Massachusetts Department of ENVIRONMENTAL PROTECTION

2006 DWM ENVIRONMENTAL MONITORING OVERVIEW

(CN 277.0)

Water quality monitoring, assessment and management activities of MassDEP are sequentially performed in accordance with a rotating five-year watershed schedule. Surface waters are typically monitored during Year 2 of the cycle by the Division of Watershed Management's (DWM) Watershed Planning Section. The main programmatic objectives of the DWM related to surface water quality monitoring are to:

- Collect chemical, physical and biological data to assess the degree to which designated uses, such as primary and secondary contact recreation, fish consumption, aquatic life and aesthetics, are being met in waters of the Commonwealth;
- Collect chemical, physical and biological data to support analysis and development of implementation plans to reduce pollutant loads to waters of the Commonwealth;
- Screen fish in selected waterbodies for fish tissue contaminants (metals, PCBs and organochlorine pesticides) to provide for public health risk assessment;
- To the extent feasible, locate pollution sources and promote and facilitate timely correction;
- Over the long term, collect water quality data to enable the determination of trends in parameter concentrations and/or loads;
- Develop new or revised standards, which may require short-term research monitoring directed towards the establishment or revision of water quality policies and standards; and to
- Measure the effectiveness of water quality management projects or programs (such as the effectiveness of implementing TMDLs, Best Management Practices (BMP) for the control of nonpoint pollution, or a state-wide policy or permitting program).

Quality assurance is maintained for DWM's watershed monitoring program to ensure implementation of an effective and efficient sampling design, to meet programmatic goals and to provide data meeting specific data quality objectives. The U.S. Environmental Protection Agency (USEPA) has approved a comprehensive Quality Assurance Program Plan (QAPP) that applies to the generation and use of surface water quality data by DWM for a five-year period (2005 through 2009). This five-year *program* QAPP is annually supplemented by project-specific Sampling and Analysis Plans (SAPs), which provide detailed information regarding individual *project* organization, tasks, background, sampling design and non-direct measurements.

The DWM performed monitoring activities in 2006 primarily within the *Concord, Farmington,*

Taunton and Westfield watersheds and *South Coastal* drainage area. In consultation with appropriate agencies and organizations (e.g., USEPA, USGS, watershed associations, etc.) DWM monitoring coordinators reviewed historical data and information, examined GIS data layers, reviewed NPDES and water withdrawal permits, conducted reconnaissance and formulated individual watershed SAP's. While some of the DWM monitoring activities in 2006 were targeted at specific issues of concern, the majority of the monitoring in the "Year Two" watersheds was aimed at providing the necessary data and information to assess the extent to which water bodies are supporting their intended uses, as designated in the Massachusetts Surface Water Quality Standards. This information will be used in the preparation of individual watershed assessment reports, the Massachusetts Integrated List of Waters submitted to the EPA in fulfillment of sections 305b (Summary of Water Quality) and 303d (List of Impaired Waters) of the Clean Water Act (CWA), and will provide, in part, "the percent of waters that are safe for fishing, and support aquatic life and recreation", and other BRP "environmental indicators" identified in the State-EPA Performance Partnership Agreement (PPA).

The DWM continued to make substantial progress in 2006 with automating selected routine data collection activities. Prior to 2005, the DWM collected theoretically "worst-case" dissolved oxygen data from rivers and streams by performing pre-dawn (typically 12-6 am) surveys using portable multiprobes. However, the following problems were encountered with this approach: 1) data regarding temperature maxima were not captured, as these occur later in the day; 2) DO data were limited to one point in time (not continuous) and may not have captured the true minimum; 3) staff schedules and functionality were stressed by having to work typically from 11pm to 7 am; and 4) working at night had greater potential for accidents (personal and equipment safety issues) and errors (data quality issues). To alleviate these problems, and to expand the quantity and quality of dissolved oxygen and temperature data obtained from "Year 2" watersheds, the DWM now deploys unattended, continuously-monitoring multiprobe data loggers at selected locations for approximately 48 hours on multiple occasions throughout the assessment monitoring period. This program yields DO and temperature data that are more representative of typical conditions in a manner that poses less risk to monitoring personnel.

The DWM's annual monitoring to assess surface water quality conditions in Massachusetts is successful in providing data for satisfying the reporting requirements of sections 305(b) and 303(d) of the Clean Water Act. Due to constraints on time and resources, however, this monitoring effort is not as useful for 1) identifying with confidence the specific sources of pollution that cause water quality impairments; and 2) implementing follow-up actions for remediation. To address the need for this type of data and information, MassDEP's Bureau of Resource Protection (BRP) continued collaborative bacteria source tracking (BST) efforts with MassDEP regional monitoring personnel with the goal of locating and eliminating sources of bacteria contamination to surface waters in their respective regions. The efforts of staff from the Southeast and Western regional offices were based on protocols developed for the DWM's 2004 Pilot Bacteria Source Tracking Project.

Finally, a few miscellaneous projects were undertaken in watersheds apart from the rotating monitoring and assessment schedule. For example, the DWM continued to perform fish toxics monitoring in 2006; however, this year only one "Year 2" watershed (Westfield) was monitored and most sites were sampled in response to public requests or to support ongoing research projects of the MassDEP and other agencies. Generally, edible fish fillets were analyzed for the presence of heavy metals, PCBs and pesticides. Data were provided to the Massachusetts Department of Public Health (MDPH) for human health risk assessment and health advisories,

as appropriate.

More detail pertaining to the monitoring activities accomplished in 2006 is presented below for both the "Year Two" watersheds, as well as throughout the state.

CONCORD

The 2006 surveys of the Concord (SuAsCo) Watershed focused on obtaining information to meet the following objectives:

- Provide quality-assured nutrient data for a continuing multi-year database to determine changes in nutrient concentrations and certain response variables in the Assabet River with respect to the nutrient TMDL.

- Evaluate specific water bodies to determine if Massachusetts water quality standards are being met in all three watersheds.

    - Provide quality assured fecal coliform and E. coli sp. bacteria data for the purpose of assessing Primary and Secondary Contact Recreation uses and to document effectiveness of source reduction programs;
    - Provide biological data to permit assessment of Aquatic Life Use assessment status;
    - Provide chemical and physical data for use in assessment status

- On-water surveillance and reconnaissance to document aesthetic conditions and detect previously unknown point and non-point sources.

- Provide analyses of split nutrient samples collected by POTWs.

Individual monitoring elements are described below. Water quality and biological monitoring sites are summarized in the matrix at the end of this section.

1) **Water quality:** Water quality monitoring was conducted at 31 river stations in the SuAsCo Watershed on five occasions during the summer of 2006: May 2-4, June 6-8, July 18-20, August 22-24 and September 25-26. Parameters monitored were station-specific as specified in the summary table below. Samples were collected for total phosphorus, nitrate/nitrite-nitrogen and ammonia-nitrogen. Color and turbidity samples were collected during the July and August surveys at 30 stations. Bacteria samples for fecal coliforms and E. coli were collected at 31 stations. h-situ water quality measurements, including dissolved oxygen, percent saturation, temperature, pH, and specific conductivity were made at 30 river stations. Multi-probes were deployed at 24 stations to obtain continuous dissolved oxygen and temperature readings for at least a 48-hour period on four occasions in June, July, August, and September.

2) **Biological monitoring:** Macroinvertebrate sampling and habitat assessments were performed to assess the aquatic life use status for 305(b) reporting requirements. The macroinvertebrate sampling procedures utilized Rapid Biomonitoring Protocols (RBPs) (5 sites) and/or the Chironomid Pupal Exuviae Technique (CPET) (9 sites).

3) **POTW Nutrient Monitoring:** The four major POTWs discharging to the Assabet River (Westborough, Marlborough West, Hudson, and Maynard) collected 24-hour composite samples on July 18, August 22, and September 26 which they split with DWM. Samples were analyzed all three dates for Total Phosphorus and Total Dissolved Phosphorus. For September, total nitrogen, ammonia, and nitrate/nitrite samples were also collected.

Concord Watershed – 2006 Water Quality and Biological Sampling Matrix

River/Stream	Monitoring Site Description (sample type*)
Assabet River	Near Maynard Street bridge, Westborough, MA (1,2,3,5,6)
Assabet River	Upstream Rte 9 bridge, Westborough, MA (1,2,3)
Assabet River	School Street bridge, Northborough, MA (1,2,3,4,5,6)
Assabet River	Upstream Rte 20 dam, Northborough, MA (1,2,3)
Assabet River	Allen Street bridge above dam, Northborough, MA (1,2,3,4)
Assabet River	Boundary Street, Northborough/Marlborough, MA (1,2,3)
Assabet River	Downstream Robin Hill bridge, Marlborough, MA (1,2,3,4,6)
Assabet River	Upstream Chapin Road bridge, Hudson, MA (1,2,3,4)
Assabet River	Upstream Cox Street bridge, Hudson, MA (1,2,3,4,6)
Assabet River	Upstream Rte 62 bridge, Gleasondale (Stow), MA (1,2,3,4,5,6)
Assabet River	Upstream Boon Road bridge, Stow, MA (1,2,3,4)
Assabet River	Upstream White Island Pond bridge, Stow/Maynard, MA (1,2,3,4)
Assabet River	Rte 62 bridge below outlet Powdermill Dam, Acton, MA (1,2,3,4,5,6)
Assabet River	Rte 2 bridge, Concord, MA (1,2,3,4)
Sudbury River	Fruit Street bridge, Hopkinton, MA (1,2,3,4,6)
Sudbury River	Rte 135 bridge (west), Ashland, MA (1,2,3,4)
Sudbury River	Danforth Street bridge, Saxonville (Framingham), MA (1,2,3,4,6)
Sudbury River	Stone Bridge Road bridge, Framingham/Wayland, MA (1,2,3)
Sudbury River	Pelham Island Road bridge, Wayland, MA (1,2,3,4)
Sudbury River	Sherman Bridge at Lincoln Road, North Sudbury, MA (1,2,3)
Sudbury River	Sudbury Road bridge, Concord, MA (1,2,3,4)
Sudbury River	Nashawtuc Street bridge, Concord, MA (1,2,3,4,6)
Hop Brook	Landham Rd bridge, South Sudbury, MA (1,2,3,4)
Concord River	Downstream from Monument St bridge, Concord, MA (1,2,3,4)
Concord River	Rte 225 bridge, Carlisle/Concord, MA (1,2,3,4)
Concord River	Downstream from Rte 4 bridge, Billerica, MA (3)
Concord River	River Street bridge, Billerica, MA (1,2,3,4)
Concord River	Downstream of Pollard St bridge, North Billerica, MA (1,2,3,4)
Concord River	Church St bridge, Lowell, MA (1,2,3,4)
River Meadow Brook	Mill Road bridge, Chelmsford, MA (1,2,3,4)
River Meadow Brook	Bridge at River Meadow Apartments, Lowell, MA (1,2,3,4)
River Meadow Brook	Upstream from Lawrence Street, Lowell (5)

*1 – Attended multi-probe (DO, temperature, pH, conductance), 2 – nutrients, 3 – bacteria samples, 4 – unattended continuous dissolved oxygen and temperature, 5 – Macroinvertebrate Rapid Bioassessment Protocol (RBP) III and habitat assessment, 6 – Chironomid Pupal Exuviae Technique (CPET)

FARMINGTON

The 2006 surveys of the Farmington River Watershed focused on obtaining information to meet the following objectives:

- Determine the water quality and biological health of rivers/streams within the watershed that were not assessed in the 2001 Water Quality Assessment Report and increase coverage to river/streams that have never before been assessed by conducting assessments based on chemical parameters and biological (aquatic macroinvertebrates, bacteria) communities.

- Provide biological and habitat data to document the status of benthic communities over time (trend monitoring); provide biological, habitat, and dissolved oxygen, temperature, and chemical data to DWM's Environmental Monitoring and assessment Program to be used in making *Aquatic Life* and *Aesthetics* use assessments required by Section 305(b) of the Clean Water Act; provide data for other informational needs of Massachusetts regulatory agencies.

- Provide quality-assured fecal coliform and *E. coli* data for the purpose of assessing *Primary* and *Secondary Contact Recreational* uses in rivers/streams.

- Provide quality-assured data to DWM's Total Maximum Daily Load Program to assist with TMDL development.

The specific sampling activities of the 2006 Farmington River Watershed Year 2 Survey are listed below. A total of 22 river stations (including water quality and biomonitoring) and four lakes were sampled to address the above objectives. Monitoring stations are summarized in the tables at the end of this section.

1) **Water Quality:** Water quality surveys were conducted a total of five times (weeks of April 24, May 29, July 10, August 14 and September 18). Grab samples for total phosphorus, total nitrogen, ammonia nitrogen, TSS, color, turbidity, and hardness were collected at a total of eight (8) stations along with in-situ multi-probe measurements for temperature, dissolved oxygen, % oxygen saturation, pH, specific conductance, and total dissolved solids. Samples for bacterial analysis (fecal coliform and *E. coli*) were obtained from these eight sites plus ten (10) additional locations. Continuous temperature and dissolved oxygen monitoring with unattended metered probes was carried out at twelve (12) sites. These unattended probes were deployed during the months of May, July, and August on Friday of the weeks preceding the water sampling surveys and retrieved 3 – 5 days later.

2) **Biological Monitoring:** Benthic macroinvertebrate and habitat assessments were performed at 11 stations to assess the aquatic life use status for 305(b) reporting requirements. The macroinvertebrate sampling procedures utilized Rapid Biomonitoring Protocols (RBPs). Periphyton assessments were performed at seven (7) sites where macroinvertebrate sampling was conducted. This consisted of an approximation of the algal coverage within the reach, and scrapes of various substrates within the riffle zone to obtain samples for taxonomic identification to genus.

3) **Lake Monitoring:** Four lakes in the Farmington River Watershed were sampled to provide baseline information for lakes that had not been sampled by DWM since 1996 and data for TMDL development. The lakes surveyed were Benton Pond (Otis), Shaw Pond (Becket), Upper Spectacle Pond (Otis/Sandisfield) and York Lake (New Marlborough). Grab samples for total phosphorus, turbidity, phytoplankton/chlorophyll *a*, and color were collected from the deep-hole

station of the lakes on three occasions between July 13 and September 7. Temperature, dissolved oxygen, % oxygen saturation, pH, specific conductance and total dissolved solids profiles were also collected from the deep-hole station using multi-probe meters. Secchi disk transparency depths were also recorded. Aquatic macrophyte coverage was mapped on one occasion for each lake during this period.

Farmington River Watershed – 2006 Water Quality and Biological Sampling Matrix

River/Stream	Monitoring Site Description (sample type*)
W. Branch Farmington River	Below the Mass Highway DPW yard, Otis, MA (5,6)
W. Branch Farmington River	Rte 8 bridge near Soucie Road, Otis, MA (3)
W. Branch Farmington River	Reservoir Road, Otis, MA (1,2,3,4)
W. Branch Farmington River	USGS Gaging Station, Clark Road bridge, Sandisfield, MA (1,2,3,4,5,6)
W. Branch Farmington River	Old Route 8 bridge, Sandisfield, MA (1,2,3,4)
Shales Brook	Dawn Drive, Becket, MA (1,2,3)
Cranberry Pond Brook	Colebrook River Road bridge, nearest Rivers Road, Tolland, MA (3,5)
Thomas Brook	Werden Otis Road, Becket, MA (3)
Thomas Brook	Upstream Rte 8, Otis, MA (5,6)
Unnamed Tributary	Route 8, Otis, MA (3)
Unnamed Tributary	West Center Road, Otis, MA (1,2,3,4)
Dimmock Brook	Route 23, Otis, MA (3,5)
Benton Brook	Lakeshore Drive, Otis, MA (1,2,3,4)
Benton Brook	Downstream from Beech Plain Road, Sandisfield, MA (5)
Fall River	Reservoir Road, Otis, MA (1,2,3,4,5,6)
Clam River	New Boston Sandisfield Road/Route 57, Sandisfield, MA (1,2,3,4,5,6)
Buck River	New Boston Sandisfield Road/Route 57, Sandisfield, MA (0.6 miles upstream from the confluence with the Clam River) (3,4,5)
Silver Brook	New Boston Sandisfield Road/Route 57, Sandisfield, MA (3,4)
Sandy Brook	South Sandisfield New Marlborough Road/Route 183, Sandisfield, MA (~0.17 miles upstream from the state border) (3,4)
Sandy Brook	State Line Hill Road, Norfolk, CT (5,6)
Valley Brook	Main Road/Route 57, Granville, MA (3,4)
Hubbard Brook	West Hartland Road, Granville, MA (3,4,5,6)

*1 – Attended multi-probe (DO, temperature, pH, conductance), 2 – nutrients, color, turbidity 3 – bacteria, 4 – unattended continuous dissolved oxygen and temperature, 5 – Macroinvertebrate Rapid Bioassessment Protocol (RBP) III and habitat assessment, 6 – periphyton

SOUTH COASTAL

The 2006 surveys of the South Coastal Watershed focused on obtaining information (i.e. water quality, bacteria, and benthic macroinvertebrate populations) at a total of 20 river stations. The specific objectives of this monitoring were to:

- Provide biological and habitat data to document the status of benthic and fish communities over time (trend monitoring).

- Provide biological, habitat, and dissolved oxygen, temperature, and chemical data to DWM's Environmental Monitoring and Assessment Program to be used in making *Aquatic Life* and *Aesthetics* use assessments required by Section 305(b) of the Clean Water Act; provide data for other informational needs of Massachusetts regulatory

agencies.

- Provide quality assured fecal coliform and *E. coli* bacteria data for the purpose of assessing *Primary* and *Secondary Contact Recreation* uses.

Individual monitoring elements are described below. Water quality and biological monitoring sites are summarized in the matrix at the end of this section.

1) **Water quality:** Water quality surveys were conducted during the months of June, July, August, September, and October. Samples for total Phosphorous, total Nitrogen, Ammonia, Total Suspended Solids, color, turbidity, bacteria counts (fecal coliform and *E. coli*), dissolved oxygen and other field measurements were obtained from a total of seventeen (17) stations. Additionally, continuous temperature and dissolved oxygen monitoring with unattended metered probes was carried out for a minimum duration of 24 hours at 17 sites.

2) **Biological monitoring:** Macroinvertebrate sampling, fish population monitoring, and habitat assessments were performed to assess the aquatic life use status for 305(b) reporting requirements. The macroinvertebrate sampling procedures utilized Rapid Biomonitoring Protocols (RBPs) and were conducted at fourteen (14) stations. Habitat assessments were also conducted at 14 stations. Periphyton assessments were performed at six (6) sites where macroinvertebrate sampling was conducted. This consisted of an approximation of the algal coverage within the reach, and scrapes of various substrates within the riffle zone to obtain samples for taxonomic identification to genus. Finally, fish population monitoring was conducted at six (6) stations.

South Coastal Watersheds – 2006 Water Quality and Biological Sampling Matrix

River/Stream	Monitoring Site Description (sample type*)
French Stream	Below Rockland WWTP, Rockland (1,2,3,4)
French Stream	Summer Street Bridge, Rockland, MA (1,2,3,4,5,7)
Drinkwater River	Circuit Street Bridge, Hanover, MA (1,2,3,4,5)
Indian Head River	Cross/State Street, Hanover/Hanson, MA (1,2,3,4,5)
Iron Mine Brook	Broadway Road Hanover, MA (1,2,3,4,5,7)
North River	Route 53 Bridge, Hanover/Pembroke, MA (1,2,3,4)
Third Herring Brook	River Street crossing, Norwell/Hanover, MA (1,2,3,4,5)
First Herring Brook	Grove Street crossing, Scituate, MA (1,2,3,4,5)
Herring River	New Driftway Road Bridge, Scituate, MA (1,2,3,4,5)
South River	Route 3A (Main Street) Bridge, Marshfield, MA (1,2,3,4,5,7)
South River	Temple Street Crossing, Duxbury, MA (1,2,3,4)
Green Harbor River	Upstream side of Route 101 Bridge, Marshfield, MA (1,2,3,4)
Jones River	Downstream of Elm Street Bridge, Kingston, MA (1,2,3,4,5,7)
Eel River	Downstream Russell Mills Road, Plymouth, MA (1,2,3,4,5,6)
Eel River	At Nature Conservancy driveway off Long Pond Road, below reclaimed bogs, Plymouth (1,2,3,4,6)
Eel River	At old dam upstream of inlet to Russell Mill Pond, Plymouth (5,6,7)
Unnamed Tributary to Eel River	Downstream Clifford Road Bridge, Plymouth, MA (1,2,3,4,6)
Unnamed Tributary to Eel River	At dirt road crossing within Pine Hills development South of Sandwich Road, Plymouth (5,6,7)
Town Brook	Downstream of Spring Street, Plymouth, MA (1,2,3,4,5)

Second Herring Brook	Downstream of Norris Reservation Walking path, off of Dover Street, Norwell, MA (5)

*1 – Attended multi-probe (DO, temperature, pH, conductance), 2 – nutrients,color,turbidity, 3 – bacteria samples, 4 – unattended continuous dissolved oxygen and temperature, 5 – Rapid Bioassessment Protocol (RBP) III and habitat assessment, 6 – fish population, 7 – periphyton

TAUNTON

The 2006 surveys of the Taunton River Watershed focused on obtaining information (i.e., water quality, bacteria, and benthic macroinvertebrate populations) at a total of 24 river stations. The specific objectives of this monitoring were to:

- Evaluate specific water bodies (rivers and lakes) to determine if Massachusetts' water quality standards are being met.
- Provide quality assured fecal coliform and *E. coli* bacteria data for the purpose of assessing *Primary* and *Secondary Contact Recreation* uses.

Individual monitoring elements are described below. Water quality and biological monitoring sites are summarized in the matrix at the end of this section.

1) **Water quality:** Water quality surveys were conducted during the months of May, June, August, September, and October. Samples for nutrient analyses as well as dissolved oxygen and other field measurements were obtained from a total of twenty-one (21) stations. Samples for bacterial analysis (fecal coliform and *E. coli*) were obtained from twenty-four (24) sites. Finally, continuous temperature and dissolved oxygen monitoring with unattended metered probes was carried out at 19 sites.

2) **Biological monitoring:** Macroinvertebrate sampling and habitat assessments were performed to assess the aquatic life use status for 305(b) reporting requirements. All river segments that were sampled were previously "not assessed" for the Aquatic Life use. The macroinvertebrate sampling procedures utilized Rapid Biomonitoring Protocols (RBPs) (17 sites). Periphyton assessments were performed at six (6) sites where macroinvertebrate sampling was conducted. This consisted of an approximation of the algal coverage within the reach, and scrapes of various substrates within the riffle zone to obtain samples for taxonomic identification to genus.

Taunton River Watershed – 2006 Water Quality and Biological Sampling Matrix

River/Stream	Monitoring Site Description (sample type*)
Salisbury Brook	Warren Ave., Brockton, MA (3)
Salisbury Brook	Otis Street, Brockton, MA (1,2,3,4,5,6)
Trout Brook	Court Street, Brockton, MA (3)
Trout Brook	Crescent Street (Route 27), Brockton, MA (1,2,3,4,5,6)
Salisbury Plain River	Sargent's Way (upstream from Brockton AWRF), Brockton, MA (1,2,3,4)

Salisbury Plain River	Matfield Street (downstream from Brockton AWRF), East Bridgewater, MA (1,2,3,4)
Salisbury Plain River	Downstream from Belmont Street, East Bridgewater, MA (5,6)
Beaver Brook	Crescent Street, Brockton, MA (1,2,3,4)
Beaver Brook	Downstream from Elm Street, East Bridgewater, MA (5)
Beaver Brook	Belmont Street, East Bridgewater, MA (3)
Meadow Brook	West Union Street, East Bridgewater, MA (1,2,3,4,5,6)
Satucket River	Plymouth Street, East Bridgewater, MA (1,2,3,4)
Satucket River	Downstream from Bridge Street, East Bridgewater, MA (5,7)
Matfield River	West Union Street, East Bridgewater, MA (1,2,3,5)
Matfield River	High Street, Bridgewater, MA (1,2,3,4)
Taunton River	Plymouth Street, Bridgewater, MA (1,2,3,4)
Taunton River	Green Street, Middleborough/Bridgewater, MA (1,2,3,4)
Taunton River	Downstream from Summer Street, Bridgewater/Middleborough, MA (7)
Taunton River	Old Colony, Taunton/Raynham, MA (1,2,3,4,7)
Canoe River	Willow Street, Foxborough, MA (1,2,3,4,5,6)
Rumford River	Coccasset Street, Foxborough, MA (1,2,3,4,5,6)
Rumford River	Willow Street, Mansfield, MA (1,2,3,4,5)
Rumford River	Pine Street, Norton, MA (1,2,3,4)
Wading River	Upstream from Balcolm Street, Mansfield, MA (5)
Wading River	West Street, Mansfield, MA (1,2,3,4)
Wading River	Route 123 (near Norton C.C.), Norton, MA (1,2,3)
Wading River	Route 140, Norton, MA (1,2,3,4,5)
Threemile River	Harvey Street, Taunton, MA (downstream of Mansfield POTW) (1,2,3,4,5)
Threemile River	Cohannet Street/Route 44, Taunton, MA (1,2,3,4)

*1 – Attended multi-probe (DO, temperature, pH, conductance), 2 – chem/nutrients, 3 – bacteria, 4 – unattended continuous dissolved oxygen and temperature, 5 – Macroinvertebrate Rapid Bioassessment Protocol (RBP) III and habitat assessment, 6 – periphyton, 7 – Macroinvertebrate multiplate samplers

WESTFIELD

The 2006 surveys of the Westfield River Watershed focused on obtaining information to meet the following objectives:

- Determine the water quality and biological health of rivers/streams within the watershed that were not assessed in the 2001 Water Quality Assessment Report and increase coverage to river/streams that have never before been assessed by conducting assessments based on biological (aquatic macroinvertebrates, fish, bacteria) communities.

- Provide biological and habitat data to document the status of benthic and fish communities over time (trend monitoring); provide biological, habitat, and dissolved oxygen, temperature, and chemical data to DWM's Environmental Monitoring and assessment Program to be used in making *Aquatic Life* and *Aesthetics* use assessments required by Section 305(b) of the Clean Water Act; provide data for other informational needs of Massachusetts regulatory agencies.

- Provide quality-assured fecal coliform and *E. coli* data for the purpose of assessing

Primary and *Secondary Contact Recreational* uses in rivers/streams.

- Screen fish to provide data to the Massachusetts Department of Public Health (MDPH) for public health risk assessment due to fish tissue contaminants (metals, polychlorinated biphenyls (PCBs) and pesticides.

- Provide quality-assured data to DWM's Total Maximum Daily Load Program to assist with TMDL development.

- Investigate compliance of two facilities (Texon, USA and Westfield WWTP) on the mainstem Westfield River (Segment MA32-05) where effluent toxicity was previously documented. The Westfield WWTP facility's NPDES permit will expire in 2006. Information from this activity coupled with upstream/downstream benthic macroinvertebrate sampling will be useful for assessing segment of the Westfield River, as well as permit reissuance.

The specific sampling activities of the 2006 Westfield River Watershed Year 2 Survey are listed below. A total of 42 river stations (including water quality and biomonitoring), four lakes, and two NPDES facilities were sampled to address the above objectives. Monitoring stations are summarized in the tables at the end of this section.

1) **Water quality:** Water quality surveys were conducted a total of five times (weeks of May 8, June 12, July 24, August 28 and October 2). Grab samples for total phosphorus, total nitrogen, ammonia nitrogen, TSS, color, turbidity, and hardness were collected at a total of nine (9) stations along with in-situ multi-probe measurements for temperature, dissolved oxygen, % oxygen saturation, pH, specific conductance, and total dissolved solids. Samples for bacterial analysis (fecal coliform and *E. coli*) were obtained from these nine sites plus twenty-seven (27) additional locations. Continuous temperature and dissolved oxygen monitoring with unattended metered probes was carried out at ten (10) sites. These unattended probes were deployed during the months of June, July, and August on Friday of the weeks preceding the water sampling surveys for that month and retrieved 3 – 5 days later. Finally, long-term temperature-only data loggers were deployed at six (6) sites.

2) **Biological monitoring:** Benthic macroinvertebrate and habitat assessments were performed at 11 (11) stations to assess the aquatic life use status for 305(b) reporting requirements. The macroinvertebrate sampling procedures utilized Rapid Biomonitoring Protocols (RBPs). Fish population surveys were conducted at three (3) sites using a backpack electrofisher.

3) **Lake Monitoring:** Four lakes in the Westfield River Watershed were sampled to provide baseline information for lakes and data for TMDL development. The lakes surveyed were Windsor Pond (Windsor), Buck Pond (Westfield), Pequot Pond (Southampton/Westfield) and Horse Pond (Westfield). Grab samples for total phosphorus, turbidity, chlorophyll *a*, and color were collected from the deep-hole station(s) of the lakes on three occasions between July 26 and September 12. Temperature, dissolved oxygen, % oxygen saturation, pH, specific conductance and total dissolved solids profiles were also collected from the deep hole station(s) using multi-probe meters. Secchi disk transparency depths were also recorded at these stations. Aquatic macrophyte coverage was mapped on one occasion for each lake during this period.

4) **Compliance Monitoring:** At the request of DWM, EPA sampled two NPDES permitted facilities, Texon USA and Westfield WWTP (discharging to Segment 32-05) for effluent toxicity. Chronic WET tests using both *C. dubia* and *P. promelas* for the Texon USA effluent and *C. dubia* for the Westfield WWTP effluent were conducted the week of October 9. As part of the testing, 24 hour composite effluent samples were collected 3 times, once to start the test and twice to provide replenishment water.

5) **Fish Toxics Monitoring:** Fish toxics monitoring was performed at two (2) locations. Fish collections were made on June 13 at Buck Pond (Westfield) and on June 20 at Windsor Pond (Windsor). Edible fillets were analyzed for the presence of heavy metals (including mercury), PCB, and organochlorine pesticides. Fish consumption advisories will be issued by the MDPH if necessary.

Westfield River Watershed – 2006 Water Quality and Biological Sampling Matrix

River/Stream	Monitoring Site Description (sample type*)
W. Br. Westfield River	Upstream from Johnson Hill Road, Chester, MA (5,7)
W. Br. Westfield River	60 m downstream from foot bridge, Huntington, MA (5,7)
W. Br. Westfield River	~0.1 miles downstream from Rte 112 Bridge, Huntington, MA (3)
Mid. Br. Westfield River	Kinne Brook Road, Chester, MA (3,8)
Mid. Br. Westfield River	Goss Hill Road at USGS Gage, Huntington, MA (3,4)
Westfield River	Off Rte 112 (approx. 225 feet upstream from Rte 66), Huntington, MA (3,8)
Westfield River	Rte 20, at roadside park downstream from confluence with West Branch Westfield River, Huntington, MA (1,2,3,5,7,8)
Westfield River	Whitney Playground, north of Shepard Street, Westfield, MA (1,2,3)
Westfield River	North of Ascutney Avenue, Westfield, MA (1,2,3,5,7,8)
Westfield River	Memorial Avenue/Rte 147, West Springfield, MA (1,2,3,4)
Westfield River	Rte 20/Springfield Road downstream from USGS Gage, Westfield, MA (1,2,3)
Little River	100 m downstream from Cook Brook, Westfield, MA (3,5)
Little River	Rte 20, Westfield, MA (3)
Powdermill Brook	Near East Main Street, Westfield, MA (1,2,3)
Glendale Brook	Clark Wright Road, Middlefield, MA (3,4)
Meadow Brook	Downstream from Nash Road, Cummington, MA (3,4,5,7)
Swift River	Shaw Road, Cummington, MA (3,4)
West Falls Branch	Ireland Street, Chesterfield, MA (3,8)
Watts Stream	Prentice Road, Worthington, MA (3,4)
Wards Stream	Upstream from Harvey Road, Worthington, MA (5,7)
Wards Stream	Buffington Hill Road, Worthington, MA (1,2,3,4)
Little River	Ireland Street, Worthington, MA (3,8)
Depot Brook	Valley Road, Worthington, MA (3)
Shaker Mill Brook	Lovers Lane, Becket, MA (1,2,3)
Yokum Brook	50 m upstream from site of former dam, downstream from Rte 8, Becket, MA (5,6)
Yokum Brook	Prentice Street, Becket, MA (3,5,6,7)
Yokum Brook	Near mouth, Becket, MA (6)
Walker Brook	Upstream from Bonny Rigg Hill Road, Becket, MA (5)
Walker Brook	Hamden Street, Chester, MA (3)
Bradley Brook	Old Wethersfield Road, Russell, MA (3)
Potash Brook	Rte 23, Russell, MA (3)
Moose Meadow Brook	Private access road off Pochassic Road, Westfield, MA (1,2,3,4)
Pond Brook	Union Street, Westfield, MA (3,4,5,7)
Great Brook	Shaker Road, Westfield, MA (3)

Miller Brook	Robinson State Park entrance road, Agawam, MA (3)
White Brook	Robinson State Park entrance road, Agawam, MA (3)
Paucatuck Brook	Sikes Avenue, West Springfield, MA (3)
Roaring Brook	Carrington Road, Montgomery, MA (3)
Sanderson Brook	Sanderson Brook Road, Chester, MA (3)
Kinne Brook	Kinne Brook Road, Chester, MA (3,4)
Bedlam Brook	Rte 23, Blandford, MA (3)
Dickinson Brook	Main Road/Rte 57, Granville, MA (3)

*1 – Attended multi-probe (DO, temperature, pH, conductance), 2 – nutrients,color,turbidity, 3 – bacteria samples, 4 – unattended continuous dissolved oxygen and temperature, 5 – Rapid Bioassessment Protocol (RBP) III and habitat assessment, 6 – fish population, 7 – periphyton, 8 – continuous temperature measurements

ADDITIONAL MONITORING ACTIVITIES – Some monitoring activities were performed in watersheds that were not actually in "Year 2" of the five-year watershed cycle. These are briefly described below:

1) **Fish toxics monitoring:** In addition to the two sites in the Westfield River Watershed identified above, DWM completed fish sampling at the following nine (9) sites at the recommendation of the Inter-agency Fish Toxics Committee:

Watershed	Monitoring Site Description
Blackstone	Rice City Pond, Uxbridge, MA
Blackstone	Upstream from "Tupperware Dam", Blackstone, MA
Cape Cod	Duck Pond, Wellfleet, MA
Cape Cod	Great Pond, Wellfleet, MA
Cape Cod	Gull Pond, Wellfleet, MA
Cape Cod	Herring Pond, Wellfleet, MA
Cape Cod	Ryder Pond, Truro, MA
French	Downstream from Hodges Village, Oxford, MA
Housatonic	Lake Garfield, Monterey, MA

Edible fillets were analyzed for the presence of heavy metals (including mercury), PCB, and organochlorine pesticides. Fish consumption advisories will be issued by the MDPH if necessary.

2) **Blue-green Algae Bloom Investigations:** Throughout the summer of 2006 MassDEP staff provided laboratory services in response to potentially toxic cyanobacter (blue-green algae) blooms. Samples from Shady Point Beach on Lake Shirley (Lunenburg) were analyzed for cyanobacter at the request of the Nashoba Associated Boards of Health. Samples were also analyzed from White Island Pond (Plymouth), Crystal Lake in Newton and from four sites on the Charles River in Boston. Phytoplankton identifications and counts were completed for each of the samples to determine whether the World Health Organization (WHO) criterion for blue-green algae blooms was exceeded.

3) **Powwow River Dye Study:** Wetlands Program staff from MassDEP's northeast regional office (NERO) requested DWM assistance with a dye/flow study of the Powwow River near Lake Gardner in Amesbury to determine if it is indeed a river by definition of the Massachusetts Rivers

Protection Act. The major emphasis on sampling was on determining unidirectional flow. DWM provided boats, motors, equipment and staff assistance. NERO personnel supplied the fluorocene dye and supervised field operations. Dye was applied on June 21, 2006 and dye transport was videotaped. In addition, drogues were tracked by GPS units. Surface water velocity measurements were taken with a Sontek® acoustic flow meter to confirm flow velocities.

4) **Monitoring Potential Effects of Insecticide Application:** As outlined in Massachusetts' "Mosquito-borne Disease Response Plan" DWM biologists conducted biomonitoring in streams within the areas designated for aerial insecticide spraying to control the mosquito vectors of Eastern Equine Encephalitis virus (EEEv). Aquatic macroinvertebrates were collected from five different streams (see table), four of which were within the designated application target area. The fifth site was outside the target area and served as a reference to changes that might occur in the absence of the aerial insecticide application. The objective of this biomonitoring effort was to detect indications of acute impacts on aquatic biota that might be resulting from the insecticide application.

Waterbody	Site Description
Canoe River *(reference site)*	Downstream from Willow Street, Foxborough, MA
Satucket River	Downstream from Bridge Street, East Bridgewater, MA
Jones River	Downstream from Elm Street, Kingston, MA
Nemasket River	At Oliver Mill Park, Middleborough, MA
Winnetuxet River	Downstream from Rte. 105, Halifax, MA

5) **2006 Bacteria Source Tracking:** Bacteria source tracking studies were performed in 2006 in selected subwatersheds by the DWM Regional Monitoring Coordinators based at the MassDEP Western and Southeast Regional Offices (WERO and SERO). The bacteria source tracking surveys followed protocols developed in 2004 by the DWM that provide site-specific data for the identification and abatement of specific bacterial pollution sources.

The DWM regional monitoring coordinators reviewed existing bacteria data and information from the MassDEP Integrated List of Waters, Water Quality Assessment Reports, recent DWM assessment monitoring bacteria data, and local watershed association volunteer monitoring data to select priority subwatersheds within their respective regions in which to conduct bacteria source tracking. Pertinent information was reviewed (such as land use, and storm drain and sewer infrastructure maps) and field reconnaissance was conducted to design the sampling plan for each subwatershed and to aid in interpreting the data.

Screening level bacteria sampling for *E. coli* was conducted on multiple occasions and locations in each subwatershed. The WERO monitoring coordinators used an enzyme substrate testing system (Colilert®) set up in a laboratory in their Springfield office to analyze the bacteria samples. DWM regional monitoring coordinators in SERO used the Colilert® system located at the DWM Worcester office to analyze their samples. DWM regional monitoring coordinators reviewed the data and refined sampling locations based on bacteria "signals", field observations and, in some cases, discussions with local watershed groups and/or municipal officials. If screening sampling results revealed bacteria contamination, iterative dry weather bacteria sampling for *E. coli* continued in an attempt to track and isolate the dry weather source(s) of bacteria. Occasionally, follow-up analyses (such as the use of optical brighteners, DNA, and

caffeine testing) were performed in an attempt to determine if the bacteria were from human or animal sources.

In the MassDEP **Western Region** bacteria source tracking was conducted in the following subwatersheds:

Sawmill River: Montague	(Connecticut Watershed)
Mill River: Hatfield	(Connecticut Watershed)
Block Brook: West Springfield	(Westfield Watershed)
Muddy Brook: Ware	(Chicopee Watershed)
Chicopee Brook: Monson	(Chicopee Watershed)
Chicopee River: Palmer (storm drain discharge)	(Chicopee Watershed)
Gulf Brook: Orange	(Millers Watershed)
Ice Company Brook: Athol	(Millers Watershed)
Mill Brook: Athol	(Millers Watershed)
South River: Conway	(Deerfield Watershed)
Southwest Branch Housatonic: Pittsfield	(Housatonic Watershed)
South Brook: Cheshire	(Hoosic Watershed)
Valley Brook: Granville	(Farmington Watershed)

In the MassDEP **Southeast Region** bacteria source tracking was conducted in the following subwatersheds:

Trout Brook: Brockton, Avon, Holbrook	(Taunton Watershed)
Pine Tree Brook: Milton, Quincy	(Boston Harbor Watershed)
Drinkwater River: Hanover, Rockland, Norwell	(South Coastal Watershed)
Speedway Brook: Attleboro, Rehoboth	(Narragansett/Mount Hope Bay Watershed)
Snell Creek: Westport	(Buzzards Bay Watershed)
Clear Run Brook: Seekonk, Rehoboth	(Ten Mile Watershed)
Mine Brook: Franklin	(Charles Watershed)

As a result of the bacteria source tracking surveys in both regions, evidence of significant bacteria contamination from suspected human sources was detected in several streams. The MassDEP regional offices notified the appropriate municipal authorities in each of the communities where problems were identified and advised them to immediately begin remediation. The MassDEP regional offices are currently monitoring the progress of the actions each community is taking to eliminate the illicit sewage inputs to these waterbodies.

Finally, in the southeast region bacteria source tracking was also conducted in the Mine Brook subwatershed (Charles River Watershed) as a small side project. Samples were collected from several stations during wet weather conditions in order to determine the impact of stormwater runoff on the number of *E.coli* bacteria in Mine Brook and its tributaries.