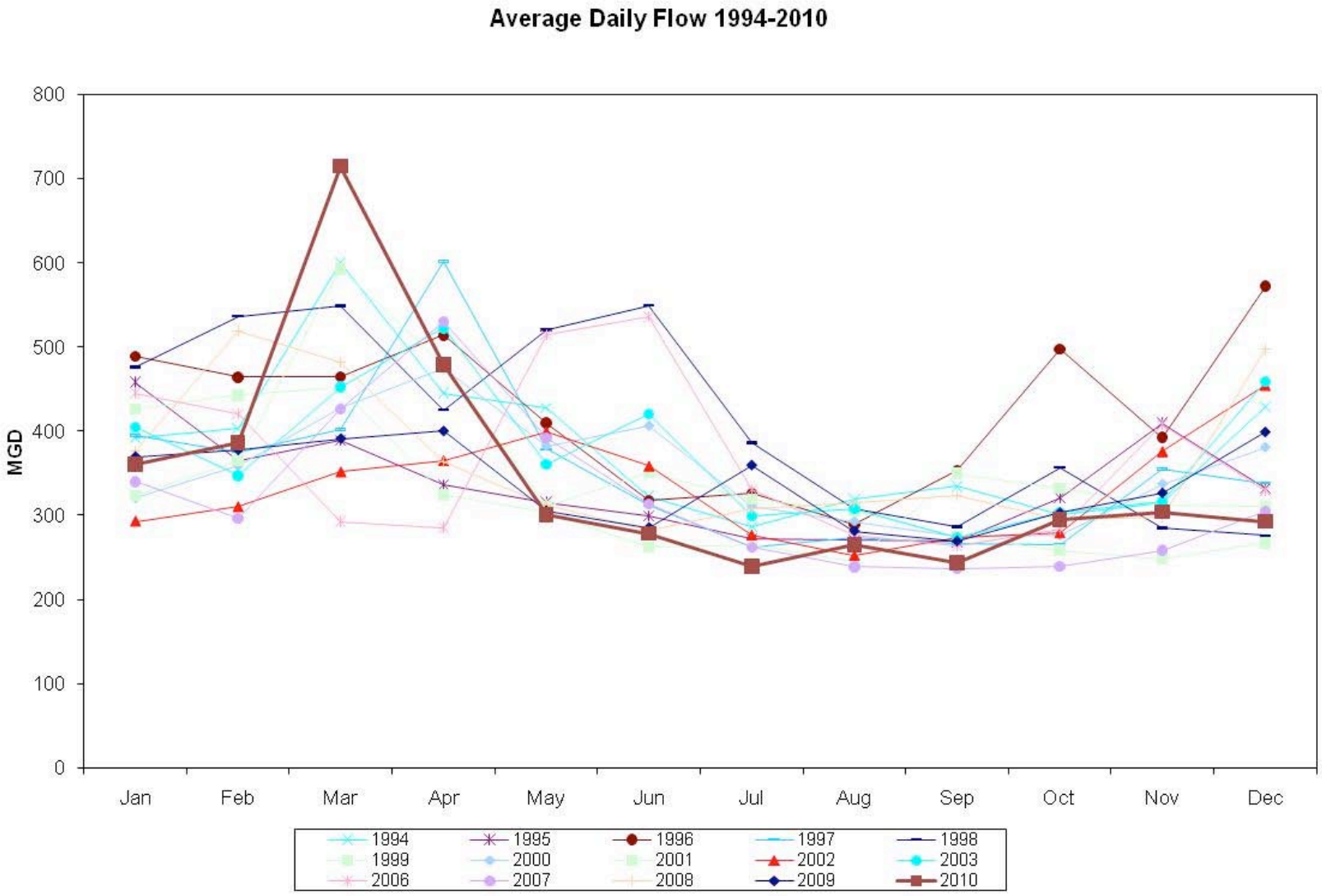
Long-Term Regional Flow Data



Long-Term Regional Flow Data



Long-Term Regional Flow Data - Monthly



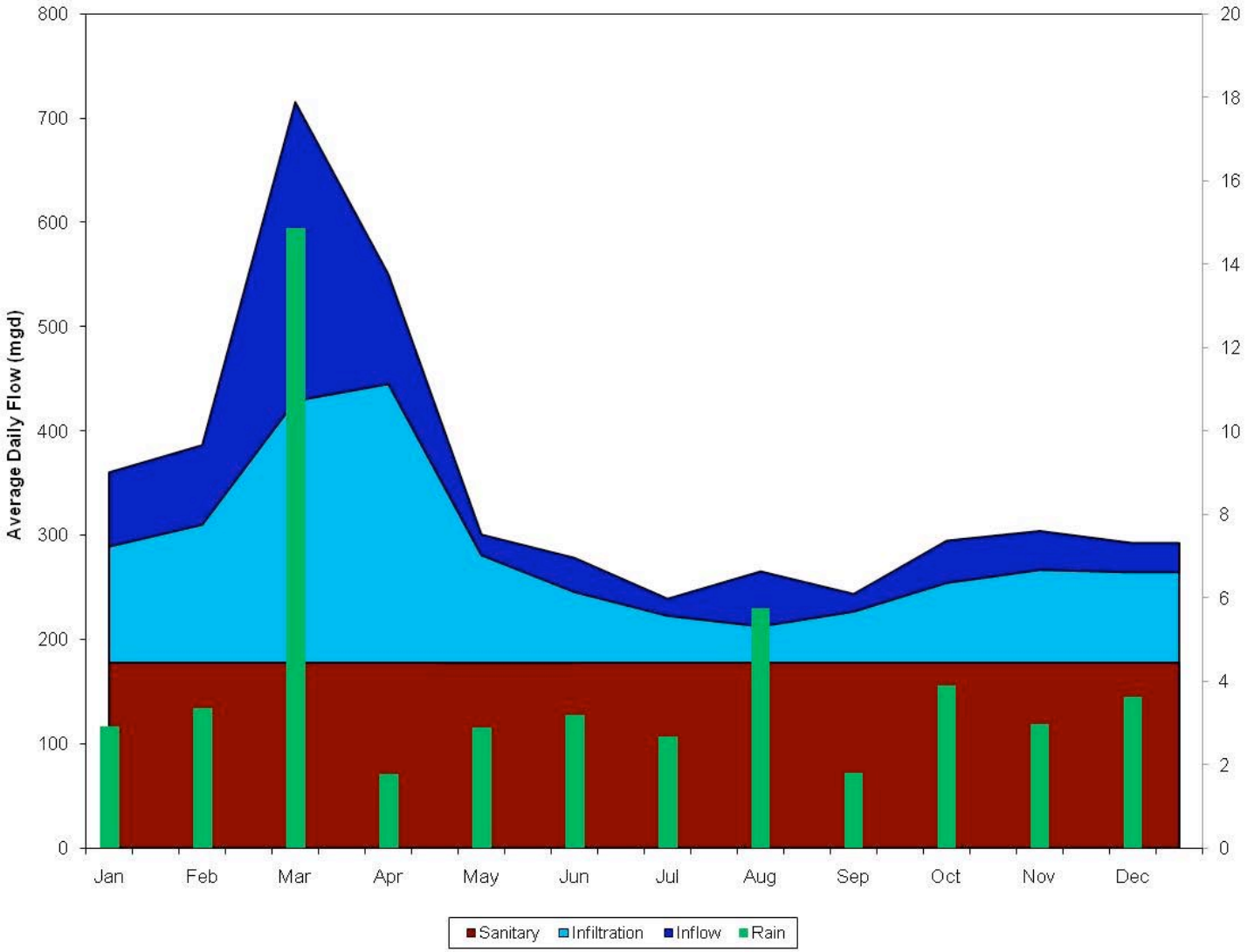
Agenda

- Wastewater Metering System Overview
- MWRA Rate Assessment Methodologies
- I/I Local Financial Assistance Program Update
- Long-Term Regional Flow Data
- **Community Flow Component Estimates**
- North System Hydraulic Study

Community Flow Component Estimates

- Wastewater Flow Components
  - Sanitary Flow (Residential/Commercial/Industrial/Institutional)
  - Stormwater Inflow
  - Groundwater Infiltration
  - Rainfall Induced I/I is included in both Inflow and Infiltration
- Rainfall Data

2010 Wastewater Flow Components



Flow Components – Monthly I/I Analysis

- Monthly Wastewater Flow Data by Individual Community
- ADF for Month
- Dry Day Flow (Average 4 Selected Dry Days)
- Inflow = ADF minus Dry Day Flow
- Infiltration = Dry Day Flow minus Sanitary Flow

Flow Components – Annual Sanitary Flow Analysis

- Historic Winter Water Use (High % Return to Sewer)
  - fully-supplied MWRA water communities
  - partially-supplied MWRA water communities
  - non-MWRA supplied communities
- Annual DEP Water Use Statistical Survey
- Cross-Community Winter Water Sales
- Community Water Population vs Sewer Population
- Historic Low Wastewater Flows Due to Extended Dry Period (High Percent Sanitary Flow and Low I/I)
- Selected Sanitary Flow is High % of Winter Water Use
- Selected Sanitary Flow is High % of Low Wastewater Flow
- Check Sanitary Flow Per Capita is Reasonable Considering Community Residential/Commercial/Industrial/Institutional Mix

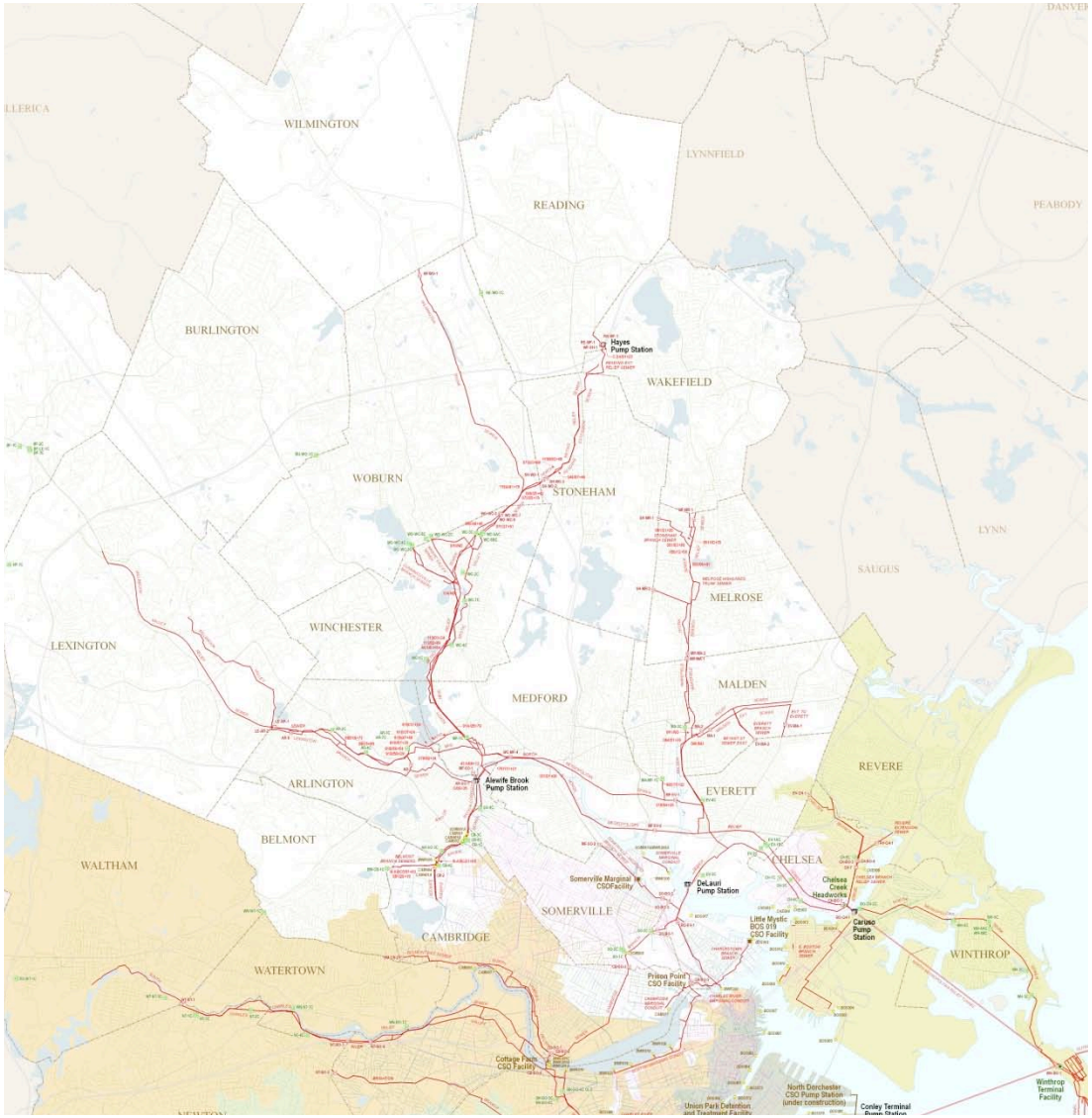
Flow Component Estimate by Community

- Provided in Annual I/I Reduction Report – see Handout
- Monthly Wastewater Flow Data by Community (Rate Basis Data)
- Annual Flow Component Summary by Community
- Community Statistics and Ranked Flow Components

Agenda

- Wastewater Metering System Overview
- MWRA Rate Assessment Methodologies
- I/I Local Financial Assistance Program Update
- Long-Term Regional Flow Data
- Community Flow Component Estimates
- **North System Hydraulic Study**

North System Map



North System Hydraulic Study – Scope Summary

Project Goal

- To analyze the MWRA Chelsea Creek Headworks tributary area and develop recommended means for system optimization and SSO impact reduction as it relates to various areas of discharge.

Study Area

- The study area includes the MWRA interceptor system tributary to Chelsea Creek Headworks associated with overflows to the Mystic River and its tributaries.

North System Hydraulic Study – Scope Summary

Major Tasks Outline

- The initial phase of this study is to review and confirm baseline information on system performance under a range of typical and extreme wet weather events. It will involve site visits, staff interviews, data collection, data analysis, current capacity analysis and hydraulic model refinements and baseline calibrations.

- The second phase will identify potential system operational or physical modifications or optimization opportunities to eliminate, reduce, or modify (relocate or consolidate) SSO's and improve wet weather flow conveyance. Considerations to include economic, public health impacts, water quality and operational feasibility. This phase will rely on use of the MWRA's hydraulic model. Three levels of alternatives will include: 1) system optimization measures; 2) inflow and infiltration data for the MWRA and tributary community systems; and 3) major system modifications and/or new facilities.

North System Hydraulic Study – Scope Summary

Schedule

The Authority envisions this project will be a collaborative effort between an expert engineering consultant team and MWRA staff.

- Completion of the scope of work & project advertisement – July 2011
- Consultant notice to proceed – October 2011
- Estimated project duration – 12 months

DEP Policy No. BRP 09-11

Managing Infiltration and Inflow in MWRA Community Sewer Systems

- This policy applies to all communities in the MWRA Sewer Service Area

- Projects over the MEPA threshold for an EIR and have new wastewater flow exceeding 15,000 gpd must offset new flow via I/I mitigation