495/MetroWest Water Resources Strategy
Trends and Tools for a Water Smart Region

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1. Assessment of water resource trends in the region:
   • Water Supply
   • Wastewater
   • Storm Water

2. Tools for Sustainable Water Management:
   • Low Impact Development
   • Peak Season Water Demand Management
   • Water Reuse/Reclaimed Water

3. Other Project Components:
   • Leak Detection regional contract
   • Water Resources Planning for 3 towns
   • Hydrologic Modeling for the Charles & Assabet (USGS)
The 495/MetroWest Corridor

- 32 cities & towns along I-495 from Littleton to Foxborough
- Most within the Charles River and the SuAsCo watersheds
- Population 511,000
  Employment 270,000
- Growth trends, 1970-2000:
  Population + 91,000 (27%)
  Employment + 144,000 (114%)
PROJECTED POPULATION 2000 - 2030

Highest growth rates in three regions:

- 495 Corridor
- Upper North Shore
- Southeastern MA

495 corridor: Increase of 86,000 or 15% growth
PROJECTED EMPLOYMENT 2000 - 2030

495 Corridor:
One of 4 major job centers in the metro area

Increase of 40,000 jobs, or 17% growth
The Context: Stressed Watersheds

The Charles & SuAsCo watersheds classified as are medium stress basins by the Mass. DCR
WATER SUPPLY: OVERVIEW

• 26 municipalities have municipal water systems:
  • 22 rely exclusively on local water sources
  • 4 are partially or fully supplied by the MWRA

• 6 water systems are over or near the withdrawal limits set by the Water Management Act.

• Peak season demand is the critical factor in most communities
17 towns had a decreasing trend: from 38 to 35 MGD, a decrease of 3 MGD or 8%.

9 towns had an increasing trend: from 15 MGD to 17 MGD, an increase of 2 MGD or 13%.
Projected 2030 Water Demand vs. Existing WMA Withdrawals

By 2030, **10 towns** in the 495 corridor may exceed their *existing* Water Management Act withdrawals.
Spotlight on Peak Demand
2000 – 2005

• In 11 towns, peak season water demand averaged 40% higher than the rest of the year

Trends by town:
• 12 towns had a trend of increasing peak demand
• 14 towns had a trend of decreasing peak demand

Trends by watershed:
• 4.5% increase in peak demand in the Charles basin
• 2.5% decrease in peak demand in the SuAsCo basin
Annual Patterns in Monthly Stream Flow and Water Demand, Assabet and Charles River Basins

- Charles River (Medway)
- Assabet River (Maynard)
- Average of 7 Charles River Towns
- Average of 8 Assabet River Towns

Data Source: U.S. Geological Survey
WASTEWATER: OVERVIEW

- 16 communities in the 495/MetroWest corridor are served by 11 WWTF’s; MWRA serves 3 towns

- 4 WWTF’s in the Assabet basin must upgrade to reduce their phosphorus loading

- Inflow and infiltration (I/I) continues to be a major challenge for most systems
Wastewater Flows: Key Trends 2000 - 2005

• 7 of 8 WWTF’s increased their discharges:
  • 4 increased by over 15%
  • 2 increased by over 25%

• In the Charles River basin, total monthly discharges increased from 9.3 MG to 10.9 MG, an increase of 18%

• In the SuAsCo watershed, total monthly discharges increased from 14.7 MG to 16.2 MG, an increase of 10%
Spotlight on Inflow and Infiltration  
2000 - 2005

- Inflow/Infiltration constituted 14% of annual discharges and 35% of April discharges.

- Total water lost to Inflow/Infiltration increased from 1.2 to 1.9 MGD in the Charles River watershed and 1.9 to 2.6 MGD in the SuAsCo watershed.

- The following chart shows the correlation between groundwater levels and wastewater discharges and demonstrates that infiltration is a major component of wastewater flow in most systems.
Spotlight on Inflow and Infiltration

Sewage Flows and Groundwater Levels, by month, 2000-2005, Charles and SuAsCo Treatment Facilities

Data Sources: Massachusetts DEP, U.S. EPA, U.S. Geological Survey
Impacts of storm water include:
- degraded water quality,
- increased frequency and severity of flooding
- decreased aquifer recharge and stream flow

Watershed health may be impaired by more than 10% impervious coverage

Significant impacts may occur with more than 25% impervious coverage
MAPC’s GIS analysis divides the 495 Corridor into 3 categories of impervious coverage:

- **LOW**: less than 10%
- **MEDIUM**: 10% to 35%
- **HIGH**: 35% to 90%
Storm Water: Impervious Surfaces

• As of 1999, the 495 corridor had 41,000 acres of impervious surfaces, or 11% of the land area

• From 1971 to 1999, the total impervious surfaces increased 12,000 acres, or 40%

• Land uses associated with impervious surfaces:
  • Residential: 49% (19,900 acres)
  • Industrial/commercial: 26% (10,600 acres)
  • Transportation: 15% (3,700 acres)
Tools for a Water-Smart Region

**Low Impact Development:**
*The Massachusetts Low Impact Development Toolkit*

**Peak Season Water Demand:**
*SummerSmart Water Use: A Guide to Peak Season Demand Management*

**Water Reuse/Reclaimed Water:**
*Once is Not Enough: A Guide to Water Reuse in Massachusetts*
Low Impact Development

Massachusetts Low Impact Development Toolkit

- Nine Fact Sheets
- Three Brochures
- LID FAQs
- Stormwater Bylaw Primer
- Local Development Controls Checklist
Low Impact Development

LID strategies include a suite of techniques:

- Low Impact Site Design
- Bioretention
- Vegetated Swales
- Grass Filter Strips
- Infiltration Trenches /Drywells
- Rain Barrels and Cisterns
- Roadways & Parking Areas
- Permeable Paving
- Green Roof Systems
Low Impact Development

LID Roadblocks & Incentives:
- Zoning Bylaw & Site Plan Review
- Subdivision Rules & Regulations
- Board of Health Regulations
- Wetland Regulations
- Building Codes

LID Local Examples:
- Acton - Long Pond
- Cohasset - Lily Pond, Aaron R. Res.
- Ipswich - Partridgeberry Place
Peak Season Water Demand Mgmt.

**SummerSmart Water Use**

A Guide to Peak Season Water Demand for MA Communities

- Public Education
- Water Use Restrictions
- Indirect Water Use Regulation
- Pricing, Metering & Billing
- Alternative Sources of Water
- Audits & Workshops
- Incentives
- Program Evaluation
Peak Season Water Demand Mgmt.

Pricing: Seasonal Rates, Concord, MA:
Uniform rate in winter, increasing block rate in summer

Concord Water Rates - Residential

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- **Peak period**
- **Non-peak**
Water Reuse / Reclaimed Water

Once Is Not Enough - A Guide to Water Reuse

Overview of Water Reuse:
- Commercial Reuse
- Industrial Reuse
- Groundwater Recharge
- Agricultural / Recreational

Technical Issues
Cost/Benefits
Regulatory Overview
Recommendations
Water Reuse / Reclaimed Water

Types of Water Reuse

- **Commercial water reuse:**
  - Irrigation
  - Toilet flushing
  - Vehicle washing
  - Fountains, reflecting pools, waterfalls
  - Fire protection

- **Industrial water reuse:**
  - Cooling water
  - Industrial process water

- **Groundwater Recharge**

- **Agricultural / Recreational**
Water Reuse / Reclaimed Water

Local Case Studies of Water Reuse

**Gillette Stadium, Foxborough**
- 60% of treated wastewater used for toilet flushing

**Intel Massachusetts, Hudson**
- Industrial process water offsets town water supply

**EMC Corporation, Hopkinton**
- 11,000 gallons/day; 95% toilets, 5% cooling

**Kingston, MA**
- Treated effluent for irrigation at golf course
- Subsurface leaching fields to recharge aquifers
Other Project Elements
Assessment, Planning, & Implementation

Hydrologic Modeling:
- USGS modeling of Assabet and Charles watersheds
- Analysis of alternative future growth scenarios

Water Resources Planning:
- 3 towns in Assabet basin: Hudson, Acton, Westborough
- Analysis of trends, alternatives and recommendations

Leak Detection:
- Regional leak detection contract administered by MAPC on behalf of cities and towns
495/MetroWest Water Resources Strategy

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Publications available online at:
www.mapc.org/495water
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www.arc-of-innovation.org