Technical Memorandum

TARGETED MONITORING PROGRAM 2011
DWM WATER QUALITY MONITORING DATA

February 2014

Division of Watershed Management
DWM Control Number CN 379.0

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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Introduction

The purpose of this technical memorandum is to publish water quality data collected in various watersheds (Blackstone, French, Millers, Quinebaug) within the central basin group as part of the Massachusetts Department of Environmental Protection (MassDEP), Division of Watershed Management (DWM) Targeted Monitoring Program (TMP) (MassDEP 2010). The water quality surveys were conducted between the months of April and September in 2011 and the collected water quality samples were analyzed for bacteria (*Escherichia coli*). Data collected in 2011 as part of the Reference Site Network (RSN) and the Massachusetts Probabilistic Monitoring and Assessment Program (MAP2) will be published in separate technical memoranda.

Project Objectives

The targeted water quality surveys included in this technical memorandum focused on 303(d) list development, specifically assessment segments listed in Category 5 for pathogens that have a potential of being delisted or for which an extended period of time had elapsed (>10 years) since they were last evaluated by DWM. The goal of the TMP in 2011 was to collect sufficient pathogen data at 26 sites on 12 assessment segments in the central basin group to determine whether or not the segments should remain on the 303(d) list. Additionally, the targeted water quality surveys included a limited bacteria source identification component at three sites in the Blackstone Watershed.

Additional information regarding project objectives may be found in: *Sampling and Analysis Plan 2011 Monitoring Central Basin Group* (MassDEP 2011a).

Sampling Plan

Water quality surveys were conducted approximately monthly from May through early October providing six sampling events at each site. Grab samples for *E. coli* were collected at a total of 26 stations. One additional sampling event for *E. coli* was conducted between May and September at some sites.

Table 1 and Figure 1 provide details and locations of the 2011 sampling sites. Additional information regarding the sampling design may be found in: *Sampling and Analysis Plan 2011 Monitoring Central Basin Group* (MassDEP 2011a).

Field and Analytical Methods

Procedures used for water quality sampling and sample handling are described in CN 1.21 - Sample Collection Techniques for DWM Surface Water Quality Monitoring (MassDEP 2004). The Wall Experiment Station (WES) supplied all sample bottles and field preservatives, which were prepared according to the WES Laboratory Quality Assurance Plan and Standard Operating Procedures (MassDEP 2001). Samples were delivered to the Senator William Wall Experiment Station (WES) or the DWM lab in Worcester for analysis. Both labs utilized the same Colilert analytical method (SM 9223B). A minimum of one duplicate and one blank sample per analyte was tested for QC for each sampling crew (10% of the samples).

Concurrent with the collection of water quality samples, site characteristics and sampling conditions were recorded on DWM field sheets. Riparian vegetation, observed uses (e.g. swimming, boating, fishing),

potential pollution sources, the presence/absence of objectionable deposits (trash, debris and scum), the extent of periphyton/algae/aquatic plant growth within the sampling reach, and sampling conditions were all noted at each station.

Quality Assurance (QA) and Quality Control (QC)

Quality assurance and quality control procedures used in collecting samples and measurements were consistent with the prevailing DWM protocols that are described in CN 1.21 - Sample Collection Techniques for DWM Surface Water Quality Monitoring (MassDEP 2004)

The DWM quality assurance and database management staff reviewed laboratory data reports. The data were validated and finalized per data validation procedures outlined in CN 56.15 - DWM Water Quality Data Validation Process (Summary) (MassDEP 2012b). All water quality sample data were validated by reviewing QC sample results, analytical holding time compliance, QC sample frequency and related ancillary data/documentation (at a minimum). A complete summary of the data review process for all 2011 DWM data is provided in CN 384.0 – Water Quality Data Validation Report for Year 2011 Project Data (MassDEP 2013). Appendix 1 of this technical memorandum contains definitions for all data qualifiers.

Table 1. MassDEP DWM targeted sampling site locations and descriptions.

Site ID	Unique ID	Description	Segment	Waterbody	Latitude	Longitude
MI202	W1311	[Route 202, Winchendon]	MA35-01	Millers River	42.67786	-72.06161
MR01	W2228	[Upstream Winchendon WWTP discharge, Winchendon]	MA35-01	Millers River	42.68591	-72.08295
MR02	W2229	[At end of Bearsden Road, Athol]	MA35-04	Millers River	42.62318	-72.18074
MI08	W0684	[Route 2A bridge, Athol]	MA35-04	Millers River	42.59281	-72.23911
MI07	W0683	[Daniel Shays Highway bridge, Athol]	MA35-04	Millers River	42.57593	-72.26064
MR03	W2230	[Off Roche Avenue, Orange]	MA35-04	Millers River	42.59084	-72.31495
MI05A	W0682	[Holtshire Road bridge, Orange]	MA35-04	Millers River	42.59816	-72.34135
M06	W0047	[immediately downstream of Route 202 bridge, Templeton]	MA35-08	Otter River	42.60661	-72.07580
M07	W0045	[abandoned RR bridge, Winchendon]	MA35-08	Otter River	42.63384	-72.09425
BB01	W0685	[Freight Shed Road (south of Route 68), Templeton/Phillipston]	MA35-09	Beaver Brook	42.60455	-72.12462
BB02	W2231	[Birch Hill Dam Road, Royalston]	MA35-09	Beaver Brook	42.62663	-72.14008
QR01	W0063	[Old Sturbridge Village access Road., Sturbridge]	MA41-01	Quinebaug River	42.11055	-72.09638
QR00	W0601	[Holland Road bridge, Sturbridge.]	MA41-01	Quinebaug River	42.10956	-72.11857
QR02	W2232	[East Brimfield Road, Holland]	MA41-01	Quinebaug River	42.07955	-72.15715
QR03	W2233	[East Brimfield Road, Brimfield]	MA41-01	Quinebaug River	42.10676	-72.14860
QR09	W0058	[at Dresser Hill Road bridge, Southbridge]	MA41-03	Quinebaug River	42.06739	-72.00776
QR04	W2234	[Off Route 131, Southbridge]	MA41-03	Quinebaug River	42.06022	-71.99851
CA03	W0065	[approximately 20 feeet upstream/north of Route 20 bridge, Charlton.]	MA41-05	Cady Brook	42.14486	-71.99381
FR01	W2235	[200 feet downstream of Brandon Road, Webster]	MA42-05	French River	42.04252	-71.88747
FR94-10	W0075	[downstream of the Perryville Dam, Webster]	MA42-06	French River	42.02470	-71.88418
KB09	W0511	[upstream/west of Auburn Street, Leicester. Wade in sample.]	MA51-01	Kettle Brook	42.23983	-71.87976
KB11	W2236	Rockland Street crossing, Auburn	MA51-01	Kettle Brook	42.21555	-71.83861
KB02	W0501	[Webster Street, Worcester]	MA51-20	Unnamed Tributary	42.23166	-71.83426
MD01	W2237	[Walmart bridge crossing, Worcester]	MA51-02	Middle River	42.23388	-71.79354
MD02	W2239	[1000 feet Downstream Mill Br. confluence with Blackstone, Worcester]	MA51-03	Blackstone River	42.23153	-71.79070
MB01	W2238	[Mill Brook outfall, Worcester]	MA51-08	Unnamed Tributary	42.23325	-71.79308

Figure 1. MassDEP DWM targeted sampling site locations.

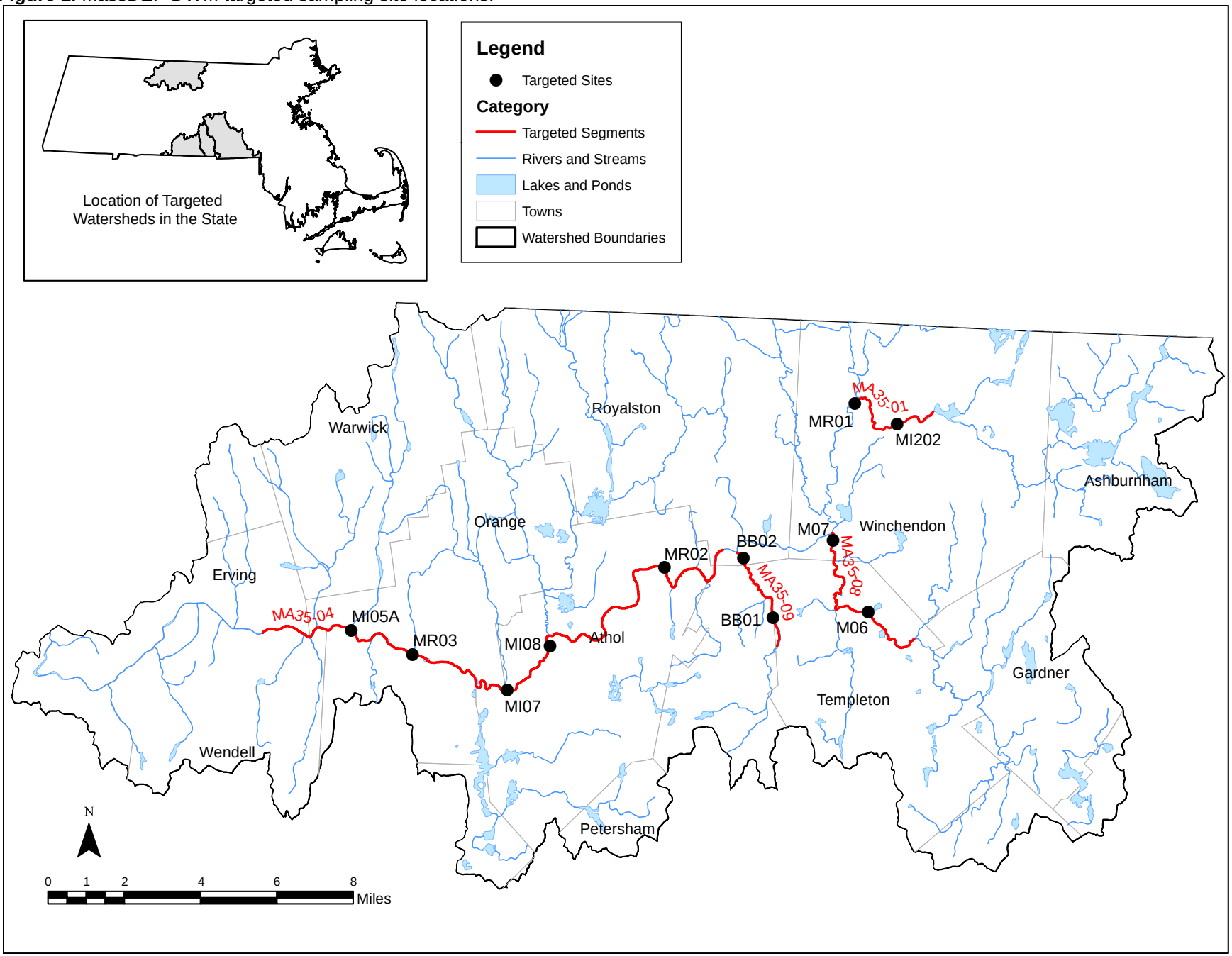
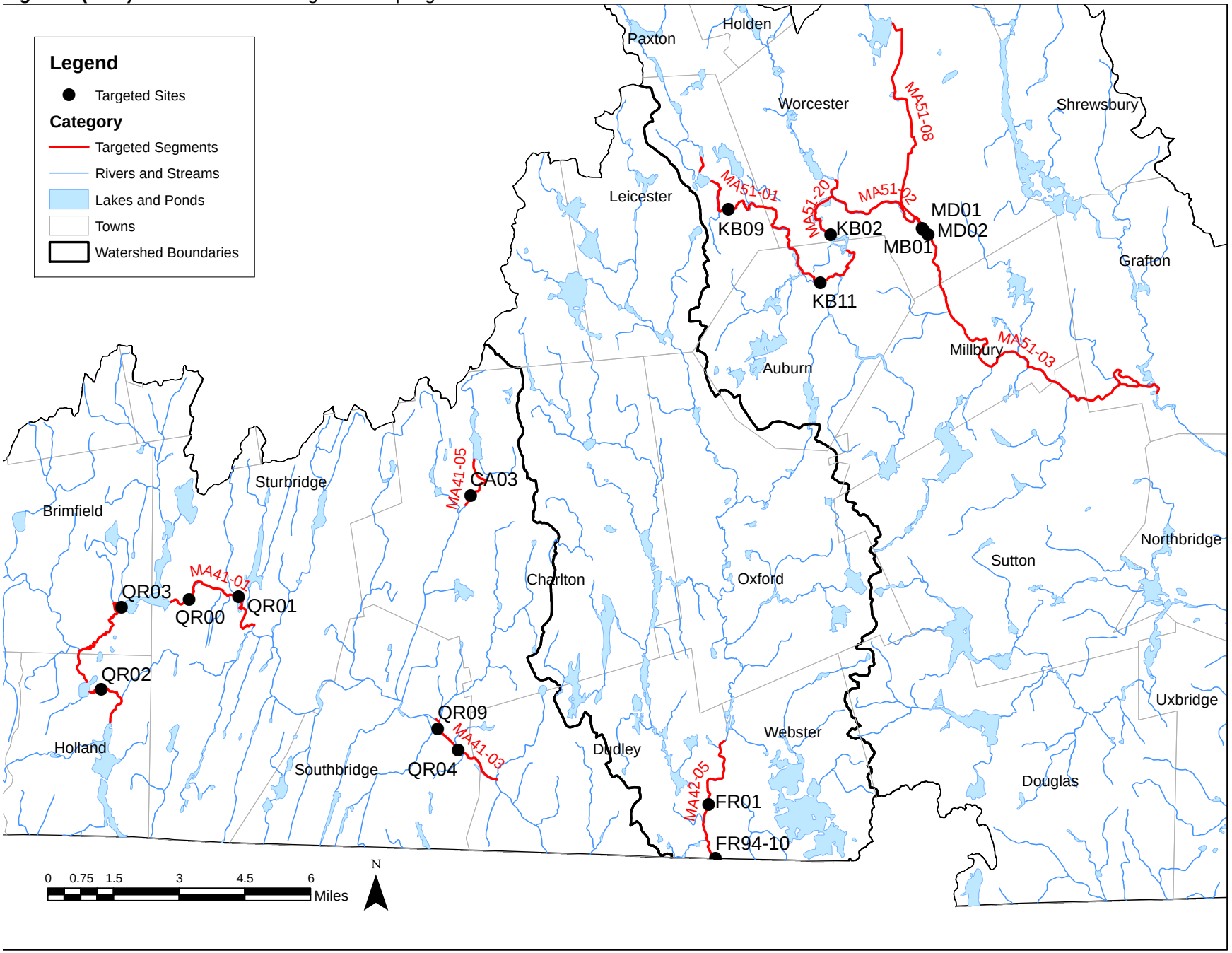


Figure 1 (cont). MassDEP DWM targeted sampling site locations.



Survey Conditions

Precipitation and stream discharge data were analyzed to estimate hydrological conditions during the targeted water quality surveys. Precipitation data collected during the survey period in 2011 were downloaded from the National Oceanic and Atmospheric Administration (NOAA), National Climatic Data Center (NCDC) for the Orange Municipal Airport (GHCND:USW00054756), Worcester Regional Airport (GHCND:USW00094746) and East Brimfield (GHCND:USC00192107) weather stations (NOAA 2014). The precipitation totals on the water quality survey dates and the five days prior to the survey dates were extracted from the records. In addition, the monthly precipitation totals for 2011 and the twenty-year monthly averages for the three weather stations were downloaded to determine if precipitation amounts in 2011 were above or below normal (Table 2).

Table 2. Total monthly precipitation in 2011 at weather stations near the sampling locations. The twenty-year monthly average precipitation totals for those stations are in parentheses (NOAA 2014).

Month	Orange Municipal Airport	Worcester Regional Airport	East Brimfield Lake
January	1.83 (2.72)	4.10 (3.49)	3.76 (3.73)
February	3.96 (2.65)	5.30 (3.23)	4.38 (3.29)
March	5.41 (3.48)	3.99 (4.21)	4.91 (4.32)
April	5.29 (3.32)	5.54 (4.11)	5.99 (4.35)
May	3.91 (3.84)	3.85 (4.19)	4.59 (3.77)
June	7.19 (4.43)	6.91 (4.19)	6.51 (3.95)
July	2.22 (4.13)	2.20 (4.23)	1.85 (3.85)
August	9.11 (3.55)	12.21 (3.71)	15.30 (3.79)
September	7.98 (3.55)	7.27 (3.93)	8.76 (3.79)
October	5.62 (3.79)	6.36 (4.68)	7.35 (4.52)
November	3.92 (3.88)	4.27 (4.28)	4.32 (4.25)
December	5.11 (3.21)	5.15 (3.82)	5.14 (4.08)
Total	61.6 (42.6)	67.2 (48.1)	72.9 (47.7)

Stream discharge data from three real-time United States Geological Survey (USGS) stream gage stations (Table 3) were downloaded from the USGS (USGS 2014a). In addition, the 7Q10 for each gage station was downloaded from the USGS website and included in Table 3 (USGS 2014b). The entire period of record for each station was downloaded and the average daily discharge values on the water quality survey dates and the five days prior to the survey dates were extracted from these records. The percent of time that the average daily discharge on the extracted dates was equaled or exceeded during the entire period of record for the gage was calculated to put the discharge value into historical perspective. The precipitation and discharge data are summarized and presented in Table 4.

Table 3. USGS gage stations used to estimate the hydrological conditions at the sampling locations and the estimated 7Q10 flows for each gage. (USGS 2014a) (USGS 2014b).

Station Name	Location	Period of Record	7Q10 (cfs)	Remarks
01166500 Millers River at Erving, MA	42° 35'51" 72° 26'19"	1915 to 2014	46.8	Flow regulated by powerplants and by Lake Monomonac and other reservoirs; high flow regulated by Birch Hill Reservoir 22 mi upstream since 1941 and Tully Lake since 1948. Greater regulation by powerplants prior to 1966.
01123600 Quinebaug River near Southbridge, MA	42° 04'58" 72° 03'27"	1962 to 2014	10.4	Flow regulated by mills, by East Brimfield and Westville Lakes, and by other reservoirs upstream.
01109730 Blackstone River at Millbury, MA	42°11'20" 71°45'56"	2002 to 2014	NA	Flows affected by effluent releases from Upper Blackstone Waste-Water Treatment Plant located approximately 2.5 mi upstream from gage. High flows may include diversion flood flows through Kettle Brook diversion system with mouth located approximately 2.0 mi upstream from gage.

Table 4. The precipitation totals (inches) and daily average discharge (cubic feet per second) for the survey date and five days prior to the survey date (USGS 2014a) (NOAA 2014).

Note: The percent of time that the daily average discharge was equaled or exceeded over the entire period of record at each stream gage are also provided (percent exceeded). Survey dates are shaded in the table.

	Precipitation			Discharge		
Date	Orange Municipal Airport	Worcester Regional Airport	East Brimfield Lake	01166500 Millers River at Erving	01123600 Quinebaug River near Southbridge	01109730 Blackstone River at Millbury
04/30/11	0.00	0.00	0.00	1180 (16)	307 (17)	187 (33)
05/01/11	0.00	0.00	0.00	1040 (19)	397 (10)	175 (36)
05/02/11	0.00	0.00	0.00	941 (21)	419 (9)	166 (39)
05/03/11	0.00	0.00	0.00	821 (25)	283 (20)	159 (41)
05/04/11	0.49	0.34	0.00	760 (28)	222 (28)	169 (38)
05/05/11	0.07	0.03	0.24	784 (27)	206 (31)	167 (39)
05/14/11	0.14	0.06	0.00	382 (53)	126 (50)	120 (56)
05/15/11	1.20	1.31	0.35	445 (48)	163 (39)	300 (14)
05/16/11	0.05	0.40	0.75	899 (23)	244 (25)	287 (15)
05/17/11	0.58	0.38	0.80	1140 (16)	304 (17)	254 (20)
05/18/11	0.41	0.23	0.86	1400 (12)	477 (7)	272 (17)
05/19/11	0.60	0.35	0.34	1530 (10)	651 (4)	298 (14)
06/04/11	0.00	0.00	0.00	442 (48)	179 (36)	194 (31)
06/05/11	0.00	0.01	0.00	349 (57)	161 (40)	160 (41)

Table 4. The precipitation totals (inches) and daily average discharge (cubic feet per second) for the survey date and five days prior to the survey date (USGS 2014a) (NOAA 2014).

Note: The percent of time that the daily average discharge was equaled or exceeded over the entire period of record at each stream gage are also provided (percent exceeded). Survey dates are shaded in the table.

	Precipitation			Discharge		
Date	Orange Municipal Airport	Worcester Regional Airport	East Brimfield Lake	01166500 Millers River at Erving	01123600 Quinebaug River near Southbridge	01109730 Blackstone River at Millbury
06/06/11	0.00	0.00	0.00	302 (61)	144 (45)	142 (47)
06/07/11	0.00	0.00	0.00	267 (66)	129 (49)	130 (52)
06/08/11	0.00	0.00	0.00	259 (67)	117 (52)	125 (54)
06/09/11	0.93	0.40	0.27	270 (65)	121 (51)	161 (41)
06/15/11	0.35	0.00	0.06	449 (48)	265 (22)	147 (46)
06/16/11	0.01	0.00	0.52	415 (51)	252 (24)	132 (51)
06/17/11	0.63	0.28	0.03	380 (54)	221 (28)	154 (43)
06/18/11	0.00	0.00	0.34	404 (51)	217 (29)	134 (51)
06/19/11	0.01	0.00	0.00	358 (56)	196 (33)	120 (56)
06/20/11	0.00	0.00	0.00	310 (61)	175 (37)	109 (62)
07/01/11	0.00	0.00	0.00	652 (33)	223 (28)	144 (47)
07/02/11	0.00	0.00	0.00	534 (41)	187 (34)	129 (53)
07/03/11	0.11	0.02	0.00	468 (46)	159 (41)	118 (57)
07/04/11	0.00	0.00	0.01	411 (51)	135 (47)	112 (60)
07/05/11	0.00	0.00	0.00	332 (58)	123 (51)	105 (64)
07/06/11	0.24	0.22	0.00	304 (61)	108 (55)	99 (68)
07/07/11	0.00	0.00	0.32	333 (58)	101 (58)	100 (67)
07/16/11	0.00	0.00	0.00	151 (82)	70 (69)	76 (81)
07/17/11	0.00	0.00	0.00	143 (84)	58 (74)	73 (82)
07/18/11	0.32	0.04	0.00	148 (83)	53 (76)	73 (82)
07/19/11	0.00	0.00	0.07	138 (85)	51 (77)	69 (84)
07/20/11	0.00	0.00	0.00	123 (87)	49 (78)	68 (85)
07/21/11	0.00	0.00	0.00	113 (89)	46 (80)	68 (85)
07/23/11	0.31	0.00	0.00	107 (90)	40 (84)	66 (86)
07/24/11	0.01	0.00	0.02	105 (91)	38 (85)	72 (83)
07/25/11	0.62	0.35	0.02	110 (90)	38 (85)	80 (79)
07/26/11	0.10	0.07	0.40	144 (84)	42 (83)	85 (76)
07/27/11	0.01	0.00	0.20	124 (87)	45 (81)	73 (82)
07/28/11	0.00	0.00	0.00	139 (85)	43 (82)	65 (87)
08/20/11	0.00	0.00	0.00	325 (59)	199 (32)	137 (49)
08/21/11	0.39	0.04	0.00	271 (65)	164 (39)	123 (55)
08/22/11	0.05	0.01	0.11	270 (65)	131 (48)	116 (58)
08/23/11	0.00	0.00	0.01	289 (63)	104 (57)	100 (67)
08/24/11	0.00	0.00	0.00	268 (66)	86 (63)	106 (64)

Table 4. The precipitation totals (inches) and daily average discharge (cubic feet per second) for the survey date and five days prior to the survey date (USGS 2014a) (NOAA 2014).

Note: The percent of time that the daily average discharge was equaled or exceeded over the entire period of record at each stream gage are also provided (percent exceeded). Survey dates are shaded in the table.

	Precipitation			Discharge		
Date	Orange Municipal Airport	Worcester Regional Airport	East Brimfield Lake	01166500 Millers River at Erving	01123600 Quinebaug River near Southbridge	01109730 Blackstone River at Millbury
08/25/11	0.13	1.27	0.00	256 (67)	89 (62)	181 (34)
08/26/11	0.01	0.00	1.84	516 (42)	222 (28)	272 (17)
08/27/11	1.14	0.54	0.00	427 (49)	257 (23)	279 (16)
08/28/11	3.17	3.81	3.01	2020 (6)	784 (3)	1840 (0.3)
08/29/11	0.00	0.00	2.94	1830 (7)	1130 (1)	967 (1)
09/10/11	0.00	0.00	0.00	2890 (2)	1190 (1)	574 (3)
09/11/11	0.01	0.00	0.00	2440 (3)	1170 (1)	405 (7)
09/12/11	0.00	0.00	0.02	1950 (6)	1090 (1)	326 (11)
09/13/11	0.00	0.00	0.00	1540 (10)	982 (1)	279 (16)
09/14/11	0.03	0.00	0.00	1160 (16)	854 (2)	241 (21)
09/15/11	0.10	0.31	0.50	901 (23)	750 (3)	243 (21)
09/23/11	1.27	0.85	0.07	633 (34)	223 (28)	207 (28)
09/24/11	0.08	0.27	1.38	1260 (14)	362 (12)	435 (6)
09/25/11	0.00	0.00	0.00	1550 (10)	356 (13)	277 (16)
09/26/11	0.01	0.00	0.00	1420 (11)	326 (15)	232 (23)
09/27/11	0.01	0.00	0.00	1130 (17)	294 (18)	207 (28)
09/28/11	0.31	0.16	0.00	1000 (20)	270 (21)	191 (32)
10/07/11	0.00	0.00	0.00	1520 (10)	304 (17)	201 (29)
10/08/11	0.00	0.00	0.00	1230 (14)	298 (18)	175 (36)
10/09/11	0.01	0.00	0.00	984 (20)	280 (20)	155 (43)
10/10/11	0.01	0.00	0.00	855 (24)	236 (26)	148 (45)
10/11/11	0.00	0.00	0.00	744 (29)	221 (28)	148 (45)
10/12/11	0.02	0.06	0.00	667 (33)	211 (30)	149 (45)

Station Observations

Station observations were recorded on field sheets for each survey by a DWM investigator. Station observations are described below in Table 5 for each sampling event (MassDEP 2011b).

Water Quality Data

All MassDEP DWM water quality data are managed and maintained in the Water Quality Data Access Database (WQD). Tables 6 – 7 below provide the 2011 water quality data. The procedures used to accept, accept with qualification, or censor data are based on the DWM Standard Operating Procedures (SOP) for data validation and usability (MassDEP 2012b), and are in addition to separate quality

assurance activities and laboratory validation steps undertaken by WES. Definitions for the data qualifiers are provided in Appendix 1.

Table 5. 2011 Field observations from MassDEP DWM surveys.
S=sparse (0-25%, M=moderate (25-50%), D=dense (50-75%), VD=very dense (75-100%), N=none, U=unobservable, NR=not recorded, NP=not applicable – probe deploy field sheet) (MassDEP 2011)

Station ID	Unique ID	Date	Odor	Water Clarity	Color	Aquatic Plants	Filamentous Algae	Film Algae	Loose Floc	Moss	Floating Scum	Floating Scum Comments	Objectionable Deposits	Objectionable Deposit Comments
BB01	W0685	05/19/11	None	Clear	Light Yellow	N	S	N	N	N	No		No	
BB01	W0685	06/20/11	None	Clear	Light Yellow	S	N	N	N	D	No		Yes	trash, single coffee cup
BB01	W0685	07/06/11	None	Clear	Light Yellow	S	N	N	N	M	No		No	
BB01	W0685	07/28/11	None	Clear	Light Yellow	N	N	N	N	D	No		No	
BB01	W0685	08/25/11	None	Clear	Brownish	S	N	N	N	M	No		No	
BB01	W0685	09/28/11	None	Clear	Dark Tan	S	N	N	N	S	Yes	foam, natural	No	
BB02	W2231	05/19/11	None	U	Light Yellow	U	U	U	U	U	Yes	Foam	No	
BB02	W2231	06/20/11	None	Clear	Light Yellow	S	U	U	U	U	No		No	
BB02	W2231	07/06/11	None	Clear	Reddish	S	N	N	N	NR	No		No	
BB02	W2231	07/28/11	None	Slightly Turbid	Light Yellow	S	N	N	D	N	Yes	algal mat	No	
BB02	W2231	08/25/11	None	Clear	Dark Tan	S	N	N	N	D	No		No	
BB02	W2231	09/28/11	None	Clear	Dark Tan	U	U	U	U	U	Yes	foam, natural	U	
CA03	W0065	05/05/11	None	Clear	Clear	N	S	N	N	N	No		No	
CA03	W0065	06/09/11	Musty	Slightly Turbid	Light Yellow	N	N	S	N	N	No		Yes	Trash
CA03	W0065	07/07/11	None	Clear	Light Yellow	N	N	N	N	N	No		No	
CA03	W0065	07/21/11	None	Clear	Clear	N	N	S	N	N	No		No	
CA03	W0065	08/11/11	None	Clear	Light Yellow	N	N	N	N	N	Yes	foam	No	
CA03	W0065	08/29/11	None	Slightly Turbid	Light Yellow	U	U	U	U	U	Yes	foam, natural	U	

Table 5. 2011 Field observations from MassDEP DWM surveys.
S=sparse (0-25%, M=moderate (25-50%), D=dense (50-75%), VD=very dense (75-100%), N=none, U=unobservable, NR=not recorded, NP=not applicable – probe deploy field sheet) (MassDEP 2011)

Station ID	Unique ID	Date	Odor	Water Clarity	Color	Aquatic Plants	Filamentous Algae	Film Algae	Loose Floc	Moss	Floating Scum	Floating Scum Comments	Objectionable Deposits	Objectionable Deposit Comments
CA03	W0065	09/15/11	None	Clear	Clear	N	N	N	N	N	Yes	foam, some foam	No	
CA03	W0065	10/12/11	None	Slightly Turbid	Light Yellow	N	N	N	D	N	Yes	foam	No	
FR01	W2235	05/05/11	None	Clear	Light Yellow	NR	NR	NR	NR	NR	Yes	foam, natural	No	
FR01	W2235	06/09/11	None	Clear	Light Yellow	N	N	N	N	N	No		No	
FR01	W2235	07/07/11	None	Slightly Turbid	Light Yellow	N	N	N	N	N	No		No	
FR01	W2235	07/21/11	None	Clear	Clear	N	N	M	N	M	Yes	foam, natural	No	
FR01	W2235	08/11/11	NR	Slightly Turbid	NR	U	U	U	U	U	Yes	foam, natural	No	
FR01	W2235	08/29/11	None	Clear	Clear	U	U	U	U	U	Yes	foam	U	
FR01	W2235	09/15/11	None	Clear	Clear	U	U	U	U	U	No		Yes	trash, trash/debris along banks, broken glass
FR01	W2235	10/12/11	None	Clear	Light Yellow	N	N	N	N	N	Yes	foam, natural	No	
FR94-10	W0075	05/05/11	None	Clear	Clear	NR	NR	NR	NR	NR	Yes	foam	No	
FR94-10	W0075	06/09/11	Musty	Clear	Light Yellow	S	U	U	U	U	Yes	foam, natural	U	
FR94-10	W0075	07/07/11	Musty	Clear	Light Yellow	S	N	N	N	N	Yes	foam	No	
FR94-10	W0075	07/21/11	Pond	Slightly Turbid	Light Yellow	S	N	N	VD	N	Yes	foam	Yes	trash, 5% of area, tires etc.
FR94-10	W0075	08/11/11	None	Moderately Turbid	Light Yellow	U	U	U	U	U	Yes	foam-natural from impoundment	U	
FR94-10	W0075	08/29/11	Effluent (Treated)	Moderately Turbid	Light Yellow	U	U	U	U	U	Yes	foam	No	

Table 5. 2011 Field observations from MassDEP DWM surveys.
S=sparse (0-25%, M=moderate (25-50%), D=dense (50-75%), VD=very dense (75-100%), N=none, U=unobservable, NR=not recorded, NP=not applicable – probe deploy field sheet) (MassDEP 2011)

Station ID	Unique ID	Date	Odor	Water Clarity	Color	Aquatic Plants	Filamentous Algae	Film Algae	Loose Floc	Moss	Floating Scum	Floating Scum Comments	Objectionable Deposits	Objectionable Deposit Comments
FR94-10	W0075	09/15/11	None	Clear	Light Yellow	U	U	U	U	U	Yes	foam, turbulent, lots of foam, probably natural, really high flows	U	
FR94-10	W0075	10/12/11	Pond	Clear	Light Yellow	U	N	N	M	N	Yes	foam, natural	No	
KB02	W0501	05/05/11	None	Slightly Turbid	Light Yellow	S	N	M	N	N	Yes	pollen/dust blankets, foam, natural	No	
KB02	W0501	06/09/11	Fishy	Clear	Light Yellow	N	N	N	N	N	Yes	foam, seems natural	No	
KB02	W0501	07/07/11	NR	Slightly Turbid	Light Yellow	N	N	N	M	N	No		Yes	trash
KB02	W0501	07/21/11	Pond	Slightly Turbid	Clear	N	S	VD	VD	N	No		No	
KB02	W0501	08/11/11	None	Slightly Turbid	Clear	N	N	N	VD	N	Yes	pollen/dust blankets, foam	Yes	trash, minor
KB02	W0501	08/29/11	None	Moderately Turbid	Light Yellow	U	U	U	U	U	Yes	foam	U	
KB02	W0501	09/15/11	None	Clear	Clear	U	U	U	U	U	Yes	foam (lots of foam)	Yes	trash, some trash along banks
KB02	W0501	10/12/11	Pond	Slightly Turbid	Light Yellow	N	N	N	VD	N	Yes	foam	No	
KB09	W0511	05/05/11	None	Clear	Clear	N	M	N	N	N	No		No	
KB09	W0511	06/09/11	None	Clear	Light Yellow	N	N	Box	N	S	No		No	
KB09	W0511	07/07/11	None	Clear	Light Yellow	N	S	N	N	S	No		No	
KB09	W0511	07/21/11	None	Clear	Clear	N	N	M	S	N	Yes	foam, foam in quiet area	No	
KB09	W0511	08/11/11	None	Clear	Clear	N	N	N	N	VD	No		No	

Table 5. 2011 Field observations from MassDEP DWM surveys.
S=sparse (0-25%, M=moderate (25-50%), D=dense (50-75%), VD=very dense (75-100%), N=none, U=unobservable, NR=not recorded, NP=not applicable – probe deploy field sheet) (MassDEP 2011)

Station ID	Unique ID	Date	Odor	Water Clarity	Color	Aquatic Plants	Filamentous Algae	Film Algae	Loose Floc	Moss	Floating Scum	Floating Scum Comments	Objectionable Deposits	Objectionable Deposit Comments
KB09	W0511	08/29/11	None	Slightly Turbid	Light Yellow	U	U	U	U	U	Yes	foam	U	
KB09	W0511	09/15/11	None	Clear	Clear	N	N	S	N	M	Yes	foam, very little	No	
KB09	W0511	10/12/11	None	Clear	Light Yellow	N	N	N	N	M	No		No	
KB11	W2236	05/05/11	None	Clear	Clear	N	M	N	N	N	No		No	
KB11	W2236	06/09/11	None	Clear	Light Yellow	N	N	S	N	N	No		Yes	broken glass minimal
KB11	W2236	07/07/11	None	Clear	Light Yellow	N	N	N	N	N	No		No	
KB11	W2236	07/21/11	None	Clear	Clear	N	N	D	D	N	Yes	foam, natural	NR	
KB11	W2236	08/11/11	None	Slightly Turbid	Clear	N	N	N	N	N	Yes	foam, natural	No	
KB11	W2236	08/29/11	None	Moderately Turbid	Light Yellow	U	U	U	U	U	Yes	foam	U	
KB11	W2236	09/15/11	Musty	Clear	Clear	S	N	N	N	N	Yes	foam, very little	Yes	trash, a little
KB11	W2236	10/12/11	Musty	Slightly Turbid	Clear	N	N	N	M	N	Yes	foam	No	
M06	W0047	05/19/11	None	Slightly Turbid	Light Yellow	N	U	U	U	U	No		No	
M06	W0047	06/20/11	None	Clear	Light Yellow	U	U	U	U	U	No		Yes	Trash, metal scrap
M06	W0047	07/06/11	Musty	Slightly Turbid	Light Yellow	U	U	U	U	U	Yes	pollen/dust blankets, foam	No	
M06	W0047	07/28/11	Musty	Moderately Turbid	Light Yellow	N	U	U	U	U	No		U	
M06	W0047	08/25/11	None	Clear	Light Yellow	U	U	U	U	U	Yes	foam	No	
M06	W0047	09/28/11	Effluent (Treated)	Clear	Dark Tan	U	U	U	U	U	U		U	

Table 5. 2011 Field observations from MassDEP DWM surveys.
S=sparse (0-25%, M=moderate (25-50%), D=dense (50-75%), VD=very dense (75-100%), N=none, U=unobservable, NR=not recorded, NP=not applicable – probe deploy field sheet) (MassDEP 2011)

Station ID	Unique ID	Date	Odor	Water Clarity	Color	Aquatic Plants	Filamentous Algae	Film Algae	Loose Floc	Moss	Floating Scum	Floating Scum Comments	Objectionable Deposits	Objectionable Deposit Comments
M07	W0045	05/19/11	None	U	Light Yellow	U	U	U	U	U	No		No	
M07	W0045	06/20/11	None	Slightly Turbid	Light Yellow	U	U	U	U	U	No		No	
M07	W0045	07/06/11	Musty	Slightly Turbid	NR	S	N	N	N	N	No		No	
M07	W0045	07/28/11	None	U	Light Yellow	U	U	U	U	U	No		U	
M07	W0045	08/25/11	None	Clear	Light Yellow	U	U	U	U	U	No		No	
M07	W0045	09/28/11	None	Clear	Dark Tan	U	U	U	U	U	No		No	
MB01	W2238	05/05/11	NR	NR	NR	NR	NR	NR	NR	NR	NR		NR	
MB01	W2238	06/09/11	Petroleum	Moderately Turbid	Greyish	N	U	U	U	U	No		No	
MB01	W2238	07/07/11	Raw sewage, Petroleum	Moderately Turbid	Greyish	N	N	N	N	N	Yes	oily sheens	Yes	trash
MB01	W2238	07/21/11	None	Slightly Turbid	Greyish	N	N	D	D	N	Yes	oily sheens	No	
MB01	W2238	08/11/11	Chemical	Highly Turbid	Clear	U	U	U	U	U	Yes	oily sheens	No	
MB01	W2238	08/29/11	Petroleum	Highly Turbid	Clear	U	U	U	U	U	Yes	oily sheens	U	
MB01	W2238	09/15/11	Raw sewage	Highly Turbid	NR	U	U	U	U	U	Yes	gray water	NR	
MB01	W2238	10/12/11	Petroleum	Moderately Turbid	Greyish	U	U	U	U	U	Yes	oily sheens	U	
MD01	W2237	05/05/11	None	Slightly Turbid	Light Yellow	U	U	U	U	U	No		Yes	trash
MD01	W2237	06/09/11	None	Slightly Turbid	Light Yellow	N	U	U	U	U	No		Yes	trash, some limited trash/debris

Table 5. 2011 Field observations from MassDEP DWM surveys.
S=sparse (0-25%, M=moderate (25-50%), D=dense (50-75%), VD=very dense (75-100%), N=none, U=unobservable, NR=not recorded, NP=not applicable – probe deploy field sheet) (MassDEP 2011)

Station ID	Unique ID	Date	Odor	Water Clarity	Color	Aquatic Plants	Filamentous Algae	Film Algae	Loose Floc	Moss	Floating Scum	Floating Scum Comments	Objectionable Deposits	Objectionable Deposit Comments
MD01	W2237	07/07/11	Musty	Slightly Turbid	Light Yellow	N	N	N	N	N	No		Yes	trash
MD01	W2237	07/21/11	NR	Moderately Turbid	Greyish	N	N	N	VD	N	No		Yes	trash
MD01	W2237	08/11/11	None	Highly Turbid	Light Yellow	U	U	U	U	U	Yes	foam	Yes	trash
MD01	W2237	08/29/11	None	Slightly Turbid	Clear	U	U	U	U	U	Yes	foam	U	
MD01	W2237	09/15/11	NR	Clear	Clear	U	U	U	U	U	Yes	foam, slight foam	Yes	trash
MD01	W2237	10/12/11	Musty	Slightly Turbid	Light Yellow	N	N	N	M	N	Yes	foam	Yes	trash, minor
MD02	W2239	05/05/11	None	Slightly Turbid	Light Yellow	N	N	VD	N	N	No		Yes	trash
MD02	W2239	06/09/11	Petroleum, Musty	Slightly Turbid	Clear	N	N	N	N	S	No		No	
MD02	W2239	07/07/11	Musty	Slightly Turbid	Light Yellow	N	S	N	N	N	No		Yes	trash
MD02	W2239	07/21/11	None	Slightly Turbid	Greyish	N	N	VD	M	N	Yes	oily sheens	Yes	trash, old oil boom
MD02	W2239	08/11/11	None	Moderately Turbid	Clear	N	N	N	N	N	No		Yes	trash
MD02	W2239	08/29/11	None	Highly Turbid	Clear	U	U	U	U	U	No		Yes	trash, oil boom
MD02	W2239	09/15/11	Effluent (Treated), Musty	Slightly Turbid	Clear	N	U	U	U	U	Yes	foam, slight some	Yes	trash, trash hanging from everywhere
MD02	W2239	10/12/11	None	Slightly Turbid	NR	N	N	VD	N	N	Yes	foam	Yes	trash
MI05A	W0682	05/19/11	None	U	Light Yellow	U	U	U	U	U	No		U	
MI05A	W0682	06/20/11	None	Clear	Light Yellow	U	U	U	U	U	No		U	

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S=sparse (0-25%, M=moderate (25-50%), D=dense (50-75%), VD=very dense (75-100%), N=none, U=unobservable, NR=not recorded, NP=not applicable – probe deploy field sheet) (MassDEP 2011)

Station ID	Unique ID	Date	Odor	Water Clarity	Color	Aquatic Plants	Filamentous Algae	Film Algae	Loose Floc	Moss	Floating Scum	Floating Scum Comments	Objectionable Deposits	Objectionable Deposit Comments
MI05A	W0682	07/06/11	None	Clear	Light Yellow	S	N	N	N	D	Yes	foam, appears natural	No	
MI05A	W0682	07/28/11	None	Clear	Light Yellow	N	N	N	N	N	No		No	
MI05A	W0682	08/25/11	None	Slightly Turbid	Light Yellow	N	N	M	D	N	Yes	foam	No	
MI05A	W0682	09/28/11	None	Slightly Turbid	Light Yellow	U	U	U	U	U	Yes	foam	U	
MI07	W0683	05/19/11	None	U	Light Yellow	U	U	U	U	U	No		U	
MI07	W0683	06/20/11	None	Clear	Light Yellow	U	U	U	U	U	No		U	
MI07	W0683	07/06/11	None	Clear	Light Yellow	U	U	U	U	U	Yes	pollen/dust blankets, other (assorted natural debris)	No	
MI07	W0683	07/28/11	None	U	Light Yellow	U	U	U	U	U	Yes	pollen/dust blankets, minor	U	
MI07	W0683	08/25/11	None	Clear	Light Yellow	U	U	U	U	U	Yes	Other (leaves, twigs, etc)	No	
MI07	W0683	09/28/11	None	Slightly Turbid	Dark Tan	U	U	U	U	U	Yes	other (leaves)	U	
MI08	W0684	05/19/11	None	U	Light Yellow	U	U	U	U	U	Yes	Foam minimal	U	
MI08	W0684	06/20/11	NR	NR	NR	U	U	U	U	U	Yes	foam, natural (dissolved organic type)	No	
MI08	W0684	07/06/11	None	Clear	Brownish	U	U	U	U	U	No		No	
MI08	W0684	07/28/11	None	U	Light Yellow	U	U	U	U	U	No		U	
MI08	W0684	08/25/11	None	Clear	Light Yellow	U	U	U	U	U	Yes	foam	No	

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Station ID	Unique ID	Date	Odor	Water Clarity	Color	Aquatic Plants	Filamentous Algae	Film Algae	Loose Floc	Moss	Floating Scum	Floating Scum Comments	Objectionable Deposits	Objectionable Deposit Comments
MI08	W0684	09/28/11	None	Slightly Turbid	Dark Tan	U	U	U	U	U	Yes	foam, other (leaves)	U	
MI202	W1311	05/19/11	None	Clear	Light Yellow	N	N	S	N	N	No		No	
MI202	W1311	06/20/11	None	Clear	Light Yellow	NR	N	S	N	S	No		No	
MI202	W1311	07/06/11	Musty	Clear	Light Yellow	S	S	N	N	D	No		No	
MI202	W1311	07/28/11	None	Clear	Light Yellow	N	N	N	N	M	No		No	
MI202	W1311	08/25/11	None	Clear	Light Yellow	N	N	D	N	D	No		No	
MI202	W1311	09/28/11	None	Clear	Light Yellow	N	N	D	N	D	Yes	foam, aeration foam	No	
MR01	W2228	05/19/11	None	Clear	Reddish	N	N	N	N	N	No		No	
MR01	W2228	06/20/11	None	Clear	Light Yellow	S	U	U	U	U	No		No	
MR01	W2228	07/06/11	None	Clear	Light Yellow	S	N	S	S	N	Yes	foam, natural	No	
MR01	W2228	07/28/11	None	Clear	Light Yellow	S	N	N	S	N	No		No	
MR01	W2228	08/25/11	None	Clear	Light Yellow	S	N	N	N	M	No		No	
MR01	W2228	09/28/11	None	Clear	Dark Tan	U	U	U	U	U	Yes	foam, other (leaves)	U	
MR02	W2229	05/19/11	None	Slightly Turbid	Light Yellow	N	U	U	U	U	No		No	
MR02	W2229	06/20/11	None	Clear	Light Yellow	U	U	U	U	U	Yes	foam, slight normal (dissolved organic type)	No	

Table 5. 2011 Field observations from MassDEP DWM surveys.
S=sparse (0-25%, M=moderate (25-50%), D=dense (50-75%), VD=very dense (75-100%), N=none, U=unobservable, NR=not recorded, NP=not applicable – probe deploy field sheet) (MassDEP 2011)

Station ID	Unique ID	Date	Odor	Water Clarity	Color	Aquatic Plants	Filamentous Algae	Film Algae	Loose Floc	Moss	Floating Scum	Floating Scum Comments	Objectionable Deposits	Objectionable Deposit Comments
MR02	W2229	07/06/11	None	Clear	Light Yellow	U	U	U	U	U	Yes	pollen/dust blankets, foam, natural	No	
MR02	W2229	07/28/11	None	Clear	Light Yellow	N	U	U	U	U	No		No	
MR02	W2229	08/25/11	Musty	Clear	Light Yellow	U	U	U	U	U	Yes	foam	No	
MR02	W2229	09/28/11	None	Slightly Turbid	Dark Tan	U	U	U	U	U	Yes	foam, other (leaves)	U	
MR03	W2230	05/19/11	None	U	Light Yellow	U	U	U	U	U	No		U	
MR03	W2230	06/20/11	None	Clear	Light Yellow	U	U	U	U	U	Yes	foam, slight foam (dissolved organic type)	U	
MR03	W2230	07/06/11	None	Clear	Light Yellow	U	U	U	U	U	Yes	oily sheens, other- leaf debris, pine needles etc (natural), oil extensive in right bank appears natural, difficult to tell	No	
MR03	W2230	07/28/11	None	U	Light Yellow	U	U	U	U	U	Yes	pollen/dust blankets, minor	U	
MR03	W2230	08/25/11	None	Clear	Dark Tan	U	U	U	U	U	No		No	
MR03	W2230	09/28/11	None	Slightly Turbid	Dark Tan	U	U	U	U	U	No		U	
QR00	W0601	05/05/11	None	Clear	Light Yellow	N	S	N	N	N	No		No	

Table 5. 2011 Field observations from MassDEP DWM surveys.
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Station ID	Unique ID	Date	Odor	Water Clarity	Color	Aquatic Plants	Filamentous Algae	Film Algae	Loose Floc	Moss	Floating Scum	Floating Scum Comments	Objectionable Deposits	Objectionable Deposit Comments
QR00	W0601	06/09/11	Musty	Clear	Light Yellow	N	N	N	N	S	Yes	foam, natural marginal areas, pretty limited	No	
QR00	W0601	07/07/11	Musty	Slightly Turbid	Light Yellow	N	S	N	N	N	No		No	
QR00	W0601	07/21/11	NR	Slightly Turbid	Light Yellow	N	N	M	N	VD	Yes	foam in quiescent areas	No	
QR00	W0601	08/11/11	None	Slightly Turbid	Light Yellow	U	U	U	U	U	Yes	foam	No	
QR00	W0601	08/29/11	None	Moderately Turbid	Light Yellow	U	U	U	U	U	Yes	foam	U	
QR00	W0601	09/15/11	None	Clear	Light Yellow	U	U	U	U	U	Yes	foam	U	
QR00	W0601	10/12/11	None	Clear	Light Yellow	N	N	M	N	N	Yes	foam	No	
QR01	W0063	05/05/11	None	Clear	Light Yellow	N	N	N	N	N	No		No	
QR01	W0063	06/09/11	None	Clear	Light Yellow	S	U	U	U	U	No		No	
QR01	W0063	07/07/11	None	Slightly Turbid	Light Yellow	S	U	U	U	U	No		No	
QR01	W0063	07/21/11	None	Slightly Turbid	Light Yellow	N	N	D	N	M	Yes	Foam	No	
QR01	W0063	08/11/11	None	Slightly Turbid	NR	U	U	U	U	U	Yes	foam, other (pine needles etc)	No	
QR01	W0063	08/29/11	NR	Highly Turbid	Light Yellow	U	U	U	U	U	Yes	foam	U	
QR01	W0063	09/15/11	None	Clear	Light Yellow	U	U	U	U	U	Yes	foam	No	
QR01	W0063	10/12/11	None	Clear	Light Yellow	U	U	U	U	U	No		No	

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Station ID	Unique ID	Date	Odor	Water Clarity	Color	Aquatic Plants	Filamentous Algae	Film Algae	Loose Floc	Moss	Floating Scum	Floating Scum Comments	Objectionable Deposits	Objectionable Deposit Comments
QR02	W2232	05/05/11	None	Clear	Light Yellow	U	N	N	N	N	No		No	
QR02	W2232	06/09/11	None	Clear	Light Yellow	N	U	U	U	U	No		No	
QR02	W2232	07/07/11	None	Clear	Light Yellow	N	N	N	N	N	No		No	
QR02	W2232	07/21/11	None	Clear	NR	N	N	N	D	N	No		No	
QR02	W2232	08/11/11	None	Moderately Turbid	Light Yellow	U	U	U	U	U	Yes	foam, natural	No	
QR02	W2232	08/29/11	None	Slightly Turbid	Light Yellow	U	U	U	U	U	Yes	foam	U	
QR02	W2232	09/15/11	None	Clear	Clear	U	U	U	U	U	Yes	foam, slight amounts of foam natural	No	
QR02	W2232	10/12/11	None	Clear	Light Yellow	U	U	U	U	U	Yes	foam	No	
QR03	W2233	05/05/11	None	Clear	NR	S	M	N	N	N	No		No	
QR03	W2233	06/09/11	None	Clear	Light Yellow	U	U	U	U	U	No		No	
QR03	W2233	07/07/11	NR	Moderately Turbid	Brownish	S	U	U	U	U	No		No	
QR03	W2233	07/21/11	None	Clear	Light Yellow	M	M	N	N	D	No		No	
QR03	W2233	08/11/11	None	Clear	Light Yellow	M	N	M	S	D	No		No	
QR03	W2233	08/29/11	NR	NR	NR	U	U	U	U	U	No		U	
QR03	W2233	09/15/11	None	Clear	Clear	U	U	U	U	U	No		No	
QR03	W2233	10/12/11	None	Clear	Light Yellow	S	S	M	N	D	No		No	
QR04	W2234	05/05/11	None	Clear	Light Yellow	N	U	U	U	U	No		No	

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Station ID	Unique ID	Date	Odor	Water Clarity	Color	Aquatic Plants	Filamentous Algae	Film Algae	Loose Floc	Moss	Floating Scum	Floating Scum Comments	Objectionable Deposits	Objectionable Deposit Comments
QR04	W2234	06/09/11	None	Clear	Light Yellow	U	U	U	U	U	No		No	
QR04	W2234	07/07/11	None	Slightly Turbid	Brownish	N	U	U	U	U	No		No	
QR04	W2234	07/21/11	None	Slightly Turbid	Light Yellow	U	U	U	U	U	Yes	pollen/dust blankets, foam, natural	No	
QR04	W2234	08/11/11	None	Moderately Turbid	Light Yellow	U	U	U	U	U	Yes	natural	No	
QR04	W2234	08/29/11	None	Highly Turbid	NR	U	U	U	U	U	Yes	foam	U	
QR04	W2234	09/15/11	None	Clear	Clear	U	U	U	U	U	Yes	foam, some foam	No	
QR04	W2234	10/12/11	None	Slightly Turbid	Light Yellow	U	U	U	U	U	Yes	foam	Yes	trash, tires, garbage mainly on banks
QR09	W0058	05/05/11	Effluent (Treated)	Clear	Light Yellow	N	N	N	N	N	No		Yes	trash on banks, minor
QR09	W0058	06/09/11	None	Clear	Light Yellow	N	N	M	N	N	No		Yes	trash, car seat minor
QR09	W0058	07/07/11	Musty	Clear	Light Yellow	N	S	N	N	N	No		No	
QR09	W0058	07/21/11	Effluent (Treated)	Slightly Turbid	Light Yellow	N	N	VD	N	N	Yes	Foam (aeration)	No	
QR09	W0058	08/11/11	Effluent (Treated)	Slightly Turbid	Light Yellow	S	N	D	N	N	Yes	foam, natural	No	
QR09	W0058	08/29/11	None	Highly Turbid	NR	U	U	U	U	U	Yes	foam	U	
QR09	W0058	09/15/11	None	Clear	Clear	U	U	U	U	U	Yes	foam, not too bad but present	U	
QR09	W0058	10/12/11	None	Clear	NR	N	N	D	N	N	Yes	foam	Yes	trash, mostly on banks some trash in stream

Table 6. 2011 MassDEP DWM water quality data.

Station ID	Unique ID	Sample OWMID	Sample Date	Sample Time	Analyte	Units	Result	Result Qualifiers
BB01	W0685	14-0024	05/19/11	10:50	*E. coli*	MPN/100mL	37	
BB01	W0685	14-0054	06/20/11	11:23	*E. coli*	MPN/100mL	110	
BB01	W0685	14-0084	07/06/11	10:52	*E. coli*	MPN/100mL	54	
BB01	W0685	14-0114	07/28/11	10:45	*E. coli*	MPN/100mL	130	
BB01	W0685	14-0145	08/25/11	11:10	*E. coli*	MPN/100mL	16	d
BB01	W0685	14-0195	09/28/11	11:18	*E. coli*	MPN/100mL	32	
BB02	W2231	14-0023	05/19/11	10:45	*E. coli*	MPN/100mL	10	
BB02	W2231	14-0053	06/20/11	11:08	*E. coli*	MPN/100mL	55	
BB02	W2231	14-0083	07/06/11	10:33	*E. coli*	MPN/100mL	66	
BB02	W2231	14-0113	07/28/11	10:30	*E. coli*	MPN/100mL	81	
BB02	W2231	14-0144	08/25/11	10:58	*E. coli*	MPN/100mL	20	
BB02	W2231	14-0194	09/28/11	11:03	*E. coli*	MPN/100mL	68	
CA03	W0065	14-0011	05/05/11	10:31	*E. coli*	MPN/100mL	101	
CA03	W0065	14-0041	06/09/11	11:45	*E. coli*	MPN/100mL	461	a, m
CA03	W0065	14-0071	07/07/11	11:05	*E. coli*	MPN/100mL	101	
CA03	W0065	14-0101	07/21/11	11:38	*E. coli*	MPN/100mL	19	
CA03	W0065	14-0132	08/11/11	12:17	*E. coli*	MPN/100mL	**	
CA03	W0065	14-0163	08/29/11	12:11	*E. coli*	MPN/100mL	365	
CA03	W0065	14-0181	09/15/11	11:23	*E. coli*	MPN/100mL	74	
CA03	W0065	14-0212	10/12/11	11:06	*E. coli*	MPN/100mL	16	
FR01	W2235	14-0001	05/05/11	7:53	*E. coli*	MPN/100mL	30	
FR01	W2235	14-0031	06/09/11	8:45	*E. coli*	MPN/100mL	115	
FR01	W2235	14-0061	07/07/11	8:50	*E. coli*	MPN/100mL	51	
FR01	W2235	14-0091	07/21/11	8:45	*E. coli*	MPN/100mL	127	
FR01	W2235	14-0122	08/11/11	9:58	*E. coli*	MPN/100mL	**	
FR01	W2235	14-0153	08/29/11	9:42	*E. coli*	MPN/100mL	548	
FR01	W2235	14-0171	09/15/11	8:25	*E. coli*	MPN/100mL	64	
FR01	W2235	14-0202	10/12/11	8:46	*E. coli*	MPN/100mL	152	
FR12	W0075	14-0004	05/05/11	8:07	*E. coli*	MPN/100mL	34	
FR12	W0075	14-0034	06/09/11	9:15	*E. coli*	MPN/100mL	178	
FR12	W0075	14-0064	07/07/11	9:05	*E. coli*	MPN/100mL	62	
FR12	W0075	14-0094	07/21/11	8:56	*E. coli*	MPN/100mL	116	
FR12	W0075	14-0125	08/11/11	10:10	*E. coli*	MPN/100mL	**	
FR12	W0075	14-0156	08/29/11	9:58	*E. coli*	MPN/100mL	687	
FR12	W0075	14-0174	09/15/11	8:45	*E. coli*	MPN/100mL	49	
FR12	W0075	14-0205	10/12/11	8:58	*E. coli*	MPN/100mL	42	
KB02	W0501	14-0014	05/05/11	11:19	*E. coli*	MPN/100mL	88	
KB02	W0501	14-0044	06/09/11	12:55	*E. coli*	MPN/100mL	72	
KB02	W0501	14-0074	07/07/11	11:50	*E. coli*	MPN/100mL	27	
KB02	W0501	14-0104	07/21/11	12:32	*E. coli*	MPN/100mL	43	
KB02	W0501	14-0135	08/11/11	13:16	*E. coli*	MPN/100mL	**	
KB02	W0501	14-0166	08/29/11	13:07	*E. coli*	MPN/100mL	214	
KB02	W0501	14-0184	09/15/11	12:37	*E. coli*	MPN/100mL	102	
KB02	W0501	14-0215	10/12/11	11:51	*E. coli*	MPN/100mL	33	

Table 6. 2011 MassDEP DWM water quality data.

Station ID	Unique ID	Sample OWMID	Sample Date	Sample Time	Analyte	Units	Result	Result Qualifiers
KB09	W0511	14-0012	05/05/11	10:54	*E. coli*	MPN/100mL	68	
KB09	W0511	14-0042	06/09/11	12:20	*E. coli*	MPN/100mL	51	
KB09	W0511	14-0072	07/07/11	11:25	*E. coli*	MPN/100mL	105	
KB09	W0511	14-0102	07/21/11	12:06	*E. coli*	MPN/100mL	18	
KB09	W0511	14-0133	08/11/11	12:42	*E. coli*	MPN/100mL	**	
KB09	W0511	14-0164	08/29/11	12:37	*E. coli*	MPN/100mL	>2419.6	
KB09	W0511	14-0182	09/15/11	11:51	*E. coli*	MPN/100mL	58	
KB09	W0511	14-0213	10/12/11	11:30	*E. coli*	MPN/100mL	15	
KB11	W2236	14-0013	05/05/11	11:11	*E. coli*	MPN/100mL	387	
KB11	W2236	14-0043	06/09/11	12:40	*E. coli*	MPN/100mL	121	
KB11	W2236	14-0073	07/07/11	11:45	*E. coli*	MPN/100mL	126	
KB11	W2236	14-0103	07/21/11	12:23	*E. coli*	MPN/100mL	153	
KB11	W2236	14-0134	08/11/11	13:07	*E. coli*	MPN/100mL	**	
KB11	W2236	14-0165	08/29/11	12:54	*E. coli*	MPN/100mL	>2419.6	
KB11	W2236	14-0183	09/15/11	12:22	*E. coli*	MPN/100mL	178	
KB11	W2236	14-0214	10/12/11	11:44	*E. coli*	MPN/100mL	114	
M06	W0047	14-0027	05/19/11	11:10	*E. coli*	MPN/100mL	43	
M06	W0047	14-0057	06/20/11	11:42	*E. coli*	MPN/100mL	94	
M06	W0047	14-0087	07/06/11	11:18	*E. coli*	MPN/100mL	48	
M06	W0047	14-0117	07/28/11	11:05	*E. coli*	MPN/100mL	110	
M06	W0047	14-0148	08/25/11	11:31	*E. coli*	MPN/100mL	67	
M06	W0047	14-0198	09/28/11	11:39	*E. coli*	MPN/100mL	55	
M07	W0045	14-0028	05/19/11	11:35	*E. coli*	MPN/100mL	110	
M07	W0045	14-0058	06/20/11	12:07	*E. coli*	MPN/100mL	93	
M07	W0045	14-0088	07/06/11	11:47	*E. coli*	MPN/100mL	97	
M07	W0045	14-0118	07/28/11	11:30	*E. coli*	MPN/100mL	110	p
M07	W0045	14-0149	08/25/11	11:52	*E. coli*	MPN/100mL	72	
M07	W0045	14-0199	09/28/11	12:18	*E. coli*	MPN/100mL	61	
MB01	W2238	14-0017	05/05/11	**	*E. coli*	--	**	
MB01	W2238	14-0047	06/09/11	13:28	*E. coli*	MPN/100mL	>2419.6	
MB01	W2238	14-0077	07/07/11	12:20	*E. coli*	MPN/100mL	>2419.6	
MB01	W2238	14-0107	07/21/11	12:58	*E. coli*	MPN/100mL	>2419.6	
MB01	W2238	14-0138	08/11/11	13:45	*E. coli*	MPN/100mL	**	
MB01	W2238	14-0169	08/29/11	13:34	*E. coli*	MPN/100mL	>2419.6	
MB01	W2238	14-0187	09/15/11	13:10	*E. coli*	MPN/100mL	10110	
MB01	W2238	14-0218	10/12/11	12:24	*E. coli*	MPN/100mL	>2419.6	
MD01	W2237	14-0015	05/05/11	11:38	*E. coli*	MPN/100mL	488	
MD01	W2237	14-0045	06/09/11	13:15	*E. coli*	MPN/100mL	225	
MD01	W2237	14-0075	07/07/11	12:05	*E. coli*	MPN/100mL	866	
MD01	W2237	14-0105	07/21/11	12:51	*E. coli*	MPN/100mL	132	
MD01	W2237	14-0136	08/11/11	13:36	*E. coli*	MPN/100mL	**	
MD01	W2237	14-0167	08/29/11	13:28	*E. coli*	MPN/100mL	687	
MD01	W2237	14-0185	09/15/11	13:01	*E. coli*	MPN/100mL	921	
MD01	W2237	14-0216	10/12/11	12:13	*E. coli*	MPN/100mL	308	
MD02	W2239	14-0016	05/05/11	11:48	*E. coli*	MPN/100mL	2420	

Table 6. 2011 MassDEP DWM water quality data.

Station ID	Unique ID	Sample OWMID	Sample Date	Sample Time	Analyte	Units	Result	Result Qualifiers
MD02	W2239	14-0046	06/09/11	13:40	*E. coli*	MPN/100mL	1120	
MD02	W2239	14-0076	07/07/11	12:30	*E. coli*	MPN/100mL	>2419.6	
MD02	W2239	14-0106	07/21/11	13:09	*E. coli*	MPN/100mL	1730	
MD02	W2239	14-0137	08/11/11	13:53	*E. coli*	MPN/100mL	**	
MD02	W2239	14-0168	08/29/11	13:43	*E. coli*	MPN/100mL	>2419.6	
MD02	W2239	14-0186	09/15/11	13:27	*E. coli*	MPN/100mL	>2419.6	
MD02	W2239	14-0219	10/12/11	12:33	*E. coli*	MPN/100mL	1300	
MI05A	W0682	14-0018	05/19/11	9:05	*E. coli*	MPN/100mL	450	
MI05A	W0682	14-0048	06/20/11	9:13	*E. coli*	MPN/100mL	73	
MI05A	W0682	14-0078	07/06/11	8:38	*E. coli*	MPN/100mL	43	
MI05A	W0682	14-0121	07/28/11	8:50	*E. coli*	MPN/100mL	49	
MI05A	W0682	14-0139	08/25/11	9:22	*E. coli*	MPN/100mL	60	
MI05A	W0682	14-0189	09/28/11	9:19	*E. coli*	MPN/100mL	55	
MI07	W0683	14-0020	05/19/11	9:40	*E. coli*	MPN/100mL	49	
MI07	W0683	14-0050	06/20/11	9:50	*E. coli*	MPN/100mL	120	
MI07	W0683	14-0080	07/06/11	9:18	*E. coli*	MPN/100mL	86	
MI07	W0683	14-0110	07/28/11	9:20	*E. coli*	MPN/100mL	67	
MI07	W0683	14-0141	08/25/11	9:48	*E. coli*	MPN/100mL	55	
MI07	W0683	14-0191	09/28/11	9:50	*E. coli*	MPN/100mL	16	
MI08	W0684	14-0021	05/19/11	9:50	*E. coli*	MPN/100mL	68	
MI08	W0684	14-0051	06/20/11	10:03	*E. coli*	MPN/100mL	61	
MI08	W0684	14-0081	07/06/11	9:32	*E. coli*	MPN/100mL	26	
MI08	W0684	14-0111	07/28/11	9:35	*E. coli*	MPN/100mL	81	
MI08	W0684	14-0142	08/25/11	10:03	*E. coli*	MPN/100mL	270	
MI08	W0684	14-0192	09/28/11	10:09	*E. coli*	MPN/100mL	49	
MI202	W1311	14-0030	05/19/11	12:15	*E. coli*	MPN/100mL	37	
MI202	W1311	14-0060	06/20/11	12:56	*E. coli*	MPN/100mL	210	
MI202	W1311	14-0090	07/06/11	12:41	*E. coli*	MPN/100mL	81	
MI202	W1311	14-0120	07/28/11	12:10	*E. coli*	MPN/100mL	94	
MI202	W1311	14-0151	08/25/11	12:41	*E. coli*	MPN/100mL	42	
MI202	W1311	14-0201	09/28/11	13:00	*E. coli*	MPN/100mL	66	
MR01	W2228	14-0029	05/19/11	12:05	*E. coli*	MPN/100mL	26	
MR01	W2228	14-0059	06/20/11	12:38	*E. coli*	MPN/100mL	54	
MR01	W2228	14-0089	07/06/11	12:22	*E. coli*	MPN/100mL	42	
MR01	W2228	14-0119	07/28/11	12:00	*E. coli*	MPN/100mL	54	
MR01	W2228	14-0150	08/25/11	12:31	*E. coli*	MPN/100mL	73	
MR01	W2228	14-0200	09/28/11	12:47	*E. coli*	MPN/100mL	43	
MR02	W2229	14-0022	05/19/11	10:30	*E. coli*	MPN/100mL	55	
MR02	W2229	14-0052	06/20/11	10:50	*E. coli*	MPN/100mL	67	
MR02	W2229	14-0082	07/06/11	10:11	*E. coli*	MPN/100mL	38	
MR02	W2229	14-0112	07/28/11	10:10	*E. coli*	MPN/100mL	60	
MR02	W2229	14-0143	08/25/11	10:38	*E. coli*	MPN/100mL	26	
MR02	W2229	14-0193	09/28/11	10:45	*E. coli*	MPN/100mL	43	
MR03	W2230	14-0019	05/19/11	9:20	*E. coli*	MPN/100mL	130	
MR03	W2230	14-0049	06/20/11	9:27	*E. coli*	MPN/100mL	98	

Table 6. 2011 MassDEP DWM water quality data.

Station ID	Unique ID	Sample OWMID	Sample Date	Sample Time	Analyte	Units	Result	Result Qualifiers
MR03	W2230	14-0079	07/06/11	8:56	*E. coli*	MPN/100mL	270	
MR03	W2230	14-0109	07/28/11	9:10	*E. coli*	MPN/100mL	61	
MR03	W2230	14-0140	08/25/11	9:34	*E. coli*	MPN/100mL	60	
MR03	W2230	14-0190	09/28/11	9:33	*E. coli*	MPN/100mL	59	
QR00	W0601	14-0008	05/05/11	9:20	*E. coli*	MPN/100mL	8	
QR00	W0601	14-0038	06/09/11	10:40	*E. coli*	MPN/100mL	5	
QR00	W0601	14-0068	07/07/11	10:15	*E. coli*	MPN/100mL	9	
QR00	W0601	14-0098	07/21/11	10:11	*E. coli*	MPN/100mL	7	
QR00	W0601	14-0129	08/11/11	11:25	*E. coli*	MPN/100mL	**	
QR00	W0601	14-0160	08/29/11	11:17	*E. coli*	MPN/100mL	196	
QR00	W0601	14-0178	09/15/11	10:15	*E. coli*	MPN/100mL	19	
QR00	W0601	14-0209	10/12/11	10:03	*E. coli*	MPN/100mL	26	
QR01	W0063	14-0007	05/05/11	9:10	*E. coli*	MPN/100mL	18	
QR01	W0063	14-0037	06/09/11	10:25	*E. coli*	MPN/100mL	50	
QR01	W0063	14-0067	07/07/11	10:05	*E. coli*	MPN/100mL	84	
QR01	W0063	14-0097	07/21/11	9:59	*E. coli*	MPN/100mL	84	
QR01	W0063	14-0128	08/11/11	11:15	*E. coli*	MPN/100mL	**	
QR01	W0063	14-0159	08/29/11	11:05	*E. coli*	MPN/100mL	248	
QR01	W0063	14-0177	09/15/11	10:00	*E. coli*	MPN/100mL	20	
QR01	W0063	14-0208	10/12/11	9:51	*E. coli*	MPN/100mL	17	
QR02	W2232	14-0009	05/05/11	9:50	*E. coli*	MPN/100mL	8	
QR02	W2232	14-0039	06/09/11	11:00	*E. coli*	MPN/100mL	112	
QR02	W2232	14-0069	07/07/11	10:35	*E. coli*	MPN/100mL	35	
QR02	W2232	14-0099	07/21/11	10:42	*E. coli*	MPN/100mL	51	
QR02	W2232	14-0130	08/11/11	11:42	*E. coli*	MPN/100mL	**	
QR02	W2232	14-0161	08/29/11	11:42	*E. coli*	MPN/100mL	365	
QR02	W2232	14-0179	09/15/11	10:30	*E. coli*	MPN/100mL	13	
QR02	W2232	14-0210	10/12/11	10:19	*E. coli*	MPN/100mL	11	
QR03	W2233	14-0010	05/05/11	10:00	*E. coli*	MPN/100mL	119	
QR03	W2233	14-0040	06/09/11	11:20	*E. coli*	MPN/100mL	276	
QR03	W2233	14-0070	07/07/11	10:45	*E. coli*	MPN/100mL	125	
QR03	W2233	14-0100	07/21/11	11:10	*E. coli*	MPN/100mL	140	
QR03	W2233	14-0131	08/11/11	11:53	*E. coli*	MPN/100mL	**	
QR03	W2233	14-0162	08/29/11	**	*E. coli*	MPN/100mL	**	
QR03	W2233	14-0180	09/15/11	10:47	*E. coli*	MPN/100mL	291	
QR03	W2233	14-0211	10/12/11	10:46	*E. coli*	MPN/100mL	34	
QR04	W2234	14-0005	05/05/11	8:36	*E. coli*	MPN/100mL	120	
QR04	W2234	14-0035	06/09/11	9:40	*E. coli*	MPN/100mL	687	
QR04	W2234	14-0065	07/07/11	9:30	*E. coli*	MPN/100mL	308	
QR04	W2234	14-0095	07/21/11	9:24	*E. coli*	MPN/100mL	687	
QR04	W2234	14-0126	08/11/11	10:39	*E. coli*	MPN/100mL	**	
QR04	W2234	14-0157	08/29/11	10:30	*E. coli*	MPN/100mL	770	
QR04	W2234	14-0175	09/15/11	9:20	*E. coli*	MPN/100mL	138	
QR04	W2234	14-0206	10/12/11	9:23	*E. coli*	MPN/100mL	99	
QR09	W0058	14-0006	05/05/11	8:45	*E. coli*	MPN/100mL	99	

Table 6. 2011 MassDEP DWM water quality data.

Station ID	Unique ID	Sample OWMID	Sample Date	Sample Time	Analyte	Units	Result	Result Qualifiers
QR09	W0058	14-0036	06/09/11	9:55	*E. coli*	MPN/100mL	980	
QR09	W0058	14-0066	07/07/11	9:40	*E. coli*	MPN/100mL	276	
QR09	W0058	14-0096	07/21/11	9:32	*E. coli*	MPN/100mL	727	
QR09	W0058	14-0127	08/11/11	10:49	*E. coli*	MPN/100mL	**	
QR09	W0058	14-0158	08/29/11	10:40	*E. coli*	MPN/100mL	727	
QR09	W0058	14-0176	09/15/11	9:34	*E. coli*	MPN/100mL	219	
QR09	W0058	14-0207	10/12/11	9:32	*E. coli*	MPN/100mL	119	

Table 7. Geometric mean* of the 2011 *E. coli* results for each MassDEP DWM sampling station.

Station ID	Unique ID	Segment ID	Sample Count	Geometric Mean (CFU/100 ml)
MI202	W1311	MA35-01	6	74.0
MR01	W2228	MA35-01	6	46.4
MI05A	W0682	MA35-04	6	78.2
MI07	W0683	MA35-04	6	55.7
MI08	W0684	MA35-04	6	69.8
MR02	W2229	MA35-04	6	45.9
MR03	W2230	MA35-04	6	95.2
M06	W0047	MA35-08	6	65.5
M07	W0045	MA35-08	6	88.5
BB01	W0685	MA35-09	6	49.5
BB02	W2231	MA35-09	6	39.8
QR00	W0601	MA41-01	7	15.8
QR01	W0063	MA41-01	7	47.4
QR02	W2232	MA41-01	7	36.3
QR03	W2233	MA41-01	6	133.6
QR04	W2234	MA41-03	7	292.6
QR09	W0058	MA41-03	7	323.3
CA03	W0065	MA41-05	7	87.3
FR01	W2235	MA42-05	7	102.5
FR94-10	W0075	MA42-06	7	93.3
KB09	W0511	MA51-01	7	75.4
KB11	W2236	MA51-01	7	238.8
MD01	W2237	MA51-02	7	423.6
MD02	W2239	MA51-03	7	1890.6
MB01	W2238	MA51-08	6	3070.8
KB02	W0501	MA51-20	7	65.7

*The detection limit or the upper quantification limit was used in the geometric mean calculation if the result was either below the detection limit or above the upper quantification limit. Results from duplicate samples were removed before completing the geometric mean calculation.

References

MassDEP. 2001. *Laboratory Quality Assurance Plan and Standard Operating Procedures*. Massachusetts Department of Environmental Protection, Division of Environmental Analysis, Senator William X. Wall Experiment Station. Lawrence, MA.

MassDEP. 2004. CN 1.21 - *Sample Collection Techniques for DWM Surface Water Quality Monitoring SOP.* December 2004. Massachusetts Department of Environmental Protection, Division of Watershed Management. Worcester, MA.

MassDEP. 2010. CN 365.0 - *QUALITY ASSURANCE PROGRAM PLAN, Surface Water Monitoring & Assessment, MassDEP-Division of Watershed Management, 2010-2014*. June 2010. Massachusetts Department of Environmental Protection, Division of Watershed Management. Worcester, MA.

MassDEP. 2011a. CN 380.0 - *SAMPLING & ANALYSIS PLAN 2011 MONITORING CENTRAL BASIN GROUP*. February 2011. Massachusetts Department of Environmental Protection, Division of Watershed Management. Worcester, MA.

MassDEP. 2011b. Open File. DWM Water quality river field sheets 2011. Massachusetts Department of Environmental Protection, Division of Watershed Management. Worcester, MA.

MassDEP. 2012a. CN 334.0 – *2011 DWM Environmental Monitoring Overview*. August 2012. Massachusetts Department of Environmental Protection, Division of Watershed Management. Worcester, MA.

MassDEP. 2012b. CN 56.15 - *DWM Water Quality Data Validation Process (Summary).* May 2012. Massachusetts Department of Environmental Protection, Division of Watershed Management. Worcester, MA.

MassDEP. 2013. CN 384.0 – *WATER QUALITY DATA VALIDATION REPORT for Year 2011 Project Data.* November 2013. Massachusetts Department of Environmental Protection, Division of Watershed Management. Worcester, MA.

NOAA. 2014. [Online]. *Precipitation Data.* January 2014. National Oceanic and Atmospheric Administration, National Climatic Data Center. Asheville, NC. http://www.ncdc.noaa.gov/oa/ncdc.html

USGS. 2014a. [Online]. *Discharge Data from Real-time Gage Stations.* January 2014. United States Geological Service. Reston, VA. http://www.usgs.gov/

USGS. 2014b. [Online]. *USGS Station Statistics.* January 2014. United States Geological Service. Reston, VA. http://water.usgs.gov/osw/streamstats/

APPENDIX 1: 2011 DATA SYMBOLS AND QUALIFIERS

Excerpted from: Water Quality Data Validation Report for Year 2011 Project Data (CN 384.0)

The following data qualifiers or symbols are used in the MADEP/DWM WQD database for qualified and censored water quality and multi-probe data. Decisions regarding censoring vs. qualification for specific, problematic data are made based on a thorough review of all pertinent information related to the data. Data qualifiers reported by laboratories are typically either directly-transferable to DWM data (e.g., "H" for holding time violation) or indirectly-transferable, where the qualifier symbol is transformed to conform to DWM's qualifier list (e.g., "R" qualifier used by a lab to reject data due to poor QC results is transformed to "a").

General Symbols (applicable to all types):

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

" ** " = Missing data (i.e., data that should have been reported).

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

" ^^ " = No data due to no water

Multi-probe-specific Qualifiers:

" i " = inaccurate readings from Multi-probe likely; may be due to significant pre-survey calibration problems, post-survey checks outside typical acceptance ranges for the low ionic and deionized water checks, 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.

" m " = method not followed; one or more protocols contained in the DWM Multi-probe SOP not followed, ie. operator error (e.g., less than 3 readings per station (rivers) or per depth (lakes), or instrument failure not allowing method to be implemented.

" s " = field sheet recorded data were used to accept data, not data electronically recorded in the Multi-probe surveyor unit, due to operator error or equipment failure.

" u " = unstable readings, due to lack of sufficient equilibration time prior to final readings, non-representative location, highly-variable water quality conditions, etc. See Section 4.1 for acceptance criteria.

" c " = greater than calibration standard used for pre-calibration, or outside the acceptable range about the calibration standard. Typically used for conductivity (>718, 1,413, 2,760, 6,668 or 12,900 uS/cm) or turbidity (>10, 20 or 40 NTU). It can also be used for TDS and Salinity calculations based on qualified ("c") conductivity data, or that the calculation was not possible due to censored conductivity data (TDS and Salinity are calculated values and entirely based on conductivity reading). See Section 4.1 for acceptance criteria.

" r " = data not representative of actual field conditions.

" t " = tidal conditions

Sample-Specific Qualifiers:

" a " = accuracy as estimated at WES Lab via matrix spikes, PT sample recoveries, internal check standards and lab-fortified blanks did not meet project data quality objectives identified for program or in QAPP.

" b " = blank Contamination in lab reagent 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.

" 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.

" f " = frequency of quality control duplicates did not meet data quality objectives identified for program or in QAPP.

" h " = holding time violation (usually indicating possible bias low)

" 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.

" m " = method SOP not followed, only partially implemented or not implemented at all, due to complications with sample matrix (e.g., sediment in sample, floc formation), lab error (e.g., cross-contamination between samples), additional steps taken by the lab to deal with matrix complications, lost/unanalyzed samples, and missing data.

" p " = samples not preserved per SOP or analytical method requirements.

" r " = samples collected may not be representative of actual field conditions, including the possibility of "outlier" data.

" t " = tidal conditions