APPENDIX A
ASSESSMENT METHODOLOGY GUIDELINES FOR EVALUATING DESIGNATED USE STATUS OF MASSACHUSETTS SURFACE WATERS

The Clean Water Act (CWA) Section 305(b) water quality reporting process is an essential aspect of the Nation's water pollution control effort. It is the principal means by which EPA, Congress, and the public evaluate existing water quality, assess progress made in maintaining and restoring water quality, and determine the extent of remaining problems. By this process, states report on waterbodies within the context of meeting their designated uses. These uses include: *Aquatic Life, Fish Consumption, Drinking Water, Primary Contact Recreation, Secondary Contact Recreation, Shellfish Harvesting* and *Aesthetics*. Two subclasses of Aquatic Life are also designated in the Massachusetts Surface Water Quality Standards (SWQS): Cold Water Fishery – waters capable of sustaining a year-round population of cold water aquatic life, such as trout – and Warm Water Fishery – waters that are not capable of sustaining a year-round population of cold water aquatic life (MassDEP 1996).

The SWQS, summarized in Table A1, prescribe minimum water quality criteria to sustain the designated uses. Furthermore, these standards describe the hydrological conditions at which water quality criteria must be applied (MassDEP 1996). In rivers the lowest flow conditions at and above which aquatic life criteria must be applied are the lowest mean flow for seven consecutive days to be expected once in ten years (7Q10). In artificially regulated waters, the lowest flow conditions at which aquatic life criteria must be applied are the flow equal or exceeded 99% of the time on a yearly basis or another equivalent flow that has been agreed upon. In coastal and marine waters and for lakes, the Massachusetts Department of Environmental Protection (MassDEP) will determine by on a case-by-case basis the most severe hydrological condition for which the aquatic life criteria must be applied.

The availability of appropriate and reliable scientific data and technical information is fundamental to the 305(b) reporting process. It is EPA policy (EPA Order 5360.1 CHG 1) that any individual or group performing work for or on behalf of EPA establish a quality system to support the development, review, approval, implementation, and assessment of data collection operations. To this end MassDEP describes its Quality System in an EPA-approved Quality Management Plan to ensure that environmental data collected or compiled by the MassDEP are of known and documented quality and are suitable for their intended use. For external sources of information, MassDEP requires the following: 1) an appropriate Quality Assurance Project Plan (QAPP) including a laboratory Quality Assurance /Quality Control (QA/QC) plan; 2) use of a state certified lab (or as otherwise approved by DEP for a particular analysis); and 3) sample data, QA/QC and other pertinent sample handling information documented in a citable report. This information will be reviewed by MassDEP to determine its validity and usability to assess water use support. Data use could be modified or rejected due to poor or undocumented QAPP implementation, lack of project documentation, incomplete reporting of data or information, and/or project monitoring objectives unsuitable for MassDEP assessment purposes.

EPA provides guidelines to states for making their use support determinations (EPA 1997 and 2002, Grubbs and Wayland III 2000 and Wayland III 2001). The determination of whether or not a waterbody supports each of its designated uses is a function of the type(s), quality and quantity of available current information. Although data/information older than five years are usually considered “historical” and used for descriptive purposes they can be utilized in the use support determination provided they are known to reflect the current conditions. While the water quality standards (Table A1) prescribe minimum water quality criteria to sustain the designated uses, numerical criteria are not available for every indicator of pollution. Best available guidance from available literature may be applied in lieu of actual numerical criteria (e.g., freshwater sediment data may be compared to *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario* 1993 by D. Persaud, R. Jaagumagi and A. Hayton). Excursions from criteria due solely to “naturally occurring” conditions (e.g., low pH in some areas) do not constitute violations of the SWQS.

Each designated use within a given segment is individually assessed as ***support*** or ***impaired***. When too little current data/information exist or no reliable data are available, the use is ***not assessed***. In this report, however, if there is some indication that water quality impairment may exist, and it is not “naturally occurring”, the use is identified with an “Alert Status”. It is important to note that not all waters are assessed. Many small and/or unnamed ponds, rivers, and estuaries have *never been assessed*; the

status of their designated uses has never been reported to EPA in the Commonwealth's 305(b) Report or the Integrated List of Waters nor is information on these waters maintained in the waterbody system database (WBS) or the new assessment database (ADB).

Table A1. Summary of Massachusetts Surface Water Quality Standards (MassDEP 1996, MA DPH 2002, and FDA 2003).

Dissolved Oxygen	Class A, Class B Cold Water Fishery (BCWF), and Class SA: ≥6.0 mg/L and >75% saturation unless background conditions are lower Class B Warm Water Fishery (BWWF) and Class SB: ≥5.0 mg/L and >60% saturation unless background conditions are lower Class C: Not <5.0 mg/L for more than 16 of any 24-hour period and not <3.0 mg/L anytime unless background conditions are lower; levels cannot be lowered below 50% saturation due to a discharge Class SC: Not <5.0 mg/L for more than 16 of any 24-hour period and not <4.0 mg/L anytime unless background conditions are lower; and 50% saturation; levels cannot be lowered below 50% saturation due to a discharge
Temperature	Class A: ≤68°F (20°C) and Δ1.5°F (0.8°C) for Cold Water and ≤83°F (28.3°C) and Δ1.5°F (0.8°C) for Warm Water. Class BCWF: ≤68°F (20°C) and Δ3°F (1.7°C) due to a discharge Class BWWF: ≤83°F (28.3°C) and Δ3°F (1.7°C) in lakes, Δ5°F (2.8°C) in rivers Class C and Class SC: ≤85°F (29.4°C) nor Δ5°F (2.8°C) due to a discharge Class SA: ≤85°F (29.4°C) nor a maximum daily mean of 80°F (26.7°C) and Δ1.5°F (0.8°C) Class SB: ≤85°F (29.4°C) nor a maximum daily mean of 80°F (26.7°C) and Δ1.5°F (0.8°C) between July through September and Δ4.0°F (2.2°C) between October through June
pH	Class A, Class BCWF and Class BWWF: 6.5 - 8.3 SU and Δ0.5 outside the background range. Class C: 6.5 - 9.0 SU and Δ1.0 outside the naturally occurring range. Class SA and Class SB: 6.5 - 8.5 SU and Δ0.2 outside the normally occurring range. Class SC: 6.5 - 9.0 SU and Δ0.5 outside the naturally occurring range.
Solids	All Classes: *These waters shall be free from floating, suspended, and settleable solids in concentrations or combinations that would impair any use assigned to each class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom.*
Color and Turbidity	All Classes: *These waters shall be free from color and turbidity in concentrations or combinations that are aesthetically objectionable or would impair any use.*
Oil and Grease	Class A and Class SA: *Waters shall be free from oil and grease, petrochemicals and other volatile or synthetic organic pollutants.* Class SA: *Waters shall be free from oil and grease and petrochemicals.* Class B, Class C, Class SB and Class SC: *Waters shall be free from oil* and *grease, petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life, coat the banks or bottom of the water course or are deleterious or become toxic to aquatic life.*
Taste and Odor	Class A and Class SA: *None other than of natural origin.* Class B, Class C, Class SB and Class SC: *None in such concentrations or combinations that are aesthetically objectionable, that would impair any use assigned to each class, or that would cause tainting or undesirable flavors in the edible portions of aquatic life.*
Aesthetics	All Classes: *All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life.*
Toxic Pollutants	All Classes: *All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife… The division shall use the recommended limit published by EPA pursuant to 33 USC 1251, 304(a) as the allowable receiving water concentrations for the affected waters unless a site-specific limit is established.*
Nutrients	*Shall not exceed the site-specific limits necessary to control accelerated or cultural eutrophication.*

Note: *Italics are direct quotations.*

Δ criterion (referring to a change from natural background conditions) is applied to the effects of a permitted discharge.

Table A1 Continued. Summary of Massachusetts Surface Water Quality Standards (MassDEP 1996, MA DPH 2002, and FDA 2003).

Bacteria (MassDEP 1996 and MA DPH 2002) Class A criteria apply to the *Drinking Water Use*. Class B and SB criteria apply to *Primary Contact Recreation Use* while Class C and SC criteria apply to *Secondary Contact Recreation Use*.	Class A: Fecal coliform bacteria: An arithmetic mean of <20 cfu/100 ml in any representative set of samples and <10% of the samples >100 cfu/100 ml. Class B: At public bathing beaches, as defined by MA DPH, where *E. coli* is the chosen indicator: No single *E. coli* sample shall exceed 235 *E. coli* /100 ml and the geometric mean of the most recent five *E. coli* samples within the same bathing season shall not exceed 126 *E. coli* / 100 ml. At public bathing beaches, as defined by MA DPH, where *Enterococci* are the chosen indicator: No single *Enterococci* sample shall exceed 61 *Enterococci* /100 ml and the geometric mean of the most recent five *Enterococci* samples within same bathing season shall not exceed 33 *Enterococci* /100 ml. Current standards for other waters (not designated as bathing beaches), where fecal coliform bacteria are the chosen indicator: Waters shall not exceed a geometric mean of 200 cfu/100 ml in any representative set of samples, nor shall more than 10% of the samples exceed 400 cfu/100 ml. (This criterion may be applied on a seasonal basis at the discretion of the MassDEP.) Class C: Fecal coliform bacteria: Shall not exceed a geometric mean of 1,000 cfu/100 ml, nor shall 10% of the samples exceed 2,000 cfu/100 ml. Class SA: Fecal coliform bacteria: Waters designated shellfishing shall not exceed a geometric mean (most probable number (MPN) method) of 14 MPN/100 ml, nor shall more than 10% of the samples exceed 28 MPN/100 ml, or other values of equivalent protection based on sampling and analytical methods used by the Massachusetts Division of Marine Fisheries and approved by the National Shellfish Sanitation Program in the latest version of the Guide for the Control of Molluscan Shellfish Areas (more stringent regulations may apply). At public bathing beaches, as defined by MA DPH, where *Enterococci* are the chosen indicator: No single *Enterococci* sample shall exceed 104 *Enterococci* /100 ml and the geometric mean of the five most recent *Enterococci* levels within the same bathing season shall not exceed 35 *Enterococci* /100 ml. Current standards for other waters (not designated as shellfishing areas or public bathing beaches), where fecal coliform bacteria are the chosen indicator: Waters shall not exceed a geometric mean of 200 cfu/100 ml in any representative set of samples, nor shall more than 10% of the samples exceed 400 cfu/100 ml. (This criterion may be applied on a seasonal basis at the discretion of the MassDEP.) Class SB: Fecal coliform bacteria: Waters designated for shellfishing shall not exceed a fecal coliform median or geometric mean (MPN method) of 88 MPN/100 ml, nor shall <10% of the samples exceed 260 MPN/100 ml or other values of equivalent protection base on sampling and analytical methods used by the Massachusetts Shellfish Sanitation Program in the latest revision of the guide for the Control of Moluscan Shellfish (more stringent regulations may apply). At public bathing beaches, as defined by MA DPH, where *Enterococci* are the chosen indicator: No single *Enterococci* sample shall exceed 104 *Enterococci* /100 ml and the geometric mean of the most recent five *Enterococci* levels within the same bathing season shall not exceed 35 *Enterococci* /100 ml. Current standards for other waters (not designated as shellfishing areas or public bathing beaches), where fecal coliform bacteria are the chosen indicator: Waters shall not exceed a geometric mean of 200 cfu/100 ml in any representative set of samples, nor shall more than 10% of the samples exceed 400 cfu/100 ml. (This criterion may be applied on a seasonal basis at the discretion of the MassDEP.) Class SC: Fecal coliform bacteria: Shall not exceed a geometric mean of 1,000 cfu/100 ml, nor shall 10% of the samples exceed 2,000 cfu/100 ml.

DESIGNATED USES

The Massachusetts Surface Water Quality Standards designate the most sensitive uses for which the surface waters of the Commonwealth shall be enhanced, maintained and protected. Each of these uses is briefly described below (MassDEP 1996):

AQUATIC LIFE - suitable habitat for sustaining a native, naturally diverse, community of aquatic flora and fauna. Two subclasses of aquatic life are also designated in the standards for freshwater bodies: *Cold Water Fishery* - capable of sustaining a year-round population of cold water aquatic life, such as trout; *Warm Water Fishery* - waters that are not capable of sustaining a year-round population of cold water aquatic life.

FISH CONSUMPTION - pollutants shall not result in unacceptable concentrations in edible portions of marketable fish or for the recreational use of fish, other aquatic life or wildlife for human consumption.

DRINKING WATER - used to denote those waters used as a source of public drinking water. They may be subject to more stringent regulation in accordance with the Massachusetts Drinking Water Regulations (310 CMR 22.00). These waters are designated for protection as Outstanding Resource Waters under 314 CMR 4.04(3).

SHELLFISH HARVESTING (in SA and SB segments) – Class SA waters in approved areas (Open Shellfish Areas) shellfish harvested without depuration shall be suitable for consumption; Class SB waters in approved areas (Restricted Shellfish Areas) shellfish harvested with depuration shall be suitable for consumption.

PRIMARY CONTACT RECREATION - suitable for any recreation or other water use in which there is prolonged and intimate contact with the water with a significant risk of ingestion of water. These include, but are not limited to, wading, swimming, diving, surfing and water skiing.

SECONDARY CONTACT RECREATION - suitable for any recreation or other water use in which contact with the water is either incidental or accidental. These include, but are not limited to, fishing, boating and limited contact incident to shoreline activities.

AESTHETICS - all surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life.

AGRICULTURAL AND INDUSTRIAL - suitable for irrigation or other agricultural process water and for compatible industrial cooling and process water.

The guidance used to assess the *Aquatic Life, Fish Consumption, Drinking Water, Shellfish Harvesting, Primary* and *Secondary Contact Recreation* and *Aesthetics* uses follows.

AQUATIC LIFE USE

This use is suitable for sustaining a native, naturally diverse, community of aquatic flora and fauna. The results of biological (and habitat), toxicological, and chemical data are integrated to assess this use. The nature, frequency, and precision of the MassDEP's data collection techniques dictate that a weight of evidence be used to make the assessment, with biosurvey results used as the final arbiter of borderline cases. The following chart provides an overview of the guidance used to assess the status (support or impaired) of the *Aquatic Life Use.*

Variable	***Support*** Data available clearly indicates support or minor modification of the biological community. Excursions from chemical criteria (Table A1) not frequent or prolonged and may be tolerated if the biosurvey results demonstrate support.	***Impaired*** There are frequent or severe violations of chemical criteria, presence of acute toxicity, or a moderate or severe modification of the biological community.
BIOLOGY		
Rapid Bioassessment Protocol (RBP) III*	Non/Slightly impacted	Moderately or Severely Impacted
Fish Community	Best Professional Judgment (BPJ)	BPJ
Habitat and Flow	BPJ	Dewatered streambed due to artificial regulation or channel alteration, BPJ
Eelgrass Bed Habitat (Howes *et al.* 2003)	Stable (No/minimal loss), BPJ	Loss/decline, BPJ
Non-native species	BPJ	Non-native species present, BPJ
Plankton/Periphyton	No/infrequent algal blooms	Frequent and/or prolonged algal blooms
TOXICITY TESTS**		
Water Column/Ambient	≥75% survival either 48 hr or 7-day exposure	<75% survival either 48 hr or 7-day exposure
Sediment	≥75% survival	<75% survival
CHEMISTRY-WATER**		
Dissolved oxygen (DO)/Percent saturation (MassDEP 1996, EPA 1997)	Infrequent excursion from criteria (Table A1), BPJ (minimum of three samples representing critical period)	Frequent and/or prolonged excursion from criteria [river and shallow lakes - exceedances >10% of representative measurements; deep lakes (with hypolimnion) - exceedances in the hypolimnetic area >10% of the surface area during maximum oxygen depletion].
pH (MassDEP 1996, EPA 1999a)	Infrequent excursion from criteria (Table A1)	Criteria exceeded >10% of measurements.
Temperature **(**MassDEP 1996,EPA 1997)	Infrequent excursion from criteria (Table A1)[1]	Criteria exceeded >10% of measurements.
Toxic Pollutants (MassDEP 1996, EPA 1999a) Ammonia-N (MassDEP 1996, EPA 1999b) Chlorine (MassDEP 1996, EPA 1999a)	Infrequent excursion from criteria (Table A1) Ammonia is pH and temperature dependent[2] 0.011 mg/L (freshwater) or 0.0075 mg/L (saltwater) total residual chlorine (TRC)[3]	Frequent and/or prolonged excursion from criteria (exceeded >10% of measurements).
CHEMISTRY-SEDIMENT**		
Toxic Pollutants (Persaud *et al.* 1993)	Concentrations ≤ Low Effect Level (L-EL), BPJ	Concentrations ≥ Severe Effect Level (S-EL)[4], BPJ
CHEMISTRY-TISSUE		
PCB – whole fish (Coles 1998)	≤500 μg/kg wet weight	BPJ
DDT (Environment Canada 1999)	≤14.0 μg/kg wet weight	BPJ
PCB in aquatic tissue (Environment Canada 1999)	≤0.79 ng TEQ/kg wet weight	BPJ

*RBP II analysis may be considered for assessment decision on a case-by-case basis, **For identification of impairment, one or more of the following variables may be used to identify possible causes/sources of impairment: NPDES facility compliance with whole effluent toxicity test and other limits, turbidity and suspended solids data, nutrient (nitrogen and phosphorus) data for water column/sediments. [1]Maximum daily mean T in a month (minimum six measurements evenly distributed over 24-hours) less than criterion. [2] Saltwater is temperature dependent only. [3] The minimum quantification level for TRC is 0.05 mg/L. [4]For the purpose of this report, the S-EL for total polychlorinated biphenyl compounds (PCB) in sediment (which varies with Total Organic Carbon (TOC) content) with 1% TOC is 5.3 ppm while a sediment sample with 10% TOC is 53 ppm.

Note: National Academy of Sciences/National Academy of Engineering (NAS/NAE) guideline for maximum organochlorine concentrations (i.e., total PCB) in fish tissue for the protection of fish-eating wildlife is 500μg/kg wet weight (ppb, not lipid-normalized). PCB data (tissue) in this report are presented in μg/kg wet weight (ppb) and are not lipid-normalized to allow for direct comparison to the NAS/NAE guideline.

FISH CONSUMPTION USE

Pollutants shall not result in unacceptable concentrations in edible portions of marketable fish or for the recreational use of fish, other aquatic life or wildlife for human consumption. The assessment of this use is made using the most recent list of Fish Consumption Advisories issued by the Massachusetts Executive Office of Health and Human Services, Department of Public Health (MA DPH), Bureau of Environmental Health Assessment (MA DPH 2005 and Krueger 2006). The MA DPH list identifies waterbodies where elevated levels of a specified contaminant in edible portions of freshwater species pose a health risk for human consumption. Hence, the Fish Consumption Use is assessed as non-support in these waters.

In July 2001, MA DPH issued new consumer advisories on fish consumption and mercury contamination (MA DPH 2001).

> The MA DPH "…is advising pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age to refrain from eating the following marine fish; shark, swordfish, king mackerel, tuna steak and tilefish. In addition, MA DPH is expanding its previously issued statewide fish consumption advisory which cautioned pregnant women to avoid eating fish from all freshwater bodies due to concerns about mercury contamination, to now include women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age (MA DPH 2001)."
>
> Additionally, MA DPH "…is recommending that pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age limit their consumption of fish not covered by existing advisories to no more than 12 ounces (or about 2 meals) of cooked or uncooked fish per week. This recommendation includes canned tuna, the consumption of which should be limited to 2 cans per week. Very small children, including toddlers, should eat less. Consumers may wish to choose to eat light tuna rather than white or chunk white tuna, the latter of which may have higher levels of mercury (MA DPH 2001)."

Other statewide advisories that MA DPH has previously issued and are still in effect are as follows (MA DPH 2001):

> Due to concerns about chemical contamination, primarily from polychlorinated biphenyl compounds (PCB) and other contaminants, no individual should consume lobster tomalley from any source. Lobster tomalley is the soft green substance found in the tail and body section of the lobster.
>
> Pregnant and breastfeeding women and those who are considering becoming pregnant should not eat bluefish due to concerns about PCB contamination in this species.

The following is an overview of EPA's guidance used to assess the status (support or impaired) of the *Fish Consumption Use*. Because of the statewide advisory no waters can be assessed as support for the *Fish Consumption Use*. Therefore, if no site-specific advisory is in place, the *Fish Consumption Use* is not assessed.

Variable	***Support*** No restrictions or bans in effect	***Impaired*** There is a "no consumption" advisory or ban in effect for the general population or a sub-population for one or more fish species or there is a commercial fishing ban in effect.
MA DPH Fish Consumption Advisory List	Not applicable, precluded by statewide advisory (Hg)	Waterbody on MA DPH Fish Consumption Advisory List

Note: MA DPH's statewide advisory does not include fish stocked by the state Division of Fisheries and Wildlife or farm-raised fish sold commercially.

DRINKING WATER USE

The term *Drinking Water Use* denotes those waters used as a source of public drinking water. These waters may be subject to more stringent regulation in accordance with the Massachusetts Drinking Water Regulations (310 CMR 22.00). They are designated for protection as Outstanding Resource Waters in 314 CMR 4.04(3). MassDEP's Drinking Water Program (DWP) has primacy for implementing the provisions of the federal Safe Drinking Water Act (SDWA). Except for suppliers with surface water sources for which a waiver from filtration has been granted (these systems also monitor surface water quality) all public drinking water supplies are monitored as finished water (tap water). Monitoring includes the major categories of contaminants established in the SDWA: bacteria, volatile and synthetic organic compounds, inorganic compounds and radionuclides. The DWP maintains current drinking supply monitoring data. The suppliers currently report to MassDEP and EPA the status of the supplies on an annual basis in the form of a consumer confidence report (http://yosemite.epa.gov/ogwdw/ccr.nsf/Massachusetts). Below is EPA's guidance to assess the status (support or impaired) of the drinking water use.

Variable	***Support*** No closures or advisories (no contaminants with confirmed exceedances of maximum contaminant levels, conventional treatment is adequate to maintain the supply).	***Impaired*** Has one or more advisories or more than conventional treatment is required or has a contamination-based closure of the water supply.
Drinking Water Program (DWP) Evaluation	See note below	See note below

Note: While this use is not assessed in this report, information on drinking water source protection and finish water quality is available at http://www.mass.gov/dep/water/drinking.htm and from local public water suppliers.

SHELLFISHING USE

This use is assessed using information from the Department of Fish and Game's Division of Marine Fisheries (DMF). A designated shellfish growing area is an area of potential shellfish habitat. Growing areas are managed with respect to shellfish harvest for direct human consumption, and comprise at least one or more classification areas. The classification areas are the management units, and range from being approved to prohibited (described below) with respect to shellfish harvest. Shellfish areas under management closures are *not assessed.* Not enough testing has been done in these areas to determine whether or not they are fit for shellfish harvest, therefore, they are closed for the harvest of shellfish.

Variable	***Support*** SA Waters: Approved[1] SB Waters: Approved[1], Conditionally Approved[2] or Restricted[3]	***Impaired*** SA Waters: Conditionally Approved[2], Restricted[3], Conditionally Restricted[4], or Prohibited[5] SB Waters: Conditionally Restricted[4] or Prohibited[5]
DMF Shellfish Project Classification Area Information (MA DFG 2000)	Reported by DMF	Reported by DMF

NOTE: Designated shellfish growing areas may be viewed using the MassGIS datalayer available from MassGIS at http://www.mass.gov/mgis/dsga.htm. This coverage currently reflects classification areas as of July 1, 2000.

[1] **Approved** - "...open for harvest of shellfish for direct human consumption subject to local rules and regulations..." An approved area is open all the time and closes only due to hurricanes or other major coastwide events.

[2] **Conditionally Approved** - "...subject to intermittent microbiological pollution..." During the time the area is open, it is "...for harvest of shellfish for direct human consumption subject to local rules and regulations…" A conditionally approved area is closed some of the time due to runoff from rainfall or seasonally poor water quality. When open, shellfish harvested are treated as from an approved area.

[3] **Restricted** - area contains a "limited degree of pollution." It is open for "harvest of shellfish with depuration subject to local rules and state regulations" or for the relay of shellfish. A restricted area is used by DMF for the relay of shellfish to a less contaminated area.

[4] **Conditionally Restricted** - "...subject to intermittent microbiological pollution..." During the time area is restricted, it is only open for "the harvest of shellfish with depuration subject to local rules and state regulations." A conditionally restricted area is closed some of the time due to runoff from rainfall or seasonally poor water quality. When open, only soft-shell clams may be harvested by specially licensed diggers (Master/Subordinate Diggers) and transported to the DMF Shellfish Purification Plant for depuration (purification).

[5] **Prohibited -** Closed for harvest of shellfish.

PRIMARY CONTACT RECREATION USE

This use is suitable for any recreational or other water use in which there is prolonged and intimate contact with the water with a significant risk of ingestion of water during the primary contact recreation season (1 April to 15 October). These include, but are not limited to, wading, swimming, diving, surfing and water skiing. The chart below provides an overview of the guidance used to assess the status (support or impaired) of the *Primary Contact Recreation Use*. Excursions from criteria due to natural conditions are not considered impairment of use.

Variable	***Support*** Criteria are met, no aesthetic conditions that preclude the use	***Impaired*** Frequent or prolonged violations of criteria and/or formal bathing area closures, or severe aesthetic conditions that preclude the use
Bacteria (105 CMR 445.000) Minimum Standards for Bathing Beaches State Sanitary Code) (MassDEP 1996)	At "public bathing beach" areas: Formal beach postings/advisories neither frequent nor prolonged during the swimming season (the number of days posted or closed cannot exceed 10% during the locally operated swimming season). Other waters: Samples* collected during the primary contact season must meet criteria (Table A1). Shellfish Growing Area classified as "Approved" by DMF.	At "public bathing beach" areas: Formal beach closures/postings >10% of time during swimming season (the number of days posted or closed exceeds 10% during the locally operated swimming season). Other waters: Samples* collected during the primary contact season do not meet the criteria (Table A1).
Aesthetics (MassDEP 1996) - *All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance* [growth or amount] *species of aquatic life*		
Odor, oil and grease, color and turbidity, floating matter	Narrative "free from" criteria met or excursions neither frequent nor prolonged, BPJ.	Narrative "free from" criteria not met - objectionable conditions either frequent and/or prolonged, BPJ.
Transparency (MA DPH 1969)	Public bathing beach and lakes – Secchi disk depth ≥1.2 meters (≥ 4') (minimum of three samples representing critical period).	Public bathing beach and lakes - Secchi disk depth <1.2 meters (< 4') (minimum of three samples representing critical period).
Nuisance organisms	No overabundant growths (i.e., blooms) that render the water aesthetically objectionable or unusable, BPJ.	Overabundant growths (i.e., blooms and/or non-native macrophyte growth dominating the biovolume) rendering the water aesthetically objectionable and/or unusable, BPJ.

* Data sets to be evaluated for assessment purposes must be representative of a sampling location (at least five samples per station recommended) over the course of the primary contact season. Samples collected on one date from multiple stations on a river are not considered adequate to assess this designated use. Because of low sample frequency (i.e., less than ten samples per station) an impairment decision will not be based on a single sample exceedance (i.e., the geometric mean of five samples is <200 cfu/100 ml but one of the five sample exceeds 400 cfu/100 ml). The method detection limit (MDL) will be used in the calculation of the geometric mean when data are reported as less than the MDL (e.g. use 20 cfu/100 ml if the result is reported as <20 cfu/100 ml). Those data reported as too numerous to count (TNTC) will not be used in the geometric mean calculation; however frequency of TNTC sample results should be presented.

SECONDARY CONTACT RECREATION USE

This use is suitable for any recreation or other water use in which contact with the water is either incidental or accidental. These include, but are not limited to, fishing, boating and limited contact incident to shoreline activities. Following is an overview of the guidance used to assess the status (support or impaired) of the *Secondary Contact Use*. Excursions from criteria due to natural conditions are not considered impairment of use.

Variable	***Support*** Criteria are met, no aesthetic conditions that preclude the use	***Impaired*** Frequent or prolonged violations of criteria, or severe aesthetic conditions that preclude the use
Fecal Coliform Bacteria (MassDEP 1996)	Other waters: Samples* collected must meet the Class C or SC criteria (see Table A1).	Other waters: Samples* collected do not meet the Class C or SC criteria (see Table A1).
Aesthetics (MassDEP 1996) - *All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance* [growth or amount] *species of aquatic life*		
Odor, oil and grease, color and turbidity, floating matter	Narrative "free from" criteria met or excursions neither frequent nor prolonged, BPJ.	Narrative "free from" criteria not met - objectionable conditions either frequent and/or prolonged, BPJ.
Transparency (MA DPH 1969)	Public bathing beach and lakes – Secchi disk depth ≥1.2 meters (≥ 4') (minimum of three samples representing critical period).	Public bathing beach and lakes - Secchi disk depth <1.2 meters (< 4') (minimum of three samples representing critical period).
Nuisance organisms	No overabundant growths (i.e., blooms) that render the water aesthetically objectionable or unusable, BPJ.	Overabundant growths (i.e., blooms and/or non-native macrophyte growth dominating the biovolume) rendering the water aesthetically objectionable and/or unusable, BPJ.

*Data sets to be evaluated for assessment purposes must be representative of a sampling location (at least five samples per station recommended) over time. Because of low sample frequency (i.e., less than ten samples per station) an impairment decision will not be based on a single sample exceedance. Samples collected on one date from multiple stations on a river are not considered adequate to assess this designated use.

AESTHETICS USE

All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life. The aesthetic use is closely tied to the public health aspects of the recreational uses (swimming and boating). Below is an overview of the guidance used to assess the status (support or impaired) of the *Aesthetics Use*.

Variable	***Support*** Narrative "free from" criteria met	***Impaired*** Objectionable conditions frequent and/or prolonged
Odor, oil and grease, color and turbidity, floating matter	Narrative "free from" criteria met or excursions neither frequent nor prolonged, BPJ.	Narrative "free from" criteria not met - objectionable conditions either frequent and/or prolonged, BPJ.
Transparency (MA DPH 1969)	Public bathing beach and lakes – Secchi disk depth ≥1.2 meters (≥ 4') (minimum of three samples representing critical period).	Public bathing beach and lakes - Secchi disk depth <1.2 meters (< 4') (minimum of three samples representing critical period).
Nuisance organisms	No overabundant growths (i.e., blooms) that render the water aesthetically objectionable or unusable, BPJ.	Overabundant growths (i.e., blooms and/or non-native macrophyte growth dominating the biovolume) rendering the water aesthetically objectionable and/or unusable, BPJ.

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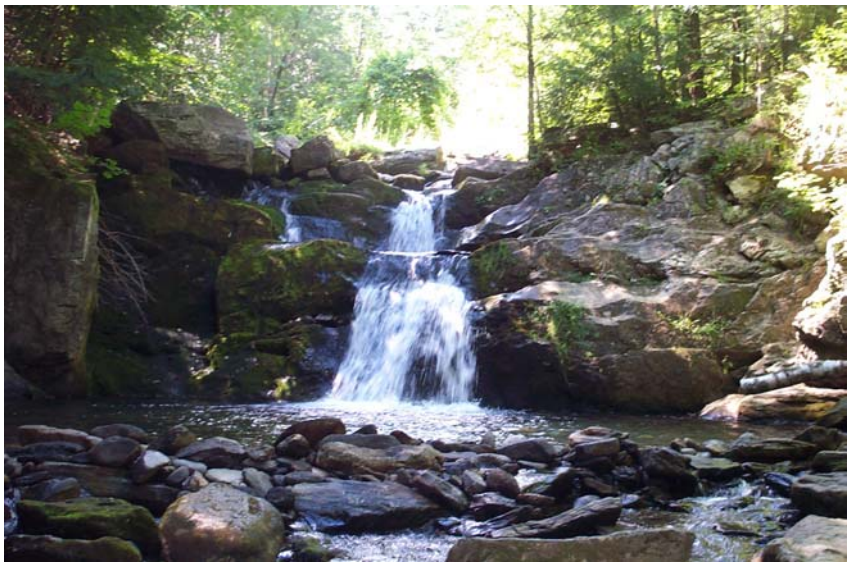
APPENDIX B

HUDSON RIVER BASIN 2002 WATER QUALITY TECHNICAL MEMORANDUM
TM-11-06



Prepared By:
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Division of Watershed Management
Worcester, MA

15 November 2005

DWM Control Number: 139.0

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INTRODUCTION

The watershed assessment process in Massachusetts is carried out on a 5-year cycle. In Year One, the Massachusetts Department of Environmental Protection, Division of Watershed Management (DWM), coordinates with watershed groups, gathers background information and begins to formulate sampling needs for streams, rivers, ponds and lakes in pre-determined watersheds. During Year Two of the cycle, sampling sites and parameters are finalized and sampling is conducted. In Year Three, the finalized data are used for assessment reporting to comply with Section 305b of the Clean Water Act (CWA). Implementation of specific projects or programs to address water quality problems, and post-project evaluation are conducted in Year Four and Year Five, respectively.

As part of the DWM Year Two monitoring for the Hudson River Basin, water quality surveys were performed, along with benthic macroinvertebrate sampling, fish population sampling, lake sampling, and fish toxics monitoring. Water quality monitoring was conducted at eleven sites and included measuring *in situ* parameters (e.g., dissolved oxygen, % saturation, temperature, pH, specific conductance), and collecting grab samples for total suspended solids, total phosphorus, and bacteria. Five additional sites were sampled solely for bacteria. This technical memorandum is designed to present final DWM-generated water quality monitoring data for use in watershed assessment reports and for reporting data to outside groups. Data presented will be analyzed in a forthcoming assessment report. Biological (macroinvertebrate and fish population) and lakes data will be presented in separate technical memoranda.

PROJECT OBJECTIVES

Sampling design, data quality objectives, as well as quality assurance for this project, may be found in: *Quality Assurance Project Plan for 2002 Watershed Monitoring in the Charles, Housatonic, Hudson, North Coastal and Ten Mile Watersheds CN 81.0 (*MA DEP/ DWM 2002).

Four programmatic objectives for gathering water quality data from selected locations in the Hudson River Watershed were identified (See QAPP). The objectives specific to water quality monitoring in rivers are listed below:

Objective: Evaluate specific water bodies for support of designated uses (in accordance with guidelines set forth in Section 305(b) of the CWA), to determine if State water quality standards are being met, and evaluate the level of impairment of CWA Section 303(d)-listed waterbodies.

- Collect physico-chemical data to assess *Aquatic Life Use*
- Collect biological data (benthic macroinvertebrate, fish population, and habitat assessments) to assess *Aquatic Life Use*
- Collect fecal coliform bacteria data to assess *Primary* and *Secondary Contact Recreational uses*

Objective: Provide quality-assured *E. coli* data for the purpose of assessing primary and secondary contact recreational uses in rivers/streams, in anticipation of the proposed Massachusetts freshwater criteria for *E. coli*.

METHODS

Eleven stations were sampled monthly in the Hoosic and Green River subbasins of the Hudson River Watershed from May-September (Figure 1). Sampling station descriptions are provided in Table 2. Additional information pertaining to station location (including detailed station maps), rationale, objectives, and sampling methods is available in *Quality Assurance Project Plan for 2002 Watershed Monitoring in the Charles, Housatonic, Hudson, North Coastal and Ten Mile Watersheds CN 81.0* (MA DEP/DWM 2002). *In- situ* parameters measured using multiprobe instruments included dissolved oxygen (DO), percent DO saturation, pH, conductivity, temperature, and total dissolved solids. Wade-in grab samples were also collected and sent to Berkshire Enviro Labs, Inc. (BEL) in Lee, MA where they were analyzed for low-level total phosphorus (TP), total suspended solids (TSS), and ammonia-nitrogen (NH_3-N). Table 1 provides the specific analytical methods for each analyte. Total phosphorus and ammonia-nitrogen samples collected on 7 May 2002 were analyzed at the Department's Wall Experiment Station (WES) while the remaining samples were analyzed at BEL. Additionally, sixteen stations (Table 2, Figure 1) were sampled monthly for *E. coli* and fecal coliform bacteria between May and September. These samples were also analyzed at BEL.

Table 1. Analytical Methods & MDLs for 2002 Hoosic River Watershed Water Quality Analytes

Analyte	Units	MDL(s) [1]	RDL(s) [1]	Method
Fecal Coliforms	CFU/100 mL	5, 6, 7, 10, 20, **	**	SM-9222-D
E. coli modified M-TEC	CFU/100 mL	6, 7, 10, 20, **	**	EPA Modified 1103.1
Ammonia-N	mg/L	0.02, 0.04, 0.08, 0.10, 0.20	0.04, 0.06, 0.08, 0.10, 0.20, 0.30	EPA 350.1
Ammonia-N	mg/L	0.01	**	SM-4500-NH3-B,C
Total Phosphorus	mg/L	0.005, 0.01, 0.010, 0.02, 0.020	**, 0.015, 0.030, 0.03	SM-4500-P-E
Total Suspended Solids	mg/L	0.5, 1.0, 1	**, 1.0	SM 2540-D

[1] Multiple MDLs and/or RDLs reflect different detection levels established by WES and BEL for water analyses.
** Missing

The QAPP states that "In an attempt to isolate any low dissolved oxygen levels that may exist at the sampling stations, all water quality surveys will occur during the pre-dawn hours. " Due to safety concerns and time constraints with the lab (open from 0900 to 1700h), only multi-probe sampling was conducted during pre-dawn hours. With the exception of the May survey (total phosphorus/ammonia collected during pre-dawn; bacteria collected on the following day), grab samples were collected the following day between the hours of 0800 and 1300h and delivered to BEL within six hours of the first sample collection time.

Due to safety concerns and MA DEP Western Regional Office enforcement actions (fine for filling in buffer zone), multiprobe sampling at station NBH02 on the North Branch Hoosic River was cancelled in August. Hydrolab sampling in September occurred instead approximately 400 feet upstream/east of the most westerly Beaver Street (Route 8) bridge crossing in North Adams, behind the parking lot of the Contemporary Artists Gallery (former Sprague Electric Beaver Mill). Grab samples were collected in August and September from the upstream station.

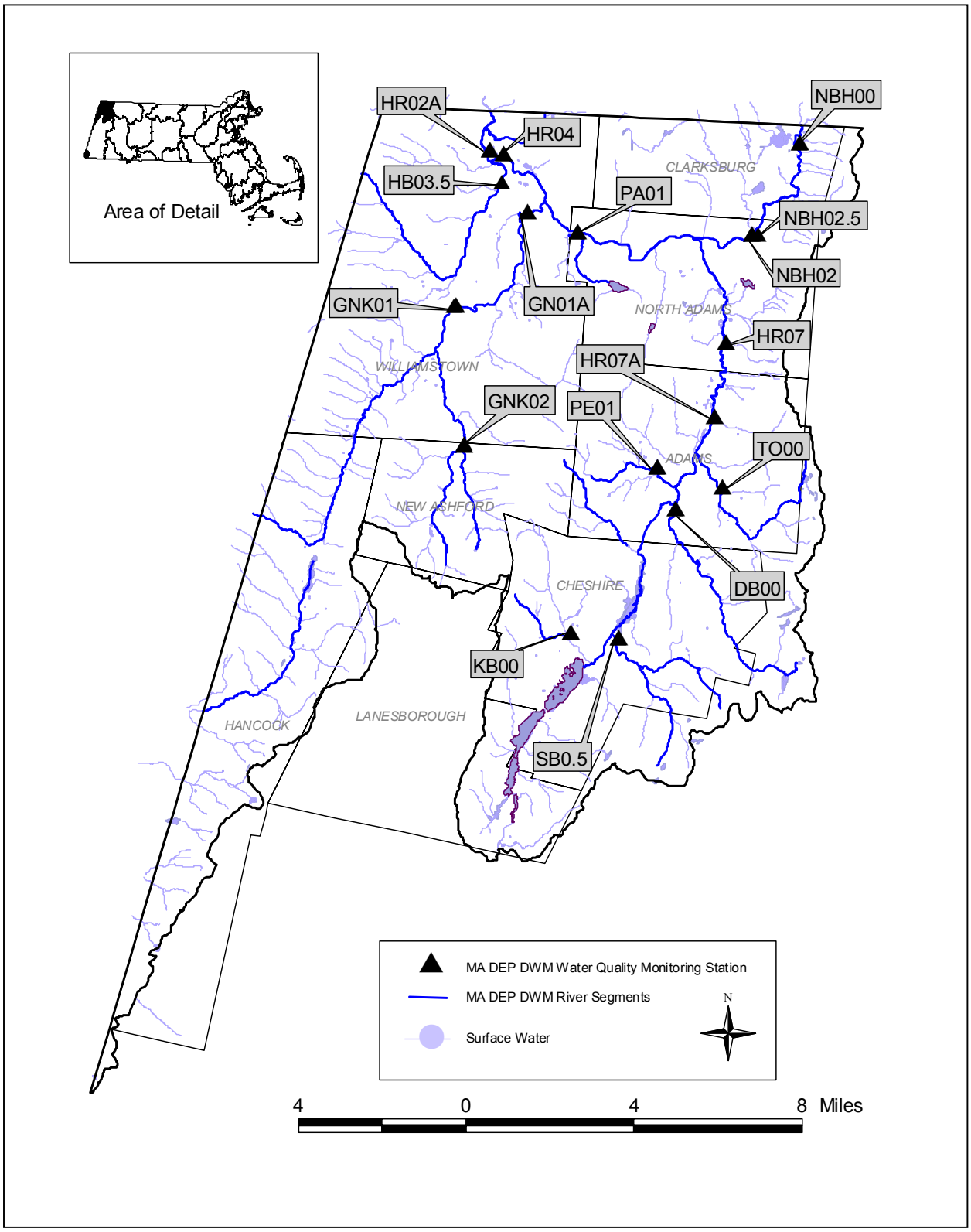
Additionally, the station at Paull Brook at Galvin Road was moved upstream to the Route 2 bridge during August due to no flow conditions (i.e., the stream bed was completely dry). In September, streamflow at Galvin Road had returned to levels sufficient for sampling.

Bacteria sampling at Dry Brook did not occur in August due to no flow conditions. Sampling resumed in September.

Table 2. Massachusetts Department of Environmental Protection Division of Watershed Management 2002 Hudson River Watershed Water Quality Sampling Station Descriptions (NOTE: Changes from QAPP noted in **bold text**. Sampling locations did not change; descriptions were modified to better reflect actual location.)

Waterbody	*STATION ID#*	SITE DESCRIPTION	PARAMETERS
Kitchen Brook	KB00	**Upstream of** the West Mountain Road bridge, Cheshire	Fecal coliform & E. coli bacteria
South Brook	SB0.5	**Upstream of** the **Wells Road** bridge, Cheshire	Same as above
Dry Brook	DB00	**Downstream of** the Leonard Street bridge, Adams	Same as above
Peck's Brook	PE01	**Upstream of** the West Road bridge, Adams	Same as above
Tophet Brook	TO00	**Upstream of** the East Street bridge, Adams	Same as above
Hoosic River	HR07A	**Upstream of the Lime Street bridge**, upstream from the Adams WWTP, Specialty Minerals, and Berkshire Mill Residences, **Adams**	Hydrolab (DO, %DO, Temperature, pH, Depth and Specific Conductance) Total phosphorus (TP), Ammonia-Nitrogen (NH_3-N), Total suspended solids (TSS), and Fecal coliform & E. coli bacteria
Hoosic River	HR07	**Upstream of the Hodges Cross Road bridge**, downstream from the Adams WWTP, Specialty Minerals, and Berkshire Mill Residences, **North Adams**	Same as above
Hoosic River	HR0**4**	Upstream from the Hoosac WWTP, **at Lauren's Launch Canoe Ramp, Williamstown**	Same as above
Hoosic River	HR02**A**	Downstream from the Hoosac WWTP, **Williamstown**	Same as above
North Branch Hoosic River	NBH00	**Upstream of** the Henderson Road bridge, **Clarksburg**	Same as above
North Branch Hoosic River	NBH02	**Behind 123 Beaver Street (Rte. 8), North Adams**	Same as above
North Branch Hoosic River	**NBH02.5**	**Approximately 400 feet upstream/east of the most westerly Beaver Street (Route 8) bridge crossing in North Adams**	Same as above
Paull Brook	PA01	**Upstream of** the Galvin Road bridge, **North Adams**	Same as above
Green River	GNK02	**At telephone pole 9B7C, on Rte 7, north of Roy's Road, and downstream from the confluence with East Branch Green River, New Ashford**	Same as above
Green River	GNK01	**Upstream of the Rte 43 bridge, south of Scott Hill Road, Williamstown**	Same as above
Green River	GN01**A**	Upstream of the Rte. 2 bridge, **north of the old dam in East Lawn Cemetery**, Williamstown	Same as above
Hemlock Brook	HB03.5	**Upstream of** the Buckley Street bridge, below the confluence with Buxton Brook, **Williamstown**	Same as above

Figure 1. Massachusetts Department of Environmental Protection Division of Watershed Management 2002 Water Quality Monitoring Station Locations in the Hudson River Watershed.



Field sheets, raw data files, chain of custody forms, lab reports, and other metadata used in this report are stored and maintained by MA DEP DWM in project files and the *Water Quality Access Database* in Worcester, MA.

SURVEY CONDITIONS

To fulfill 305(b) assessment guidance, information on precipitation at the North Adams airport (National Weather Service undated) and stream discharge (Socolow *et al.* 2003) were analyzed to estimate hydrological conditions during the 2002 water quality sampling events in the Hudson River Basin. This review was conducted to estimate streamflow conditions in relation to the 7-day, 10-year (7Q10) low flow. Additionally, this review was used to determine whether fecal coliform bacteria data were collected during "dry" or "wet weather" sampling conditions (i.e., data were collected when streamflows were increasing substantially as a result of precipitation). It is important to note that the Hoosic River system is considered to have a flashy streamflow regime (i.e., streamflow responds rapidly to precipitation events) due to steep slopes, limited hydrologic connection, and extensive bedrock exposures (MA DEM 1989).

There are three United States Geological Survey (USGS) stream gages in the Hudson River Basin (Figure 3). Gage #013315000, Hoosic River at Adams, is located 500 feet downstream of Dry Brook and 0.4 miles upstream from Pecks Brook and is affected by diversion upstream for the municipal supply of Adams and by Cheshire Reservoir. Gage #01332500, Hoosic River near Williamstown, is located 2.7 miles east of the junction of U.S. Highway 7 and State Highway 2 in Williamstown and is somewhat regulated by Cheshire Reservoir 16 miles upstream. Gage #01333000, Green River at Williamstown, is 0.1 miles upstream from the bridge on State Highway 2 and 0.8 miles from the mouth.

The Massachusetts Draft Drought Management Plan outlines five action levels related to drought conditions- normal, advisory, watch, warning, and emergency (EOEA and MEMA 2001). Additional information on drought levels is available online http://www.mass.gov/dcr/waterSupply/rainfall/droughtplan.doc.
It should be noted that Massachusetts was under drought advisories and drought watches throughout 2002.

> "July and August precipitation in Massachusetts has been far below normal. Precipitation totals for the month of July averaged only 51 percent of normal. Although the state's rainfall improved steadily between March and June 2002, the lack of precipitation during July and August has caused surface water and ground water conditions to deteriorate. The National Weather Service is forecasting drier than normal conditions for New England through November 2002 and the National Oceanic and Atmospheric Administration is predicting that drought conditions are likely to develop in the region over this period (MA DCR 2002)."

Survey conditions are described below for each MA DEP DWM sampling event.

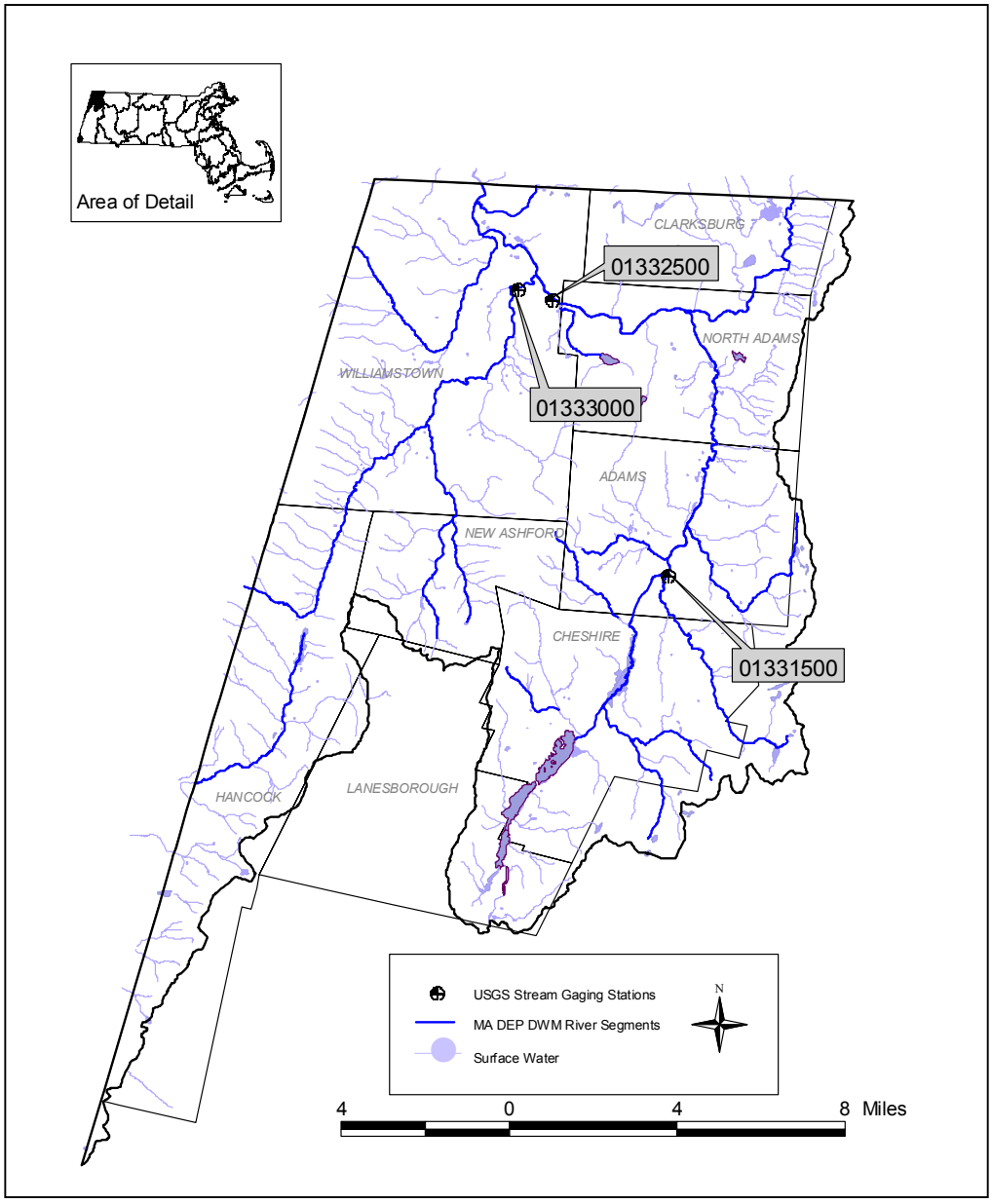


Figure 2. Location of USGS Stream Gages in the Hudson River Basin

7 May 2002: Weather conditions reported by the sampling crew on the day of sampling ranged from overcast skies and drizzle during the pre-dawn hours to partly sunny during the bacteria sample collection. Trace amounts of precipitation were recorded at the North Adams Airport on the sampling date. Less than 0.5 inches of precipitation fell at the airport over the five days preceding the survey (Table 3). Streamflow data (Table 4) from the USGS gage at the Hoosic River near Williamstown showed a slight increase in streamflow four days prior to sampling, with streamflows decreasing by the sampling date. The 7Q10 low flow for the Hoosic River near Williamstown is 25.5 cfs; flows recorded at this gage during the sampling event were approximately 10 times greater than the 7Q10. Streamflow data for the Hoosic River at Adams and for the Green River at Williamstown mirrored those for the Hoosic River at Williamstown (Figure 4). The data collected during this survey will be interpreted as being representative of dry weather conditions.

12 June 2002: Weather conditions reported by the sampling crew on the day of sampling indicated overcast skies with occasional periods of drizzle and light rain. Precipitation (~0.4 inches total) was recorded at the North Adams Airport on the day of the survey (0.23 inches) and the day prior to the survey (0.21 inches). Streamflow data indicate that streamflow was decreasing from a previous storm on 6 June that deposited less than 0.2 inches (Figure 5). On the day of sampling streamflows increased slightly, however not significantly. Flows recorded at this gage during the sampling event were approximately five times greater than the 7Q10. The data collected during this survey will be interpreted as being representative of dry weather conditions.

17 July 2002: Survey conditions reported by the sampling crew indicated clear skies and streamflows below the annual high water mark. There was no precipitation reported at the airport in the five days prior to the survey or on the day of the survey. Streamflows averaged 87 cfs and ranged from 82-94 cfs. Streamflows on the day of sampling were only about three times greater than the 7Q10. The data collected during this survey will be interpreted as being representative of dry weather conditions.

14 August 2002: Survey conditions reported by the survey crew showed hazy, warm weather with streamflows again below normal (i.e., below the annual high water mark, perceived to be low). Precipitation was not recorded at the airport and streamflows remained constant and only about twice as great as the 7Q10. The data collected during this survey will be interpreted as being representative of dry weather conditions.

18 September 2002: Sampling commenced under foggy conditions, however, after approximately one-half hour, conditions improved and skies were clear. A large storm system with steady rain and thunderstorms deposited more than two inches of rain in the gage at the North Adams Airport between 15 and 16 September. Streamflows showed a marked increase between 14 September and 16 September but were decreasing on 18 September (Figure 6). Flows at all three gages on the day of the survey were still approximately twice as high as flows before the storm and were approximately three times greater than the 7Q10. Despite the large amount of precipitation, the Hoosic River System, as noted above, is extremely flashy. Therefore, it is best professional judgment that the storm had minimal affects on the samples collected on 18 September. The data collected during this survey will be interpreted as being representative of dry weather conditions.

Table 3. Precipitation data summaries for MA DEP DWM bacteria surveys obtained from the NWS website for North Adams, MA (National Weather Service undated).

Hudson River Basin Survey
Precipitation Data Summary (reported in inches of rain)

Survey Dates	5 Days Prior	4 Days Prior	3 Days Prior	2 Days Prior	1 Day Prior	Sample Date
North Adams						
5/7/2002	0.31	0.05	0.00	0.00	0.00	0.00*
6/12/2002	0.04	0.00	0.06	0.00	0.21	0.23
7/17/2002	0.00	0.00	0.00	0.00	0.00	0.00
8/14/2002	0.00	0.00	0.00	0.00	0.00	0.01
9/18/2002	0.00	0.00	1.35	1.15	0.00	0.00

* trace amount of precipitation noted

Table 4. USGS gage data summaries in the Hudson River Basin for the 2002 MA DEP DWM surveys (Socolow *et al*. 2003).

Hudson River Basin Survey
USGS Flow Data Summary (reported in cfs)

Survey Dates	5 Days Prior	4 Days Prior	3 Days Prior	2 Days Prior	1 Day Prior	Sample Date	Monthly Mean	POR* Monthly Mean
Hoosic River at Adams, MA. (7Q10 = 8.53 cfs (Hansen et al 1973)) Gage #01331500 0								
5/7/2002	148	146	117	103	95	88	138	118
6/12/2002	273	183	144	122	107	119	116	72.3
7/17/2002	27	26	25	24	22	21	30.9	48.9
8/14/2002	14	13	14	14	14	14	16.7	41.5
9/18/2002	13	12	14	70	31	24	23.6	44.9
Hoosic River near Williamstown, MA (7Q10 = 25.5 cfs (Hansen et al 1973)) Gage #01332500								
5/7/2002	469	463	362	314	282	253	448	371
6/12/2002	955	575	433	358	303	367	412	225
7/17/2002	84	80	76	78	79	73	97.0	134
8/14/2002	48	47	46	48	47	47	62.7	117
9/18/2002	39	35	57	313	100	66	86.2	122
Green River at Williamstown, MA (7Q10 = 4.57 cfs (Ries 1998)) Gage #01333000								
5/7/2002	153	159	135	120	102	92e	144	111
6/12/2002	323e	202e	143e	113e	96e	107e	116	66.2
7/17/2002	24e	22e	21e	20e	18e	18e	23.7	32.5
8/14/2002	8.6	8.3	7.9	7.4	7.1	6.7	10.1	28.3
9/18/2002	5.3	5.2	9.9	70	16	11	16.1	28.8

* Period of Record
e – Estimate

Figure 3. May 2002 flow versus precipitation graphs for the Hoosic River Watershed.

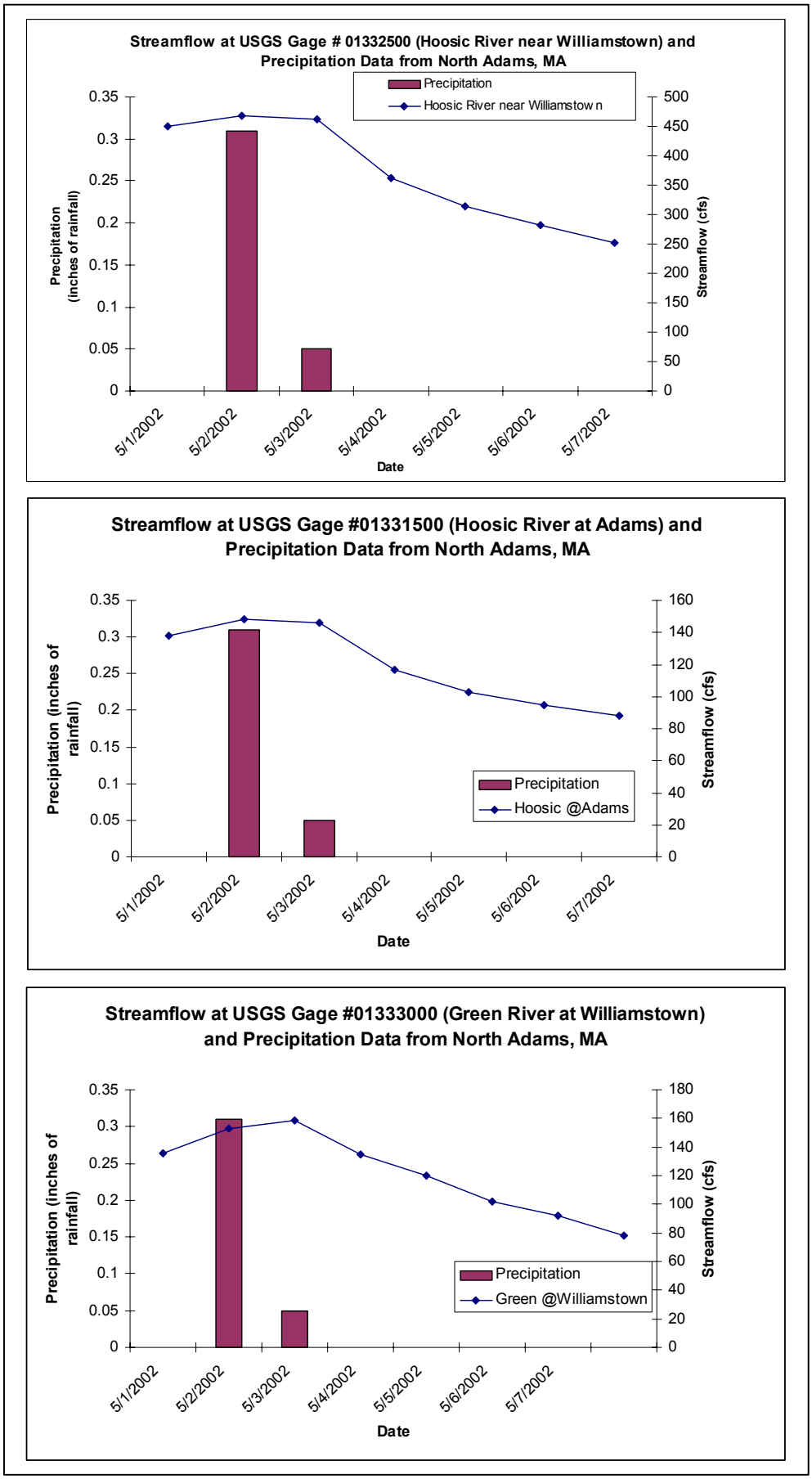


Figure 4. June 2002 flow versus precipitation graphs for the Hoosic River Watershed

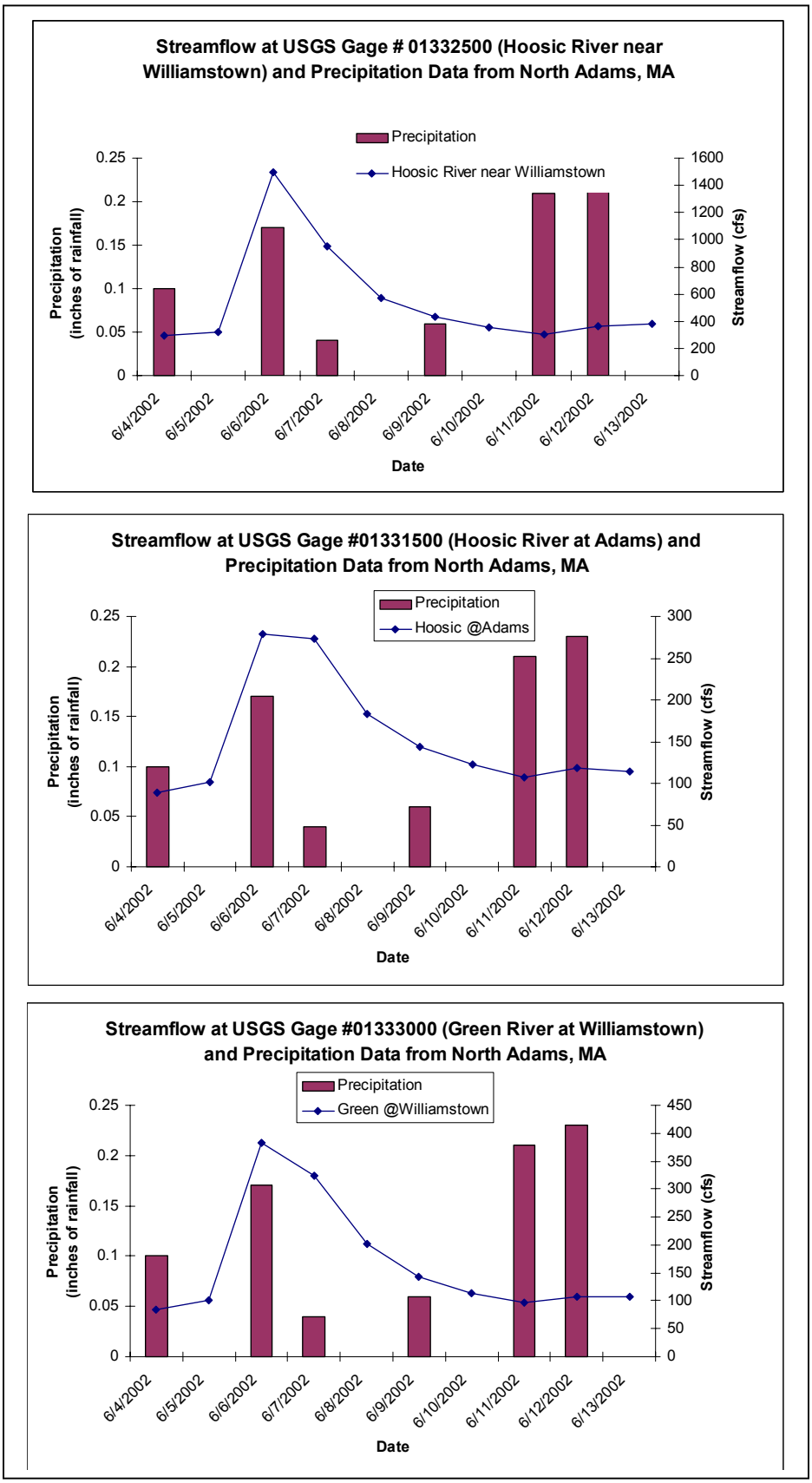
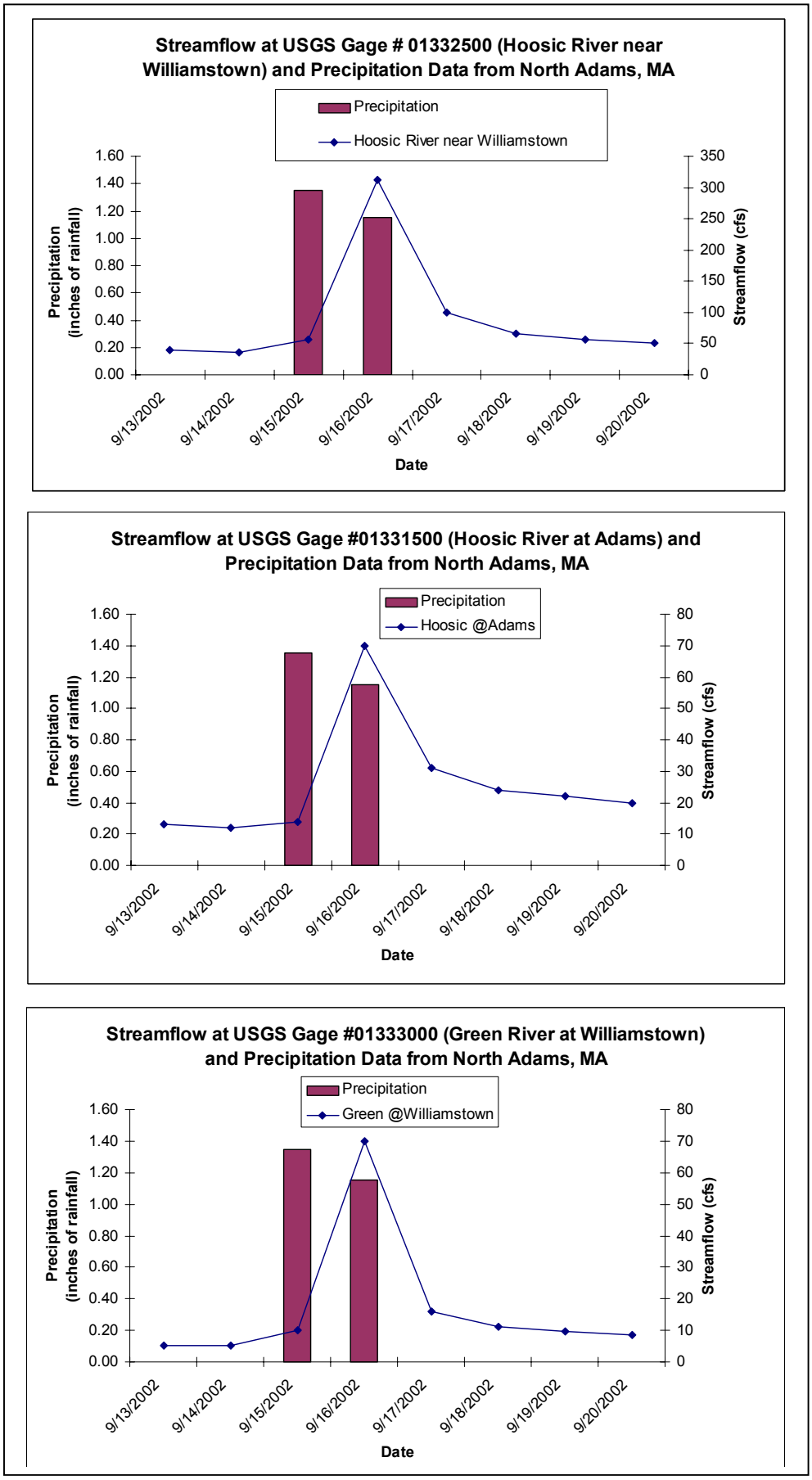


Figure 5. September 2002 flow versus precipitation graphs for the Hoosic River Watershed.



STATION OBSERVATIONS

Station KB00- Kitchen Brook, West Mountain Road, Cheshire

Station KB00 was accessed through a private residence, approximately 50 feet upstream from West Mountain Road in Cheshire. Samples were collected from the right bank looking downstream. Kitchen Brook Reservoir, approximately 0.4 miles upstream from the sampling location, is an emergency public water supply for the Town of Cheshire. The station was visited on five occasions between May and September 2002. The land use of the 3.4-mi^2 drainage area upstream of the sampling station is mostly forest with a small medium density residential section; the percent imperviousness of the upstream drainage area is only 2.3%. Moderate coverage of moss on the predominantly cobble substrates was observed throughout the sampling season. A thin slime-film of periphyton was also present on the rocks. The water was clear and no objectionable deposits were noted. The banks at this station were quite steep. Human activities on the right bank (lawn mowed right down to the bank) could potentially impact in-stream temperatures and contribute to nonpoint source (NPS) pollution. The left bank was buffered from the neighboring residence. Deciduous trees offered some canopy cover, although the percentage of open sky was not estimated. Approximately 150 feet upstream from the bridge on the left bank was a small pipe that was discharging clear liquid. It is probable that this discharge is from a sump pump. Even though the state was under drought conditions, flows in Kitchen Brook were normal throughout the sampling season.

Station SB0.5- South Brook, Wells Road, Cheshire

Access to Station SB0.5 was obtained by walking down to the brook on the right bank approximately 30 feet upstream from the bridge. South Brook confluences with the {South Branch} Hoosic River 0.2 miles downstream. The headwaters of this high gradient stream are in the Chalet State Wildlife Management Area. Land use in the 7.0-mi^2 upstream drainage area is forest, agriculture, and medium density residential and there is only 0.2 mi^2 of impervious surfaces (2.4%). This station, like Kitchen Brook was also visited on five occasions. A non-native invasive terrestrial plant, Japanese knotweed, was noted along the left bank. Downstream from the sampling location and the road bridge, the left bank was channelized by a concrete retaining wall that had been undermined slightly. At the sampling location, the riparian zone was less than 6 meters on both banks. A residence impacted the right bank, while Flaherty Road impacted the left, however deciduous trees and under story vegetation offered some buffering capacity. Moderate film periphyton covered the cobble substrates. Even though the banks were steep, there was little evidence of erosion, with only slight undercutting of the right bank. With the exception of the May sampling (water color light yellow/tan) event the water was clear with no colors or odors. No objectionable deposits (i.e., trash, flocculent masses, scum, nuisance plants) were noted. During the July and August surveys field crews noted that road construction, particularly resurfacing, was occurring on Wells Road and that BMPs were not in place to keep sand from entering the brook downstream from the road. Flows in South Brook were generally normal and water filled the channel during every sampling event.

Station DB00- Dry Brook, Leonard Street, Adams

Dry Brook originates as the outlet of a small-unnamed pond in the Savoy State Wildlife Management Area in Savoy, MA. This high gradient stream was sampled 0.2 miles upstream from the confluence with the {South Branch} Hoosic River in the Town of Adams. The 10.5-mi^2 drainage area is principally forest and agricultural land with some medium density residential properties. Only 3.4% of the area is covered with impervious surfaces. Dry Brook has historically had sedimentation problems, especially along Sand Hill Road in Cheshire (BRPC 2000). In photographs from the BRPC report, the streambed is completely covered with sand and is also completely de-watered. The report stated that installing water diversion berms and turnouts was not a priority for the DPW (BRPC 2000). The sampling station was accessed by walking down an old dirt road adjacent to the residence 80 feet east (i.e., downstream) of the Leonard Road Bridge. The sampling station was also 30 feet downstream from a storm water outfall. Periphyton (slime) was abundant on the boulder and cobble substrates. At the sampling location severe sedimentation was noted, as was the erosion of the left bank approximately 150 meters downstream from the Leonard Street Bridge. Additionally, a large sand pile was noted at the end of the access road. As

early as the first survey beginning in May, the water level was reported as being low. In August the streambed was completely dry. In September, water had returned and was sufficient for sampling. A stream walk was not performed to determine the cause of the dewatering. Potentially a cemetery, the high school, and numerous farms upstream from the sampling location could withdraw water directly from the brook for irrigation, although this is speculation. While no in-stream trash or objectionable deposits were noted, there was a plethora of trash on the left bank originating from one residence, including an old stove and aluminum cans. The water was clear and colorless. In July field crews noted a fishy odor. The Town of Adams was awarded a 604(b) grant project to develop a management plan for their storm water system in 2004, which may address the sedimentation problem.

Station PE01- Pecks Brook, West Road, Adams

Pecks Brook was sampled upstream from West Road in the Town of Adams. Immediately downstream from West Road is a small dam. Approximately 160 feet upstream from West Road an old mill building was built over the brook. There are two concrete box culverts under West Road. The left culvert was completely full of sediment and overgrown with terrestrial plants. Flows through the right box culvert were normal over the course of the sampling season and the water was always clear and colorless. No aquatic plants were observed in the brook, but by July slime and floc periphyton had appeared on the substrates. No trash, odors, scums, or nuisance plants were observed. There was no erosion noted. The 2.2-mi^2 upstream drainage area is dominated by forest, open land, and agricultural land use. Potential pollution sources include the Gould farm, an orchard, road runoff downstream from the sampling location, and shoreline residences/green lawns.

Station TO00- Tophet Brook, East Street, Adams

Tophet Brook is a very high gradient stream that was sampled from the right bank, approximately 50 feet upstream from East Street in Adams. Water levels in Tophet Brook were lower than other streams in the watershed with >25% of the boulder/cobble substrates exposed throughout the sampling season. Slime periphyton was also present throughout the season, covering >50% of the substrates by September. The water was clear and colorless. No odors, scums, nuisance plants or objectionable deposits were seen in the water. However, along the road, trash was abundant, apparently thrown from passing cars. The non-native, invasive terrestrial plant, Japanese knotweed, was noted along the banks of Tophet Brook. The 4.6-mi^2 upstream drainage area is 80% forest, 15% agricultural, and 3% residential. Potential pollution sources are limited upstream from the sampling location, as the majority of the stream is buffered from the surrounding land uses by a vegetative strip. However, the abundance of periphyton suggests some nutrient inputs, possibly from the agricultural activities. Downstream from the sampling station, road runoff can enter the brook directly from the East Street bridge (holes in the bridge). Upstream from the confluence with the {South Branch} Hoosic River, Tophet Brook is also channelized in concrete flood control chutes for approximately 0.3 miles.

Station HR07A- Hoosic River, Lime Street, Adams

Station HR07A was located approximately 300 feet upstream from the Lime Street bridge in Adams. Samples were collected from the right bank, downstream from what appeared to be a one-way storm water gate. The sampling location was also located in the riprapped portion of the South Branch flood control project. The substrate was cobble. Trees are not allowed on the stream banks under the operation and maintenance order from the Army Corps of Engineers (i.e., 100% open canopy). The station was visited on ten occasions between May and September: five times for pre-dawn sampling and five times for bacteria sampling. The {South Branch} Hoosic River water was clear and colorless, although the May bacteria survey noted light green water and the June pre-dawn survey noted slight in-stream turbidity (rained on previous day). Field crews estimated that water levels were “normal”. White foam was noted on six of the ten surveys, although it is presumed to be natural. No aesthetically objectionable conditions were noted (e.g., trash, nuisance plants). Aside from the thermal pollution associated with the flood control chutes, other potential pollution sources included waterfowl and storm water runoff from the surrounding streets and light industrial facilities. Waterfowl were seen congregating downstream from the dam (approximately 0.33 miles upstream from the sampling station); in September more than 40 waterfowl were counted.

Station HR07- Hoosic River- Hodges Cross Road, North Adams

In North Adams, the {South Branch} Hoosic River was sampled from the right bank approximately 30 feet upstream from the Hodges Cross Road bridge. The water was noted to be slightly turbid on five occasions. On one occasion (not associated with the turbidity) the water was a brownish color. Generally no scums were noted. A large logjam trapped trash and debris; the {former} EOEA Watershed Team conducted a cleanup after the July survey and the fire department removed the trees. In-stream sedimentation has been an historic problem at this site. There are two large box culverts that convey water under Hodges Cross Road. Point bar formation has occurred at the sampling site and the right culvert is completely dewatered due to the sediment inputs. Substrates are mostly sand with an occasional cobble. Under the bridge a pipe was observed to be discharging clear liquid in both wet and dry weather. Other pollution sources include the Adams WWTP, Specialty Minerals Inc, Zylonite, and Crown Vantage Paper. Potential non-point source pollution includes cropland, the McCann Technical School athletic fields, and storm water runoff from the light commercial/industrial facilities in the watershed.

Station NBH00- North Branch Hoosic River, Henderson Road, Clarksburg

The North Branch Hoosic River originates in Stamford Vermont. The sampling station was located 0.7 miles from the VT/MA border. Samples were collected from the right bank upstream from the bridge at Henderson Road in Clarksburg. The water was clear, colorless, and odorless on each of the ten occasions DWM visited the sampling site. Moderate filamentous periphyton was noted on the substrates in June while dense to moderate floc was noted in August and September. The substrates were predominantly boulder and cobble with some inputs of sand. Beginning in July and continuing through September, the water level was reported to be three feet below normal. No scums, trash, or other objectionable conditions were reported. There were no shoreline erosion or sedimentation problems identified. Land use in the Massachusetts portion of the 28.8-mi^2 upstream drainage area is comprised of 78% forest, 8% residential, and 6% agricultural uses. Potential pollution sources include Mauserts Pond in the DCR Clarksburg State Forest, which is notorious for high bacterial concentrations, and cropland immediately adjacent to the river with little to no vegetative buffer. Additionally failing septic systems could also contribute to non-point source pollution.

Station NBH02 - North Branch Hoosic River, behind 123 Beaver Street, North Adams
and Station NBH02.5- North Branch Hoosic River, Beaver Street, across from the Contemporary Artists Center, North Adams

In May, June, and July this portion of the North Branch Hoosic River was sampled by accessing the river through private property at 123 Beaver Street. This station was located upstream from the roll dam, USGS gage, and Eclipse dam and was on the left bank. Here the river is impounded somewhat with reduced velocities. The water was reported to be a colored (grayish/green/blue-green) and/or highly turbid/murky on most of the sampling dates. The water did not smell and no scums were present. Periphyton was present in moderate densities as floc on the substrates in July and slime in June. A small localized area of trash was noted on the left bank in the vicinity of the residence. A large sand pile was stored adjacent to the river without proper BMPs. Brush and construction debris were placed on the bank, blocking access for sampling. Due to safety concerns (inability to get through the pile) sampling was moved further upstream in August and September.

In August and September, sampling took place behind the parking lot for the Contemporary Artists Center, approximately 0.2 miles upstream from station NBH00. The station was accessed by climbing down remnants of an old stone dam and sampling from the right bank. In August the water was clear but had a fishy odor while in September the water was blue-green and murky with no odor. Two dead fish were found on the dam, believed left by fishermen. Dense to moderate floc, filamentous, and slime periphyton was documented on the substrates. No objectionable deposits or erosion were reported.

Potential pollution sources to both locations include road runoff and green lawns/shoreline residences. Land use in the areas adjacent to the banks includes industry, multi-family residences, and forest.

Station PA01- Paull Brook, Galvin Road, Williamstown

Paull Brook originates as the outlet of Mount Williams Reservoir, a public water supply for the Town of North Adams. The brook flows under the Harriman Airport in North Adams. [The airport was planning an expansion in 2002 and submitted a single Environmental Impact Report to the MEPA office. The expansion will mostly be in the form of extended safety areas and a shifting of the runway. The project is still ongoing (Schlesinger 2005).] The brook then flows under Route 2 before it confluences with an unnamed tributary 0.2 miles from the Hoosic River. In 2002 Paull Brook was sampled approximately 60 feet upstream from Galvin Road in Williamstown. Samples were collected from the right bank. There are two large fields to the north of Paull Brook in the vicinity of the sampling location. Tire tracks were noted going into and out of the brook at the sampling location, probably from automobiles rather then ATVs. Runoff from Galvin Road and nearby fields discharges directly to the stream. With the exception of the June bacteria survey (slightly cloudy), the water in Paull Brook was clear, odorless, and colorless. Sand was the dominant substrate with a few scattered cobbles present. A vegetative buffer strip approximately 10 feet wide on the right bank provided some canopy cover. The left bank was very wide and flat, similar to a flood plain. Periphyton was absent. An old bicycle was discarded in the middle of the stream and remained there for the majority of the sampling event, trapping other trash and debris (e.g., soda cans, plastic toys, logs). In May and June water levels were normal. In July the water level was two feet below normal. On the August pre-dawn survey the brook was completely dry at the sampling location. The August bacteria survey was conducted upstream from Route 2 where there was sufficient flowing water to collect the samples. Following a September rainstorm, sufficient flow returned to the Galvin Road site.

Upstream from Route 2, habitat in Paull Brook was significantly different than at Galvin Road. Dense filamentous and film periphyton covered the cobble substrates. There was 85% canopy cover and greater than 10 feet of buffering vegetation between the brook and residences. Samples were collected upstream from the Route 2 Bridge, halfway between the bridge and two metal culverts. The water was clear, odorless, and colorless and no objectionable deposits were present.

Station GN01A- Green River Route 2, Williamstown

Access to station GN01A was obtained through the East Lawn Cemetery in Williamstown. This station was located approximately 0.1 miles upstream from the Route 2 Bridge. Remnants of an old stone dam are located approximately 30 feet upstream. Samples were collected from the right bank on 12 occasions between May and September. The Hoosic River Watershed Association (HooRWA) also sampled this station; DWM performed two side-by-side *in situ* sampling events with HooRWA for quality assurance purposes. Deciduous trees sparsely populated the left bank, although green lawns extend to the waters edge. Grasses and green briar provide buffering from the manicured cemetery lawns. The water was described as grayish and slightly turbid during the May, June, and September pre-dawn surveys and the June bacteria survey. Moderate periphyton appeared in June and persisted through September. Substrates were bedrock, boulder, and cobble. No scums, odors, trash, or nuisance plants were observed. Field crews generally reported water levels as being normal. The USGS gage (01333000) is located just upstream from this location on the left bank. Potential pollution sources include a golf course, Christmas Brook (bacterial contamination), the cemetery, shoreline residences, and industrial properties.

Station HR04- Hoosic River, upstream from the Hoosac Water Quality District WWTP, at Lauren's Launch, Williamstown

Station HR04 was accessed at the Lauren's Canoe Launch off Simmonds Road in Williamstown. Samples were collected from the right bank. The riparian zone was minimally impacted by human activity at the sampling location with deciduous trees providing partial canopy cover. Some erosion had occurred resulting in undercutting of the right bank. The water was slightly turbid for both the September pre-dawn and bacteria survey, as well as the June pre-dawn survey. The water was grayish in color during the September pre-dawn and both surveys in June. On two surveys the water had a musty odor. The field crews noted no scums or other objectionable conditions. Potential pollution sources include the Boston & Maine railroad tracks and cropland. The Boston & Maine Cole Avenue railroad depot is a 21e site under the Massachusetts Contingency Plan due to contamination of the soil with petroleum products. (B&M was recently fined by Mass DEP for failure to submit biannual inspection and monitoring reports and for conducting cleanup activities with an expired permit (Mandell 2005).)

Station HR02A- Hoosic River, downstream from the Hoosac WWTP

From Station HR04, crews continued on Simmonds Road, passing the Hoosac Water Quality District WWTP, an unnamed pond, turning left into an equipment storage area, and then going down a hill to the river. The river was sampled on the right bank. The outlet of the unnamed pond discharges to the Hoosic River three feet downstream from the sampling location. This discharge was black and very silty in July. In May, June, and September Hoosic River water had a septic smell. The water column was slightly to highly turbid in May, June, and September. The water was grayish in color during both surveys in May and June. It was also gray during the July, August, and September pre-dawn surveys. Water levels were normal through September. Moderate floc periphyton was observed at the station beginning in July. The right bank was undercut. Canopy cover was minimal at the sampling location and did not extend out to the middle of the river. Vegetation on the left bank consisted of grasses and shrubs. No objectionable scums, trash, or nuisance aquatic plants were reported.

Station HB03.5- Hemlock Brook, Buckley Street, Williamstown

Hemlock Brook was sampled upstream from Buckley Street on the left bank. This bank had been stabilized with riprap; lawn went right to the edge of the riprap. Substrates along this portion of Hemlock Brook were mostly cobble with some sand. Filamentous periphyton appeared on the cobble substrates in July and was of moderate density by September. With the exception of the June sampling event, the water was clear, colorless, and odorless. In June the water was grayish in color and slightly turbid to highly cloudy. No objectionable conditions or erosion were recorded. Water levels were reported as being normal. The top three land uses in the 13-mi^2 upstream drainage area are forest, agriculture, and residential, although low-density residential uses are the dominant land use in the immediate vicinity of the sampling station. Storm water runoff from the Route 7 corridor could also be a potential source of NPS pollution to Hemlock Brook.

Station GNK01- Green River- at the Rte 43 bridge, south of Scott Hill Road, Williamstown

Station GNK01 was located on Trustees of the Reservation property and was accessed via a small footpath leading to the water, upstream from the Route 43/Green River Road bridge. Samples were collected off a large point bar on the right bank that was comprised of sand and cobble. Substrates in the river were primarily cobble with sand inputs. The left bank riparian zone was largely unimpacted by human activities. Large outcroppings of bedrock lined the banks and deciduous and coniferous trees provided some canopy cover. On the right bank, there is also a small section of the riparian zone that provides buffer capacity from the road. However, 550 feet upstream, there is no buffer strip between Route 43 and the river. Moderate to dense floc periphyton was observed on substrates at the site beginning with the July survey. The sampling season began with normal water levels but by September levels had dropped by an estimated three feet. The water was described as having a grayish color during the May, June, and August survey (pre-dawn only) and was slightly turbid during the May pre-dawn and bacteria surveys as well as the June pre-dawn survey. Trash, nuisance plants, or scums were never observed at this sampling station. A major source of pollution to this station is grazing cattle. Cattle were observed to be in the river during five of the ten sampling events. The pasture for these cows is approximately 1700 feet upstream from Station GNK01 and fences have not been installed to restrict access to the river. Additional farms upstream have implemented BMPs (i.e., fencing) to keep livestock out of the water. Phelps' Knoll has been converted into cropland. Road runoff from Routes 7 and 43 are also sources of NPS pollution to the Green River.

Station GNK02- Green River, Route 7, New Ashford

The Green River was sampled off Route 7 at telephone pole number 9B7C. This station is downstream from Roy's Road and the confluence with the East Branch Green River. The river was sampled from the right bank, which is steep. Only approximately eight feet separates the road from the river. On the left bank a small vegetative strip of deciduous trees separates the bank from a cornfield. Substrates are primarily cobble. The water was clear, colorless, and odorless on each of the ten sampling events between May and September. No areas of erosion or sedimentation, scums, trash, or nuisance plants were reported. Potential pollution sources include septic systems of residences upstream, road runoff, and agricultural activities.

WATER QUALITY DATA

In-situ multi-probe data are presented in Table 5. Physico-chemical data are presented in Table 6.

The procedures used to accept, accept with qualification or censor data are based on the DWM SOP for data validation (MA DEP 2005a), and are in addition to separate quality assurance activities and laboratory validation performed by WES and BEL. The following criteria for acceptance were excerpted from the Data Validation Report of Year 2002 Project Data (MA DEP 2005b).

Multiprobe

In lieu of verifying in the electronic record that the Multi-probe was depth-calibrated prior to use, both general and specific criteria are used to accept, qualify or censor of Depth readings, as follows:

General Depth Criteria: Apply to each OWMID#

- Clearly erroneous readings due to faulty depth sensor: Censor (i)
- Negative and zero depth readings: Censor (i); (likely in error)
- 0.1 m depth readings: Qualify (i); (potentially in error)
- 0.2 and greater depth readings: Accept without qualification; (likely accurate)

Specific Depth Criteria: Apply to entirety of depth data for survey date

- If zero and/or negative depth readings occur more than once per survey date, censor all negative/zero depth data, and qualify all other depth data for that survey (indicates that erroneous depth readings were not recognized in the field and that corrective action (field calibration of the depth sensor) was not taken, i.e., that all positive readings may be in error.)

Multi-probe record acceptance criteria: Within each set of records for individual OWMID #s, accept the final line of data for each depth where the change in depth from the previous accepted-record-depth is greater than 0.2 meters.

The criterion used in 2002 to accept, qualify or censor Conductivity (and the dependent, calculated estimates for TDS and Salinity) readings was based on exceedance of the calibration standard concentration. For exceedances greater than two times the standard, the conductivity reading was typically censored. Readings above the calibration standard were qualified whenever the reading was less than two times the calibration standard. In cases where readings fell far below the calibration standard concentration (e.g., measured value of 100 µS/cm using 6668 calibration standard), no censoring or qualification was imposed.

For D.O. values less than 0.2 mg/L, 2002 data were accepted without qualification and reported as "<0.2". Similarly for % saturation, values less than 2% were accepted without qualification and reported as "<2%".

For all parameters taken at the same location and whose range for 3-5 successive readings fluctuated beyond the range (+/-) of probe accuracy, the data was typically qualified or censored (depending on the degree of fluctuation) with "u" (unstable). Data exhibiting significant, continuous movement in one direction and that did not appear to reach equilibrium was also qualified or censored.

For instances where temperature has been censored, data for Conductivity, pH and D.O. are typically qualified. (Multi-probe readings for Conductivity, pH and dissolved oxygen are internally-corrected for temperature; conductivity is temperature-compensated to 25°C, D.O. readings are adjusted about 5% per degree C to account for changes in oxygen solubility and membrane permeability, and pH is compensated for electrode effects due to variable sample temperatures.) In cases where temperature has only been qualified, no qualification of data for conductivity, pH and D.O. is imposed.

Criteria for acceptance of discrete water quality samples were as follows:

- For simplicity, samples that were "lost", "missing", "spilled" and "not analyzed" were 'censored' using the 'm' (method not followed) qualifier.

- Sampling/Analysis Holding Time: Each analyte has a standard holding time that has been established to ensure sample/analysis integrity. Refer to DWM Standard Operating Procedure CN# 1.1 for a complete listing. If the standard holding time was exceeded, this criterion is violated and the data may be censored, depending on the extent of exceedance. For minor exceedances (e.g., < than 20% of the holding time), the data is typically qualified ("h" for minor holding time violation).

- Quality Control Sample Frequency: At a minimum, one field blank and one replicate must be collected for every ten samples by any given sampling crew on any given date. If less than 10% blanks and replicates were collected, the data are typically qualified with "f". If blanks were omitted and duplicates taken, typically no data are qualified, as long as there are no documented historical problems for the survey-specific samplers or station locations with regard to field contamination. If blanks were taken but duplicates were not, the data may be qualified with "f". Typically, no censoring of data takes place for insufficient QC sample frequencies only.

- Field Blanks: Field blanks were prepared at the DWM Worcester Laboratory. Reagent grade water was transported into the field in a sample container where it was transferred into a different sample container directly or via a sampling device (equipment blank) using the same methods as for its corresponding field sample (e.g., blank samples were preserved in the same way). All blanks were submitted to the WES laboratory "blind". If the field blank results were greater than the MDL (indicating potential sampling error, airborne contaminants, dirty equipment, etc.), the data may be censored or qualified, depending on extent and other factors.

- Field Replicates: In 2002, field duplicate samples for rivers were taken as co-located, simultaneous duplicates. As a result, these duplicate results include any spatial, natural variability present between side-by-side samples (which should be minimal in most cases where site selection has accounted for uniform mixing). Duplicate lake samples were sequential and therefore also include any temporal variability.

Samples were submitted to WES laboratory "blind". In order for this data quality criterion to be met, the results must generally be:

- <20% Relative Percent Difference (RPD) for method detection limits >1mg/L, or
- <30% RPD for method detection limits <1mg/L.

or meet more specific criteria contained in a 2002 QAPP document. If the criteria are not met, the sample/duplicate data may be censored or qualified, depending on extent of exceedance and other factors. Arguably, very poor precision of field duplicate samples reflects poor reproducibility for entire surveys and/or analytical batch runs, and should result in censoring or qualification of the entire survey/batch data.

Table 5. 2002 Mass DEP DWM Hudson River Watershed *in-situ* multi-probe data.

Hoosic River (SARIS: 1100500), Station: HR07A, Unique ID: W0426
Description: approximately 50 feet upstream of Lime Street bridge, Adams. (downstream of gated storm valve) (approximately 2050 feet upstream of Adams WWTP (MA0100315) discharge)

Date	OWMID	Time (24 hr)	Sample Depth (m)	Temp (°C)	pH (SU)	Conductivity at 25 °C (µS/cm)	TDS (mg/L)	DO (mg/L)	DO Saturation (%)
05/07/02	11-0045	00:52	0.3	13.2	7.8	223	142	10.4	97
05/07/02	11-0046	00:58	0.2	13.2	7.8	223 u	143 u	10.4	96
06/11/02	11-0061	01:14	0.2	15.5	7.9	228	146	10.0	98
07/16/02	11-0092	00:53	## i	17.3	8.0	369	236	9.1 u	93 u
08/13/02	11-0124	04:25	0.2	17.7	8.0	439 i	281 i	8.9	91
09/17/02	11-0156	02:40	0.1 i	16.3	8.0	259 u	166 u	9.5	96

Hoosic River (SARIS: 1100500), Station: HR07, Unique ID: W0427
Description: upstream at Hodges Cross Road bridge, North Adams.

Date	OWMID	Time (24 hr)	Sample Depth (m)	Temp (°C)	pH (SU)	Conductivity at 25 °C (µS/cm)	TDS (mg/L)	DO (mg/L)	DO Saturation (%)
05/07/02	11-0048	01:29	0.4	13.7	7.6 u	266 u	170 u	9.6 u	90 u
06/11/02	11-0062	01:43	0.3	15.9	7.8	261	167	9.2	91
07/16/02	11-0093	01:16	0.2 i	20.4	7.9	445	285	7.1	78
08/13/02	11-0125	04:03	0.4	21.8	7.9	525 i	336 i	7.0	78
09/17/02	11-0157	03:08	0.4	17.9	7.7	348	222	8.2	85

Hoosic River (SARIS: 1100500), Station: HR04, Unique ID: W1127
Description: approximately 1300 feet downstream of Route 7 bridge, Williamstown (approximately 500 feet upstream of Hoosac WPCF discharge MA0100510)

Date	OWMID	Time (24 hr)	Sample Depth (m)	Temp (°C)	pH (SU)	Conductivity at 25 °C (µS/cm)	TDS (mg/L)	DO (mg/L)	DO Saturation (%)
05/07/02	11-0055	03:22	0.2	13.1	7.8	209	134	9.8	91
06/11/02	11-0067	03:18	## i	15.0	7.6	210	135	9.3	90
07/16/02	11-0098	01:56	## i	21.2	8.1	378 u	242 u	7.6 iu	84 iu
08/13/02	11-0130	04:02	0.3	22.6	8.0	421	269	7.0	79
09/17/02	11-0162	03:33	0.3	17.9	7.8	229	147	8.7	90

Hoosic River (SARIS: 1100500), Station: HR02A, Unique ID: W1126
Description: approximately 4000 feet downstream of Route 7 bridge, Williamstown (approximately 2000 feet downstream of Hoosac WPCF discharge MA0100510)

Date	OWMID	Time (24 hr)	Sample Depth (m)	Temp (°C)	pH (SU)	Conductivity at 25 °C (µS/cm)	TDS (mg/L)	DO (mg/L)	DO Saturation (%)
05/07/02	11-0056	02:53	0.2	13.1	7.7	233	149	9.8	90
06/11/02	11-0068	02:53	## i	15.0	7.5	248 u	159 u	9.2	89
07/16/02	11-0099	02:19	## i	20.9	8.0	385	246	7.6 iu	83 iu
08/13/02	11-0131	04:28	0.3	22.1	7.9	433	277	6.9	77
09/17/02	11-0163	03:54	0.3	17.9	7.8	249	159	8.6	89

NORTH BRANCH HOOSIC RIVER (SARIS: 1100925), Station: NBH00, Unique ID: W1124
Description: Henderson Road, Clarksburg

Date	OWMID	Time (24 hr)	Sample Depth (m)	Temp (°C)	pH (SU)	Conductivity at 25 °C (µS/cm)	TDS (mg/L)	DO (mg/L)	DO Saturation (%)
05/07/02	11-0049	02:05	0.3	10.8	6.5 c	44.9	28.7	10.4	91
06/11/02	11-0063	02:20	0.3	12.7	6.6 c	45.2	29.0	9.8	90
07/16/02	11-0094	01:47	0.1 i	17.9	6.8 c	92.3	59.1	8.2 u	85 u
08/13/02	11-0126	03:17	0.2	20.3	6.8 c	118 i	75.8 i	7.6	82
09/17/02	11-0158	03:41	0.2	16.1	6.7 c	63.7	40.8	8.9	89

" i " = inaccurate readings from Multi-probe likely; may be due to significant pre-survey calibration problems, post-survey calibration readings outside typical acceptance range for the low ionic check and for the deionized blank water check, lack of calibration of the depth sensor prior to use, or to checks against laboratory analyses. Where documentation on unit pre-calibration is lacking, but SOPs at the time of sampling dictated pre-calibration prior to use, then data are considered potentially inaccurate.

" **u** " = **u**nstable readings, due to lack of sufficient equilibration time prior to final readings, non-representative location, highly-variable water quality conditions, etc.

" ## " = Censored data (i.e., data that has been discarded for some reason).

Table 5 (Continued). 2002 Mass DEP DWM Hudson River Watershed *in-situ* multi-probe data.

North Branch Hoosic River (SARIS: 1100925), Station: NBH02, Unique ID: W1123
Description: approximately 550 feet downstream/west of the most westerly Beaver Street (Route 8) bridge crossing in North

Date	OWMID	Time (24 hr)	Sample Depth (m)	Temp (°C)	pH (SU)	Conductivity at 25 °C (µS/cm)	TDS (mg/L)	DO (mg/L)	DO Saturation (%)
05/07/02	11-0050	02:29	0.2	11.5	6.9 u	67.5	43.2	10.6	94
06/11/02	11-0064	02:42	0.2	13.2	7.2 u	66.9	42.8	10.2 u	95 u
07/16/02	11-0095	02:11	0.2 i	18.5	7.7 u	157	101	8.7 u	91 u

North Branch Hoosic River (SARIS: 1100925), Station: NBH02.5, Unique ID: W1132
Description: approximately 400 feet upstream/east of the most westerly Beaver Street (Route 8) bridge crossing in North

Date	OWMID	Time (24 hr)	Sample Depth (m)	Temp (°C)	pH (SU)	Conductivity at 25 °C (µS/cm)	TDS (mg/L)	DO (mg/L)	DO Saturation (%)
09/17/02	11-0159	04:06	0.1 i	15.9	7.4	88.4	56.6	9.6	96

Paull Brook (SARIS: 1100850), Station: PA01, Unique ID: W1125
Description: Galvin Road, North Adams

Date	OWMID	Time (24 hr)	Sample Depth (m)	Temp (°C)	pH (SU)	Conductivity at 25 °C (µS/cm)	TDS (mg/L)	DO (mg/L)	DO Saturation (%)
05/07/02	11-0051	02:59	0.1 i	11.6	7.6 u	166	106	10.3	92
06/11/02	11-0065	03:06	0.1 i	15.6	7.9	170	109	9.4 u	92 u
07/16/02	11-0205	02:44	0.2 i	18.7	8.1	242	155	8.8	93
08/13/02	No Flow	02:43j	--	--	--	--	--	--	--
09/17/02	11-0160	04:38	0.1 i	17.4	8.0	351	224	8.7	90

Green River (SARIS: 1100650), Station: GNK02, Unique ID: W1129
Description: approximately 150 feet downstream of the East Branch Green River confluence, New Ashford

Date	OWMID	Time (24 hr)	Sample Depth (m)	Temp (°C)	pH (SU)	Conductivity at 25 °C (µS/cm)	TDS (mg/L)	DO (mg/L)	DO Saturation (%)
05/07/02	11-0059	00:51	## i	10.3	7.8	175	112	11.0	95
06/11/02	11-0071	00:59	## i	11.7	7.8	175	112	10.4	94
07/16/02	11-0102	00:47	## i	16.4	8.2 u	248	159	9.3 u	94 u
08/13/02	11-0134	02:49	## i	17.6	8.0	293	187	8.9	92
09/17/02	11-0166	02:25	## i	15.4	8.0	263	168	9.6	95

Green River (SARIS: 1100650), Station: GNK01, Unique ID: W1128
Description: Route 43 bridge crossing closest to Scott Hill Road, Williamstown

Date	OWMID	Time (24 hr)	Sample Depth (m)	Temp (°C)	pH (SU)	Conductivity at 25 °C (µS/cm)	TDS (mg/L)	DO (mg/L)	DO Saturation (%)
05/07/02	11-0058	01:25	0.5	11.0	7.7	156	100	10.7	94
06/11/02	11-0070	01:26	## i	12.2	7.4 u	159	102	10.1 u	92 u
07/16/02	11-0101	01:09	## i	17.9	7.8	223	143	8.8 iu	91 iu
08/13/02	11-0133	03:18	0.2	19.1	7.9	244	156	8.3	88
09/17/02	11-0165	02:48	0.2	16.0	7.9	225	144	9.3	93

" i " = inaccurate readings from Multi-probe likely; may be due to significant pre-survey calibration problems, post-survey calibration readings outside typical acceptance range for the low ionic check and for the deionized blank water check, lack of calibration of the depth sensor prior to use, or to checks against laboratory analyses. Where documentation on unit pre-calibration is lacking, but SOPs at the time of sampling dictated pre-calibration prior to use, then data are considered potentially inaccurate.

" **u** " = **u**nstable readings, due to lack of sufficient equilibration time prior to final readings, non-representative location, highly-variable water quality conditions, etc. .

" ## " = Censored data (i.e., data that has been discarded for some reason).

" -- " = No data (i.e., data not taken/not required)

Table 5 (Continued). 2002 Mass DEP DWM Hudson River Watershed *in-situ* multi-probe data.

Green River (SARIS: 1100650), Station: GN01A, Unique ID: W1130
Description: approximately 450 feet upstream of Route 2 bridge, Williamstown

Date	OWMID	Time (24 hr)	Sample Depth (m)	Temp (°C)	pH (SU)	Conductivity at 25 °C (µS/cm)	TDS (mg/L)	DO (mg/L)	DO Saturation (%)
05/07/02	11-0052	01:56	0.3	11.7	7.9 u	169	108	10.8	96
05/07/02	11-0060	06:16	0.2	10.7	7.9	169	108	11.0	97
06/11/02	11-0066	01:57	## i	12.8	7.7	178	114	10.2	95
07/16/02	11-0097	03:22	## i	18.7	8.0	248	159	9.1 iu	95 iu
08/13/02	11-0129	05:01	0.3	20.5	8.1	277	178	8.4 u	91 u
08/13/02	11-0135	05:58	0.4	20.2	8.1	309 i	198 i	8.6	93
09/17/02	11-0161	04:21	0.3	16.6	8.1	237	152	9.4	95

Hemlock Brook (SARIS: 1100550), Station: HB03.5, Unique ID: W1131
Description: Bulkley Street, Williamstown

Date	OWMID	Time (24 hr)	Sample Depth (m)	Temp (°C)	pH (SU)	Conductivity at 25 °C (µS/cm)	TDS (mg/L)	DO (mg/L)	DO Saturation (%)
05/07/02	11-0057	02:21	0.2	11.0	7.6	169	108	10.8	95
06/11/02	11-0069	02:21	## i	11.9	7.4	158	101	10.3	93
07/16/02	11-0100	01:35	## i	17.3	7.8	246	157	9.0 iu	92 iu
08/13/02	11-0132	03:44	0.2	18.1	7.9	287	184	8.7	90
09/17/02	11-0164	03:15	0.2	15.7	7.9	250	160	9.5	94

" i " = inaccurate readings from Multi-probe likely; may be due to significant pre-survey calibration problems, post-survey calibration readings outside typical acceptance range for the low ionic check and for the deionized blank water check, lack of calibration of the depth sensor prior to use, or to checks against laboratory analyses. Where documentation on unit pre-calibration is lacking, but SOPs at the time of sampling dictated pre-calibration prior to use, then data are considered potentially inaccurate.

" **u** " = **u**nstable readings, due to lack of sufficient equilibration time prior to final readings, non-representative location, highly-variable water quality conditions, etc.

" ## " = Censored data (i.e., data that has been discarded for some reason).

Table 6. 2002 Mass DEP DWM Hudson River Watershed *physico-chemical* data.

Hoosic River (SARIS: 1100500), Station: HR07A, Unique ID: W0426
Description: approximately 50 feet upstream of Lime Street bridge, Adams. (downstream of gated storm valve) (approximately 2050 feet upstream of Adams WWTP (MA0100315) discharge)

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total phosphorus (mg/L)	TSS (mg/L)
05/07/02	11-0045	00:46	--	--	<0.02	0.019	## b
05/07/02	11-0046	00:46	--	--	<0.02	0.019	## b
05/07/02	11-0202	08:48	200* e	230* e	--	--	--
05/07/02	11-0203	08:48	190*	180*	--	--	--
06/12/02	11-0077	09:30	1000* e	1100* e	<0.01*	0.020* b	5* d
06/12/02	11-0078	09:30	1200* e	1400* e	<0.01*	0.030* b	8* d
07/17/02	11-0109	09:25	1000*	950*	<0.01*	0.030*	2*
07/17/02	11-0110	09:25	950* e	1050* e	<0.01*	0.028*	3*
08/14/02	11-0141	09:18	680*	600*	0.025*	0.016*	2*
09/18/02	11-0172	09:18	1410*	1350*	0.013*	0.033*	7*

Hoosic River (SARIS: 1100500), Station: HR07, Unique ID: W0427
Description: upstream at Hodges Cross Road bridge, North Adams.

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total phosphorus (mg/L)	TSS (mg/L)
05/07/02	11-0048	01:25	--	--	<0.02	0.027	## b
05/07/02	11-0201	08:34	230*	210*	--	--	--
06/12/02	11-0080	09:53	900*	600*	0.070*	0.040* b	8*
07/17/02	11-0112	09:45	380* e	410* e	0.010*	0.108*	1*
08/14/02	11-0142	09:33	500*	420*	0.047*	0.049* d	2* d
08/14/02	11-0143	09:33	620*	580*	0.045*	0.022* d	5* d
09/18/02	11-0173	09:38	1100*	960*	0.046*	0.041*	6*
09/18/02	11-0174	09:48	1800*	1200*	0.046*	0.022*	7*

Hoosic River (SARIS: 1100500), Station: HR04, Unique ID: W1127
Description: approximately 1300 feet downstream of Route 7 bridge, Williamstown (approximately 500 feet upstream of Hoosac WPCF discharge MA0100510)

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total phosphorus (mg/L)	TSS (mg/L)
05/07/02	11-0055	03:17	--	--	<0.02	0.021	5.5
05/07/02	11-0196	07:21	300* e	310* e	--	--	--
06/12/02	11-0087	11:27	500*	400*	0.020*	0.040* b	5*
07/17/02	11-0119	11:27	150*	120*	<0.01*	0.028*	<1*
08/14/02	11-0149	11:25	120* e	150* e	0.032*	0.027*	3*
09/18/02	11-0180	11:11	800*	780*	0.020*	0.036*	8*

Hoosic River (SARIS: 1100500), Station: HR02A, Unique ID: W1126
Description: approximately 4000 feet downstream of Route 7 bridge, Williamstown (approximately 2000 feet downstream of Hoosac WPCF discharge MA0100510)

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total phosphorus (mg/L)	TSS (mg/L)
05/07/02	11-0056	02:50	--	--	<0.02	0.026	6.1
05/07/02	11-0197	07:28	280* e	360* e	--	--	--
06/12/02	11-0088	11:38	230*	200*	0.020*	0.040* b	5*
07/17/02	11-0120	11:38	150*	130*	<0.01*	0.075*	<1*
08/14/02	11-0150	11:40	120* e	130* e	0.025*	0.030*	5*
08/14/02	11-0151	11:40	250*	250*	0.025*	0.030*	6*
09/18/02	11-0181	11:23	820*	760*	0.026*	0.044*	5*
09/18/02	11-0182	11:23	640*	590*	0.028*	0.052*	6*

" - - " = No data (i.e., data not taken/not required)
" ##" = Censored data (i.e., data that has been discarded for some reason).
" b " = blank contamination in lab reagent blanks and/or field blank samples (indicating possible bias high and false positives).
* = Analysis performed by Laboratory OTHER than DEP's Wall Experiment Station (WES)
" e " = not theoretically possible. Specifically, used for bacteria data where colonies per unit volume for e-coli bacteria > fecal coliform bacteria, for lake Secchi and station depth data where a specific Secchi depth is greater than the reported station depth, and for other incongruous or conflicting results
" d " = precision of field duplicates (as RPD) did not meet project data quality objectives identified for program or in QAPP. Batched samples may also be affected.

Table 6 (Continued). 2002 Mass DEP DWM Hudson River Watershed *physico-chemical* data.

North Branch Hoosic River (SARIS: 1100925), Station: NBH00, Unique ID: W1124
Description: Henderson Road, Clarksburg

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total Phosphorus (mg/L)	TSS (mg/L)
05/07/02	11-0049	02:00	--	--	<0.02	0.006 j	## b
05/07/02	11-0199	08:05	20* e	30* e	--	--	--
06/12/02	11-0081	10:17	40* e	70* e	<0.01*	0.020* b	1*
07/17/02	11-0113	10:13	310* e	330* e	<0.01*	0.014*	<1*
08/14/02	11-0145	10:03	160*	140*	0.017*	<0.01*	1*
09/18/02	11-0176	10:13	180*	160*	<0.01*	<0.01*	4*

North Branch Hoosic River (SARIS: 1100925), Station: NBH02.5, Unique ID: W1132
Description: approximately 400 feet upstream/east of the most westerly Beaver Street (Route 8) bridge crossing in North Adams

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total Phosphorus (mg/L)	TSS (mg/L)
08/14/02	11-0146	10:30	140* e	150* e	0.015*	0.014*	2*
09/18/02	11-0177	10:27	140* e	150* e	0.023*	0.022*	3*

North Branch Hoosic River (SARIS: 1100925), Station: NBH02, Unique ID: W1123
Description: approximately 550 feet downstream/west of the most westerly Beaver Street (Route 8) bridge crossing in North Adams

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total Phosphorus (mg/L)	TSS (mg/L)
05/07/02	11-0050	02:24	--	--	<0.02	0.008 j	## b
05/07/02	11-0200	08:16	20* e	40* e	--	--	--
06/12/02	11-0082	10:31	80*	60*	<0.01*	0.020* b	2*
07/17/02	11-0114	10:27	100*	80*	<0.01*	0.022*	3*

Paull Brook (SARIS: 1100850), Station: PA01.5, Unique ID: W1133
Description: Route 2, North Adams

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total Phosphorus (mg/L)	TSS (mg/L)
08/14/02	11-0147	10:53	1500*	1300*	0.204*	0.055*	11*

Paull Brook (SARIS: 1100850), Station: PA01, Unique ID: W1125
Description: Galvin Road, North Adams

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total Phosphorus (mg/L)	TSS (mg/L)
05/07/02	11-0051	02:53	--	--	<0.02	0.008 j	## b
05/07/02	11-0198	07:45	90*	40*	--	--	--
06/12/02	11-0083	10:51	320* e	360* e	<0.01*	0.030* b	6*
07/17/02	11-0115	10:52	150* e	180* e	<0.01*	0.019*	2*
08/13/02	No Flow	02:43j	--	--	--	--	--
09/18/02	11-0178	10:46	450*	400*	0.010*	0.049*	30*

" -- " = No data (i.e., data not taken/not required)
" j " = 'estimated' value; used for lab-related issues where certain lab QC criteria are not met and re-testing is not possible (as identified by the WES lab only). Also used to report sample data where the sample concentration is less than the 'reporting' limit or RDL and greater than the method detection limit or MDL (mdl< x <rdl). Also used to note where values have been reported at levels less than the mdl.
" ## " = Censored data (i.e., data that has been discarded for some reason).
" b " = Blank contamination in lab reagent blanks and/or field blank samples (indicating possible bias high and false positives).
" e " = not theoretically possible. Specifically, used for bacteria data where colonies per unit volume for e-coli bacteria > fecal coliform bacteria, for lake Secchi and station depth data where a specific Secchi depth is greater than the reported station depth, and for other incongruous or conflicting results.
* = Analysis performed by Laboratory OTHER than DEP's Wall Experiment Station (WES)

Table 6 (Continued). 2002 Mass DEP DWM Hudson River Watershed *physico-chemical* data.

GREEN RIVER (SARIS: 1100650), Station: GNK02, Unique ID: W1129
Description: approximately 150 feet downstream of the East Branch Green River confluence, New Ashford

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total Phosphorus (mg/L)	TSS (mg/L)
05/07/02	11-0059	00:45	--	--	<0.02	0.007 j	1.8
05/07/02	11-0193	06:50	70*	40*	--	--	--
06/12/02	11-0091	12:22	500*	300*	<0.01*	<0.01* b	5*
07/17/02	11-0123	12:23	20* e	40* e	<0.01*	<0.01*	1*
08/14/02	11-0155	12:32	20*	10*	0.010*	<0.01*	2*
09/18/02	11-0186	12:08	40*	10*	<0.01*	0.011*	2*

Green River (SARIS: 1100650), Station: GNK01, Unique ID: W1128
Description: Route 43 bridge crossing closest to Scott Hill Road, Williamstown

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total Phosphorus (mg/L)	TSS (mg/L)
05/07/02	11-0058	01:20	--	--	<0.02	0.016	5.4
05/07/02	11-0194	07:00	60*	20*	--	--	--
06/12/02	11-0090	12:12	1200*	800*	<0.01*	0.010* b	4*
07/17/02	11-0122	12:09	150* e	180* e	<0.01*	0.019*	1*
08/14/02	11-0154	12:18	230*	230*	0.017*	<0.01*	3*
09/18/02	11-0185	11:55	200*	190*	<0.01*	0.014*	4*

Green River (SARIS: 1100650), Station: GN01A, Unique ID: W1130
Description: approximately 450 feet upstream of Route 2 bridge, Williamstown

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total Phosphorus (mg/L)	TSS (mg/L)
05/07/02	11-0052	01:54	--	--	<0.02	0.011 j	**
05/07/02	11-0053	01:54	--	--	<0.02	0.014 j	**
05/07/02	11-0190	06:12	150*	140*	--	--	--
05/07/02	11-0191	06:12	130*	120*	--	--	--
06/12/02	11-0084	11:05	1200* e	1600* e	<0.01*	0.020* b	5*
06/12/02	11-0085	11:05	1300* e	1800* e	<0.01*	0.020* b	4*
07/17/02	11-0116	11:05	80*	70*	<0.01*	0.014*	<1*
07/17/02	11-0117	11:05	80* e	90* e	<0.01*	0.017*	1*
08/14/02	11-0148	11:05	80*	60*	0.020*	<0.01*	2*
09/18/02	11-0179	10:56	400*	350*	<0.01*	0.027*	2*

Hemlock Brook (SARIS: 1100550), Station: HB03.5, Unique ID: W1131
Description: Bulkley Street, Williamstown

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total Phosphorus (mg/L)	TSS (mg/L)
05/07/02	11-0057	02:17	--	--	<0.02	0.008 j	1.6
05/07/02	11-0195	07:14	40*	40*	--	--	--
06/12/02	11-0089	11:51	40*	40*	<0.01*	0.020* b	7*
07/17/02	11-0121	11:51	70* e	80* e	<0.01*	0.011*	1*
08/14/02	11-0153	12:00	350*	290*	0.017*	<0.01*	4*
09/18/02	11-0184	11:38	300*	260*	<0.01*	0.016*	3*

" -- " = No data (i.e., data not taken/not required)
" j " = 'estimated' value; used for lab-related issues where certain lab QC criteria are not met and re-testing is not possible (as identified by the WES lab only). Also used to report sample data where the sample concentration is less than the 'reporting' limit or RDL and greater than the method detection limit or MDL (mdl< x <rdl). Also used to note where values have been reported at levels less than the mdl.
* = Analysis performed by Laboratory OTHER than DEP's Wall Experiment Station (WES)
" b " = blank contamination in lab reagent blanks and/or field blank samples (indicating possible bias high and false positives).
" e " = not theoretically possible. Specifically, used for bacteria data where colonies per unit volume for e-coli bacteria > fecal coliform bacteria, for lake Secchi and station depth data where a specific Secchi depth is greater than the reported station depth, and for other incongruous or conflicting results.
* = Analysis performed by Laboratory OTHER than DEP's Wall Experiment Station (WES)

Table 6 (Continued). 2002 Mass DEP DWM Hudson River Watershed *physico-chemical* data.

Kitchen Brook (SARIS: 1101525), Station: KB00, Unique ID: W1119
Description: West Mountain Road, Cheshire

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)
05/07/02	11-0040	09:45	<10* e	20* e
06/12/02	11-0072	08:22	10*	10*
07/17/02	11-0104	08:19	20*	20*
08/14/02	11-0136	08:15	20*	<10*
09/18/02	11-0167	08:07	40*	10*

South Brook (SARIS: 1101475), Station: SB0.5, Unique ID: W1118
Description: Wells Road, Cheshire

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)
05/07/02	11-0041	09:55	50*	20*
06/12/02	11-0073	08:35	60* e	70* e
07/17/02	11-0105	08:30	20*	10*
08/14/02	11-0137	08:28	140*	130*
09/18/02	11-0168	08:18	40* e	50* e

Dry Brook (SARIS: 1101400, Station: DB00, Unique ID: W1120
Description: Leonard Street , Adams

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)
05/07/02	11-0042	09:31	310*	270*
06/12/02	11-0074	08:52	110* e	130* e
07/17/02	11-0106	08:44	50*	30*
08/14/02	No Flow	08:44j	--	--
09/18/02	11-0169	08:33	390*	350*

Pecks Brook (SARIS: 1101375), Station: PE01, Unique ID: W1121
Description: West Road, Adams

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)
05/07/02	11-0043	09:24	20*	10*
06/12/02	11-0075	09:02	50* e	80* e
07/17/02	11-0107	08:53	<10*	10*
08/14/02	11-0139	08:52	20*	20*
09/18/02	11-0170	08:45	20*	20*

Tophet Brook (SARIS: 1101250), Station: TB00, Unique ID: W1122
Description: East Street, Adams

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)
05/07/02	11-0044	09:04	90*	80*
06/12/02	11-0076	09:15	70* e	110* e
07/17/02	11-0108	09:07	10* e	20* e
08/14/02	11-0140	09:05	50* e	60* e
09/18/02	11-0171	08:57	300* e	310* e

* = Analysis performed by Laboratory OTHER than DEP's Wall Experiment Station (WES)
" e " = not theoretically possible. Specifically, used for bacteria data where colonies per unit volume for e-coli bacteria > fecal coliform bacteria, for lake Secchi and station depth data where a specific Secchi depth is greater than the reported station depth, and for other incongruous or conflicting results.
" -- " = No data (i.e., data not taken/not required)
* = Analysis performed by Laboratory OTHER than DEP's Wall Experiment Station (WES)

QUALITY CONTROL DATA

Table 7. 2002 Mass DEP DWM Hudson River Watershed Field Blank Data

Date	OWMID	Time (24 hr)	Fecal coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total Phosphorus (mg/L)	TSS (mg/L)
05/07/02	11-0047	00:46j	--	--	<0.02	<0.005	## b
05/07/02	11-0054	01:54j	--	--	<0.02	<0.005	**
05/07/02	11-0192	06:12j	<10*	<10*	--	--	--
05/07/02	11-0204	08:46j	<10*	<10*	--	--	--
06/12/02	11-0079	09:29	<10*	<10*	<0.01*	<0.01* b	<1*
06/12/02	11-0086	11:05	<10*	<10*	<0.01*	0.020* b	2* b
07/17/02	11-0111	09:22j	<10*	<10*	<0.01*	<0.01*	1* b
07/17/02	11-0118	11:04j	<10*	<10*	<0.01*	<0.01*	<1*
08/14/02	11-0152	11:40j	<10*	<10*	<0.01*	<0.01*	<1*
08/14/02	11-0144	09:42	<10*	<10*	<0.01*	<0.01*	<1*
09/18/02	11-0175	09:36j	<10*	<10*	<0.01*	<0.01*	3* b
09/18/02	11-0183	11:20j	<10*	<10*	<0.01*	0.011* b	3* b

" **j** " = 'estimated' value
" -- " = No data (i.e., data not taken/not required)
" ## " = Censored data (i.e., data that has been discarded for some reason).
" b " = blank Contamination in lab reagent blanks and/or field blank samples (indicating possible bias high and false positives).
* = Analysis performed by Laboratory OTHER than DEP's Wall Experiment Station (WES)

Table 8. 2002 Mass DEP DWM Hudson River Watershed Field Duplicate Data.

Hoosic River (SARIS: 1100500), Station: HR07A, Unique ID: W0426
Description: approximately 50 feet upstream of Lime Street bridge, Adams. (downstream of gated storm valve) (approximately 2050 feet upstream of Adams WWTP (MA0100315) discharge)

Date	OWMID	QAQC	Time (24 hr)	Log 10 Fecal coliform (cfu/100 mL)	Log10 *E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total Phosphorus (mg/L)	TSS (mg/L)
05/07/02	11-0045	11-0046	00:46	--	--	<0.02	0.019	## b
05/07/02	11-0046	11-0045	00:46	--	--	<0.02	0.019	## b
	Relative Percent Difference			***--***	***--***	***0.0%***	***0.0%***	***--***
05/07/02	11-0202	11-0203	08:48	2.301* e	2.362* e	--	--	--
05/07/02	11-0203	11-0202	08:48	2.279*	2.255*	--	--	--
	Relative Percent Difference			***1.0%***	***4.6%***	***--***	***--***	***--***
06/12/02	11-0077	11-0078	09:30	3.000* e	3.041* e	<0.01*	0.020* b	5* d
06/12/02	11-0078	11-0077	09:30	3.079* e	3.146* e	<0.01*	0.030* b	8* d
	Relative Percent Difference			***2.6%***	***3.4%***	***0.0%***	***40.0%***	***46.2%***
07/17/02	11-0109	11-0110	09:25	3.000*	2.978*	<0.01*	0.030*	2*
07/17/02	11-0110	11-0109	09:25	2.978* e	3.021* e	<0.01*	0.028*	3*
	Relative Percent Difference			***0.7%***	***1.4%***	***0.0%***	***6.9%***	***40.0%***

Hoosic River (SARIS: 1100500), Station: HR07, Unique ID: W0427
Description: upstream at Hodges Cross Road bridge, North Adams.

Date	OWMID	QAQC	Time (24 hr)	Log 10 Fecal coliform (cfu/100 mL)	Log10 *E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total Phosphorus (mg/L)	TSS (mg/L)
08/14/02	11-0142	11-0143	09:33	2.699*	2.623*	0.047*	0.049* d	2* d
08/14/02	11-0143	11-0142	09:33	2.792*	2.763*	0.045*	0.022* d	5* d
	Relative Percent Difference			***3.4%***	***5.2%***	***4.3%***	***76.1%***	***85.7%***

Hoosic River (SARIS: 1100500), Station: HR02A, Unique ID: W1126
Description: approximately 4000 feet downstream of Route 7 bridge, Williamstown (approximately 2000 feet downstream of Hoosac WPCF discharge MA0100510)

Date	OWMID	QAQC	Time (24 hr)	Log 10 Fecal coliform (cfu/100 mL)	Log10 *E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total Phosphorus (mg/L)	TSS (mg/L)
08/14/02	11-0150	11-0151	11:40	2.079* e	2.114* e	0.025*	0.030*	5*
08/14/02	11-0151	11-0150	11:40	2.398*	2.398*	0.025*	0.030*	6*
	Relative Percent Difference			***14.2%***	***12.6%***	***0.0%***	***0.0%***	***18.2%***
09/18/02	11-0181	11-0182	11:23	2.914*	2.881*	0.026*	0.044*	5*
09/18/02	11-0182	11-0181	11:23	2.806*	2.771*	0.028*	0.052*	6*
	Relative Percent Difference			***3.8%***	***3.9%***	***7.4%***	***16.7%***	***18.2%***

Green River (SARIS: 1100650), Station: GN01A, Unique ID: W1130
Description: approximately 450 feet upstream of Route 2 bridge, Williamstown

Date	OWMID	QAQC	Time (24 hr)	Log 10 Fecal coliform (cfu/100 mL)	Log10 *E. coli* (cfu/100 mL)	Ammonia-nitrogen (mg/L)	Total Phosphorus (mg/L)	TSS (mg/L)
05/07/02	11-0052	11-0053	01:54			<0.02	0.011 j	**
05/07/02	11-0053	11-0052	01:54			<0.02	0.014 j	**
	Relative Percent Difference					***0.0%***	***24.0%***	***--***
05/07/02	11-0190	11-0191	06:12	2.176*	2.146*	--	--	--
05/07/02	11-0191	11-0190	06:12	2.114*	2.079*	--	--	--
	Relative Percent Difference			***2.9%***	***3.2%***	***--***	***--***	***--***
06/12/02	11-0084	11-0085	11:05	3.079* e	3.204* e	<0.01*	0.020* b	5*
06/12/02	11-0085	11-0084	11:05	3.114* e	3.255* e	<0.01*	0.020* b	4*
	Relative Percent Difference			***1.1%***	***1.6%***	***0.0%***	***0.0%***	***22.2%***
07/17/02	11-0116	11-0117	11:05	1.903*	1.845*	<0.01*	0.014*	<1*
07/17/02	11-0117	11-0116	11:05	1.903* e	1.954* e	<0.01*	0.017*	1*
	Relative Percent Difference			***0.0%***	***5.7%***	***0.0%***	***19.4%***	***0.0%***

" -- " = No data (i.e., data not taken/not required)
" ## " = Censored data (i.e., data that has been discarded for some reason).
" b " = blank Contamination in lab reagent blanks and/or field blank samples (indicating possible bias high and false positives).
* = Analysis performed by Laboratory OTHER than DEP's Wall Experiment Station (WES)
" **e** " = not theoretically possible. Specifically, used for bacteria data where colonies per unit volume for e-coli bacteria > fecal coliform bacteria
" **j** " = 'estimated' value; used for lab-related issues where certain lab QC criteria are not met and re-testing is not possible (as identified by the WES lab only). Also used to report sample data where the sample concentration is less than the 'reporting' limit or RDL and greater than the method detection limit or MDL (MDL< x <RDL). Also used to note where values have been reported at levels less than the MDL.
" d " = precision of field duplicates (as RPD) did not meet project data quality objectives identified for program or in QAPP. Batched samples may also be affected.

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APPENDIX C
DWM 2002 HUDSON RIVER BASIN LAKES SURVEY DATA

The north and middle basins of Cheshire Reservoir (Cheshire, MA) were surveyed to provide data in support of the DWM TMDL program. These basins were listed on the 1998 303(d) List of Impaired Waters and are candidates for TMDL development (MassDEP 1999a). Lake monitoring included the preparation of a bathymetric map (if not already available), mapping of aquatic vegetation, Secchi disc readings, *in-situ* water quality profile measurements (i.e., temperature, dissolved oxygen, pH, conductance) at one or more stations, water quality sampling for phosphorus analysis at Wall Experiment Station (WES), chlorophyll *a* determinations and the analysis of apparent color. Each basin was sampled on three separate occasions, although multiprobe profiles were obtained only once.

A technical memorandum by Mattson (in preparation) entitled *Baseline Lake 2002 Technical Memo* provides details of sample collection methods, results, data, and weed maps for the lakes surveyed in the Hudson, Housatonic, Charles, and Ten Mile watersheds in 2002.

In-situ measurements using the Hydrolab® multiprobe (measures dissolved oxygen, water temperature, pH, conductivity, and depth and calculates total dissolved solids and % oxygen saturation) were recorded at various depths creating profiles at deep hole stations. In-lake samples were also collected and analyzed for alkalinity, total phosphorus, apparent color, and chlorophyll *a* (an integrated sample). Procedures used for water sampling and sample handling are described in DWM Standard Operating Procedures (SOPs) (MassDEP 1999b, 1999c, 2002a, and 2002b). The Wall Experiment Station (WES), the Department's analytical laboratory, supplied all sample bottles and field preservatives, which were prepared according to the WES *Laboratory Quality Assurance Plan and Standard Operating Procedures* (MassDEP 1995). Both quality control samples (field blanks, trip blanks, and split samples) and raw water quality samples were transported on ice to WES on each sampling date; they were subsequently analyzed according to the WES SOP. Information about data quality objectives (accuracy, precision, detection limits, holding times, representativeness and comparability) will also be presented. Apparent color and chlorophyll *a* were measured according to standard procedures at the MassDEP DWM office in Worcester (MassDEP 2002a and MassDEP 2002b). An aquatic macrophyte survey was conducted at each lake. The aquatic plant cover (native and non-native) and species distribution were mapped and recorded. Details on procedures used can be found in the *Baseline Lake Survey Quality Assurance Project Plan* (MassDEP 2002c). Data was excerpted from the *Baseline Lake Survey 2002 Technical Memo* and presented in tables C2 and C3.

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Table C1. MassDEP 2002 Baseline Lake Survey Multi-probe Data - Cheshire Reservoir.

Cheshire Reservoir (Palis: 11002)
Unique_ID: W0974 Station: A
Description: North Basin, deep hole, southeast of Bliss Point, Cheshire

Date	OWMID	Time (24 hr)	Sample Depth (m)	Temp (°C)	pH (SU)	Conductivity at 25 °C (µS/cm)	TDS (mg/L)	DO (mg/L)	DO Saturation (%)
09/11/02	LB-2190	13:21	0.5	22.9	8.3	300	192	6.8	79
	LB-2190	13:28	1.5	22.9	8.3	299	191	6.6 u	76 u
	LB-2190	13:35	2.5	22.4	7.9	301	192	4.5 u	52 u

Cheshire Reservoir (Palis: 11018)
Unique_ID: W0975 Station: B
Description: Middle Basin, deep hole, northern end, Cheshire

Date	OWMID	Time (24 hr)	Sample Depth (m)	Temp (°C)	pH (SU)	Conductivity at 25 °C (µS/cm)	TDS (mg/L)	DO (mg/L)	DO Saturation (%)
09/11/02	LB-2203	11:55	0.5	23.4	8.5	291	186	9.4	110
	LB-2203	12:04	1.7	23.4	8.5	292	187	9.1 u	106 u

U= unstable readings, due to lack of sufficient equilibration time prior to final readings, non-representative location, highly-variable water quality conditions, etc.

Table C2. MassDEP 2002 Baseline Lake Survey Physico-chemical Data- Cheshire Reservoir.

Cheshire Reservoir (Palis: 11002)
Unique_ID: W0974 Station: A
Description: North Basin, deep hole, southeast of Bliss Point, Cheshire

Date	Secchi Depth (m)	Secchi Time (24hr)	Station Depth (m)	OWMID	QA/QC	Time (24hr)	Sample Type	Relative Depth	Depth (m)	Chlorophyll-a (mg/m^3)	Total Phosphorus (mg/L)	Apparent Color (PCU)
07/17/02	1.3	11:37	2.9	LB-1902	LB-1903	11:28	VDOR	s	0.5	--	0.044	24* d
				LB-1903	LB-1902	11:28	VDOR	s	0.5	--	0.046	39* d
				LB-1904	--	11:33	VDOR	nb	2.4	--	0.052	--
				LB-1906	LB-1907	11:45	DINT	--	0 - 2.5	11.8*	--	--
				LB-1907	LB-1906	11:45	DINT	--	0 - 2.5	10.6*	--	--
08/14/02	1.4	13:45	3.8	LB-2043	LB-2044	13:45	VDOR	s	0.5	--	0.029 b	24*
				LB-2044	LB-2043	13:46	VDOR	s	0.5	--	0.035 b	27*
				LB-2045	--	13:50	VDOR	nb	3.3	--	0.070 b	--
				LB-2047	LB-2048	13:55	DINT	--	0 - 3.3	10.8*	--	--
				LB-2048	LB-2047	13:56	DINT	--	0 - 3.3	11.3*	--	--
09/11/02	1.2	13:20	3.4	LB-2184	LB-2185	13:45	VDOR	s	0.5	--	0.032	35*
				LB-2185	LB-2184	13:50	VDOR	s	0.5	--	0.034	37*
				LB-2186	--	13:55	VDOR	nb	2.5	--	0.035	--
				LB-2188	LB-2189	14:00	DINT	--	0 - 2.5	13.6*	--	--
				LB-2189	LB-2188	14:05	DINT	--	0 - 2.5	13.0*	--	--

Cheshire Reservoir (Palis: 11018)
Unique_ID: W0975 Station: B
Description: Middle Basin, deep hole, northern end, Cheshire

Date	Secchi Depth (m)	Secchi Time (24hr)	Station Depth (m)	OWMID	QA/QC	Time (24hr)	Sample Type	Relative Depth	Depth (m)	Chlorophyll-a (mg/m^3)	Total Phosphorus (mg/L)	Apparent Color (PCU)
07/17/02	2.4	13:52	2.8	LB-1909	--	13:43	VDOR	s	0.5	--	0.027 b	<15*
				LB-1911	--	13:48	VDOR	nb	2.4	--	0.027 b	--
				LB-1910	--	14:05	DINT	--	0 - 2.5	6.6*	--	--
08/14/02	2.1	**	2.8	LB-2050	--	14:50	VDOR	s	0.5	--	0.020 b	20*
				LB-2051	--	15:00	VDOR	nb	2.2	--	0.025 b	--
				LB-2052	--	15:10	DINT	--	0 - 2.2	5.6*	--	--
09/11/02	>2.2	12:05	2.2	LB-2192	--	12:10	VDOR	s	0.5	--	0.022	21*
				LB-2193	--	12:15	VDOR	nb	1.7	--	0.021	--
				LB-2194	--	12:17	DINT	--	0 - 1.7	3.2*	--	--

VDORN= Van Dorn DINT= Depth Integrated
S= Surface Nb= near bottom
-- = No data (i.e., data not taken/not required)
* = Analysis performed by Laboratory OTHER than DEP's Wall Experiment Station (WES)
" b " = blank Contamination in lab reagant blanks and/or field blank samples (indicating possible bias high and false positives).
" d " = precision of field duplicates (as RPD) did not meet project data quality objectives identified for program or in QAPP. Batched samples may also be affected.

Cheshire Reservoir (Palis: 11019)
Unique_ID: W0976 Station: C
Description: South Basin, outlet at south side of Nobody's Road, Cheshire

Date	Secchi Depth (m)	Secchi Time (24hr)	Station Depth (m)	OWMID	QA/QC	Time (24hr)	Sample Type	Relative Depth	Depth (m)	Chlorophyll-a (mg/m^3)	Total Phosphorus (mg/L)	Apparent Color (PCU)
07/17/02	**	**	**	LB-1912	--	15:35	MNGR	--	--	--	0.022	--
08/14/02	**	**	**	LB-2053	--	12:20	MNGR	--	--	--	0.015	--
09/11/02	--	--	--	LB-2204	--	14:31	MNGR	--	--	--	0.019	--

-- = No data (i.e., data not taken/not required)
** = Missing data (i.e., data that should have been reported).
MNGR= Manual Grab

APPENDIX D

Technical Memorandum TM-11-7

Hudson Watershed 2002 Biological Assessment

Photo removed from this Appendix.
See original technical memorandum for photo.

Head capsule of a chironomid midge, *Polypedilum aviceps*, from Dry Brook, Cheshire, MA.

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Division of Watershed Management
Worcester, MA

15 March 2006

CN 193.0

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Introduction

Biological monitoring using aquatic macroinvertebrates is an integral part of watershed assessments conducted by the Department of Environmental Protection's (DEP) Division of Watershed Management (DWM). The most recent previous DWM biomonitoring survey in the Hudson Watershed was conducted in 1997. The results of that survey indicated that, with the exception of the most downstream areas, aquatic community health in the Green River was generally good, though probably showing signs of slight stress from nonpoint source (NPS) nutrient enrichment. Two upstream tributaries to the Hoosic River (Bassett Brook and Peck's Brook) also scored as *Slightly Impacted*. In the Hoosic River mainstem the downstream station of the pair bracketing the Hoosac Water Quality District (WQD) discharge was found to be moderately impaired, but its upstream complement and the two sites bracketing the Adams WWTP showed signs of only slight impacts. With the exception of the downstream Hoosac WQD site, it appeared that NPS contamination played a large role in this result. Two sites sampled on Kinderhook Creek were also found to be moderately impaired, and again NPS pollution was the most likely cause.

In 2002 the benthic macroinvertebrate survey targeted some of the previously assessed stream segments but also included some previously unsampled tributaries. In all, samples were collected from 14 sites in the Hoosic River and its tributaries (Table 1; Figure 1) from 12 to 14 August 2002. These samples were analyzed to detect indications of the status of aquatic community health.

Table 1. Sampling locations for DEP/DWM's benthic biological monitoring survey in the Hoosic River and its tributaries from 12 to 14 August 2002.

Stream	Station	Description
South Brook	SB01	upstream from Notch Road, Cheshire, MA
Dry Brook	DB01	between Rte. 116 crossings, Cheshire, MA
Tophet Brook	TB01	upstream from East Street, Adams, MA
Peck's Brook	PB00	upstream from gas pipeline, Adams, MA
Hoosic River	HR07A	upstream from Adams WWTP, Adams, MA
Hoosic River	HR07	downstream from Adams WWTP, Adams, MA
North Branch Hoosic River	NBH00	upstream from Henderson Road, Clarksburg, MA
Green River	GNK02A	upstream from East Branch Green River, New Ashford, MA
East Branch Green River	GE01	upstream from Roy's Road, New Ashford, MA
West Branch Green River	GW01	upstream from Old Mill Road, Williamstown, MA
Green River	GNK01	upstream from Rte. 43 lower bridge, Williamstown, MA
Hemlock Brook	HB00A	at Hemlock Brook development, Williamstown, MA
Hoosic River	HR03	upstream from Hoosac Valley WQD, Williamstown, MA
Hoosic River	HR02	downstream from Hoosac Valley WQD, Williamstown, MA

Methods

As described in the standard operating procedures (Nuzzo 2003), aquatic macroinvertebrates were collected from wadable riffle habitat sites by kicking bottom substrates to dislodge the organisms. A kick-net with a 500 μm mesh bag, pressed firmly against the stream bottom just downstream from the kicked area, was used to capture the organisms released to the current. Samples were composites of 10 kicks taken from approximate 0.46 m by 0.46 m areas (about 2 m^2 total) of riffle habitat within a 100 m reach. Samples were preserved in the field with denatured 100% reagent alcohol, then brought to the DWM lab for processing. Before leaving the sample reach, habitat data were recorded on field sheets and habitat qualities were scored using a modification of the evaluation procedure in Plafkin, et al. (1989).

Processing the benthos samples entailed extracting a count-based subsample. To accomplish this the sample was distributed across the bottom of a sorting pan and materials were removed from grids based on a randomized sequence. A dissecting microscope set on low power was used to separate specimens from the other materials in the sample until approximately 100 organisms (±10%) were extracted.

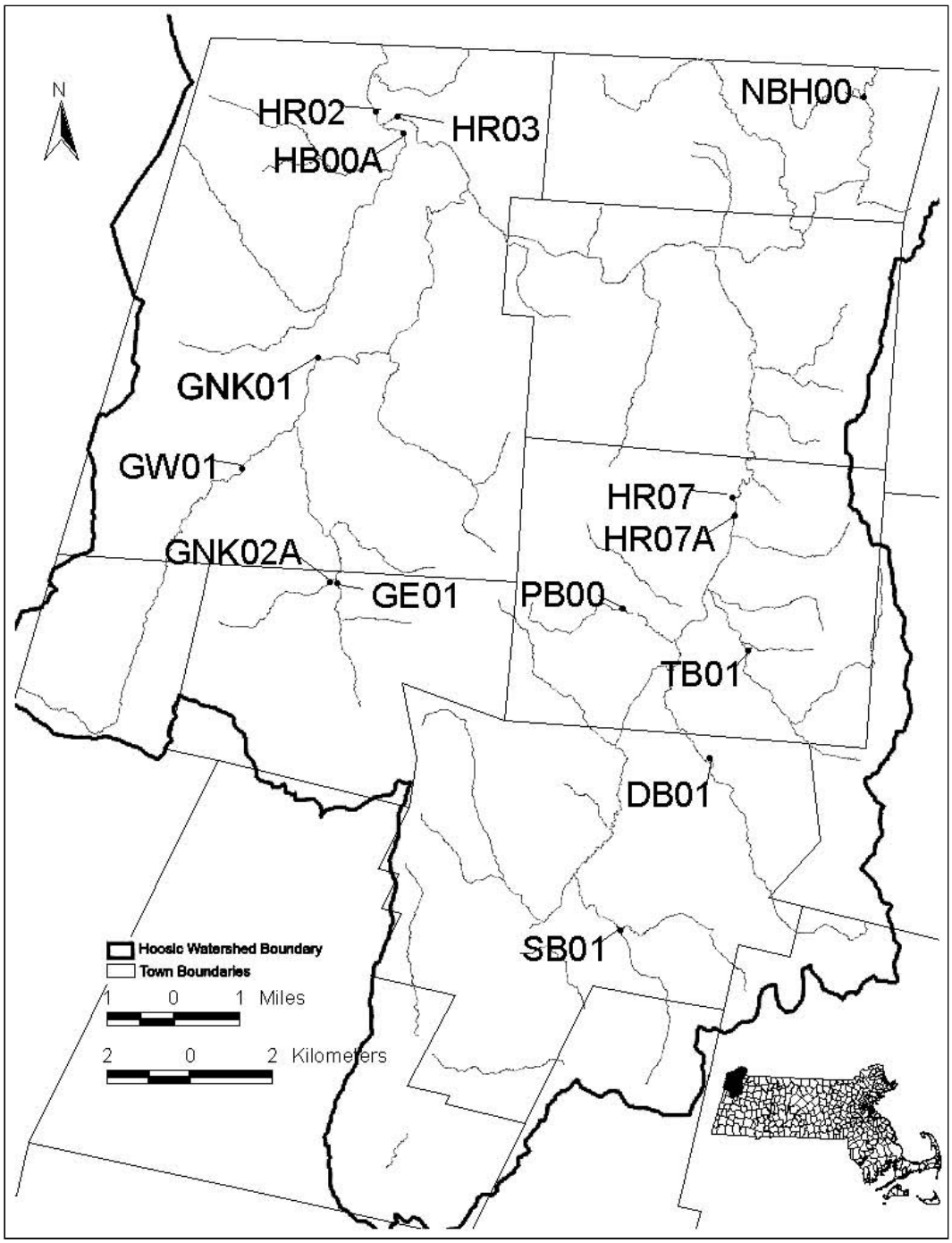

Figure 1. Map of 2002 benthic macroinvertebrate sampling stations in the Hoosic River watershed.

Specimens were identified to genus or species, as allowed by available keys, specimen condition, and specimen maturity. Taxonomic data were analyzed using a modification of Rapid Bioassessment Protocol III (RBP) metrics and scores (Plafkin, et al. 1989). The modifications were: substitution of "reference site affinity" (RSA) for the Community Loss Index and elimination of the shredder/total ratio (no separate leaf-pack material was collected). The reference site affinity metric is a modification of Percent Model Affinity (Novak and Bode 1992). Instead of using the model's percentages for Oligochaeta,

Ephemeroptera, Plecoptera, Trichoptera, Coleoptera, Chironomidae, and "other," these percentages were taken from the reference site data. The RSA score is then calculated as:

$$100 - \Sigma(\delta \times 0.5)$$

where δ is the difference between the reference percentage and the sample percentage for each taxonomic grouping. RSA percentages convert to RBP III scores as follows: 0 points for <35%; 2 points in the range from 35 to 49%; 4 points for 50 to 64%; and 6 points if ≥65%. The whole suite of metrics used for the analysis was:

Richness (the total number of different species present);
HBI (Hilsenhoff Biotic Index, as modified in Nuzzo (2003); HBI is the sum of the product of each taxon's abundance and its corresponding pollution tolerance value, divided by the total count in the subsample);
EPT (sum of richness among the orders Ephemeroptera, Plecoptera, and Trichoptera);
EPT/Chironomidae (ratio of total abundance among EPT taxa to total abundance among chironomid taxa);
SC/FC (ratio of the proportion of sample that is represented by individuals that predominantly feed by scraping to those that are primarily filter-feeders);
% Dominant (most abundant taxon as a percent of the assemblage; >20% is generally considered hyperdominant and indicative of a stressor impact);
RSA (described above).

Results

The Hoosic River and its tributaries

Sampling was conducted at 10 locations in seven tributaries and at four sites on the mainstem Hoosic River, bracketing the Adams Wastewater Treatment Plant (WWTP) and the Hoosac Water Quality District (WQD, Williamstown). The list of macroinvertebrate taxa encountered at each station, and from which RBP metrics were calculated, can be found in the Appendix, Table A1. A summary table (Table A2) of the RBP metrics can also be found in the Appendix. Habitat assessment results were used to evaluate the role of habitat in the RBP assessment. The habitat assessment scores are shown in the Appendix Table A3.

Peck's Brook, Adams, MA—PB00-I, PB00-D, PB00-X

Habitat

The Peck's Brook sample reach was upstream from the gas pipeline crossing upstream from West Road in Adams, MA. Here the brook flowed between the steep slopes of a forested ravine. Scattered erosion scars were evident on the banks, but over the reach as a whole the extent was only slight. No evidence of Nonpoint Source (NPS) pollution was apparent but the recreational trails on both sides of the brook represent potential sources. About midway through the reach a small, hand-made dam of cobbles and small boulders ran across the brook. The stream had not been channelized and was approximately 4 m wide. Riffles and runs were around 0.25 m deep and some of the pools were up to 1 m deep. The water did not have any noticeable odors, surface oils, color, or turbidity.

Similarly, the sediments lacked any abnormal odors, deposits, or oils. The size distribution of substrate materials through the reach was judged to be 10% bedrock, 30% boulder, 40% cobble, 10% pebble, and 10% sand and gravel. The distribution was only slightly different at the actual kick-samples locations: 40% boulder, 40% cobble, 10% pebble, and 10% sand and gravel. Organic substrate materials were all coarse particulate organic matter (CPOM).

The tree canopy over the brook was nearly completely closed (ca. 98%). *Tsuga canadensis* (eastern hemlock) was the dominant tree, but there were also *Betula alleghaniensis* (yellow birch), *Fagus*

grandifolia (American beech), and *Acer pensylvanicum* (striped maple). Shrub cover was very sparse and only *Hamamelis virginiana* (witch hazel) was recorded. Less than 5% of the riparian zone had herbaceous cover—ferns and *Impatiens* sp. (jewel weed). This kind of sparse understory is fairly typical of hemlock forests. In-stream rooted vegetation was absent. Some growths of diatoms were found in the pool at the head of the reach, but the amount of coverage was negligible.

The brook's channel was judged to be >75% covered with water and all four depth/velocity combinations were observed. In-stream cover for fish, epifaunal substrate, embeddedness, channel alteration, and sediment deposition all scored at the high end of the optimal category. Bank vegetative protection and bank stability scored at the upper end of suboptimal due to the limited understory plant growth and minor erosion related to the steep banks and valley sides. Heavily used foot trails on both sides of the brook were the only detectable disruptions within the riparian buffer zone (18 m) but were not severe enough to warrant down-grading the feature to suboptimal. Overall the habitat score for this site was 177—the highest in this biomonitoring survey.

Benthos

Peck's Brook was chosen for reference sampling because of its excellent habitat and its relatively undisturbed watershed. The high richness (27) and the lack of hyperdominance indicated a diverse macroinvertebrate community. Low HBI (3.28) and a high EPT index (12) were signs of a healthy community lacking stress from nutrient enrichment and chronic DO reduction.

Sampling at this site was duplicated (PB00-D) as part of routine QC operating procedures. The results of the duplicate sample were very similar (see Table A1). The notable differences (Table 2) were in the HBI (lower, even, than in sample PB00-I), an EPT/Chironomidae abundance ratio little more than half that for PB00-I, and a SC/FC ratio double that of PB00-I due to filtering collectors (FC) abundance that was less than half that of PB00-I. PB00-D also had slight hyperdominance (24% of individuals) by an intolerant stonefly (*Sweltsa* sp., TV=0).

Table 2. Comparison of RBP metrics from samples PB00-I, PB00-D, and the averaged result, PB00-X.

SAMPLES:	PB00-I	PB00-D	PB00-X
Richness	27	27	27
HBI	3.18	2.57	2.86
EPT	12	11	11.5
EPT/Chiro	5.64	3.00	3.94
SC/FC	1.31	2.67	1.74
% Dom.	16%	24%	18%

Both sets of data are characteristic of communities from high quality waters. For some sites, however, the outcome of the RBP analysis is slightly different depending on which sample is used for calculating the metrics. Because of this, a "reference sample" was created, PB00-X, by combining the two taxa lists and dividing the abundances by two. All metrics except Richness and EPT index were calculated from the taxa list of this averaged sample. The Richness and EPT metrics from PB00-I and PB00-D were averaged to produce those values for PB00-X. The taxa lists from the two samples are not identical because some individuals of the lowest density populations may have been picked up in one sample/subsample set, but not the other. Because the Richness and EPT metrics are counts of the number of different taxa (Richness is the total number of different taxa detected, and EPT the number of different taxa within the EPT groups) generating them directly from the combined taxa list would result in both metrics being higher than what was generated for either sample set individually.

South Brook, Cheshire, MA—SB01

Habitat

The sampling for benthic macroinvertebrates in South Brook was conducted upstream from Notch Road in Cheshire, MA. Land surrounding the sample reach was all forested. No dam was present and the stream was not channelized. There was no evidence of local water erosion nor were there any obvious indications of NPS pollution inputs. The wetted stream width on the sampling date was 3 m, with a fairly uniform depth of about 0.1 m throughout. The water was clear, lacking any color or abnormal odors. Some flecks of oil were seen on the water's surface but this appeared to be bacterial in origin. The sediments themselves also lacked indications of perturbation: no abnormal odors, no deposits, and no oils. The inorganic substrate components were characterized as 20% boulder, 60% cobble, 10% pebble, and 10% sand and gravel. The organic substrate materials were all CPOM (e.g., sticks, leaves, etc.).

Tree canopy covered about 50% of the stream channel area. Tree cover in the riparian zone was about 90%, shrub coverage was about 80%, and herbaceous cover was about 40%. The most prominent trees were *Fraxinus* sp. (ash), *Ulmus rubra* (slippery elm), *Betula papyrifera* (paper birch), *Acer rubrum* (red maple), *Acer platanoides* (Norway maple), and *Populus deltoides* (cottonwood). Among the shrubs and woody vines were *Salix* sp., (willows), *Lonicera* sp. (honeysuckle), *Vitis* sp. (grapes), and *Berberis* sp. (barberry). Grasses and ferns dominated the herbaceous layer. There were no rooted aquatic plants in the sample reach but about 90% of the rocks in the reach were slippery—an indicator of the presence of thin-film algae growths.

The habitat assessment revealed that, at the time of sampling, low water (water in less than 75% of the stream channel) was largely responsible for limiting full habitat potential. Less than 10% of the reach had usable fish cover and only two velocity/depth combinations (shallow/fast and shallow/slow) could be accounted for. All other habitat qualities considered in the assessment were optimal except embeddedness, which was suboptimal (cobble and other coarse substrates were about 40-50% surrounded by fine sediments). The total Habitat Assessment score was 153.

Benthos

South Brook had high richness and a high EPT index. HBI, however, was moderate and the ratios of EPT/Chironomidae abundances and SC/FC were low. RSA was only 63%. These latter four metrics resulted in reductions in the RBP score and a final rating of *Slightly Impacted*. Possible stressors would be the low water conditions (as evident in the habitat scores for In-stream cover, channel flow status, and velocity-depth combinations) and NPS pollution, such as road run-off (since the brook runs adjacent to Notch Road upstream from the sample reach).

Dry Brook, Cheshire, MA—DB01

Habitat

The sampling reach along Dry Brook was between the crossings of Route 116, near the Hoosac Valley High School in Cheshire, MA. The riparian zone was about 10% forested, about 80% field (successional and athletic), and 10% cow pasture (at the upstream end of the reach). Good vegetative protection along the banks in the reach surely account for the lack of evidence of erosion across them. The adjacent athletic fields represent some potential for NPS pollution to the stream, but the obvious concern for NPS pollution is the upstream cow pasture that encompasses Dry Brook.

The wetted stream channel was about 3 m wide and 0.1 m (in riffles/runs) to 0.6 m (in the pools) deep. No evidence was seen in the sample reach of dams or past channelization. Sediments collected in the reach did not have any oils or unusual odors or deposits. The water column did not have any detectable color, turbidity, oils, or odors. Substratum composition was described as 45% boulder, 45% cobble, and 10% pebble where the kick-samples were taken; 40% boulder, 40% cobble, 10% pebble, and 10% sand and gravel over the entire sample reach. The organic components were essentially CPOM.

The tree canopy extended out over about 50% of the stream channel. Tree coverage within the riparian zone was about 30%, while about 25% of the area had shrub cover, and 95% had herbaceous cover. The dominant riparian zone trees were *Populus tremuloides* (quaking aspen)*, Populus deltoides* (cottonwood), and *Fraxinus* sp. (ash). The shrubs and woody vines found were *Salix* sp. (willows), *Vitis* sp. (grapes), *Berberis* sp. (barberry), and *Lonicera* sp. (honeysuckle). The herbaceous layer included grasses, *Eupatorium* sp. (Joe-pye weed), and *Solidago* sp. (goldenrod). In-stream vegetation coverage was essentially nil, although some scattered patches of moss were seen. Thin-film algae were acknowledged as present in the reach but coverage did not seem to be extensive.

The habitat assessment indicated that a little more than 75% of the stream channel had water. This meant there was enough water for usable, stable fish cover in about half the reach, and for three of the four velocity-depth combinations to be recognized. Embeddedness, sediment deposition, and riparian vegetative zone width (only 6-12 m on either bank) were all suboptimal, while epifaunal substrate, bank vegetative protection, and bank stability were all judged to be optimal. The overall habitat score was 148.

Benthos

Dry Brook's taxa Richness and EPT index were relatively high, usually two indications of a healthy aquatic environment. The HBI, however, was moderately elevated, usually an indication of enrichment. The EPT/chironomid abundance ratio and the scraper/filtering collector ratio were low relative to the reference, lowering the overall RBP score. The overall RBP score was in the range for *Slightly Impacted*. Habitat potential was not as limited by low water here as at some of the other streams in this watershed. The most obvious potential for impacts then would be NPS inputs from the upstream pasture, but these impacts appear to be relatively mild at this point.

Tophet Brook, Adams, MA—TB01

Habitat

The riparian zone along the Tophet Brook sample reach was characterized as 50% forest and 50% successional field. Very little erosion was detected along the reach nor was there any evidence of NPS pollution. Upstream agriculture, however, was recognized as a potential source of NPS pollution inputs.

The sample reach was not channelized and had no man-made dams; a small beaver dam was taking shape across the upper part of the sample reach, however. The stream width was estimated to be 3 m and the average depth, 0.3 m. No odors, surface oils, color, or turbidity were associated with the water here. There were no abnormal odors or oils associated with the sediments either, but some deposits of fine particulates were noted. Substrate composition in the kick-sample areas was recorded as 45% boulder, 45% cobble, and 10% sand and gravel. The reach as a whole was 40% boulder, 30% cobble, 10% pebble, and 20% sand and gravel. Organic substrate materials were all CPOM.

The tree canopy extended over no more than about 10% of the channel. Tree coverage in the riparian zones was only about 50%, shrub cover about 20%, and herbaceous cover was essentially 100%. The dominant trees were *Fraxinus* sp. (ash), *Pinus strobus* (white pine), *Salix* sp. (willow), *Ulmus rubra* (slippery elm), and *Acer negundo* (boxelder). The conspicuous shrubs and woody vines were *Vitis* sp. (grape), *Rhus typhina* (staghorn sumac), and *Lonicera* sp. (honeysuckle). *Eupatorium* sp. (Joe-pye weed), *Galium* sp. (bedstraw), *Solidago* sp. (goldenrod), *Impatiens* sp. (jewel weed), and *Polygonum* sp. (knotweed) were the most prominent herbaceous components. (Other Asteraceae species were present but were not recognized by the field crew.) There was no rooted vegetation in-stream and only some small patches of moss were seen in the reach. Filamentous green algae were seen attached to wood but the total coverage within the reach was less than 1%.

Most of the habitat parameters scored within the optimal range. The notable exception was sediment deposition, which affected about 30% of the stream bottom, scoring in the marginal range for that parameter. Velocity-depth combinations were suboptimal, with only three of the four combinations found (suboptimal range). Channel flow status was greater than 75%, but still in the suboptimal range. The eastern bank had enough small areas of erosion to push the rating for bank stability to the low end of the suboptimal range—the other bank had very little evidence of erosion and scored in the optimal range. The total habitat score was 162.

Benthos

Richness in the Tophet Brook sample was reasonably good but the EPT index was only 78% of that for the reference. Relatively low ratios for EPT/chironomid abundances and SC/FC, and a low RSA resulted in a score that was only 52% of the reference. The final RBP rating was *Slightly-Moderately Impacted*. Inasmuch as the habitat potential was not appreciably compromised by low water conditions—indeed the habitat score was comparable to the reference—it appears that NPS pollution factors are impacting this site.

Hoosic River upstream from Adams WWTP—HR07A

Habitat

About half the adjacent riparian zone land use in this sample reach was agricultural (corn field), the remainder was forested. There did not appear to be any erosion over the banks. There were no obvious sources of NPS pollution but urban run-off and the adjacent cornfield were acknowledged as potential sources. No dam was present but the west bank was rip-rapped (more than 20 y old). Stream width was estimated to be 8 m; riffles and runs were typically 0.3 m deep, while pool depth was about 0.5 m. Bottom substrate size distribution in the kicked areas was consistent with that of the reach overall: 10% boulder, 75% cobble, 10% pebble, and 5% sand and gravel. Organic substrate materials were 100% CPOM.

About 70% of the stream channel was overhung by the tree canopy. Tree cover in the riparian zone was only about 50% of its potential, with *Populus deltoides* (cottonwood), *Salix* sp. (willow), and *Acer negundo* (boxelder) the dominant species present. Shrub and woody vine cover was limited to about 5%—mostly tree saplings, but with *Cornus* sp. (dogwood), *Rosa* sp. (rose), and *Vitis* sp. (grape), also. Herbaceous cover ran through 100% of the riparian zone of both banks. The most prominent of these were grasses, the corn crop, a mustard (family Brassicaceae), a couple different mint species (family Lamiaceae), *Impatiens* sp. (jewel weed), and *Myosotis* sp. (forget-me-not). In-stream the reach was devoid of rooted aquatic vegetation, even mosses were absent. Approximately 90% of the rocks in the reach were very slippery—typically an indication of thin-film periphyton growth. Filamentous green algae were also seen attached to rocks in the reach.

Only about 20% of the reach provided usable, stable fish cover (score 8, marginal). By contrast, the epifaunal substrates were most optimal (score 20). Embeddedness scored in the suboptimal category, as did sedimentation. Channel alteration was rated as optimal in spite of a minimal amount of rip-rapping along the west bank. All four velocity-depth combinations were sufficiently present to rate this habitat parameter as optimal. Channel flow status was rated suboptimal, with little more than 75% of the channel covered with water. Vegetative protection was very good on both banks, but the riparian vegetative zone width along the west bank was no more than about 3 m between the stream and the agricultural activities. The stability of the west bank was very good, but small areas of scouring along the east bank bumped its rating into the suboptimal category. The total habitat score was 146.

Benthos

This site served as the upstream bracket on the Adams WWTP discharge. The benthic invertebrate community here had fairly good taxonomic richness, but the EPT index was somewhat reduced and the HBI relatively high (second highest for this survey). The two ratios, EPT/chironomid abundances and SC/FC, were low enough relative to the watershed reference (PB00-X) to result in reductions in the RBP score. There was also clear hyperdominance by the filter-feeding caddisfly *Hydropsyche morosa* gr. (37%). Compared to PB00-X this site ranked as *Slightly Impacted*. The hyperdominance by *H. morosa* gr., and the preponderance of filtering collectors overall (52% of the community), serve as strong indications that there is a heavy load of suspended solids providing a rich supply of organic matter and nutrients. This point on the Hoosic River is downstream from downtown Adams and no doubt is reflecting impacts from urban run-off.

Hoosic River downstream from Adams WWTP—HR07

Habitat

The sample reach, at its upper end, was a little more than 350 m downstream from the Adams WWTP effluent discharge. Along this stretch of the river the riparian zone on the west was forested and the riparian zone to the east was all hay field except for a narrow band of trees running right along the bank. No signs of erosion were seen and, as with the upstream station bracketing this discharge, agricultural activities were acknowledged as a potential source of NPS pollution. No dam was present but some rip-rap (older than 20 y) remains along the east bank. The river here was approximately 7 m wide. Riffle depth was around 0.2 m, runs 0.4 m, and pools ranged from 0.4 m to over 1 m deep. The water had a very slight sewage odor and slight turbidity, but no color or surface oils. The sediment had no abnormal odors and no noticeable deposits or oils. Substrate composition was essentially the same in the kick-sample areas as for the reach as a whole: 80% cobble, 10% pebble, and 10% sand and gravel. Organic substrate components were all CPOM.

Streamside trees created a canopy over about 60% of the stream channel. The most conspicuous trees were *Acer negundo* (boxelder), *Populus deltoides* (cottonwood), *Acer saccharinum* (silver maple), and *Salix* sp. (willow). Woody vines and shrubs occupied only about 25% of the riparian zone, represented primarily by *Parthenocissus* sp. (Virginia creeper) and *Lonicera* sp. (honeysuckle). Herbaceous plants covered 100% of the riparian zones, most notably with grasses, *Polygonum* sp. (knotweed), and *Impatiens* sp. (jewelweed). Rooted aquatic vegetation and mosses were absent in-stream but slippery rocks indicated thin-film algae growths over about 95% of the stream bottom. A filamentous alga (later identified as *Cladophora* sp.) was also found, occupying about 10% of the riffle habitat.

In-stream fish cover was barely suboptimal, with little more than 30% of the reach offering stable cover. Embeddedness (cobbles up to 50% surrounded by fine sediment) and sediment deposition (30% of the bottom affected) were also rated at the very low end of suboptimal. Epifaunal substrate was optimal and, as with the site upstream from the discharge, channel alteration ranked as optimal despite the presence of old rip-rap. Velocity-depth combinations were all accounted for, making this habitat parameter score in the optimal range, yet the water did not quite cover enough of the channel for flow status to score in the optimal range. Both riverbanks were well protected by vegetation but the west bank showed signs of some instability (sloughing, scouring) along about 15% of its length. The full width of the 18 m riparian vegetative zone width was undisturbed on the west side of the river (optimal), whereas agricultural activities came to within 12 m on the east side of the river (marginal). The total habitat score for this sample reach was 149.

Benthos

A field observation that there were “lots of perlids” (the stonefly family Perlidae) at this site was a hopeful sign that the wastewater discharge was not having a severe impact on the in-stream invertebrate communities. Indeed, the results from this site were comparable to its upstream bracket (HR07A) for all metrics except percent dominance, indicating that no taxon was hyperdominant. The total RBP score was actually slightly higher than at the upstream bracket because of the lack of hyperdominance, so the rating relative to the river upstream from the discharge was *Nonimpacted*. Relative to the reference, however, the RBP score was very close to that of HR07A, meaning that this site was also rated *Slightly Impacted*. It would appear from these data then, that the effluent from the treatment plant is not causing additional pollution stress on the benthic macroinvertebrate community in this portion of the river.

North Branch Hoosic River, Clarksburg, MA—NBH00

Habitat

The sample reach in the North Branch Hoosic began in riffles a short distance upstream from Henderson Road in Clarksburg, MA. The riparian zone land use adjacent to the reach was characterized as 50% field and 50% residential. There were no signs of erosion along the reach nor any evidence of NPS pollution. The river was not channelized but at the very top of the reach was a small dam made of boulders, and above that was a beaver dam. The width of the river at the time of sampling was

approximately 7 m; riffles and runs were about 0.2 m deep, and the greatest pool depth did not exceed 0.3 m. The water had no odors, surface oils, or color but was slightly turbid. Similarly, the sediments did not have noticeable odors, deposits, or oils. Sediment composition was characterized the same for the kick-sample areas as for the reach as a whole: 45% boulder, 35% cobble, 10% pebble, and 10% sand and gravel. Organic substrate materials were all CPOM.

Trees along the banks produced a canopy over about 40% of the channel but were limited to about 20% of the riparian zones (10% each side). Shrub cover was also limited to the near-bank areas, or about 10% of the riparian zone of each bank. The most prominent trees were *Acer saccharum* (sugar maple), *Acer rubrum* (red maple), *Fraxinus* sp. (ash), and *Ulmus rubra* (slippery elm). The predominant shrubs and woody vines were *Lonicera* sp. (honeysuckle) and *Vitis* sp. (grape). Herbaceous cover was essentially 100% throughout the riparian zones, mostly grasses but with conspicuous stands of knotweed (*Polygonum* sp.). There was no rooted vegetation or moss in-stream. Thin-film algae coverage within the reach was estimated to be 90%.

Habitat quality scores were all in the optimal range except for Velocity/Depth combinations (suboptimal—only three of the four combinations observed), channel flow status (suboptimal—water filled more than 75% of the channel but did not reach the base of both banks), and Riparian Vegetative zone width (suboptimal on east bank—undisturbed zone approximately 15 m; marginal on west bank—undisturbed zone no more than 6 m). The total habitat score was 174.

Benthos

The North Branch sampling site was another situation where Richness and EPT index were high, but an HBI value that was also high indicated enrichment. Very low ratios for EPT/chironomids and scrapers/filtering collectors resulted in no RBP points for those metrics, and the low RSA caused a reduction in the score also. The final rating for this site was *Slightly-Moderately Impacted*. With a habitat score very close to that for Peck's Brook it is doubtful the benthic community was habitat limited. The strong presence of filtering-collectors (47%, second in this survey only to the 52% at HR07A) and moderately high HBI (third highest in the survey) are suggestive of NPS impacts resulting from elevated loadings of organic particulates and nutrients.

West Branch Green River, Williamstown, MA—GW01

Habitat

The West Branch sample reach was about 200 m upstream from Old Mill Road in Williamstown, MA, where the riparian zone was all forested. Moderate erosion on the east bank was no doubt due to the steep slope of the bank and hillside. No evidence of NPS pollution was detected. There was no dam present and no evidence of channelization, past or present. The stream was around 8 m wide and ranged in depth from 0.1 m to 0.4 m in the riffles to 0.75 m in some of the pools. The water had no unusual odors, surface oils, turbidity, or color. No odors, deposits, or oils were associated with the sediments either. The inorganic substrate components were estimated to be 5% boulder, 45% cobble, 45% pebble, and 5% sand and gravel. Organic substrate components were all CPOM.

The canopy cover of the channel was about 80% and tree coverage in the riparian zone was about 95%. The dominant trees were *Tsuga canadensis* (eastern hemlock), *Acer saccharum* (sugar maple), *Ulmus rubra* (slippery elm), *Fraxinus* sp. (ash), and *Quercus rubra* (red oak). Shrubs and woody vines covered about 30% of the riparian zone area with *Alnus rugosa* (speckled alder), *Vitis* sp. (grape), *Cornus* sp. (dogwood), *Rhamnus* sp. (buckthorn), and *Lonicera* sp. (honeysuckle). Herbaceous components covered about 50% of the riparian zone and included grasses, *Impatiens* sp. (jewel weed), *Urtica dioica* (stinging nettle), *Rumex* sp. (dock), and *Myosotis* sp. (forget-me-not). Mosses and liverworts occurred in patches along the banks. No in-stream vegetation was found but some filamentous algae were present.

Fish cover rated in the suboptimal category but at least 50% of the reach offered stable habitat. Epifaunal substrates, embeddedness, and channel alteration were all within the optimal scoring range. Sediment deposition—i.e., obvious build-ups or extensions of gravel bars—appeared to be affecting about 40% of the reach, making this parameter score in the marginal range. In spite of low water conditions resulting in

only about 50% of the stream bottom being covered with water, all four velocity/depth combinations were accounted for. Indeed, this stream's unique physical features provided some remarkably deep water under the circumstances—this was no doubt a great benefit to holdover fish populations. Scores for the bank features (vegetative protection, stability, and zone width) were all optimal for the west bank. Vegetative protection and stability of the east bank were ranked as marginal by their scores, most likely the result of the combination of steep slopes and the sparse herbaceous layer typical of a hemlock understory. The riparian vegetative zone width on the east side was in the optimal range. The total habitat score was 149.

Benthos

The benthos sample from the West Branch Green River had both the highest total richness and the highest EPT richness of any of the samples collected in the Hoosic watershed during the 2002 survey. Though the HBI was reasonably low, it was enough higher than the reference to result in lower points for this metric. The only other points lost were for an EPT/chironomid abundance ratio that was little more than a third that of the reference. Nevertheless, the total RBP score for this site ranked it as *Nonimpacted*. With these indications of good water quality at this site it was used as an additional RBP reference for sites within the Green River drainage.

Green River, New Ashford, MA—GNK02A

Habitat

This site was on the mainstem Green River in New Ashford, MA, just upstream from where Roy's Road crosses and the confluence of the East Branch. The riparian zone was all forested on the east side, while the west side was all mowed grass with a narrow band of trees along the bank (50% forested, 50% field). There were no signs of erosion and the only evidence of NPS pollution inputs were small in-stream accumulations of trash—presumably litter from travelers along Route 7. There was no dam present but the river was channelized in this reach (with rip-rap old enough that mature trees were growing through it). The river was roughly 3 m wide in this stretch. Depths were not recorded but the reach was wadable throughout. The water was free of unusual odors, surface oils, color, and turbidity. The sediments lacked any notable odors or oils, and the only deposits noted were the aforementioned accumulations of trash. Sediment substrate characterization was the same for the kick area as for the whole reach: 5% bedrock, 35% boulder, 30% cobble, 20% pebble, and 10% sand and gravel. All of the organic materials were CPOM.

About 95% of the stream channel was covered by tree canopy. Riparian zone coverage by trees was estimated at 55% (all forested on the east bank, only 5% on the west bank), with *Populus tremuloides* (quaking aspen), *Fraxinus* sp. (ash), *Ulmus rubra* (slippery elm), *Tsuga canadensis* (eastern hemlock), and *Betula alleghaniensis* (yellow birch) recorded. Only about 10% of the riparian zone had shrub cover, mainly maple saplings (*Acer* sp., possibly *A. spicatum*) and *Berberis* sp. (barberry). The herbaceous cover ran throughout the riparian zone, mostly grasses, ferns, and an underdetermined creeping ground cover. There was no in-stream vegetation but filamentous and thin film algae were found growing on the rocks.

The very low water in the river (channel flow status marginal—25% covered with water) restricted the amount of available fish cover to only about 30% of the reach (marginal). Although epifaunal substrates and embeddedness scored in the optimal range, significant deposition of fine sediment and sand in about 30% of the reach meant the sediment deposition score was in the suboptimal range. Three of the four velocity depth combinations were accounted for in the reach, giving it a score in the suboptimal range. The remaining habitat characters were optimal except for riparian vegetative zone width on the west bank, which was poor (< 6). The total score was 142.

Benthos

As the most upstream location on the mainstem Green River this site was intended to serve as a reference for the Green River drainage. In spite of having Richness comparable to the watershed

reference (PB00-X) all the other metrics except percent dominance had reduced scores. The resultant RBP score rated this site *Slightly-Moderately Impacted*. When compared to the West Branch Green River (GW01) the HBI was comparable but the EPT was only a little more than half as much. Both ratios (abundance of EPT/Chironomidae and scrapers/filtering collectors) were much lower than for GW01. The resultant rating of this site compared to the GW01 was *Slightly Impacted*. Given how dramatically the low water conditions detracted from the assessed habitat score, it is likely that the related habitat limitations played a significant role in the RBP outcome at this site.

East Branch Green River, New Ashford, MA—GE01

Habitat

The East Branch was sampled upstream from Roy's Road, about 200 m upstream from its confluence with the mainstem Green River. This segment of the East Branch flowed through a landscape with the riparian zone characterized as half forested and half field. Slight erosion was noted along the south bank but there was no indication of NPS pollution. There was no dam present and the stream was not channelized. The water was very low in the stream at the time of sampling: width was only 2 m and depth was no more than 0.1 m throughout the reach. The water lacked detectable odors, surface oils, turbidity, and color. Bottom substrates likewise lacked unusual odors, oils, or deposits. The inorganic substrate components were characterized the same in the kick areas as for the overall: 10% boulder, 40% cobble, 40% pebble, and 10% sand and gravel. Organic substrates were all CPOM.

About 90% of the stream channel was overhung by the tree canopy but only a narrow band of trees on the north bank contributed to that canopy (total riparian zone tree cover about 55%). The trees present were a good mix of hardwoods, including *Acer saccharum* (sugar maple), *Fraxinus* sp. (ash), *Betula alleghaniensis* (yellow birch), *Acer spicatum* (mountain maple), *Carpinus caroliniana* (American hornbeam), *Ostrya virginiana* (eastern hophornbeam), and *Ulmus rubra* (slippery elm). Shrub cover was present in about 30% of the riparian zone, represented mainly by *Hamamelis virginiana* (witch hazel) and *Berberis* sp. (barberry). Herbaceous cover ran throughout the riparian zone represented largely by grasses, several different species of ferns, and various composites (family Asteraceae). *Equisetum* sp. was also among the riparian vegetation. There was no in-stream vegetation and no algae were found, either.

Due in large part to the very low water conditions, velocity-depth combinations, channel flow status, sediment deposition, and availability of fish cover all scored as marginal. All other habitat parameters except stability of the south bank (suboptimal because of small areas of erosion) were optimal. The total habitat score was 141.

Benthos

Though the total richness and HBI were different enough from the watershed reference (PB00-X) to result in point deductions for those metrics, the EPT richness was greater than the reference. The two ratios (EPT/Chironomidae abundance and SC/FC) were quite a bit lower than the reference, and thus had the greatest point deductions. Relative to the watershed reference the outcome was *Slightly Impacted*. When the RBP category was calculated against the West Branch Green River (GW01), total richness, EPT richness, and the SC/FC ratio were sufficiently lower at GE01 resulting in a lower score for those metrics. GE01 was rated as *Non-Slightly Impacted* compared to West Branch Green River(GWO1), a somewhat better rating than it's comparison against the watershed reference.

Green River, Williamstown, MA—GNK01

Habitat

This sample reach began at the bottom of a long riffle stretch, just upstream from lower (more downstream) Route 43 bridge in Williamstown, MA. The surrounding land use was characterized as 100% forested, but cow paths were well worn along the western riparian zone, contributing to some erosion along the banks. NPS pollution was obvious here, with dung deposited along the banks and the water's edge. Though the river was remarkably straight here, there were no visible indications of deliberate channelization. No dam was present at this site. The width of the stream was estimated at 9

m and the depth was fairly uniform throughout at about 0.1 m. Water odors were normal and no surface oils, color, or turbidity were detected. No sediment odors or oils were detected either, but there were deposits of fine silt everywhere. The sample reach as a whole had substrate composition of 20% boulder, 50% cobble, 20% pebble, and 10% sand and gravel. The actual kick-sample areas differed only slightly: 10% boulder, 60% cobble, 20% pebble, and 10% sand and gravel. Uncharacteristically for sites assessed in the Hoosic watershed, the organic substrate components were largely (80%) fine particulate organic matter (FPOM) and only 20% was CPOM.

Because of the width of the river only about 10% of the stream channel had tree canopy over it. About 90% of the riparian zone had trees, mostly *Tsuga canadensis* (eastern hemlock), *Acer saccharum* (sugar maple), *Carpinus caroliniana* (American hornbeam), *Betula alleghaniensis* (yellow birch), *Salix* sp. (willow), and *Fraxinus* sp. (ash). *Lonicera* sp. (honeysuckle) was the only shrub recorded from this site and was present only in about 5% of the riparian zone area. Herbaceous growth was also fairly sparse, only about 10% of the riparian zone, with grasses, *Eupatorium* sp. (Joe-pye weed), *Solidago* sp. (goldenrod), *Rumex* sp. (dock), *Daucus carota* (Queen Anne's lace), and *Lythrum salicaria* (purple loosestrife). Rooted aquatic vegetation and mosses were absent from within the stream but thin-film and filamentous algae covered virtually the entire stream bottom.

At the time of sampling, the most obvious habitat feature at this site was that stable fish cover was restricted to only about 10% of the reach (marginal). Epifaunal substrates, on the other hand, were optimal, though compromised somewhat by suboptimal embeddedness conditions. With no indication of channel manipulations, channel alteration was rated optimal. Sediment deposition was evident along about 30% of this reach, resulting in a score in the marginal range for this parameter. The uniformly shallow depth through this reach meant only two velocity/depth combinations were present (marginal) but the water covered more than 75% of the stream bottom without reaching the base of both lower banks (suboptimal). Bank vegetative protection was optimal on the west bank but suboptimal on the east bank. Both banks were judged to be moderately unstable, with about 30% each bank showing areas of erosion. The riparian vegetative zone width was optimal on the west bank but was only marginal (approximately 12 m) on the east bank. The total habitat score was 132.

Benthos

The highest HBI result encountered in this survey, and the extremely low EPT index (2) for the macroinvertebrate community at this site, were two strong signals of organic enrichment. The very low EPT/chironomid abundance ratio and the weak affinity (RSA) to the watershed reference also resulted in score reductions. The overall RBP rating for this site relative to PB00-X (the watershed reference) was *Slightly-Moderately Impacted*. When compared against the subwatershed reference (GW01) the RSA was slightly better, resulting in a rating of *Slightly Impacted*. Coupled with the field observations these results suggest NPS effects related to agricultural land use practices.

Hemlock Brook, Williamstown, MA—HB00A

Habitat

This stream was sampled in a segment adjacent to Hemlock Brook Development in Williamstown, MA, about a kilometer upstream from its confluence with the Hoosic River. The surrounding land use was residential on one side and field on the other. There were no signs of erosion or sources of NPS pollution within the reach. A little further downstream, however, a cow pasture with crossings of the stream was an obvious NPS pollution source that surely would have an influence (e.g., increased particulate and nutrient loadings) further downstream and in the mainstem Hoosic River. No dam was present, and although there were no remnant structures suggestive of past channelization, the stream was remarkably straight through the sample reach. The stream was about 5 m wide and had a fairly uniform depth of 0.1 m. The water had no distinctive odors, no surface oils, no color, and no turbidity. The sediments also lacked odors and oils and did not have any noticeable deposits. The character of the substrates was the same in the sampled areas as for the reach overall: 20% boulder, 60% cobble, 10% pebble, and 10% sand and gravel. Organic substrates were all in the form of CPOM.

The percent canopy was not recorded in the field but trees were present in a narrow band along both banks, representing no more than about 25% of riparian zone areas. The predominant trees were *Acer*

negundo (boxelder), *Populus deltoides* (cottonwood), *Ulmus rubra* (slippery elm), and *Salix* sp. (willow). Shrubs were present in about 40% of the riparian zone, represented mainly by *Lonicera* sp. (honeysuckle) and *Berberis* sp. (barberry). Herbaceous cover occurred throughout the riparian zone, with a variety of grasses, ferns, and composites (Asteraceae). There was no in-stream aquatic vegetation but there were extensive areas of exposed root mats from bank vegetation. About 95% of the reach had noticeably slimy rocks, an indication of the presence of thin-film periphyton.

With such a shallow stream it was difficult to identify more than about 10% of the reach that offered stable fish habitat (marginal). Epifaunal substrates were optimal, though compromised somewhat by suboptimal embeddedness (about 30%). Channel alteration and sediment deposition both scored in the optimal range. Velocity depth combinations were limited to slow/shallow and fast/shallow (marginal). Channel flow status was suboptimal with only about 75% of the stream bottom covered with water. Bank vegetative protection was optimal, as was bank stability, but the riparian vegetative zone width was poor (undisturbed buffer zone < 6 m). The total habitat score was 132.

Benthos

Hyperdominance, coupled with a relatively high HBI and low EPT index were signals from this data set of organic enrichment in Hemlock Brook. The hyperdominant taxon was the elmid beetle, *Optioservus* sp. Several species of this genus are known to be tolerant of sewage and chlorides (Brown 1972). The next two most abundant taxa, *Rheotanytarsus exiguus* group and *Hydropsyche morosa* group, when relatively abundant, are associated with elevated levels of suspended particulate organic matter (Bode and Novak 1998, Merritt and Cummins 1996). Indeed, one third of this assemblage was filter feeders, indicating that suspended solids were an important food source for the established benthic community. All metrics except Richness and RSA were reduced in points but the total RBP score still was within the range for *Slightly Impacted*. This would seem to implicate some mild NPS pollution pressures (e.g., road and/or agricultural runoff) but low water effects may be important in contributing to this RBP result, as well.

Hoosic River upstream from Hoosac WQD, Williamstown, MA—HR03

Habitat

Riparian zone land use along this reach was roughly 50% forest and 50% pasture. Just outside the 18 m buffer on the north side of the river were the access roads associated with the Hoosac Water Quality District (WQD) wastewater treatment plant and the Williamstown transfer station and highway department operations. Slight erosion was noted near footpaths on the north bank and the horse/cow farm along the south edge of the reach was identified as an obvious source of NPS pollution. No dam or channelization was evident. The river was about 25-30 m wide and depths ran about 0.3 m in the riffles, 0.5 m in the runs, and 0.4 m in the pool. No odor was associated with the water nor were there any surface oils; the water did not have color but was slightly turbid. The sediments lacked odor, deposits, and oils. Sediment component estimates were the same for the reach and the kick-sample areas: 40% boulder, 40% cobble, 10% pebble, and 10% sand and gravel. Organic substrate materials were all CPOM.

Because of the river's width, canopy cover over the river was negligible. The most common trees in the riparian zone were *Populus deltoides* (cottonwood), *Acer negundo* (boxelder), and *Salix* sp. (willow). Shrubs and woody vines were in 80% of the riparian zone, most prominently represented by *Vitis* sp. (grape) and *Lonicera* sp. (honeysuckle). Herbaceous cover occurred over only about 50% of the riparian zone area, mostly grasses and *Lythrum salicaria* (purple loosestrife). No rooted aquatic vegetation was seen in-stream. All the rocks in the reach were very slippery, indicating the presence of periphyton, but there were also filamentous forms growing on rocks in both pools and riffles.

Fish habitat was marginal at this site, with stable cover in only about 20% of the area. Epifaunal substrates were optimal as were embeddedness and channel alteration. Enough sediment deposition was occurring in the reach to lower the score into the suboptimal range. All four velocity-depth patterns were present (optimal) but channel flow status was marginal because more than 25% of the channel substrates were exposed. Bank vegetative protection and bank stability were optimal on the north bank but suboptimal on the south. The riparian vegetative zone width on the north side of the river was just

about 18 m at its narrowest (optimal) but less than 12 m (marginal) on the south side. The total habitat score was 153.

Benthos

The HBI was moderately high and the EPT index slightly lower than for the reference sample, PB00-X. Along with hyperdominance, these metrics accounted for the point losses that resulted in an RBP rating of *Slightly Impacted* for the Hoosic River reach immediately upstream from the Hoosac WQD effluent discharge. *Hydropsyche morosa* group and *Optioservus* sp. both occurred in high enough numbers to be considered hyperdominant. The hydropsychid caddisflies are often dominant when there is a substantial load of suspended particulates. Several *Optioservus* spp. are known to be tolerant of sewage and chlorides (Brown 1972). These data probably are not a signal of serious degradation, considering all the potential influences upstream (urban runoff, agricultural runoff, discharges) from the sample reach.

Hoosic River downstream from Hoosac WQD, Williamstown, MA—HR02

Habitat

Both sides of the sample reach in the Hoosic River downstream from the Hoosac plant were forested within the 18 m riparian buffer. No indications of erosion were recorded for the reach and the only potential source of NPS pollution was just downstream from the sample reach where a gravel storage area was located less than 18 m from the riverbank. There was no dam or channelization present in this portion of the river. The width of the river was estimated at 18 m. The water had a slight sewage odor but no surface oils or turbidity. Substrate composition was comparable to the site upstream from the Hoosac plant, approximately 40% boulder, 40% cobble, 10% pebble, and 10% sand and gravel, with only CPOM contributing significant amounts of organic substrate.

Because of the width of the riverbed, the tree canopy over the river was negligible. Riparian zone tree cover was estimated at 70%. Among the trees present were *Acer negundo* (boxelder), *Populus deltoides* (cottonwood), *Salix* sp. (willow), *Ulmus* sp. (elm), *Juglans cinerea* (butternut), and *Acer platanoides* (Norway maple). Shrubs and woody vines were present over approximately 80% of the riparian zone, represented mainly by *Lonicera* sp. (honeysuckle) and *Vitis* sp. (grape). Herbaceous cover was throughout the riparian zone, including grasses, *Polygonum* sp. (knotweed), *Eupatorium* sp. (Joe-pye weed), *Impatiens* sp. (jewel weed), *Lythrum salicaria* (purple loosestrife), and *Solidago* sp. (goldenrod). There was no rooted aquatic vegetation in the reach but filamentous algae were attached to the rocks in about 80% of the area.

Fish cover was limited to only about 30% of the reach (suboptimal). Epifaunal substrate and channel alteration parameters received the maximum scores for optimal, but there was enough sediment deposition that both the embeddedness and sediment deposition parameters scored in the suboptimal range. Good representation of all four velocity-depth combinations was found in this reach (optimal). Even so, 30% or more of the channel substrates lay exposed. Bank vegetative protection, bank stability, and riparian vegetative zone width all scored in the optimal range. The total habitat score for this site was 162.

Benthos

This most downstream station on the Hoosic River in Massachusetts showed clear signs of pollution stress. There was extreme hyperdominance, the lowest Richness in the survey, a very low EPT index, a moderately high HBI, and a low affinity (RSA) to the watershed reference, PB00-X. *Optioservus* sp. was the hyperdominant taxon; several species within this genus are known to be tolerant of sewage and chlorides (Brown 1972). The RBP assessment placed this site in the *Moderately Impaired* category when scores were calculated against PB00-X. The RBP scores compared more closely when calculated against the upstream bracket (HR03) on the Hoosac WQD plant, but the extreme hyperdominance, relatively low total richness, and low EPT index still resulted in an RBP score in the *Slightly Impaired* range. The very good habitat score for this site obviates habitat limitation as a significant factor in this outcome. The main influences isolated by station HR03 and HR02 are the effluent from the wastewater treatment plant and the confluence of Hemlock Brook. It is likely that Hemlock Brook is contributing some

level of NPS-derived nutrients and particulates (based on biomonitoring results from HB00A and observations of land use between HB00A and the confluence), but the treatment plant is presumed to be the greater influence on water quality.

Discussion and Conclusions

In 1997 GE01 was used as the watershed reference station because of its relatively undisturbed watershed and metrics indicating that its aquatic macroinvertebrate community was quite healthy. Even then the seasonally low water in the stream was noted as a potential stressor, though it did not appear to be causing stress on the community at that time. Low water conditions again were found during the 2002 sampling, reducing the wetted stream width to half what it was when sampled in 1997, as well as reducing the typical riffle/run depth to 10 cm (it was recorded as 15 cm when sampled in 1997). This time, however, some of the metrics seemed to indicate possible stressor impacts (not necessarily directly related to the low water). By contrast, Pecks Brook did not seem to be as limited by seasonal low-flow conditions (the reach had all four velocity depth combinations, and riffles were typically 20 cm deep) and the benthic community attributes were exceptional. For these reasons the results from the duplicate samples taken at PB00 were averaged to produce a reference sample, **PB00-X**.

Using PB00-X as the reference the RBP results showed at least slight impacts for all sampled sites in the Hoosic watershed except the West Branch Green River. Some of the *Slightly Impacted* sites presented only weak evidence of a biological impairment in the stream but may be showing signs of susceptibility to impairment if best management practices (BMP) are not followed. In this class are South Brook (**SB01**), Dry Brook (**DB01**), and East Branch Green River (**GE01**). Field observations made at the Dry Brook site suggest that cow pastures encompassing the stream reach could eventually be problematic, even though the indications are weak at this time.

The other *Slightly Impacted* sites had stronger signals of possible impairment to aquatic communities. The high HBI and proportion of filtering-collectors, coupled with reduced presence of EPT taxa at Hoosic River site **HR07A**, indicate a benthic community responding to cumulative effects of upstream urban and agricultural runoff. **HR07**, despite being downstream of the Adams WWTP, perhaps reflected slightly better conditions than its upstream counterpart, **HR07A.** Hoosic River station **HR03**, also upstream of a wastewater discharge, had RBP metric values not unlike other urban rivers of its size. The remaining *Slightly Impacted* site, **HB00A** (Hemlock Brook), was similar to **HR07A** with respect to the combination of HBI, EPT, and presence of filtering collectors, suggesting upstream influences from road and/or agricultural runoff. The low habitat score at **HB00A** relative to the reference, however, indicates a significant habitat limitation here (attributable in large part to the seasonally low water conditions).

Four sites scored in the range between the low end of *Slightly Impacted* (54% of reference) and the high end of *Moderately Impacted* (50% of reference). Tophet Brook (**TB01**) and the upstream-most Green River site (**GNK02A**) were two of these, but besides having fairly even abundance distributions, among their most dominant taxa were species (*Polypedilum aviceps, Micropsectra dives* gr., *Sweltsa* sp., and *Parachaetocladius* sp. for **TB01**; *M. dives* gr., *Rhyacophila* sp., and *Dolophilodes* sp. for **GNK02A**) considered to be indicative of "clean" water (Bode and Novak 1998 and Bode et al. 2002). Habitat quality at **TB01** was comparable to the watershed reference and at **GNK02A** the habitat quality was good enough to be ranked "Supporting." So it does not seem likely that habitat factors were a major influence on the outcome. There may be some subtle NPS influences affecting both sites, and **GNK02A** may be slightly habitat limited, linked mainly to the low water conditions. Overall, these two sites probably should be regarded as having the same status as the *Slightly Impacted* sites.

Another *Slightly-Moderately Impacted* site, the North Branch Hoosic River station **NBH00,** had habitat quality that ranked second in this survey only to the watershed reference (**PB00**). The strong presence of filter-feeding forms at this site and the fact that the most dominant taxa were mostly more tolerant forms, is evidence that the benthic community is responding to increased loadings of suspended organics along with nutrient enrichment, presumably from NPS inputs. Review of available water quality data, especially if nutrient data are available, should help determine whether to treat this site as *Slightly Impacted* or

Moderately Impacted. High nutrients, low DO, or high suspended solids would support an interpretation of biological impairment at this site.

The remaining site rated *Slightly-Moderately Impacted* was **GNK01**, located in the segment of the Green River that runs along the west side of Route 43 (Green River Road). The extremely low presence of EPT taxa and the high (also highest in this survey) HBI suggest high nutrients and low DO are stressors on the benthic invertebrate community. This argues for treating this site the same as a *Moderately Impacted* site. Field observations implicate agricultural land use practices—specifically the unfettered access of cows to the river and riparian zone—as the most likely influence on the impaired condition of the benthic community, as well as on habitat degradation.

The mainstem Hoosic River site **HR02** was the only site in this survey with an RBP score that placed it squarely into the *Moderately Impacted* category when compared to the watershed reference (**PB00-X**). Compared to its upstream counterpart (**HR03)**, it rated *Slightly Impacted,* confirming an intervening stressor. These two stations bracket the Hoosac WQD wastewater discharge and Hemlock Brook. It seems likely that Hemlock Brook is contributing nutrient and/or suspended solids loadings, but it is presumed that the treatment plant, by virtue of contributing a greater volume of water is probably the greater influence on water quality in this segment of the Hoosic River.

While the RBP assessment results indicate that almost all of the sites in this survey exhibit some degree of stress, only a few warrant particular attention. The Hoosic River site **HR02** surfaced from this survey—as it did from the 1997 survey—as the most degraded site. The next highest priority based on the biological assessments would be **GNK01** in the Green River and **NBH00** in the North Branch Hoosic River. These sites will probably require BMPs to mitigate NPS impacts. The remaining sites gave mild indications of water quality stressors, probably related to NPS inputs. These sites would likely benefit from a review of stormwater management and other BMPs—an observation that was also expressed in the report on the 1997 survey results (Nuzzo 1999).

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Appendix: Hoosic 2002 RBP Data

Table A1. List of taxa present in the 2002 RBP samples from the Hoosic River and its tributaries. Sample locations are identified as: SB01—South Brook; DB01—Dry Brook; TB01—Tophet Brook; PB00—Peck's Brook; HR07A and HR07—Hoosic River (bracketing the Adams WWTP upstream/downstream, respectively); NBH00—North Branch Hoosic River; GNK02A—Green River, New Ashford; GE01—East Branch Green River; GW01—West Branch Green River; GNK01—Green River, Williamstown; HB00A—Hemlock Brook; HR03 and HR02—Hoosic River (bracketing the Hoosac WQD WWTP upstream/downstream, respectively). Column FFG shows each taxon's functional feeding group designation, where: SC = scraper; GC = gathering collector; FC = filtering collector; SH = shredder; and PR = predator. The TV column shows the tolerance value used for each taxon in the HBI calculations.

FinalId	FFG	TV	SB01	DB01	TB01	PB00-I	PB00-D	PB00-X	HR07A	HR07	NBH00	GNK02A	GE01	GW01	GNK01	HB00A	HR03	HR02
Ferrissia sp.	SC	6	1															
Enchytraeidae	GC	10		1		1	1	1										
Nais behningi	GC	6		3							1				2			
Nais bretscheri	GC	6								1								
Nais communis	GC	8					1	0.5			1							
Nais variabilis	GC	10		1														
Lumbriculidae	GC	7										1					1	
Hydrachnidia	PR	6	2	4		1		0.5	3	4		1			5		2	1
Baetidae	GC	4	7	4	6	2	1	1.5		5				3		3	4	4
Baetis (cerci only) sp.	GC	6												1			2	1
Baetis (short term. fil.) sp.	GC	6					4	2				6		5				
Baetis (subeq. term.) sp.	GC	6			2													2
Baetidae (cerci only)	GC	6		2		2	4	3	1	2			7			6		
Baetidae (short term. fil.)	GC	6	3	4	7	16		8					8					
Baetidae (subeq. term.)	GC	6	2	4					2	3			7	2		7	1	
Ephemerellidae	GC	1		3			1	0.5	1	1	3			2		2		
Drunella sp.	SC	0											2					
Ephemerella sp.	GC	1										2						
Serratella sp.	GC	2													7			
Heptageniidae	SC	4		2		4		2		8						2	1	
Epeorus sp.	SC	0	1											1				
Epeorus (Iron) sp.	SC	0					1	0.5	1									
Heptagenia sp.	SC	4											2					
Stenonema sp.	SC	3							9		2			1				
Isonychia sp.	GC	2											1				1	

Table A1. List of taxa . . . (Continued.)

FinalId	FFG	TV	SB01	DB01	TB01	PB00-I	PB00-D	PB00-X	HR07A	HR07	NBH00	GNK02A	GE01	GW01	GNK01	HB00A	HR03	HR02
Leptophlebiidae	GC	2											2					
Chloroperlidae	PR	1		1												1		
Sweltsa sp.	PR	0	4		7	10	26	18			1	3	6	3				
Leuctridae	SH	0							1			3	7					
Leuctra sp.	SH	0	4	5	2	13	3	8						4		2		
Leuctridae/Capniidae	SH	2									1							
Peltoperlidae	SH	0					5	2.5					1					
Perlidae	PR	1		3						1		2						
Agnetina sp.	PR	2	2		4									2				
Paragnetina sp.	PR	1							1								2	
Perlodidae	PR	2												3				
Diura sp.	PR	2				1		0.5										
Pteronarcys sp.	SH	0	1			1		0.5					1	1				
Nigronia serricornis	PR	4												2			1	
Brachycentridae	FC	2	1															
Adicrophleps hitchcocki	SH	2										2						
Glossosoma sp.	SC	0			2	2		1		5				1				1
Helicopsyche borealis	SC	3		4							1			1				
Cheumatopsyche sp.	FC	5	1	4		1	1	1		2	3		1				2	7
Hydropsyche morosa gr.	FC	6	12	8	6	2	1	1.5	36	17	12	10	5	12		9	23	11
Lepidostomatidae	SH	1	2			1		0.5						1				
Lepidostoma sp.	SH	1					1	0.5			1							
Chimarra sp.	FC	4									2						2	1
Dolophilodes sp.	FC	0	2	1	6						2	6	6	1		3		
Psychomyia sp.	GC	2							3	5							1	
Rhyacophila sp.	PR	1	1	4	1	7	12	9.5			1	7					1	
Neophylax sp.	SC	3											1	1	1			
Pyralidae	SH	5												1				
Dubiraphia sp.	GC	6			1													
Optioservus sp.	SC	4	2	4						6		1		16		19	19	43
Optioservus fastiditus	SC	4			1	3	7	5			3				12			
Oulimnius latiusculus	SC	4				7	6	6.5	9					1	1	1		

Table A1. List of taxa . . . (Continued.)

FinalId	FFG	TV	SB01	DB01	TB01	PB00-I	PB00-D	PB00-X	HR07A	HR07	NBH00	GNK02A	GE01	GW01	GNK01	HB00A	HR03	HR02
Promoresia sp.	SC	2				1		0.5										
Promoresia tardella	SC	2						0									2	
Stenelmis sp.	SC	5					1	0.5			1						5	13
Ectopria nervosa	SC	5		1			1	0.5				1						
Psephenus herricki	SC	4							1								1	1
Atherix sp.	PR	4		1														
Microtendipes pedellus gr.	FC	6								1	1							
Microtendipes rydalensis gr.	FC	4							1									
Nilothauma sp.	GC	6													1			
Polypedilum sp.	SH	6													1			
Polypedilum aviceps	SH	4	3	10	13						11	1		3	6	6		
Polypedilum flavum	SH	6	1						1					1	11		1	1
Polypedilum tritum	SH	6			1									1				1
Micropsectra sp.	GC	7	8	3					1		5	5	6		1			1
Micropsectra dives gr.	GC	4	7		9	2	9	5.5			3	17	17	16	2	1		
Micropsectra polita gr.	GC	7										3	3		1			
Micropsectra/Tanytarsus sp.	FC	7	4	2			1	0.5										
Rheotanytarsus sp.	FC	6							3									
Rheotanytarsus exiguus gr.	FC	6							7	4	14					13	1	1
Rheotanytarsus pellucidus	FC	4	7	1		3	1	2			3	4	4	4				
Sublettea coffmani	FC	4							2	2					5	3		
Tanytarsus sp.	FC	6	7	3						1	7				3			
Zavrelia/Stempellinella sp.	GC	4												3				
Diamesa sp.	GC	5	2		1		1	0.5				2						
Pagastia sp.	GC	1			1				1									
Orthocladiinae	GC	5										1						
Brillia sp.	SH	5				1		0.5			1					1		
Cardiocladius sp.	PR	5			2												4	
Corynoneura sp.	GC	4														2		
Cricotopus sp.	SH	7							1	1								
Cricotopus annulator	SH	7															1	
Cricotopus bicinctus	GC	7									2							

Table A1. List of taxa . . . (Continued.)

FinalId	FFG	TV	SB01	DB01	TB01	PB00-I	PB00-D	PB00-X	HR07A	HR07	NBH00	GNK02A	GE01	GW01	GNK01	HB00A	HR03	HR02
Cricotopus bicinctus gr.	GC	7													1			
Cricotopus tremulus	SH	7								1					3	1		
Cricotopus tremulus gr.	SH	7																1
Cricotopus trifascia	SH	6													1			
Cricotopus trifascia gr.	SH	6															1	
Cricotopus vierriensis	SH	7													3			
Cricotopus/Orthocladius sp.	GC	7			1					3					4			
Eukiefferiella brehmi gr.	GC	4					1	0.5										
Eukiefferiella brevicalcar gr.	GC	4										1						
Eukiefferiella devonica gr.	GC	4				2		1		1	2						1	1
Eukiefferiella pseudomontana gr.	GC	8	1		1										1			
Krenosmittia sp.	GC	1					1	0.5										
Nanocladius sp.	GC	7								1								
Orthocladius (Symposiocladius) lignicola	SH	5									1							
Parachaetocladius sp.	GC	2	1		7	1	2	1.5						1				
Parametriocnemus sp.	GC	5		2	7	1	4	2.5		2	3	2	4		3	4		
Rheocricotopus sp.	GC	6								1						1		
Thienemanniella sp.	GC	6								1	1	1					1	
Thienemanniella xena	GC	6										3						
Tvetenia sp.	GC	5							2									
Tvetenia paucunca	GC	4	1	5	4	1		0.5				5		1	1		1	
Tvetenia vitracies	GC	5							1									
Tanypodinae	PR	7												1				
Conchapelopia sp.	PR	6	6		7				3	4	5			1	4	2	2	
Empididae	PR	6	1															
Chelifera sp.	PR	6	1												1		1	
Hemerodromia sp.	PR	6		1					4	9	1				6		3	6
Oreogeton sp.	PR	6					1	0.5										
Simuliidae	FC	6							1									
Simulium sp.	FC	5	1	2		7	2	4.5		1	1	5		1				
Simulium tuberosum cplx	FC	4											4			3		

Table A1. List of taxa . . . (Continued.)

FinalId	FFG	TV	SB01	DB01	TB01	PB00-I	PB00-D	PB00-X	HR07A	HR07	NBH00	GNK02A	GE01	GW01	GNK01	HB00A	HR03	HR02
Tipulidae	SH	5			1							1						
Antocha sp.	GC	3			3				1	2					3	1	3	
Dicranota sp.	PR	3			3	3	7	5					1	1				
Hexatoma sp.	PR	2	2									1		2				
Molophilus sp.	SH	3				1		0.5										
Total			101	93	106	97	107	102	97	95	96	97	96	101	90	93	91	97

Table A2. RBP data summary and assessment results from the 2002 Hudson River watershed bioassessment survey. Sample locations are identified as: SB01—South Brook; DB01—Dry Brook; TB01—Tophet Brook; PB00—Peck's Brook; HR07A and HR07—Hoosic River (bracketing the Adams WWTP upstream/downstream, respectively); NBH00—North Branch Hoosic River; GNK02A—Green River, New Ashford; GE01—East Branch Green River; GW01—West Branch Green River; GNK01—Green River, Williamstown; HB00A—Hemlock Brook; HR03 and HR02—Hoosic River (bracketing the Hoosac WQD WWTP upstream/downstream, respectively).

RBP Raw Data Values														
STATION:	PB00-X	SB01	DB01	TB01	HB00A	HR07A	HR07	HR03	HR02	NBH00	GW01	GNK02A	GE01	GNK01
Habitat Score	177	153	148	162	132	146	149	153	162	174	149	142	141	132
Richness	27	30	28	25	22	24	26	29	17	30	33	25	21	24
HBI	2.86	4.47	4.35	3.66	4.58	5.01	4.85	4.80	4.72	4.91	3.78	3.94	3.85	5.09
EPT	11.5	13	13	9	8	9	9	10	6	11	17	9	15	2
EPT/Chiro	3.94	0.90	1.88	0.80	1.03	2.39	2.13	3.08	4.50	0.49	1.41	0.91	1.68	0.15
SC/FC	1.74	0.11	0.52	0.25	0.71	0.40	0.68	1.00	2.90	0.16	1.22	0.08	0.25	1.75
% Dom.	18%	12%	11%	12%	20%	37%	18%	25%	44%	15%	16%	18%	18%	13%
RSA	100	63	71	64	66	65	65	65	47	44	76	57	67	49
RBP Ratios To Reference Sample PB00-X														
STATION:	PB00-X	SB01	DB01	TB01	HB00A	HR07A	HR07	HR03	HR02	NBH00	GW01	GNK02A	GE01	GNK01
Habitat	1	0.86	0.84	0.92	0.75	0.82	0.84	0.86	0.92	0.98	0.84	0.80	0.80	0.75
Richness	1	1.11	1.04	0.93	0.81	0.89	0.96	1.07	0.63	1.11	1.22	0.93	0.78	0.89
HBI	1	0.64	0.66	0.78	0.62	0.57	0.59	0.60	0.61	0.58	0.76	0.73	0.74	0.56
EPT	1	1.13	1.13	0.78	0.70	0.78	0.78	0.87	0.52	0.96	1.48	0.78	1.30	0.17
EPT/Chiro	1	0.23	0.48	0.20	0.26	0.61	0.54	0.78	1.14	0.12	0.36	0.23	0.43	0.04
SC/FC	1	0.07	0.30	0.14	0.41	0.23	0.39	0.57	1.67	0.09	0.70	0.05	0.14	1.01
% Dom.	18%	12%	11%	12%	20%	37%	18%	25%	44%	15%	16%	18%	18%	13%
RSA	100%	63%	71%	64%	66%	65%	65%	65%	47%	44%	76%	57%	67%	49%

RBP Scores and Final Assessment Determination														
STATION:	PB00-X	SB01	DB01	TB01	HB00A	HR07A	HR07	HR03	HR02	NBH00	GW01	GNK02A	GE01	GNK01
Habitat Status[1]	Comp.	Supp.	Supp.	Comp.	Pt. Supp.	Supp.	Supp.	Supp.	Comp.	Comp.	Supp.	Supp.	Supp.	Pt. Supp.
Richness	6	6	6	6	6	6	6	6	4	6	6	6	4	6
HBI	6	2	2	4	2	2	2	2	2	2	4	4	4	2
EPT	6	6	6	2	2	2	2	4	0	6	6	2	6	0
EPT/Chiro	6	0	2	0	2	4	4	6	6	0	2	0	2	0
SC/FC	6	0	2	0	4	2	4	6	6	0	6	0	0	6
% Dom.	6	6	6	6	4	2	6	4	0	6	6	6	6	6
RSA	6	4	6	4	6	6	6	6	2	2	6	4	6	2
Total Score	42	24	30	22	26	24	30	34	20	22	36	22	28	22
Impact Category[2]	Ref.	SI	SI	SI/MI	SI	SI	SI	SI	MI	SI/MI	NI	SI/MI	SI	SI/MI

[1] Habitat Status Categories: Comparable (Comp.); Supporting (Supp.); Partially Supporting (Pt. Supp.)

[2] Impact Categories: Reference (Ref.); Nonimpacted (NI); Slightly Impacted (SI); Moderately Impacted (MI)

Table A3. Habitat scores for sites sampled in 2002 in the Hoosic River and tributaries. Sample locations are identified as: SB01—South Brook; DB01—Dry Brook; TB01—Tophet Brook; PB00—Peck's Brook; HR07A and HR07—Hoosic River (bracketing the Adams WWTP upstream/downstream, respectively); NBH00—North Branch Hoosic River; GNK02A—Green River, New Ashford; GE01—East Branch Green River; GW01—West Branch Green River; GNK01—Green River, Williamstown; HB00A—Hemlock Brook; HR03 and HR02—Hoosic River (bracketing the Hoosac WQD WWTP upstream/downstream, respectively).

Description	SB01	DB01	TB01	PB00	HR07A	HR07	NBH00	GNK02A	GE01	GW01	GNK01	HB00A	HR03	HR02
In-stream Cover	5	15	16	20	8	11	18	10	6	15	6	6	8	11
Epifaunal Substrate	17	16	18	20	20	17	20	18	17	19	17	18	19	20
Embeddedness	12	14	18	19	12	11	17	18	18	18	14	14	16	13
Sediment Deposition	19	11	10	19	12	11	19	11	8	8	10	16	15	11
Channel Alteration	20	18	17	18	16	16	20	15	20	20	20	16	20	20
Channel Flow Status	10	11	15	15	14	15	15	6	6	8	15	11	9	9
Velocity & depth combinations	10	12	13	16	16	17	15	13	10	16	10	10	19	19
Bank Stability-Left Bank	10	10	9	8	10	7	10	10	8	9	5	9	10	10
Bank Stability-Right Bank	10	10	6	8	7	9	10	10	10	4	5	10	7	9
Bank Vegetative Protection—Left Bank	10	10	10	8	10	10	10	10	9	10	9	10	10	10
Bank Vegetative Protection—Right Bank	10	10	10	8	10	10	10	10	10	3	6	10	6	10
Riparian Vegetative Zone Width—Left Bank	10	5	10	9	1	10	7	1	10	10	10	1	9	10
Riparian Vegetative Zone Width—Right Bank	10	6	10	9	10	5	3	10	9	9	5	1	5	10
Total Habitat Score	**153**	**148**	**162**	**177**	**146**	**149**	**174**	**142**	**141**	**149**	**132**	**132**	**153**	**162**

APPENDIX E – SUMMARY OF NPDES AND WMA PERMITTING INFORMATION, HUDSON RIVER BASIN

Table E1. Hudson River Basin Municipal Surface Wastewater Discharges- Town of Adams

PERMITTEE Town of Adams	NPDES # MA0100315	SEGMENT MA11- 04

The Town of Adams is authorized (MA0100315 issued in August 2001) to discharge from the Adams Wastewater Treatment Plant (WWTP) a flow of 3.5 MGD (average monthly June 1 – October 31) and 5.0 MGD (average monthly for the remaining months of the year) of treated effluent via Outfall #001 to the Hoosic River. The permit expired November 2004.

The facility is required under the current permit to conduct quarterly whole effluent toxicity tests using *Ceriodaphnia dubia*. The permit limits for whole effluent toxicity are $LC_{50} \geq$ 100% effluent and CNOEC$\geq$ 24% effluent.

The permit includes seasonal limits on BOD_5, total suspended solids (TSS), dissolved oxygen, fecal coliform bacteria, total residual chlorine (TRC), total ammonia-nitrogen (NH3-N), and total phosphorus (TP), as well as limits on total copper and total aluminum.

Parameter	Avg. monthly limit from 1 June to 31 October	Avg. monthly limit from 1 November to 31 May	Avg. monthly limit from 1 April to 31 October
BOD_5	30 mg/l (1276 lbs/day)	30 mg/L (876 lbs/day)	
TSS	30 mg/l (1276 lbs/day)	30 mg/L (876 lbs/day)	
DO			6.0 mg/L
Fecal coliform bacteria			200 cfu/100 mL
TRC			0.046 mg/L
NH3-N	2.6 mg/L		
TP			1.0 mg/L

The Town of Adams, operating an extended aeration activated sludge facility, has upgraded some major components and associated equipment from 2002 to 2004 (Fijal 2005). These upgrades followed the preparation of a MassDEP approved Project Evaluation Report (Schleeweis and Kurpaska 2005). Nitrification is performed for ammonia-nitrogen reduction. The ammonia-nitrogen concentration in the effluent between July 1999 and May 2005 (n=26) ranged from 0.1 to 9.5 mg/L (TOXTD database). Provisions are currently being added to the WWTP for the purpose of reducing total phosphorus by chemical addition using alum (Fijal 2005). The pH of the effluent between July 1999 and May 2005 (n=26) ranged from 7.5 to 8.3 SU (TOXTD database). Dechlorination was implemented at the facility in August 1994.The facility currently uses sodium hypochlorite for disinfection and sodium bisulfite for dechlorination. The TRC in the effluent between July 1999 and May 2005 (n=26) were all $\leq$0.05 mg/L TOXTD database).

A new permit was issued for this facility in July 2005.

Chemistry-water:

Hardness: The hardness in the river water between July 1999 and May 2005 ranged from 60 to 130 mg/L (n=26)(TOXTD database).

Table E2. Hudson River Basin Municipal Surface Wastewater Discharges- Hoosac Water Quality District

PERMITTEE Hoosac Water Quality District	NPDES # MA0100510	SEGMENT MA11- 05

The Hoosac Water Quality District is authorized (MA0100510 issued in December 2001) to discharge from the Hoosac Water Pollution Control Facility (WPCF) a flow of 5.37 MGD (average monthly) of treated effluent via Outfall #001 to the Hoosic River. The permit expired in February 2005.

The facility is required to conduct quarterly whole effluent toxicity tests using *Ceriodaphnia dubia* as the test organism. The whole effluent toxicity limits are $LC_{50} \geq$ 100% effluent and CNOEC$\geq$ 16% effluent.

The permit includes limits on BOD_5 (1344 lbs/day), total suspended solids (1344 lbs/day), dissolved oxygen (6.0 mg/L minimum) and total copper (report), as well as seasonal limits for fecal coliform bacteria, total residual chlorine (TRC), total ammonia nitrogen (NH3-N), and total phosphorus (TP).

Parameter	Avg. monthly limit from 1 June to 31 October	Avg. monthly limit from 1 November to 31 May	Avg. monthly limit from (1 April to 31 October)
Fecal coliform bacteria			200 cfu/100 mL
TRC			0.07 mg/L (0.12 mg/L max daily)
NH3-N	7 mg/L	report	
TP			1.0 mg/L

This conventional activated sludge facility has begun a two-phase upgrade project utilizing state revolving loan fund awarded in 2004 for long-term upgrades to the facility. The first phase will focus on short-term corrective measures to the collection system and treatment facility and the second phase will target long-term improvements to the treatment facility (Furlon 2005). Ammonia-nitrogen reduction is accomplished by nitrification. The ammonia-nitrogen concentrations in the effluent between August 1999 and May 2005 (n=24) ranged from <0.1 to 2.2 mg/L. In February 2005 there was one ammonia-nitrogen concentration of 10.0 mg/L (TOXTD database). Total Phosphorus reduction is accomplished by chemical addition using aluminum sulfate. The pH of the effluent between August 1999 and May 2005 ranged from 7.5 to 8.1 SU (n=24) with the exception the (August 2004 event where the pH was 8.9 SU (TOXTD database). Seasonal chlorination requirements are carried out by the addition of sodium hypochlorite for disinfection and sodium bisulfite for dechlorination. The TRC of the effluent between August 1999 and May 2005 (n=24) ranged from <0.02 to 0.28 mg/L (August 2001) (TOXTD database).

In the late 70's the former primary WWTP in North Adams was abandoned and converted to a pump station when the Williamstown facility came under the ownership of the Hoosac Water Quality District. The North Adams pump station is reported to have a high level overflow to protect the pump station from severe flooding. The City hired Metcalf & Edy to assess the city's sewage collection system in the 80's. In the 90's a Sewer System Evaluation Study (SSES) was conducted. As portions of the city's sewage collection system are commingled with its storm drain system, the SSES reported some locations that could provide for a discharge of sewage under significant flooding conditions. Some stormwater has been historically piped directly into the sanitary system as no stormwater system was/is available (Schleeweis and Kurpaska 2005).

The HWQD with Williamstown and North Adams as co-defendants entered into a consent decree with EPA joined by MassDEP in Oct 2003. The decree required the district and the municipalities to remove excessive Inflow/Infiltration (I/) and upgrade the WWTP as necessary to meet NPDES permit conditions. The district made repairs to its interceptor (the only capital good that it owns outside of the potw grounds). Williamstown and North Adams have also made some repairs to fix excessive I/Iand they are required to maintain vigilance in pursuit of excessive I/I (Schleeweis and Kurpaska 2005).

There also existed an overflow directly across the river from the district WWTP. This overflow has been sealed (Schleeweis and Kurpaska 2005).

Chemistry-water:
Hardness: Between August 1999 and May 2005, the river water hardness ranged from 60 to 148 mg/L (n=24)(TOXTD database).

Table E3. Hudson River Basin Commercial and Industrial Surface Wastewater Discharges-SMI

PERMITTEE Specialty Minerals, Inc.	NPDES # MA0005991	SEGMENT MA11- 04

Specialty Minerals, Inc. (SMI), a limestone mining and processing facility located in Adams, Massachusetts, is authorized (MA0005991 issued in September 2003) to discharge a flow of 5.0 MGD (average monthly) via Outfall #001 consisting of non-contact cooling water (NCCW), quarry water, storm water runoff, and process water to the Hoosic River. Outfall #001A discharges process water from limestone processing, lime production, and precipitated calcium carbonate production. Outfall #001B discharges stormwater and non-contact cooling water. Outfalls 001A and 001B combine to form Outfall #001. Outfall #001 discharges via a canal to the Hoosic River. The SMI treatment process incorporates settling, neutralization, and settling. Detention lagoons are then utilized to cool water temperature (Brown 2005).

The facility is required to conduct quarterly whole effluent toxicity tests using the test organism *C. dubia* and *Pimephales promelas.* The whole effluent toxicity limits are $LC_{50} \geq 100\%$ effluent and C-NOEC $\geq$ 27.17% effluent. SMI received a waiver from EPA to use synthetic water as the diluent for testing with *P. promelas* due to fungus growth when using river water (Brown 2005). Ambient water is still used as a test control for the *P. promelas* tests. The permit includes daily maximum limits for temperature (84.7°F), TSS (30 mg/L), and turbidity (60 JTU).

Outfall temperatures are met at the canal confluence with the Hoosic River (Brown 2005). The pH of the effluent between November 2003 and May 2005 (n=8) ranged from 7.4 to 8.0 SU (TOXTD database).

The permit included special limits in the event that the US Army Corps of Engineers flood control chute habitat modification project is completed, allowing the facility to discharge 6.0 MGD and imposes a temperature limit of 81.5°F. The Army Corps of Engineers flood control chute habitat modification project has never been completed. Therefore, the modifications to the permit have never been implemented (Brown 2005).

CHEMISTRY-WATER:

Hardness: The hardness in the river between November 2003 and May 2005 ranged from 96 to 140 mg/L (n=8)(TOXTD database).

Table E4. Hudson River Basin General NPDES permits.

PERMITTEE Steinerfilm, Inc.	NPDES # MAG250037	SEGMENT MA11-23

Steinerfilm, Inc. merged with the former Chadbourne International Inc. The facility now has a general permit (MAG250037 issued in April 2005) for the discharge of non-contact cooling water to Broad Brook, a tributary to the Hoosic River. The two former individual NPDES permits (MA0027499 and MA0026638) have been closed as of April 2005 (MassDEP 2005).

Table E5. Multi-sector General Stormwater General Permits in the Hudson River Basin

Permitee	NPDES #	Locality
Crown Paper Co*	MAR05B183	Adams
Curtis Fine Papers*	MAR05C413	Adams
Macdermid Graphic Arts	MAR05B566	Adams
Macdermid Graphic Arts	MAR05B906	Adams
Polyfibron Tech Inc	MAR05B033	Adams
Specialty Minerals Inc	MAR05A991	Adams
Specialty Minerals Inc	MAR05C402	Adams
Specialty Minerals Inc	MAR05C397	Adams
The Lane Construction Corp	MAR05C244	Adams
Browning Ferris Industries	MAR05C029	Cheshire
Transfer Station And Recycling	MAR05C508	Cheshire
Coury's Used Auto Parts	MAR05C120	North Adams
Excelsior Printing Co	MAR05C418	North Adams
Excelsior Process & Engraving	MAR05C419	North Adams
George Apkin & Sons Inc	MAR05B357	North Adams
Modern Aluminum Corp.	MAR05C395	North Adams
Hoosac Water Quality WWTP	MAR05C465	Williamstown
Williamstown Transfer Station	MAR05C456	Williamstown
Harriman Airport	MAR05A616, MAR05A61, MAR05A619	Williamstown

***** Crown Paper became Curtis Fine Paper

Table E6. Terminated NPDES permits in the Hudson River Basin.

Polyfibron Technologies, Inc. was permitted (MAG250007, issued June 1995) to discharge 0.1 MGD of non-contact cooling water to the Hoosic River (MA11-03). Polyfibron Technologies became MacDermid Graphic Arts. The facility went out of business in July 2002 and EPA terminated the permit in March 2003.
In May of 1999, EPA determined that Berkshire Mill Residences did not require a permit. The individual permit (MA0031046) was terminated and a storm water permit was also not required.
Commonwealth Sprague Capacitor, Inc. (MA0005924), formerly Sprague Electric Company, ceased operations in August 2000. In February 2005, EPA terminated the permit that authorized the daily average discharge of 0.475 MGD from outfall 001 to the Hoosic River Segment MA11-05 (Hogan 2005). The permit contained a daily maximum temperature limit of 28°C (83°F),as well as a PCB limit (12 g/day daily average, and a daily maximum concentration limit of 0.010 mg/L). If the facility demonstrated that PCBs existed in the intake waters, the data could be used in a compliance evaluation. The permit also states “In no case shall any of the PCB limits be achieved by dilution”.
The Mallory restaurant (MA0022233 issued in May 1977 and expired in June 1982) was formerly TP and Four, Inc. TP and Four assumed ownership in September 1998 of the restaurant from the previous owner, The Springs, Inc. The Mallory restaurant has closed, therefore, no permit is required according to sources at the EPA Boston Office (Hogan 2005).
Boston & Maine Corporation, Cole Ave Williamstown (MA0034177) the site is no longer an active railroad terminal or railroad line. Actions at the site are currently limited to booms in the river and a bio-sparge system. The site used to have an interceptor trench and product recovery system many years ago - that may have been the reason for the NPDES permit. MassDEP has no current DMRs from the site, and although EPA indicates that the permit was issued in 1991, and is still active, nothing is currently being reported.

Table E7. List of WMA withdrawals in the Hudson River Basin.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground, S = surface)	20 Year Authorized Withdrawal (MGD)	Segment	COMMENTS
Adams Fire District	9P10100401	10100404	1004000-02G 1004000-03G 1004000-04G 1004000-01S	2.0 (reg) 0.16 (perm) 2.16	MA11-03	Adams Fire District supplies approximately 94% of the water to the Town of Adams. The former source, Bassett Brook Reservoir has been replaced with the existing ground water sources as a result of the Surface Water Treatment Rule. The wells are located on the east side of Route 8, approximately one mile south of the center of town. Well #2A, is a 12 inch diameter, 87 foot deep gp well, with an approved safe yield of 0.86 MGD. Well #3, is a 12 inch diameter, 101 foot deep gp well, with an approved safe yield of 1.96 MGD.Well #4, the newest well is a 30 inch diameter, 81 foot deep gp well, with an approved safe yield of 2.3 MGD.
Mount Greylock Natural Spring Water Corp.		10100403	Glen Street Spring	0.0	MA11-04	The water source, which was expected to provide water for a bottling water facility, was not used. The facility had a WMA Registration allowance of 0.72 MGD, however the registration was voided on 23 August 1999. There has been no water used from the spring since 1981. This company's registration was terminated 6/2002.
Catamount Ski Area		10109001	01S 02S	0.4	Bash Bish Subbasin	The ski area is registered to withdraw 0.40 MGD from two surface sources for snow making purposes. The ski area also uses a drilled well for potable water use, which is not covered under the WMA registration.
Cheshire Water Department	9P210105801	10105801	1058000-02G 1058000-03G 1058000-01S (Emergency)	0.22	MA11-03	Cheshire Water Department supplies approximately 59% of the water to the Town of Cheshire. The former sources, Kitchen Brook (emergency source) and Thunder Brook Reservoirs (abandoned source), have been replaced with two ground water sources as a result of the Surface Water Treatment Rule. The two wells are located on the east-side of Route 8, approximately one mile north of the center of town. Well #1 is a 50 foot deep, 18 X 12 gravel packed (gp) well, with an approved safe yield of 0.396 MDG (or 275 gallons per minute--gpm) and a Zone I Protective Radius of 400 feet. Well #2 is also 50 foot deep, 18 X 12 gp well, with the identical approved safe yield and Zone I Radius. Well #2 is located 25 feet from well #1, and is used as a back up to well #1.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground, S = surface)	20 Year Authorized Withdrawal (MGD)	Segment	COMMENTS
Curtis Fine Papers (formerly Crown Vantage Paper)		10100401	-01G -02G	0.63	MA11-04	Facility closed, continues to maintain registration for potential transfer of withdrawal rights. Used 0.0 gallons in 2004.
Jiminy Peak Ski Resort	9P310112101	10112101	1121004-01G 1121004-02G 1121004-03G 1121004-04G -01S (Benthly Brook) -02S (Kinderhook Creek) -03S (Jiminy Creek)	0.45 (reg) 1.05 (perm) 1.5	MA12-01	The resort uses approximately 0.029 MGD with a maximum monthly use of 0.040 MGD. The ski area utilizes approximately 0.706 MGD for snow making purposes. The facility takes water from six well sources and one surface source. Beaver Pond Meadows Condominiums is managed by Jiminy Peak. The condominium development utilizes 2 wells (not covered under WMA) to supply approximately 0.025 MGD to the facility.
North Adams Water Department		10120901	-02S (Broad Brook) -01S (Notch Reservoir) -01G (Greylock Well) -04S (Mt. Williams Reservoir)	2.8	MA11-23 MA11011 MA11-05 MA11010	Actual use for 2004 = 2.0 MGD
Specialty Minerals	9P10100402	10100402	-01G -02G -03G -04G -05G	3.7 (reg) 2.32 (perm) 6.02	MA11-04	
Steinerfilm, Inc.	9P10134103	10134102	-01 -02 -03	0.82 (reg) 0.54 (perm) 1.36	MA11-05	5 year permit review completed 2005
Williamstown Water Department	9P310134104	10134101	1341000-01G 1341000-02G 1341000-03G 1341000-01S	0.9	MA11-05	Sherman Springs Reservoir is an emergency supply
			-03S (Sherman Springs Reservoir)		MA11-20	

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APPENDIX F- FISH TOXICS MONITORING IN THE HUDSON RIVER BASIN (2002)

The following information pertaining to Cheshire Reservoir in the Hudson River Basin was excerpted from *2002 Fish Toxics Monitoring Public Request and Year 2 Watershed Surveys* (CN99.0) by Maietta, Ryder and Chase (July 27 2004).

Cheshire Reservoir is a 418-acre eutrophic pond located in the towns of Cheshire and Lanesborough at the headwaters of the Hoosic River. The river flows north through the lake, which is divided into a number of distinct basins. The southern end of the lake is shallowest area and almost entirely covered with aquatic macrophytes during the growing season. The northernmost basin receives herbicide treatments annually in an effort to control the growth of aquatic macrophytes. Land use in the watershed is a mix of forest and agricultural, with a small amount of low density residential. The shoreline of the northernmost basin is approximately 20 to 30 percent developed with residences.

Field Methods

The North Basin of Cheshire Reservoir was sampled using an electrofishing boat. Electrofishing was performed by maneuvering the boat through the littoral zone and shallow water habitat of a given waterbody, and collecting most fish shocked. Fish collected by electrofishing were stored in a live well filled with site water until the completion of sampling. Live fish, which were not included as part of the sample, were released. Electrofishing at Cheshire Reservoir (North Basin) in Cheshire on 6/18/02 resulted in the collection of three largemouth bass, three rock bass, three pumpkinseed, three bluegill, and three brown bullhead. Additional species observed included northern pike E*sox lucius* and black crappie.

Laboratory Methods

Fish brought to the DEP DWM laboratory in Worcester were processed using protocols designed to assure accuracy and prevent cross-contamination of samples. Specimen lengths and weights were recorded along with notes on tumors, lesions, or other anomalies noticed during an external visual inspection. Scales, spines, or pectoral fin ray samples were obtained for use in age determination. Fish were filleted (skin off) on glass cutting boards and prepared for freezing. All equipment used in the filleting process was rinsed in tap water and then rinsed twice in de-ionized water before and/or after each sample. Samples targeted for % lipids, PCBs and organochlorine pesticide analysis were wrapped in aluminum foil. Samples targeted for metals analysis were placed in high-density polyethylene (HDPE) cups with covers. Composite samples were comprised of three fillets from like-sized individuals of the same species (on rare occasions two different species of the same genus). Samples were tagged and frozen for subsequent delivery to the Department's Wall Experiment Station (WES) for analysis.

Methods used at WES for metals analysis include the following:
Mercury was analyzed by a cold vapor method using a Perkin Elmer, FIMS (Flow Injection Mercury System), which uses Flow Injection Atomic Absorption Spectroscopy. Cadmium and lead were analyzed using a Perkin Elmer, Optima 3000 XL ICP - Optical Emmission Spectrophotometer. Arsenic and selenium were analyzed using a Perkin Elmer, Zeeman 5100 PC, Platform Graphite Furnace, Atomic Absorption Spectrophotometer (MassDEP 2000, 2002).

PCB Arochlor, PCB congener, and organochlorine pesticide analysis was performed on a gas chromatograph equipped with an electron capture detector "according to the modified AOAC 983.21 procedure for the analysis of PCB Arochlors, Congeners, and Organochlorine Pesticides" (MassDEP 2002). Additional information on analytical technique used at WES is available from the laboratory.

Results

Mercury concentrations were well below the MA DPH trigger level of 0.5 mg/kg in the five samples analyzed. It should be noted that this included largemouth bass a predatory species. Arsenic, lead, cadmium and selenium were either below MDLs or at concentrations that do not appear to be of concern.

PCB Arochlors, PCB Congeners, and organochlorine pesticides were below MDLs in all but one sample analyzed. Trace amounts of PCB Arochlor 1260, PCB Congener BZ#s 118 and 180, and DDE (result

qualified) were detected in brown bullhead. It is unclear where PCB Arochlors, Congeners or DDE may have originated, but concentrations are not indicative of an ongoing source of these contaminants.

Table F1. Analytical Results for 2002 Fish Toxics Monitoring Public Request and Year 2 Watershed Surveys. Results reported in wet weight, are from composite samples of fish fillets with skin off.

Sample ID	Collection Date	Species Code[1]	Length (cm)	Weight (g)	Sample ID (laboratory sample #)	Cd (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	As (mg/kg)	Se (mg/kg)	% Lipids (%)	PCB Arochlors and Congeners (μg/g)	Pesticides (μg/g)
Cheshire Reservoir, Cheshire/Lanesborough, Hoosic River Watershed													
CHF02-01	6/18/02	LMB	34.2	520	2002011 (L2002245-1) (L2002249-1)	<0.040	<0.20	0.29	<0.060	0.12	0.06	ND	ND
CHF02-02	6/18/02	LMB	31.3	394									
CHF02-03	6/18/02	LMB	30.4	398									
CHF02-04	6/18/02	RB	22.6	239	2002012 (L2002245-2) (L2002249-2)	<0.040	<RDL (0.60)	0.24	<0.060	0.13	0.06	ND	ND
CHF02-05	6/18/02	RB	24.5	326									
CHF02-06	6/18/02	RB	22.7	273									
CHF02-07	6/18/02	P	18.8	147	2002013 (L2002245-3) (L2002249-3)	<0.040	<0.20	0.11	<0.060	0.20	0.11	ND	ND
CHF02-08	6/18/02	P	16.3	93									
CHF02-09	6/18/02	P	17.7	124									
CHF02-10	6/18/02	B	17.9	108	2002014 (L2002245-4) (L2002249-4)	<0.040	<0.20	0.17	<0.060	0.14	0.24	ND	ND
CHF02-11	6/18/02	B	19.2	156									
CHF02-12	6/18/02	B	17.5	101									
CHF02-13	6/18/02	BB	33.6	516	2002015 (L2002245-5) (L2002249-5)	<0.040	<0.20	0.04	<0.060	0.18	1.8	A1260-0.084 BZ#118-0.0019J BZ#180-0.0028J	DDE-.016J
CHF02-14	6/18/02	BB	35.8	751									
CHF02-15	6/18/02	BB	37.9	860									

1 Species Code , Common Name, Scientific name

(AE)	American eel	Anguilla rostrata
(B)	bluegill	Lepomis macrochirus
(BB)	brown bullhead	Ameiurus nebulosus
(BC)	black crappie	Pomoxis nigromaculatus
(BT)	brown trout	Salmo trutta
(C)	common carp	Cyprinus carpio
(LMB)	largemouth bass	Micropterus salmoides
(P)	pumpkinseed	Lepomis gibbosus
(RB)	rock bass	Ambloplites rupestris
(WP)	white perch	Morone americana
(WS)	white sucker	Catostomus commersoni
(YB)	yellow bullhead	Ameiurus natalis
(YP)	yellow perch	Perca flavescens

ND - not detected or the analytical result is at or below the established method detection limit (MDL).
J-estimated value, concentration <RDL or certain QC criteria not met
RDL = reporting detection limit
< = result not detected above method detection limit, unless otherwise noted

APPENDIX G – MASSDEP GRANT AND LOAN PROGRAMS

604(b) WATER QUALITY MANAGEMENT PLANNING GRANT PROGRAM

http://www.mass.gov/dep/water/grants.htm

This grant program is authorized under the federal Clean Water Act Section 604(b) for water quality assessment and management planning.

- 02-02 *Stormwater Management Assessment Project (Town of Adams)* The Town of Adams will conduct a comprehensive assessment of the stormwater management system, stormwater management practices, and development of review and management measures. This assessment will identify specific locations or discharges contributing to stormwater problems, identify needed improvements to Adams' stormwater management practices, and identify improvements to Adams' development control measures. A comprehensive stormwater managmentplan will be prepared by the Town with the goal of improving water quality in the Hoosic River and removal of specific segments of the Hoosic River from the 303(d) list of impaired waters. Project deliverables include identifying, mapping, and evaluating the stormwater system, conducting an assessment of the stream network to identify problems, preparing a QAPP and conducting a water quality monitoring program to identify "hot" spots, and preparing conceptual remediation designs and strategies.

104(b) (3) WETLANDS AND WATER QUALITY GRANT PROGRAM

http://www.mass.gov/dep/water/grants.htm

This grant program is authorized under the wetlands and Clean Water Act Section 104(b)(3) of the federal Clean Water Act. The water quality proposals received by DEP under this National Environmental Performance Partnership Agreement (NEPPA) with the U.S. Environmental Protection Agency is a results oriented approach that will focus attention on environmental protection goals and the efforts to achieve them. The goals of the NEPPA are to: 1) achieve clean air, 2) achieve clean water, 3) protect wetlands, 4) reduce waste generation, and 5) cleanup waste sites.

No 104(b) (3) Projects have been awarded in the Hudson River Basin.

319 NONPOINT SOURCE GRANT PROGRAM

This grant program is authorized under Section 319 of the CWA for implementation projects that address the prevention, control, and abatement of nonpoint source (NPS) pollution. In order to be considered eligible for funding projects must: implement measures that address the prevention, control, and abatement of NPS pollution; target the major source(s) of nonpoint source pollution within a watershed/subwatershed; have a 40 percent non-federal match of the total project cost (match funds must meet the same eligibility criteria as the federal funds); contain an appropriate method for evaluating the project results; address activities that are identified in the Massachusetts NPS Management Program Plan.

There have been no 319 projects funded in the Hudson River Basin.

MASSACHUSETTS WATERSHED INITIATIVE PROJECTS

http://www.mass.gov/dep/water/priorities/priorities.htm

The Massachusetts Watershed Initiative is a broad partnership of state and federal agencies, conservation organizations, businesses, municipal officials and individuals that protects and restores natural resources and ecosystems on a watershed basis. The primary goals of the Watershed Initiative are to: improve water quality; restore natural flows to rivers; protect and restore habitats; improve public access and balanced resource use; improve local capacity to protect water resources; and, promote shared responsibility for watershed protection and management. Projects funded under the MWI include hydrologic and water quality monitoring and assessment, habitat assessment, nonpoint source assessment, hydrologic modeling, open space and growth planning, technical assistance and outreach.

- *99-10/MWI Hudson and Housatonic Watersheds Stormwater Assessment Project.* This project will identify and assess the extent of stormwater problems in the Hudson and Housatonic River

Basins and identify potential solutions or projects for remediation. Assessment activities in the Hudson Basin will focus on identifying vulnerable subwatersheds.

- *01-12/MWI Hudson and Housatonic Watersheds Team Laboratory Services.* This project will provide laboratory services to the Hudson and Housatonic Watershed Teams for selected chemical and bacteriological constituents (including total phosphorus, and total and fecal coliform bacteria) on river and lake samples collected by volunteers.
- *02-09/MWI Hudson River Watershed Water Quality Monitoring Program.* This project will conduct water quality monitoring in the Massachusetts portion of the Hoosic River Watershed to identify water quality issues and concerns and recommend remedial actions. Project deliverables include the preparation of a QAPP, conducting wet and dry weather water quality surveys, and preparing a final report including an Action Plan.
- *03-16/MWI.* This project will conduct water quality monitoring in the Massachusetts portion of the Hoosic River Watershed to identify water quality issues and concerns and recommend remedial actions. Project deliverables include the preparation of a QAPP, conducting wet and dry weather water quality surveys, and preparing a final report including an Action Plan.

SOURCE WATER AND TECHNICAL ASSISTANCE/LAND MANAGEMENT GRANT PROGRAM

http://www.mass.gov/dep/water/othergrt.htm

The Source Water Protection Technical Assistance/Land Management Grant Program provides funds to *third party* technical assistance organizations that assist public water suppliers in protecting local and regional ground and surface drinking water supplies. There are no source water and technical assistance/land management grants awarded in the Hudson River Basin.

WELLHEAD PROTECTION GRANT PROGRAM

http://www.mass.gov/dep/water/othergrt.htm

The Wellhead Protection Grant Program provides funds to assist public water suppliers in addressing wellhead protection through local projects and education.

- *00-11/WHP Cheshire Wellhead Protection Project* This project will create a public education and outreach program, update the Emergency Action Plan, supplement the existing Wellhead Protection Plan, install wellhead protection fencing to prevent unauthorized access to the Town of Cheshire's wellfield.

CLEAN WATER STATE REVOLVING LOAN FUND (SRF) PROGRAM

http://www.mass.gov/dep/water/wastewater/cwsrf.htm

The Massachusetts State Revolving Loan Fund for water pollution abatement projects was established to provide a low-cost funding mechanism to assist municipalities seeking to comply with federal and state water quality requirements. The SRF Program is jointly administered by the Division of Municipal Services of the MassDEP and the Massachusetts Water Pollution Abatement Trust. Each year the MassDEP solicits projects from the Massachusetts municipalities and wastewater districts to be considered for subsidized loans, which are currently offered at 50% grant equivalency (approximates a two percent interest loan). The SRF Program now provides increased emphasis on watershed management priorities. A major goal of the SRF Program is to provide incentives to communities to undertake projects with meaningful water quality and public health benefits and which address the needs of the communities and the watershed. Recent SRF projects specific to the Hudson River Basin include:

- 04 1971 Hoosac Water Quality District Long Term WWTF improvements

MASSACHUSETTS DRINKING WATER STATE REVOLVING FUND PROGRAM

http://www.mass.gov/dep/water/wastewater/dwsrf.htm

The Massachusetts Drinking Water State Revolving Fund (DWSRF) provides low-cost financing to help

community public water suppliers comply with federal and state drinking water requirements. The DWSRF Program's goals are to protect public health and strengthen compliance with drinking water requirements, while addressing the Commonwealth's drinking water needs. The Program incorporates affordability and watershed management priorities. The DWSRF Program is jointly administered by the Division of Municipal Services of the Department of Environmental Protection and the Massachusetts Water Pollution Abatement Trust (Trust). The current subsidy level is equivalent to a 50% grant, which approximates a two percent interest loan. The Program will initially operate with approximately $50 million in financing capacity. For calendar years 1999 through 2003, up to $400 million may be available through the loan program.

- None in the Hudson Watershed in 2004

TITLE 5

Under the Title 5 Program, the Commonwealth has developed three programs to assist homeowners with wastewater management problems. The Homeowner Septic Loan Program provides low interest loans to homeowners to upgrade systems that will not pass Title 5 inspections. The Comprehensive Community Septic Management Program provides betterment loans to communities to target known or suspected failures or to develop a community-wide management plan. The third option allows homeowners to claim tax credits for septic upgrades. Additional information about the Title 5 Program is available online from the MassDEP website http://www.mass.gov/dep/water/laws/regulati.htm#t5regs. In the Hudson River Basin, no towns have participated in the Comprehensive Community Septic Management Program (Cabral 2005). However, Williamstown and Lanesborough received money to help implement Title 5 regulations but the program was not implemented as a loan program.

References

Cabral, D. 2005. Personal Communication. FW Hoosic/Hudson Watershed Questions. E-mail from Mark Schlweeweiss, Masachusetts Department of Environmental Protection, Western Regional Office, Springfield, MA. Email to Katie O'Brian Clayton Massachusetts Department of Environmental Protection, Division of Watershed Management, Worcester, MA. Dated 7 December 2005.

APPENDIX H- 21E TIER CLASSIFIED SITES IN THE HUDSON RIVER BASIN

Table H1. MassDEP Bureau of Waste Site Cleanup 21E Tier Classified Oil and HAZMAT Sites in the Hudson River Basin as of 26 January 2005.

RTN	Name	Address	Town	Status
1-0011670	Mass Electric Co Substation	33 Columbia St	Adams	TIER1C
1-0012431	Harriman And West Airport Turbo Prop Tnk	State Rd	North Adams	TIER1B
1-0013277	Macdermid Graphic Arts	Harmony St	Adams	TIERII
1-0013281	No Location Aid	327 Ashland St	North Adams	TIERII
1-0000367	B&M Cole Avenue	Cole Ave	Williamstown	TIER1B
1-0014817	O'connell Oil Facility	483 Ashland St	North Adams	TIERII
1-0014164	No Location Aid	1490 North State Rd	Cheshire	TIER1D
1-0014382	No Location Aid	128 Union St	North Adams	TIERII
1-0012693	Pittsfield Courtesy Bus Company	Putnam Rd	Lanesborough	TIER1D
1-0014734	No Location Aid	13 Main St	Cheshire	TIER1C
1-0000122	Berkshire Tannery Fmr	Ashton Ave	North Adams	TIER1B
1-0010828	Pitchers Mound Pub	218 Ashland St	North Adams	TIERII
1-0010694	New England Electric	74 Brown St	North Adams	TIER1B
1-0013902	Cariddi Sales	506 State Rd	North Adams	TIER1B
1-0014753	No Location Aid	1 Ashton Ave	North Adams	TIER1B
1-0001061	Greylock Auto	708 State Rd	North Adams	TIER1C
1-0012511	Beaver Mill	189 Beaver St	North Adams	TIER1B
1-0000916	Nickliens Service Center	364 Main St	Williamstown	TIER1C
1-0012650	Adams Dpw	92 North Summer St	Adams	TIERII
1-0000126	American Annuity Grp Fmr Spelc	Brown St	North Adams	TIER1A
1-0000881	Walden Street Garage	51 Waldon St	North Adams	TIERII
1-0013554	Mt Greylock Admin Bldg	Rockwell Rd	Lanesborough	TIER1C
1-0014919	Former Sprague Electric Company	87 Marshall St	North Adams	TIERII
1-0000460	American Annuity Grp Fmr Spelc	87 Marshall St	North Adams	TIER1A

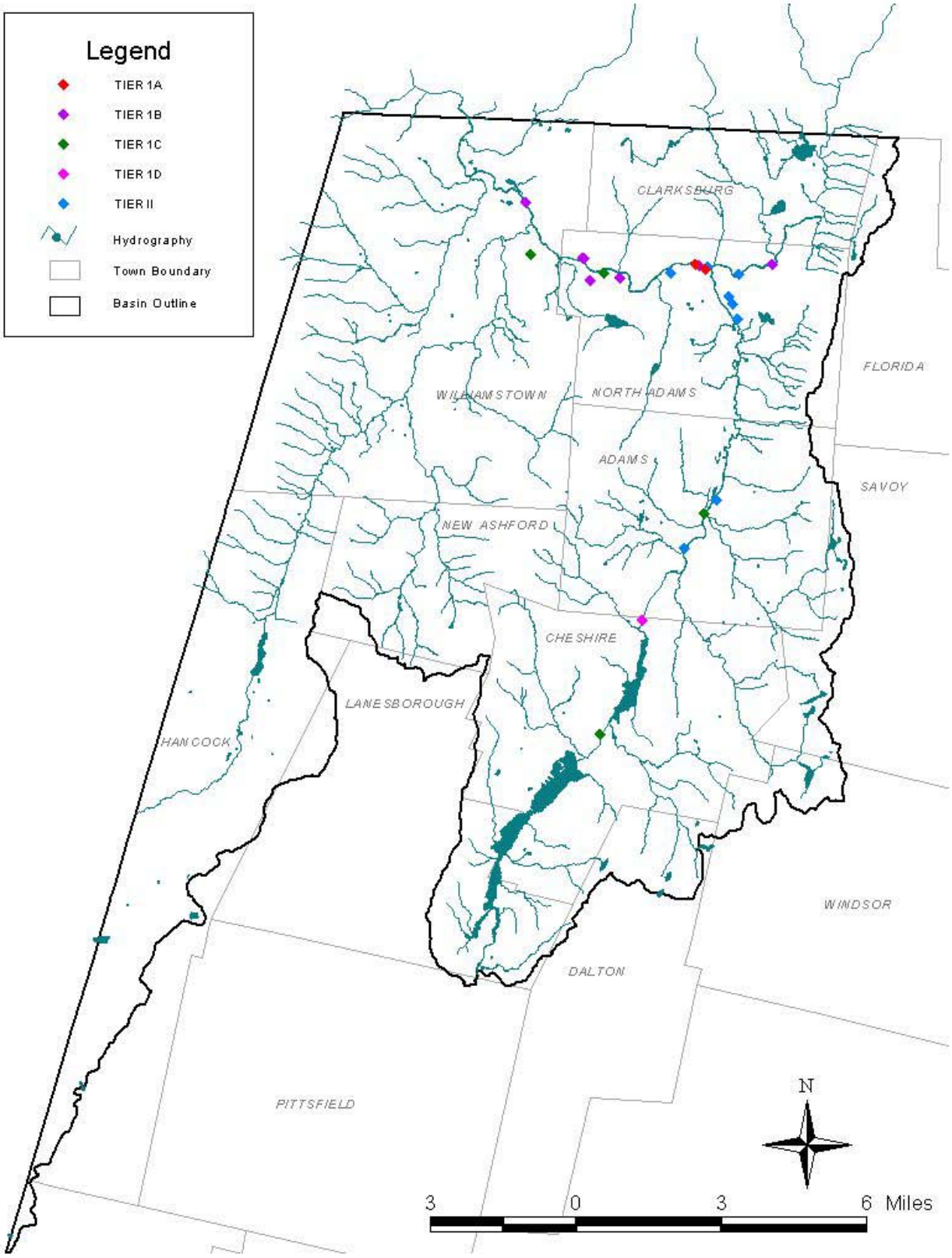

Figure H1. MassDEP Bureau of Waste Site Cleanup 21E Tier Classified Oil and HAZMAT Sites in the Hudson River Basin.

APPENDIX I- SOLID WASTE FACILITIES IN THE HUDSON RIVER BASIN

Table I1. MassDEP Bureau of Waste Prevention Solid Waste Landfill Facilities in the Hudson River Watershed

Site Name	Address	Town	CAPPED	LINER	Owner/Operator	STATUS	TONS/DAY	SUBWATERSHED
Williamstown Landfill (Phase I)	671 Simonds Rd (Rte 7)	Williamstown	Capped	Not Lined	Town Of Williamstown/ Williamstown DPW	Closed	49	MA11-05
Williamstown Transfer Station	671 Simonds Rd (Rte 7)	Williamstown			Town Of Williamstown/ Williamstown DPW			MA11-05
Williamstown Landfill (Phase II)	Simonds Rd (Rte 7)	Williamstown	Capped	Not Lined	Town Of Williamstown/ Williamstown DPW	Inactive	0	MA11-05
Cole Field Landfill	Stetson/Syndicate Rds	Williamstown	Capped 2006	Not Lined	Williamstown DPW /Williams College	Inactive	0	MA11-05
Clarksburg Landfill	West St	Clarksburg	Capped	Not Lined	Town Of Clarksburg	Closed	49	MA11-01
Cole Avenue Dump	Cole Ave	Williamstown	Not Capped	Not Lined	Harwood Moore	Inactive	0	MA11-05
Elm Street Dump	Elm St	Williamstown	Not Capped	Not Lined	Nelson Roberts	Inactive	0	MA11-06
Luce Road Dump	Luce Rd	Williamstown	Not Capped	Not Lined	Harwood Moore	Inactive	0	MA11-20
North Adams Landfill	E St	North Adams	Capped	Not Lined	City Of North Adams	Closed	40	MA11-04
North Adams Transfer Station	E St	North Adams			City Of North Adams	Active	80	MA11-04
Holland Co Sludge Landfill	South State St	North Adams	Not Capped, under Administrative Consent Order to cap or remove	Not Lined	Holland Company	Inactive	21	MA11-04
Powerline Mineral Sludge Landfill	Notch Rd (East)	Adams	Partially Capped	Not Lined	Specialty Minerals Inc	Active	600	MA11-04
Williamstown Dump	New Ashford Rd (Rte 7)	Williamstown	Not Capped	Not Lined	Williamstown DPW/ Hart Farm	Inactive	0	MA11-06
Adams Landfill	East Rd	Adams	Capped	Not Lined	Adams DPW / Town Of Adams	Closed	40	MA11-04
Adams Compost Site	East Rd	Adams			Town of Adams	Active		MA11-04
Dollar Farm Mineral Sludge Landfill	Notch Rd (West)	Adams	Capped	Not Lined	Specialty Minerals Inc	Closed	0	MA11-04
Hancock Landfill	Rte 43	Hancock	Capped	Not Lined	Town of Hancock	Inactive	0	MA11-22
Hancock Transfer Station	Rte 43	Hancock			Town of Hancock	Active	3	MA11-22
Cheshire Dump	Main St (Town Shed Rd)	Cheshire	Capped	Not Lined	Town Of Cheshire	Closed	0	MA11-03
Cheshire Landfill	Notch Rd	Cheshire	Inactive, graded and grassed, may not be capped	Not Lined	Cheshire DPW	Closed	0	MA11-15
Cheshire Transfer Station	Main Street (Town Shed)	Cheshire			Town of Cheshire/ Cheshire Board of Health	Active	1	MA11-03

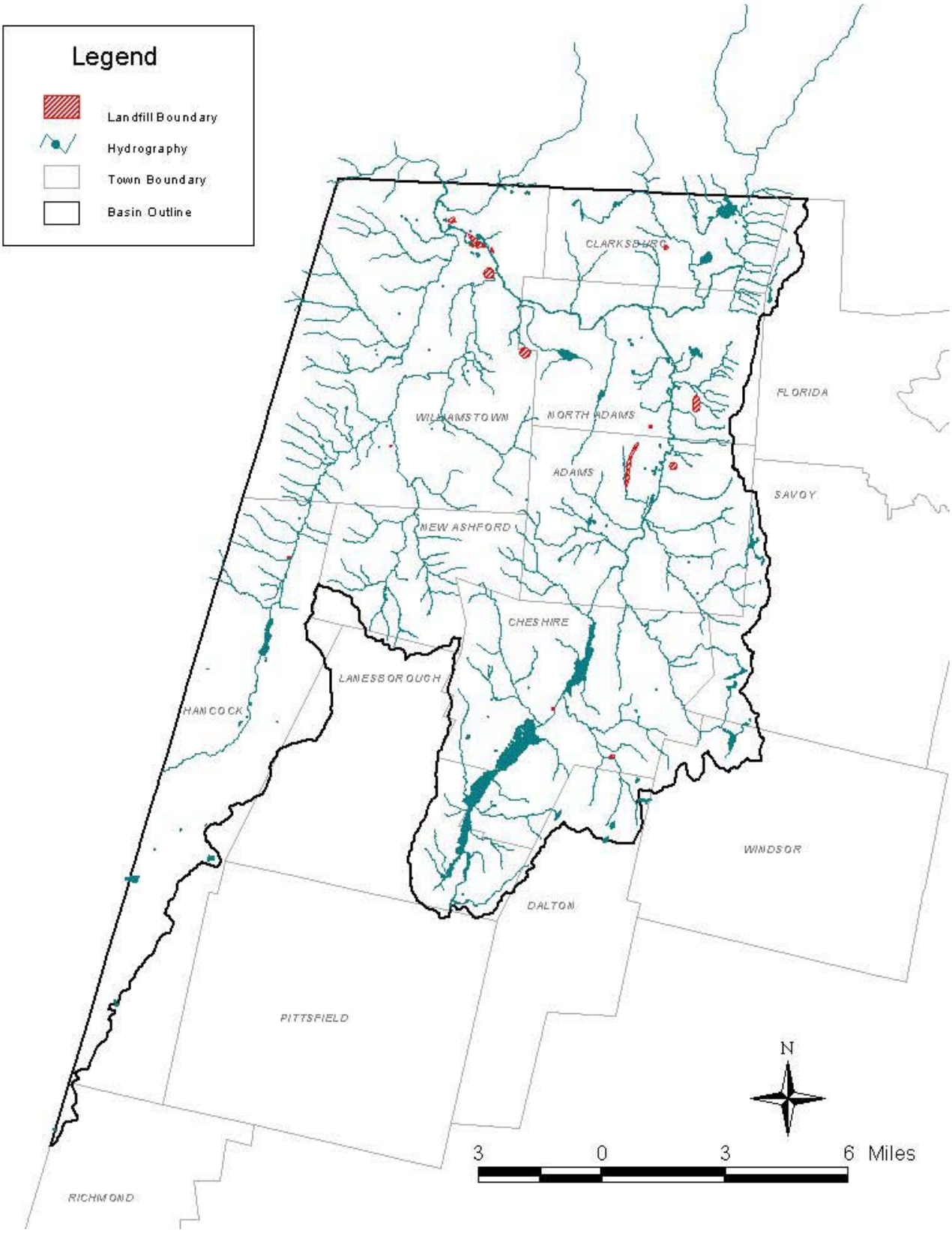

Figure I1. MassDEP Bureau of Waste Prevention Landfill Sites in the Hudson River Basin.