Attachment 6:

Pathogen Only

List of Impaired Water Bodies

MA34-11	Manhan River
MA34-27	Fort River
MA34-28	Mill River
MA34-29	Mill River
MA36-17	Quaboag River
MA36-24	Chicopee River
MA36-25	Chicopee River
MA41-04	Quinebaug River
MA52-08	Sevenmile River
MA62-49	Wading River
MA71-07	Mill Brook
MA74-03	Old Swamp River
MA81-01	North Nashua River
MA81-03	North Nashua River
MA81-24	Gates Brook
MA91-09	Mill River*
MA91-12	Plum Island Sound*
MA91-15	Plum Island River*
MA93-01	Waters River
MA93-04	Porter River
MA93-09	Danvers River
MA93-12	Annisquam River
MA93-15	Pines River
MA93-19	Manchester Harbor
MA93-20	Beverly Harbor
MA94-06	North River
MA94-07	Herring River
MA94-09	South River
MA94-14	Jones River
MA94-15	Duxbury Bay
MA94151	Studleys Pond
MA94-24	Iron Mine Brook
MA94-27	Third Herring Brook
MA94-30	Bluefish River
MA94-34	Ellisville Harbor
MA96-18	Great Harbor
MA96-27	Namskaket Creek
MA96-32	Duck Creek*
MA96-37	Mill Creek
MA96-79	Cockle Cove Creek*
MA96-81	Snows Creek*

MA96-84	Old Harbor Creek*
MA96-85	Mill Creek*
MA96-86	Dock Creek*
MA96-87	Springhill Creek*
MA96-92	Santuit River*
MA96-93	Halls Creek*
MA96-94	Stewarts Creek*

*Not on original L-1 List

12/08/2014

Impaired Waters Assessment for Manhan River (MA34-11)

Summary

Impaired Water[1]	Stormwater Impairments:	*Escherichia coli*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Connecticut River Watershed 2003 Water Quality Assessment Report* [2]
Location	Towns:	*Southampton, Easthampton, Westfield*
	MassDOT Roads:	*Interstate 91, Routes 10 and 5*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒

Site Description

Manhan River (MA34-11) is a Class B water body, covering approximately 19.2 miles. It flows from the outlet of Tighe Carmody Reservoir in Southampton to the confluence with the Connecticut River in Easthampton as shown in Figure 1. Land use in the Manhan River watershed is predominately rural/open land with a smaller portion of residential and urban land, including portions of Interstate 91 and Routes 10 and 5. MassDEP's *Connecticut River Watershed 2003 Water Quality Assessment Report* notes that there are three Water Management Act permits for Manhan River (MA34-11) applying to the Easthampton Water Department, Holyoke Water Works, and Southampton Water Department.[2] The report also notes that there is one NPDES permit for the Easthampton WWTF.

The Water Quality Assessment Report identified the Secondary Contact and Aesthetics use with Support. The Aquatic Life use was designated with an "alert" status because of elevated phosphorous levels at a sampling station in the downstream portion of this segment. There is also a dam in Easthampton on the assessed segment that blocks the upstream migration of anadromous fish. The report notes that a project is underway to construct a fish ladder at the dam.[3] The Primary Contact use of the Manhan River has been designated as "support" for the upper 13.0 miles, but

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2008. Connecticut River Watershed 2003 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/34wqar07.pdf

[3] USACOE, 2007. Update Report for Massachusetts. Online citation referenced on 12/4/2007 from: http://www.nae.usace.army.mil/news/ma.pdf

"impaired" for the lower 6.2 miles due to elevated *E. coli* bacteria levels during sampling. Two locations in this segment were sampled for *E. coli* between April and October 2003, the geometric mean of these samples at each location was 99 and 157 cfu/100ml.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA34-11 is comprised of portions of Interstate 91, Route 10, and Route 5. Refer to Figure 1 for the location of these roadways within the subwatershed to Segment MA34-11.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[4] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[5] MassDOT assessed Manhan River (MA34-11) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[6] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[7] The condition of the Manhan River is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (*Escherichia coli*) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[8]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[9]

[4] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[5] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[6] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[7] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[8] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[9] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft municipal separate storm sewer system permit requirements in regard to pathogens.[10]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for the Manhan River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of the Manhan River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

[10] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

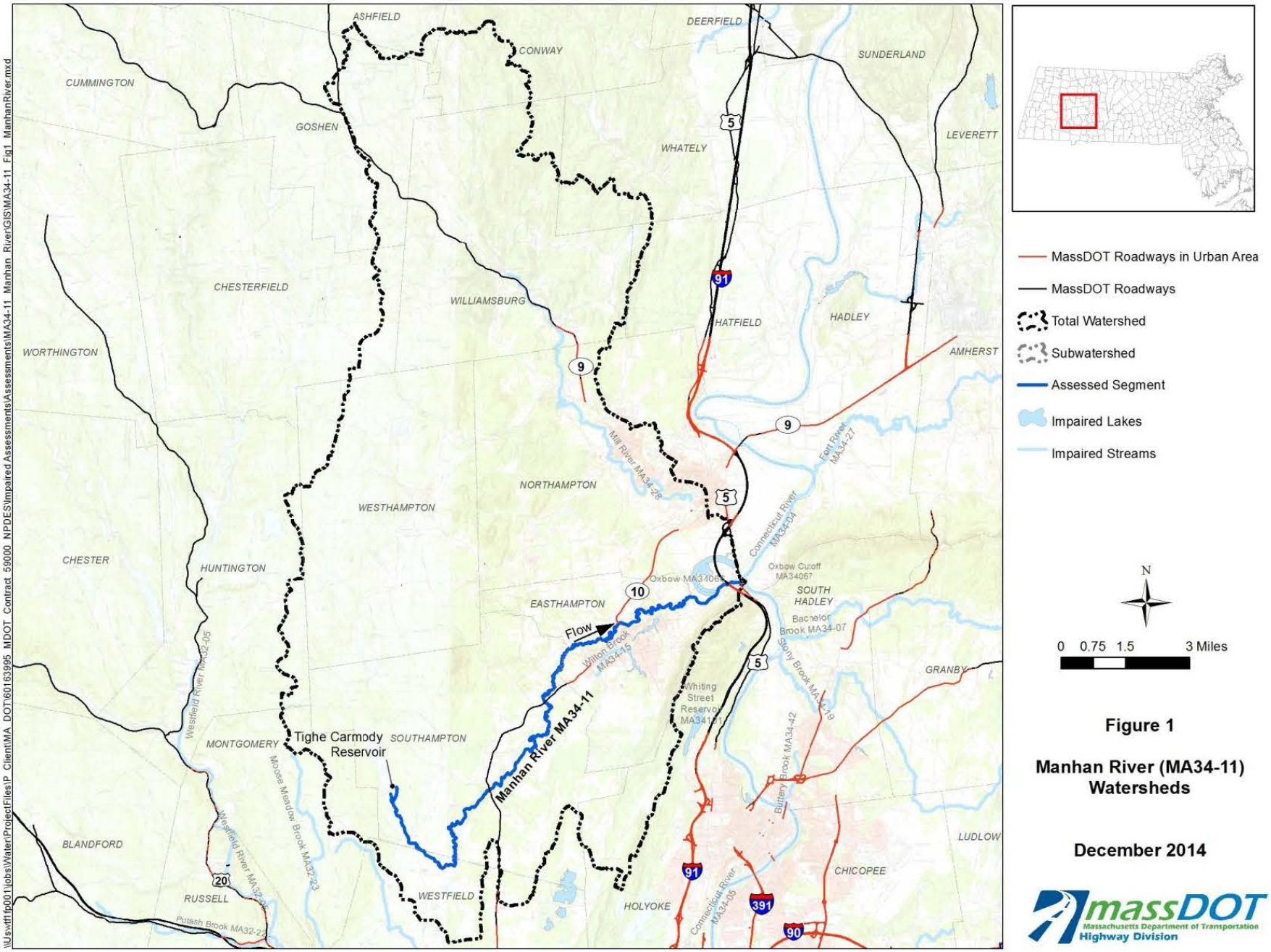

Figure 1

Manhan River (MA34-11) Watersheds

December 2014

12/08/2014

Impaired Waters Assessment for Fort River (MA34-27)

Summary

Impaired Water[1]	Stormwater Impairments:	*Escherichia coli*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Connecticut River Watershed 2003 Water Quality Assessment Report* [2]
Location	Towns:	*Amherst, South Amherst, Hadley*
	MassDOT Roads:	*Route 9 and Route 116*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒

Site Description

Fort River (MA34-27) is a Class B water body, covering approximately 12.8 miles. It flows from its headwaters at the confluence of Adams and Amethyst Brooks in Amherst, to its confluence with the Connecticut River in Hadley (Figure 1). Land use in the Fort River watershed is mostly rural/open land with some agricultural and a small proportion of residential land use. The only MassDOT roadway in the watershed is a portion of Route 9. MassDEP's *Connecticut River Watershed 2003 Water Quality Assessment Report* notes that there are four Water Management Act permits along Fort River (MA34-27) applying to the Amherst DPW Water Division, Belchertown Water District, Hickory Ridge Country Club, and Hadley Water Department.[2] The report also notes that there is one NPDES permit for the University of Massachusetts Coal Storage and Handling Facility.

The Water Quality Assessment Report identified the Secondary Contact and Aesthetics use with an "alert" status, due to high turbidity and TSS concentrations during wet weather sampling. The Aquatic Life use was also designated with an "alert" status because of elevated phosphorous levels. The Primary Contact use of Fort River has been designated as "impaired" due to elevated *E. coli* bacteria levels detected during sampling. The sources of this impairment are unknown with no suspected sources identified.

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2008. Connecticut River Watershed 2003 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/34wqar07.pdf

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA34-27 is comprised of portions of Route 9 and Route 116. Refer to Figure 1 for the location of these roadways within the subwatershed to Segment MA34-27.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed Fort River (MA34-27) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[5] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[6] The condition of Fort River is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (*Escherichia coli*) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[7]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[8]

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that

[3] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[4] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[5] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[6] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[7] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

existing efforts are consistent with the current and draft municipal separate storm sewer system permit requirements in regard to pathogens.[9]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Fort River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Fort River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

[9] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

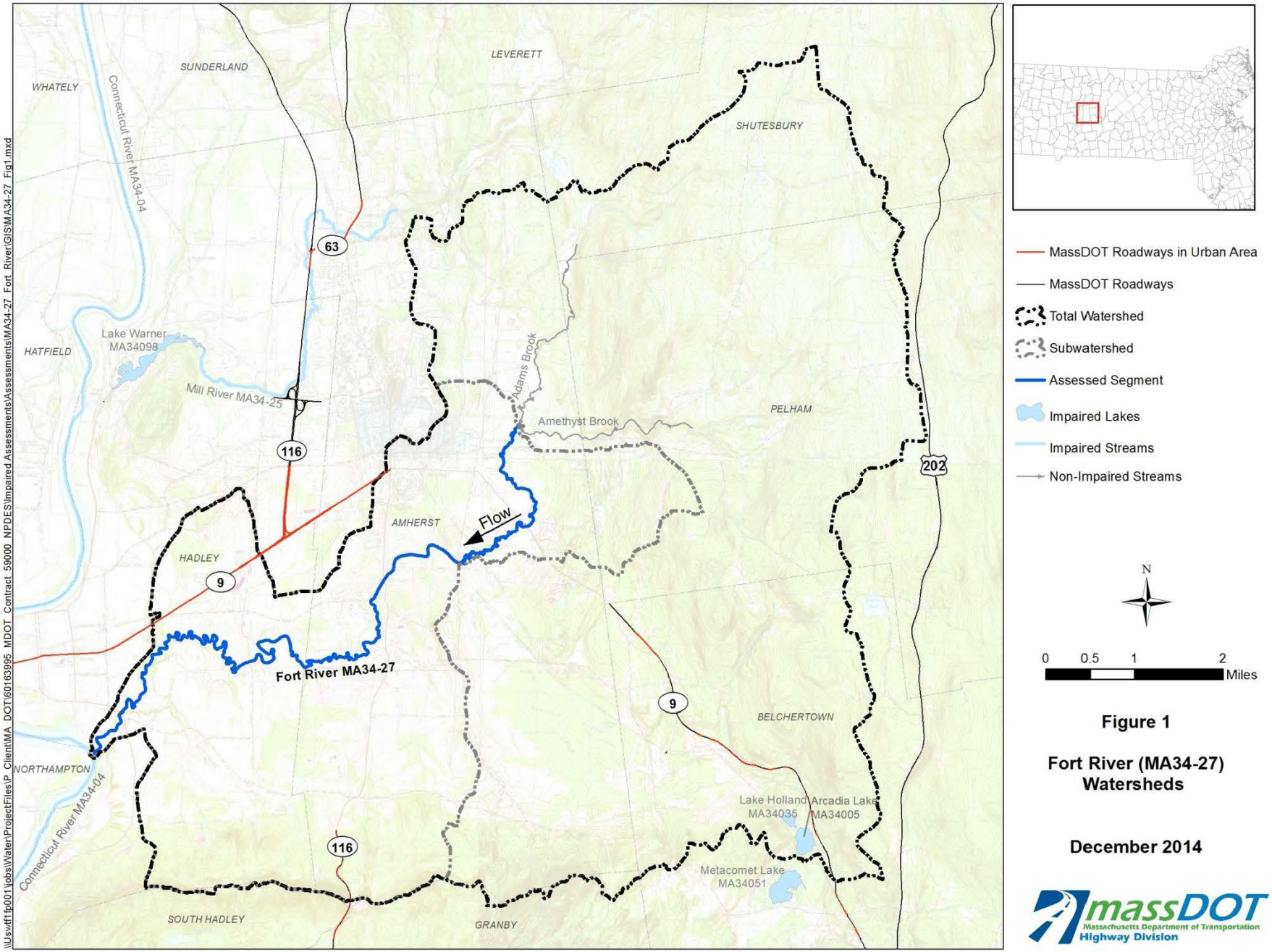

Figure 1

Fort River (MA34-27) Watersheds

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

12/08/2014

Impaired Waters Assessment for Mill River (MA34-28)

Summary

Impaired Water[1]	Stormwater Impairments:	*Escherichia coli*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Connecticut River Watershed 2003 Water Quality Assessment Report* [2]
Location	Towns:	*Williamsburg, Northampton*
	MassDOT Roads:	*Route 9*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒

Site Description

This segment of Mill River (MA34-28) is a Class B water body, approximately 10.0 miles in length. It flows from its headwaters at the confluence of the East and West Branch Mill River in Williamsburg, to the inlet of Paradise Pond in Northampton (Figure 1). The watershed for this segment includes a portion of Route 9; land use is predominately rural/open land with a smaller portion of residential and urban land. MassDEP's *Connecticut River Watershed 2003 Water Quality Assessment Report* notes that there are two Water Management Act permits along Mill River (MA34-28) applying to the Williamsburg Water Department and Northampton Department of Public Works.[2] The report also notes that there are four NPDES permits for Techalloy, Berkshire Electric Cable Company, Raytor Compounds Incorporated, and Pro Corporation – PMC of Florence.

The Water Quality Assessment Report identified the Secondary Contact, Aesthetics, and Aquatic Life with a "support" designation. The Primary Contact use of Mill River has been designated as "impaired" due to elevated *E. coli* bacteria levels during sampling. The report recommends that bacteria source tracking be conducted to locate the source(s) of elevated bacteria in this segment. Fish Consumption was not assessed in the Water Quality Assessment Report.

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2008. Connecticut River Watershed 2003 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/34wqar07.pdf

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA34-28 is comprised of portions of Route 9. Refer to Figure 1 for the location of this roadway within the subwatershed to Segment MA34-28.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed Mill River (MA34-28) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[5] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[6] The condition of Mill River is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (*Escherichia coli*) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[7]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[8]

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that

[3] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[4] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[5] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[6] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[7] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDOT, December 2014. Description of MassDOT's Application of BMP BMP 7U for Pathogen Related Impairments.

existing efforts are consistent with the current and draft municipal separate storm sewer system permit requirements in regard to pathogens.[9]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Mill River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Mill River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

[9] MassDOT, December 2014. Description of MassDOT's Application of BMP BMP 7U for Pathogen Related Impairments.

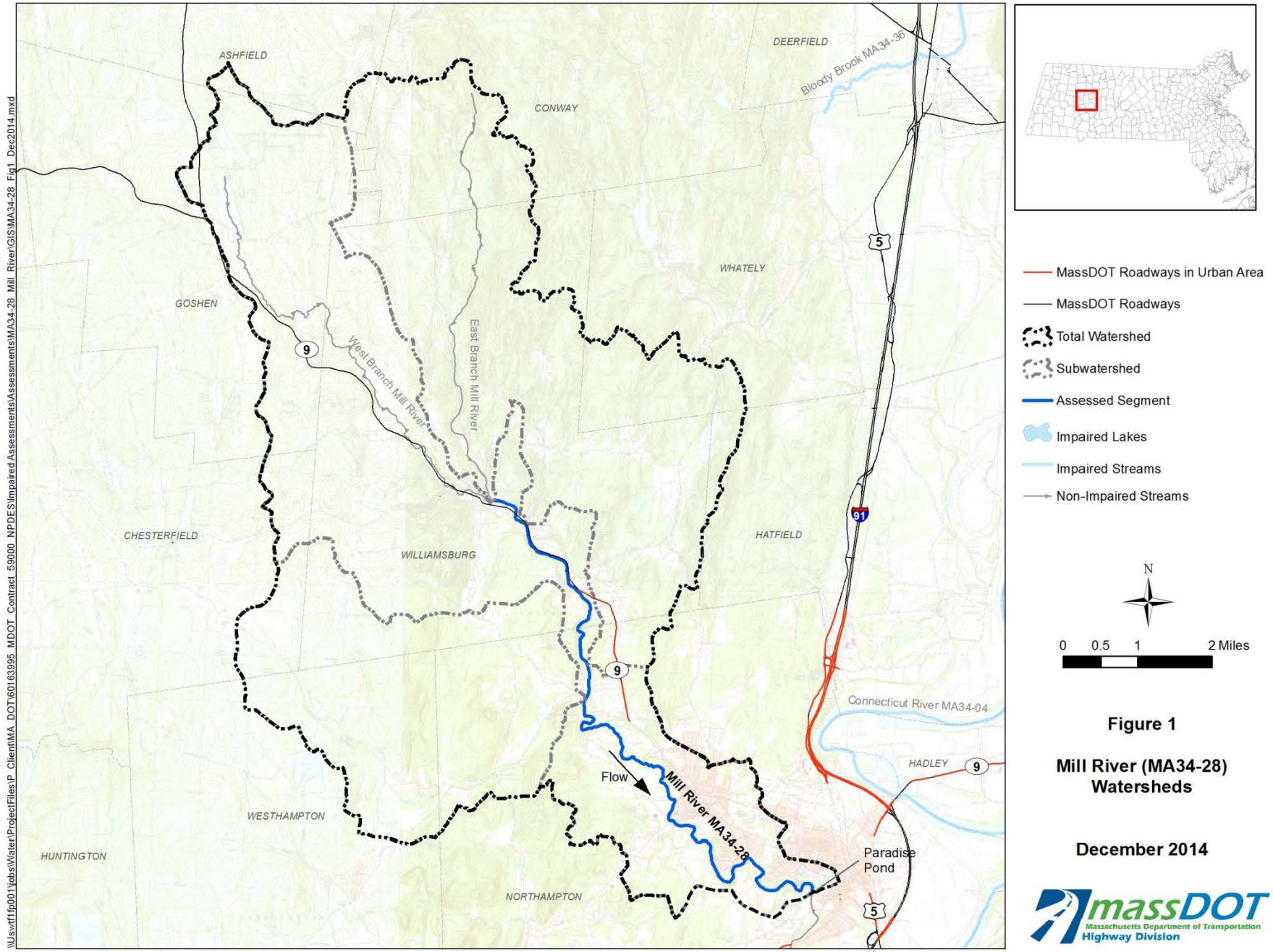

Figure 1

Mill River (MA34-28) Watersheds

December 2014

MassDOT Massachusetts Department of Transportation Highway Division

massDOT Massachusetts Department of Transportation Highway Division

12/08/2014

Impaired Waters Assessment for Mill River (MA34-29)

Summary

Impaired Water[1]	Stormwater Impairments:	*Escherichia coli*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Connecticut River Watershed 2003 Water Quality Assessment Report* [2]
Location	Towns:	*Springfield*
	MassDOT Roads:	*Interstates 91, 291 and Route 20*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒

Site Description

Mill River (MA34-29) covers approximately 1.3 miles and is located in Springfield. It flows from the outlet of Watershops Pond (MA34099) southwest to its confluence with the Connecticut River (MA34-05) (Figure 1). Segment (MA34-29) is located in the western portion of the watershed, which includes portions of Interstates 91, 291, and Route 20. Land use in the Mill River (MA34-29) watershed is high density residential and commercial in the western portion in the vicinity of Springfield and is low/medium density residential and forest in the eastern portion of the watershed. There is one NPDES permit (MA0103331) for Springfield Water and Sewer Commission for seven CSO outfalls.[2] A CSO elimination project on the Mill River – Springfield was completed in December of 2003, eliminating an estimated 60 million gallons per year of CSO discharge. MassDEP's *Connecticut River Watershed 2003 Water Quality Assessment Report* recommends that monitoring be conducted to evaluate water quality improvements in this segment of Mill River since the CSO elimination project was implemented in 2003.[2]

According to MassDEP's *Connecticut River Watershed 2003 Water Quality Assessment Report*, Mill River (MA34-29) is "impaired" for Primary Contact and Secondary Contact uses due to elevated *E. coli* bacteria levels, and the source was cited as wet weather discharges and unknown.[2] Mill River (MA34-29) was not assessed for the Aquatic Life, Fish Consumption or Aesthetic uses.

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2008. Connecticut River Watershed 2003 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/34wqar07.pdf

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA34-29 is comprised of portions of Interstate 91. Refer to Figure 1 for the location of this roadway within the subwatershed to Segment MA34-29.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed Mill River (34-29) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[5] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[6] The condition of Mill River is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (*Escherichia coli*) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[7]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[8]

Proposed Mitigation Plan

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[3] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[4] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[5] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[6] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[7] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDOT, December 2014. Description of MassDOT's Application of BMP BMP 7U for Pathogen Related Impairments.

existing efforts are consistent with the current and draft municipal separate storm sewer system permit requirements in regard to pathogens.[9]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Mill River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Mill River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

[9] MassDOT, December 2014. Description of MassDOT's Application of BMP BMP 7U for Pathogen Related Impairments.

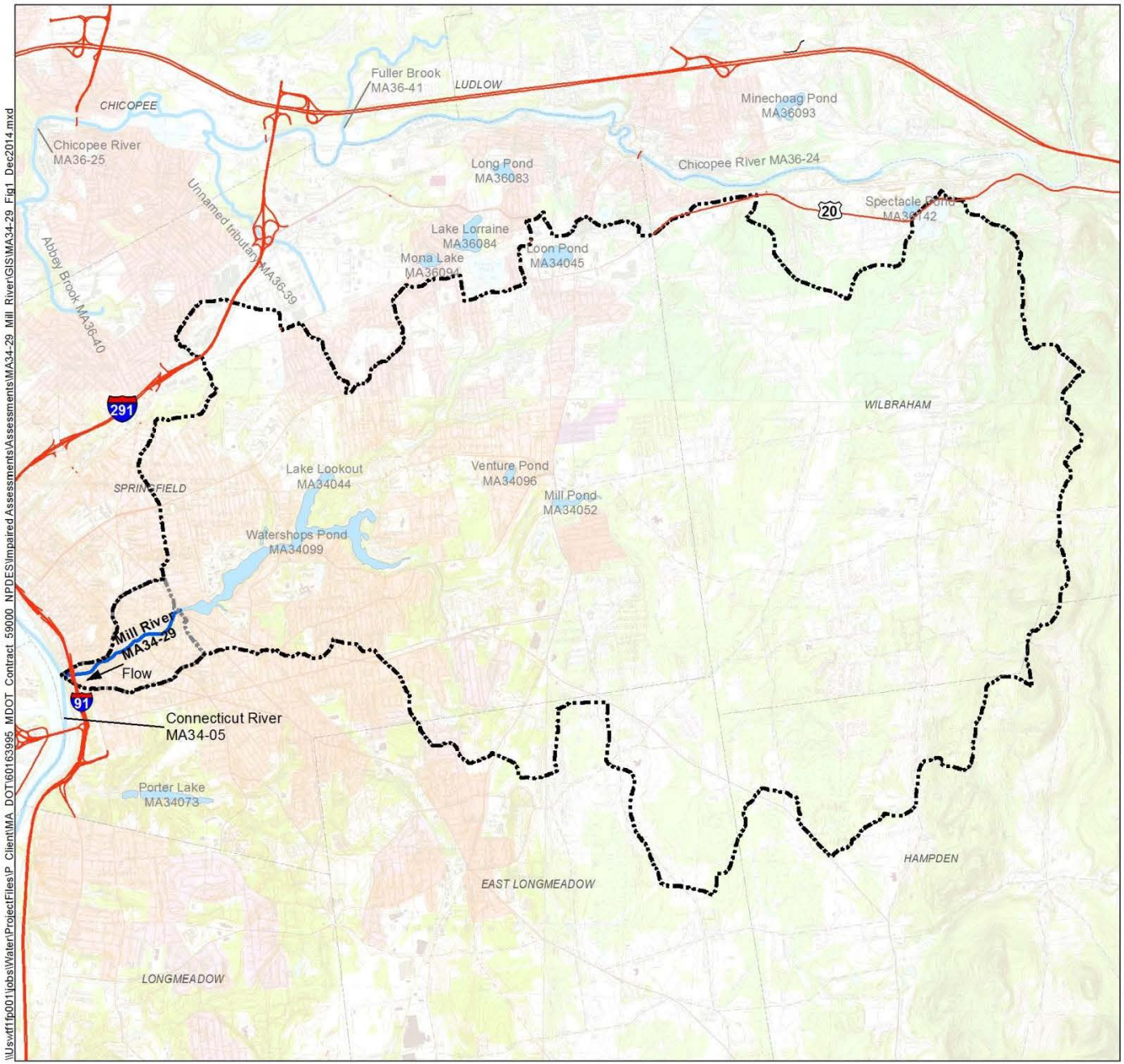


Figure 1

Mill River (MA34-29) Watersheds

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

massDOT Massachusetts Department of Transportation Highway Division

12/08/2014

Impaired Waters Assessment for Quaboag River (MA36-17)

Summary

Impaired Water[1]	Stormwater Impairments:	*Escherichia Coli*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Chicopee River Watershed 2003 Water Quality Assessment Report* [2]
Location	Towns:	*Monson and Palmer*
	MassDOT Roads:	*Interstate 90, Route 32, and Route 20*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒

Site Description

The Quaboag River (MA36-17) begins at Quaboag Pond (MA36130) in Brookfield, Massachusetts and flows in a generally western direction. Figure 1A shows the total watershed of the Quaboag River and this segment. The total watershed is approximately 212 square miles and encompasses forested/open, agricultural, residential, and urban land uses. The majority of the land is under forested/open land use with most agricultural land uses located in the upper reaches of the watershed above the subwatershed of the assessed segment.[3] The majority of point source flows also occur in the upper reaches of the watershed.

There are two segments of the Quaboag River that are listed as impaired in the *Massachusetts Year 2012 List of Waters;* MA36-16 and MA36-17. MA36-16 begins in Warren, Massachusetts and ends at the Route 32 bridge crossing.[4] This is where the segment of the river that is the subject of this assessment begins. Quaboag River (MA36-17) is shown in detail in Figure 1B along with its subwatershed. The segment is 5.3 miles long and generally flows northwest to the end of the

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] Reardon, M, 2008. Chicopee River Watershed 2003 Water Quality Assessment Report. CN 106.5. Massachusetts Department of Environmental Protection, Division of Watershed Management, Worcester, MA. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/36wqar03.doc

[3] MassDEP, September 2006. Watershed Based Plan for the Chicopee Basin. Technical Memorandum. Available at: http://public.dep.state.ma.us/Watershed/documents/TechMemo/Chicopee%20Tech%20Memo.pdf

[4] MassDOT, December 2012. Impaired Waters Assessment for Impaired Waters with Impairments Unrelated to Stormwater. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/impairedWaters/Year3//Year3_ImpairedWatersAssessment_1.pdf#page=308

segment at the confluence with the Ware River, where the rivers combine to form the headwaters of the Chicopee River.[5] The subwatershed is approximately 32 square miles. This section of the river comprises a portion of the border between the towns of Palmer and Monson, Massachusetts.

MassDEP's *Chicopee River Watersheds 2003 Water Quality Assessment Report* provides details on the impairments in this water body.[6] This water body is classified as a Class B, Warm Water Fishery, with a Combined Sewer Overflow (CSO). The town of Palmer historically had 14 wet weather CSOs; 13 of the 14 CSOs were taken out of service in 2003. The CSO that remained active as of 2007 was modeled and the model showed that it only contributes a small amount of discharge to Segment MA36-17.

The MassDEP Division of Watershed Management conducted six sampling events in the summer of 2003 at a site downstream from the CSOs as they were being taken out of service. However, it is unknown how the sample collection timing and locations relate to decommissioning of the CSO's. The data that were gathered showed elevated counts of *Escherichia coli (E. coli)* and fecal coliform during wet weather sampling, prior to the CSOs being decommissioned.

Based on the data collected, the Water Quality Assessment Report identified that Aquatic Life was designated as "support" status because water quality was good for Aquatic Life despite the impairments.[6] Secondary Contact use was assessed as "support" status because the *E. coli* counts were less than the criteria for an "alert" status. The Secondary Contact use was also given an "alert" status because of the presence of an active CSO discharge and one high *E. coli* count. The CSOs have been eliminated since 2003; however the data in the report were used to assess the impairments of this water body. Primary Contact use was assessed as "impaired" due to elevated *E. coli* bacteria counts.

MassDOT's property in an urban area with the potential to directly contribute stormwater runoff to Segment MA36-17 is comprised of portions of Interstate 90, Route 32, and Route 20. Refer to Figure 1B for the location of these roadways within the subwatershed to Segment MA36-17.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[7] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[8] MassDOT assessed Quaboag River (MA36-17) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314

[5] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[6] Reardon, M, 2008. Chicopee River Watershed 2003 Water Quality Assessment Report. CN 106.5. Massachusetts Department of Environmental Protection, Division of Watershed Management, Worcester, MA. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/36wqar03.doc

[7] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[8] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

and 303(d) of the Clean Water Act.[9] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[10] The condition of this segment of the Quaboag River (MA36-17) is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (*E. Coli*) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[11]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[12]

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Methodology, MassDOT believes that existing efforts are consistent with the current and draft municipal separate storm sewer sytem permit requirements.[12]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Quaboag River (MA36-17). These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its

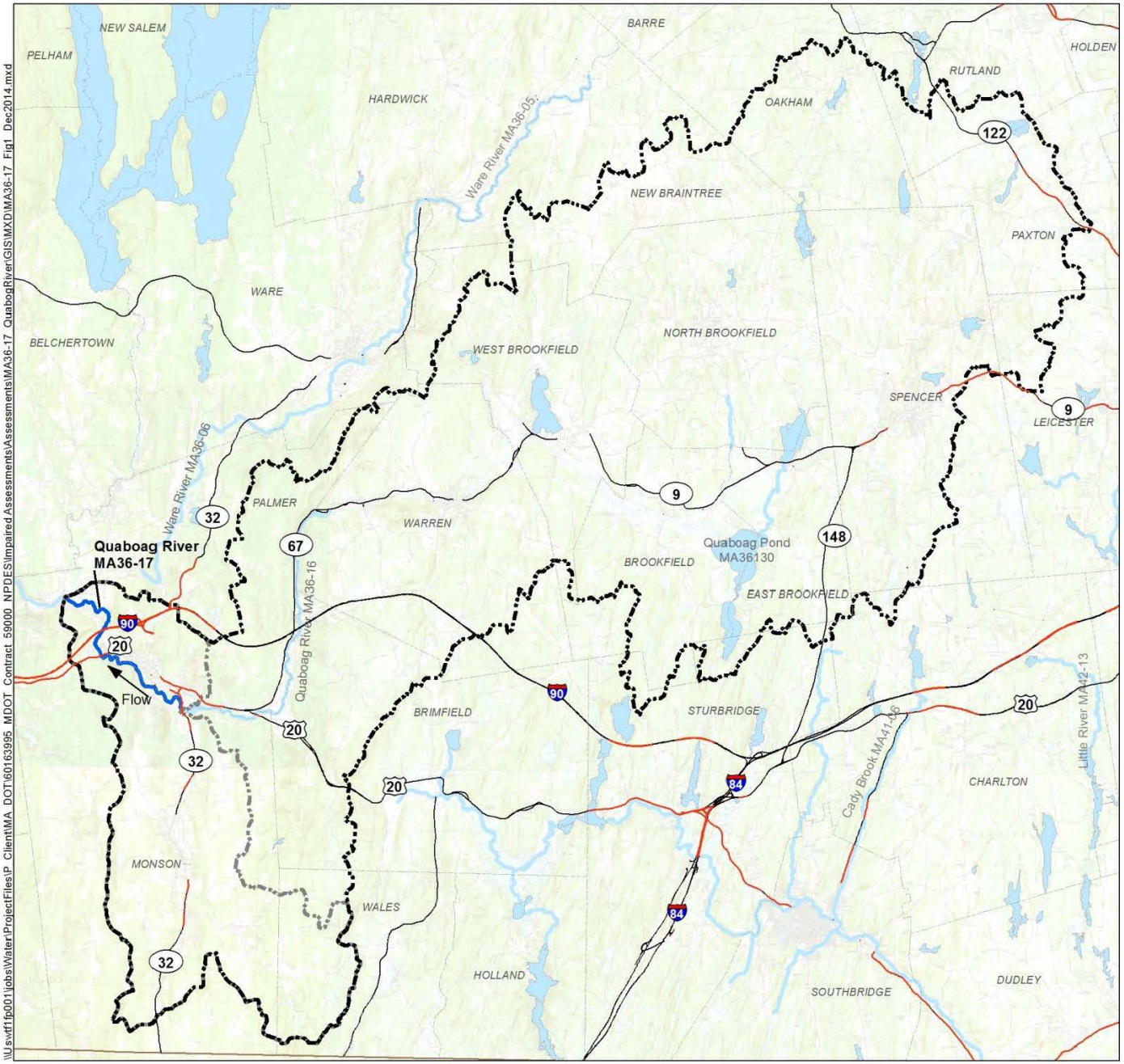
[9] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

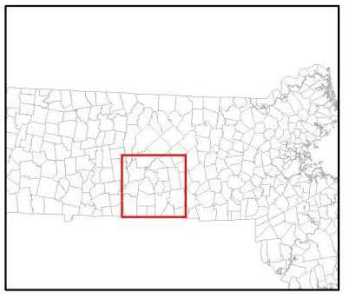
[10] MassDEP, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[11] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[12] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of the Quaboag River (MA36-17), including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.





MassDOT Roadways in Urban Area

MassDOT Roadways

Total Watershed

Subwatershed

Assessed Segment

Impaired Lakes

Impaired Streams

N

0 1 2 4 Miles

Figure 1A

Quaboag River (MA36-17) Watersheds

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

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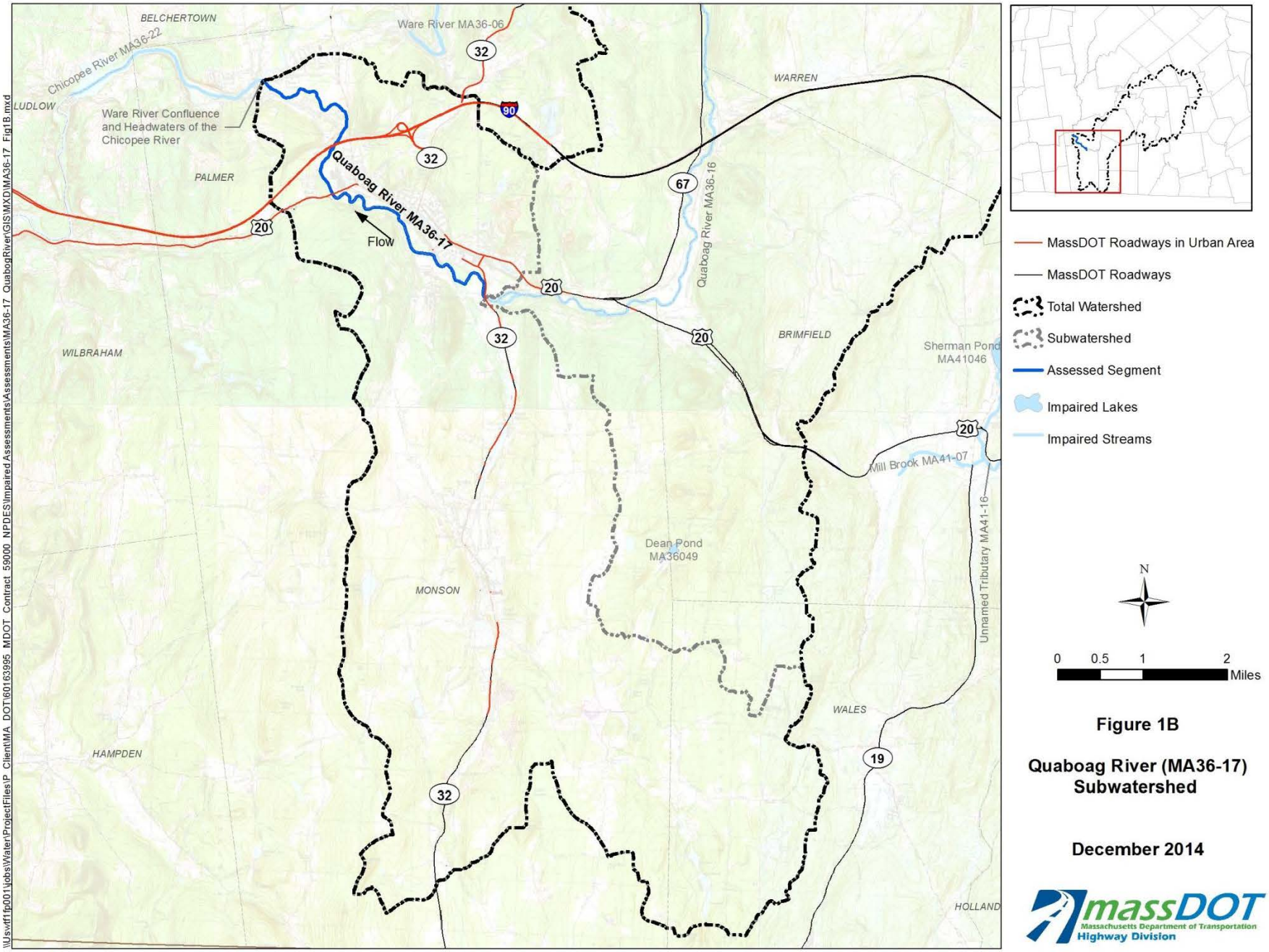

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Figure 1B

Quaboag River (MA36-17) Subwatershed

December 2014

12/08/2014

Impaired Waters Assessment for Chicopee River (MA36-24)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Chicopee River Watershed 2003 Water Quality Assessment Report* [2]
Location	Towns:	*Ludlow, Wilbraham, Chicopee*
	MassDOT Roads:	*Interstates 90 and 291, Routes 141, 33 and Route 20*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒

Site Description

The Chicopee River and its watershed are located in central Massachusetts, see Figure 1A. *Massachusetts Year 2012 Integrated List of Waters* identifies three segments of the Chicopee River that are impaired.[1] Segment MA36-22 extends from the headwaters of the Chicopee River (the confluence of the Ware and Quaboag Rivers) to the Red Bridge Impoundment Dam in Wilbraham/Ludlow. Segment MA36-24 of the Chicopee River (which is the subject of this assessment) is approximately 9.1 miles long and extends from the Wilbraham Pumping Station to Chicopee Falls Dam as shown in Figure 1B. Segment MA36-25 is just downstream from MA36-24 and continues to the confluence with the Connecticut River. Segment MA36-24 of the Chicopee River is classified by MassDEP as Class B, Warm Water Fishery with Combined Sewer Overflows (CSOs).[2]

Chicopee River Watershed 2003 Water Quality Assessment Report described the stormwater related sources of impairments for this water body.[2] Eight CSOs were identified as active in this segment as of 2007. One of these CSOs was planned to be eliminated by the towns of Ludlow and Springfield in 2009. The town of Chicopee had a CSO that was permitted to discharge 0.1 million gallons per year. Springfield had six CSOs with a total estimated annual discharge of 22.6 million gallons. At the time the Water Quality Assessment Report was authored, the town had plans to

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] Reardon, M, 2008. Chicopee River Watershed 2003 Water Quality Assessment Report. CN 106.5. Massachusetts Department of Environmental Protection, Division of Watershed Management, Worcester, MA. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/36wqar03.doc

reduce their output from CSOs to less than 1.0 million gallons per year.[3] The CSO work was completed in 2008. This segment is impounded by three hydroelectric dams that are 22 feet, 28 feet, and 10 feet in height. The Primary Contact and Secondary Contact uses were assessed as "support" with an "alert" status because of the detection of *E. coli* and the presence of CSOs. The Aquatic Life use is assessed as "support" with an "alert" status because although observed water quality conditions were acceptable, potential impacts of dam operations and CSOs are problematic. Assuming the planned elimination of CSOs has been completed, conditions are likely improving.

The watershed based plan for the Chicopee Basin describes the land use of the 714.5 square mile watershed as mostly forested/rural, with some water/wetland, agricultural/pasture and low density residential uses.[4] The subwatershed for MA36-24 is shown on Figure 1B and is approximately 31.1 square miles of mostly residential land with some rural/open and commercial/industrial land uses.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA36-24 is comprised of portions of Interstates 90 and 291, Routes 141, 33 and Route 20. Refer to Figure 1B for the location of these roadways within the subwatershed to Segment MA36-24.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[5] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[6] MassDOT assessed Chicopee River (MA36-24) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[7] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[8] The condition of this segment of the Chicopee River is not proposed to change.

[3] Reardon, M, 2008. Chicopee River Watershed 2003 Water Quality Assessment Report. CN 106.5. Massachusetts Department of Environmental Protection, Division of Watershed Management, Worcester, MA. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/36wqar03.doc.

[4] MassDEP, September 2006. Watershed Based Plan for the Chicopee Basin. Technical Memorandum. Available at: http://public.dep.state.ma.us/Watershed/documents/TechMemo/Chicopee%20Tech%20Memo.pdf

[5] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[6] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[7] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[8] MassDEP, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[9]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[10]

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft municipal separate storm sewer system permit requirements.[10]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Chicopee River (MA36-24). These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Chicopee River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

[9] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[10] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

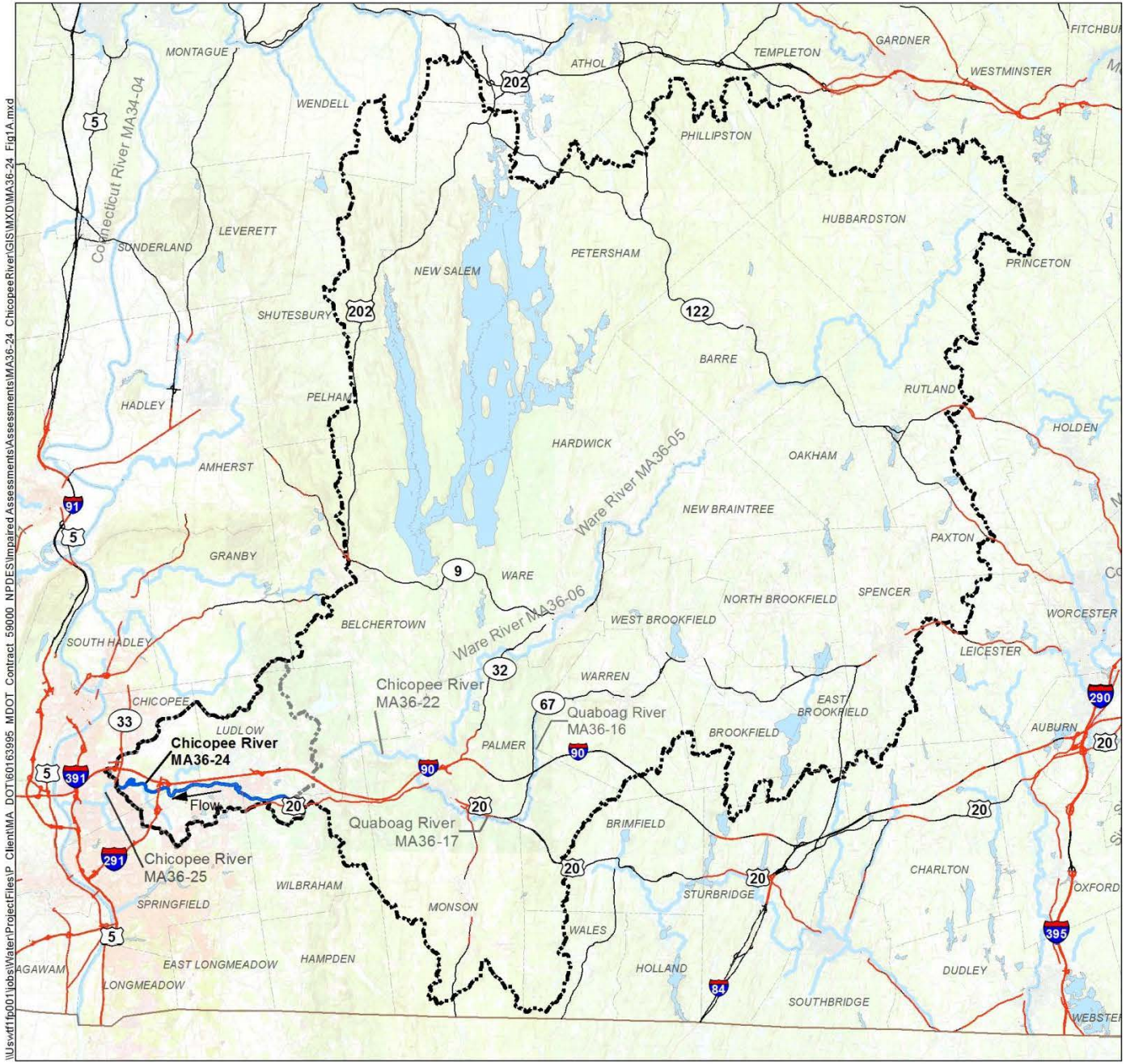

Figure 1A

Chicopee River (MA36-24) Watersheds

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

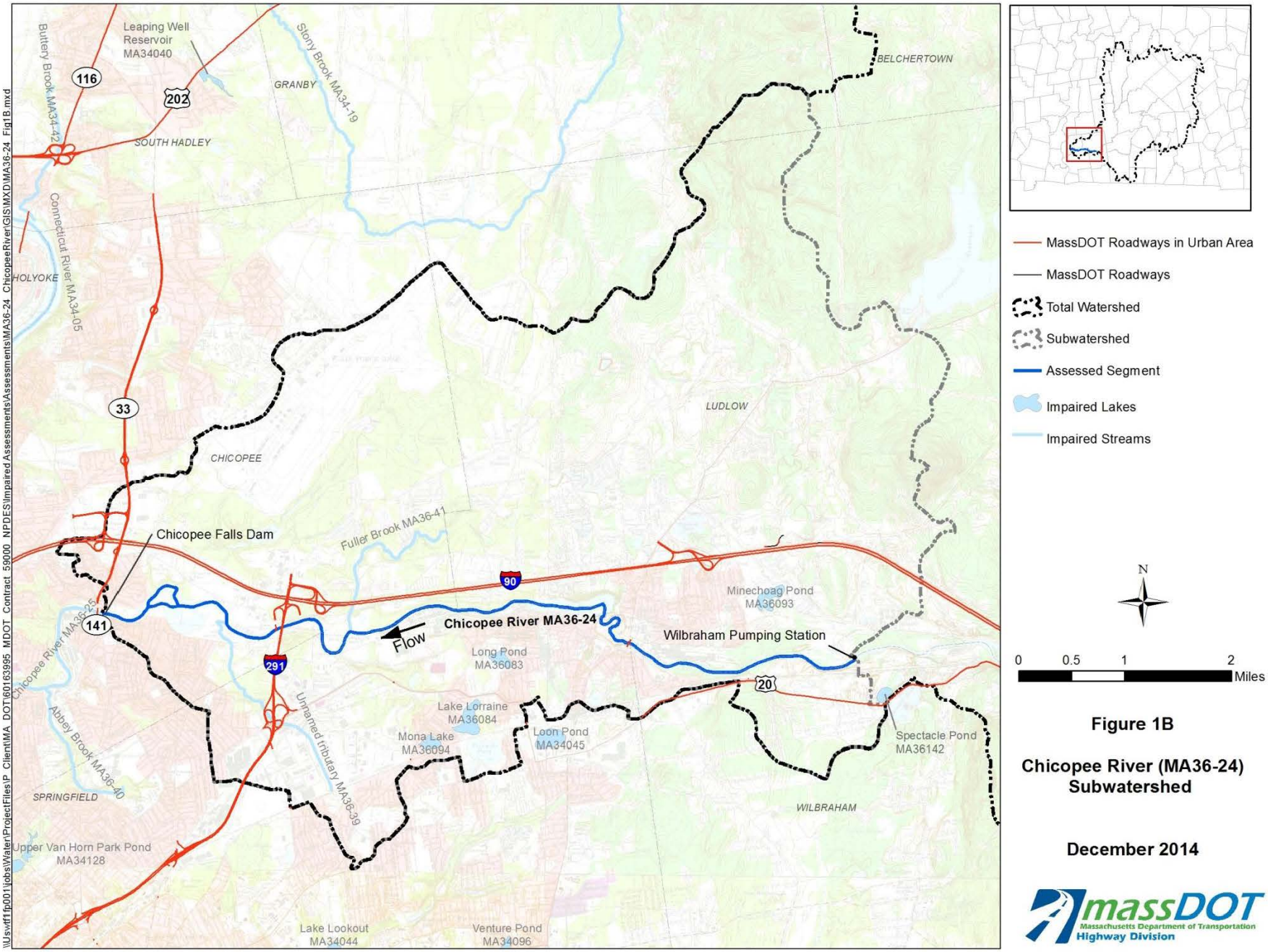

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Figure 1B

Chicopee River (MA36-24) Subwatershed

December 2014

12/08/2014

Impaired Waters Assessment for Chicopee River (MA36-25)

Summary

Impaired Water[1]	Stormwater Impairments:	*Escherichia coli*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Chicopee River Watershed 2003 Water Quality Assessment Report* [2]
Location	Towns:	*Chicopee*
	MassDOT Roads:	*Interstates 391 and 90, Routes 33, 116 and 141*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒

Site Description

The Chicopee River and its watershed are located in central Massachusetts, as shown on Figure 1A. The *Massachusetts Year 2012 Integrated List of Waters* identifies three segments of the Chicopee River that are impaired.[1] Segment MA36-22 extends from the headwaters of the Chicopee River (the confluence of the Ware and Quaboag Rivers) to the Red Bridge Impoundment Dam in Wilbraham/Ludlow. Segment MA36-24 extends from the Wilbraham Pumping Station to Chicopee Falls Dam. Segment MA36-25, which is the subject of this assessment, is shown in Figure 1B. This segment is approximately 3 miles long and begins just downstream from the previously listed segment at the base of the Chicopee Falls Dam in Chicopee and continues to the confluence with the Connecticut River at segment MA34-05. Chicopee River (MA36-25) is classified by MADEP as a Class B, Warm Water Fishery with Combined Sewer Overflows (CSOs).[2]

The *Chicopee River Watershed 2003 Water Quality Assessment Report* described the stormwater related sources of impairments for this water body.[2] Ten CSOs were identified as active in this segment as of 2007 with an estimated discharge of 76 Million Gallons per year. A portion of this segment is also impounded by a 15-foot high dam. The Primary Contact and Secondary Contact uses are assessed as "impaired" because of elevated *E. coli* counts. The Aquatic Life use is assessed as "support" with an "alert" status because there were acceptable levels of survival in test

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] Reardon, M, 2008. Chicopee River Watershed 2003 Water Quality Assessment Report. CN 106.5. Massachusetts Department of Environmental Protection, Division of Watershed Management, Worcester, MA. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/36wqar03.doc

organisms and acceptable water quality conditions, but there were potential impacts from dam operations and CSOs.

The watershed based plan for the Chicopee Basin describes the land use of the 723 square mile watershed as mostly forested/rural, with water/wetland, agricultural/pasture and low density residential comprising much of the rest of the land.[3] The subwatershed for MA36-25 is shown on Figure 1B and is approximately 8.5 square miles of mostly residential land.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA36-25 is comprised of portions of Interstates 391 and 90 and Routes 33, 116 and 141. Refer to Figure 1B for the location of these roadways within the subwatershed to Segment MA36-25.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[4] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[5] MassDOT assessed Chicopee River (MA36-25) using the methodologies described below. There is no final or draft TMDL for this water body.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[6] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[7] The condition of Chicopee River (MA36-25) is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (*E. coli*) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[8]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific

[3] MassDEP, September 2006. Watershed Based Plan for the Chicopee Basin. Technical Memorandum. Available at: http://public.dep.state.ma.us/Watershed/documents/TechMemo/Chicopee%20Tech%20Memo.pdf

[4] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[5] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[6] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[7] MassDEP, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[8] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[9]

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft municipal separate storm sewer system permit requirements.[9]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Chicopee River (MA36-25). These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Chicopee River (MA36-25), including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

[9] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

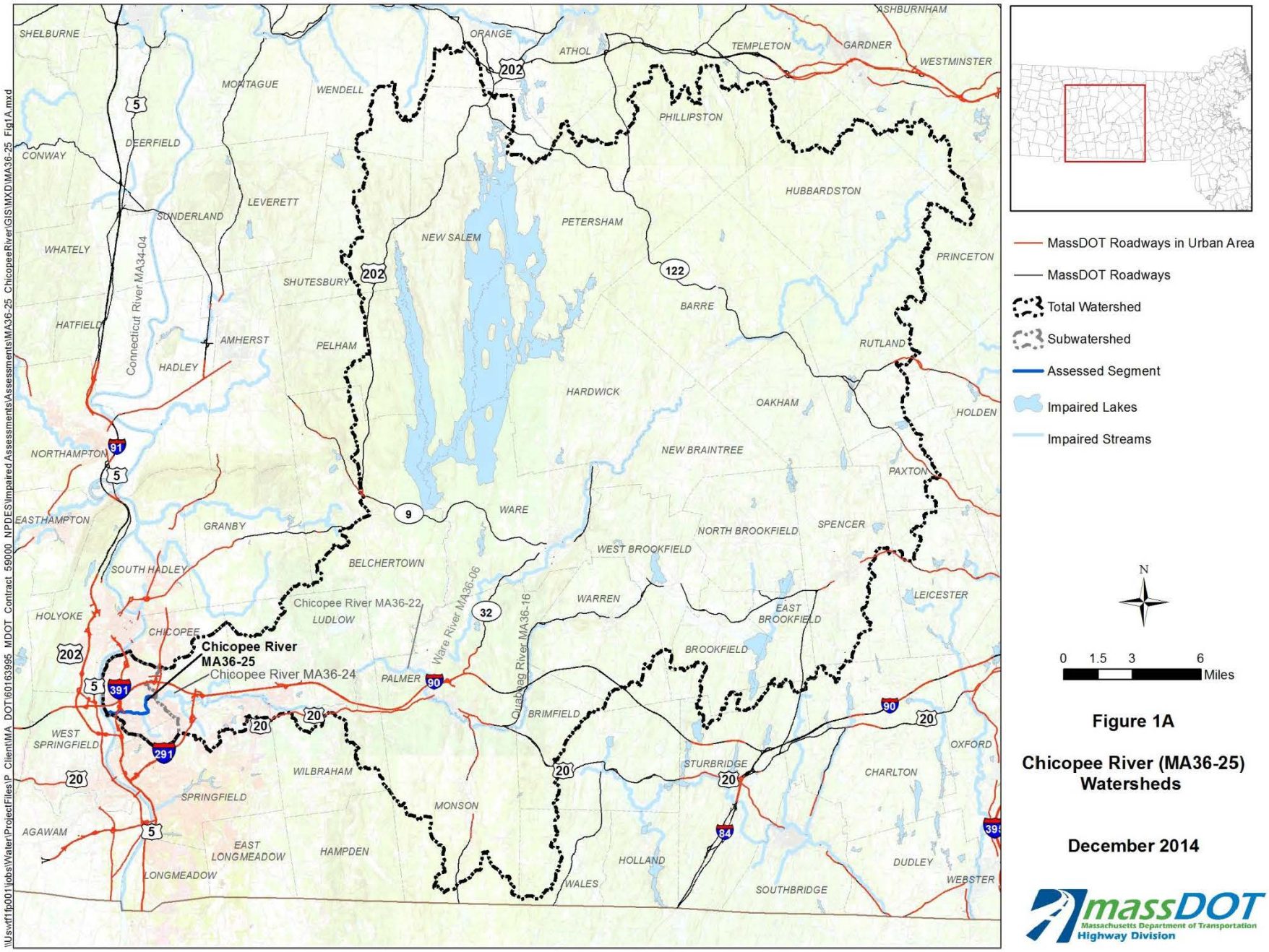
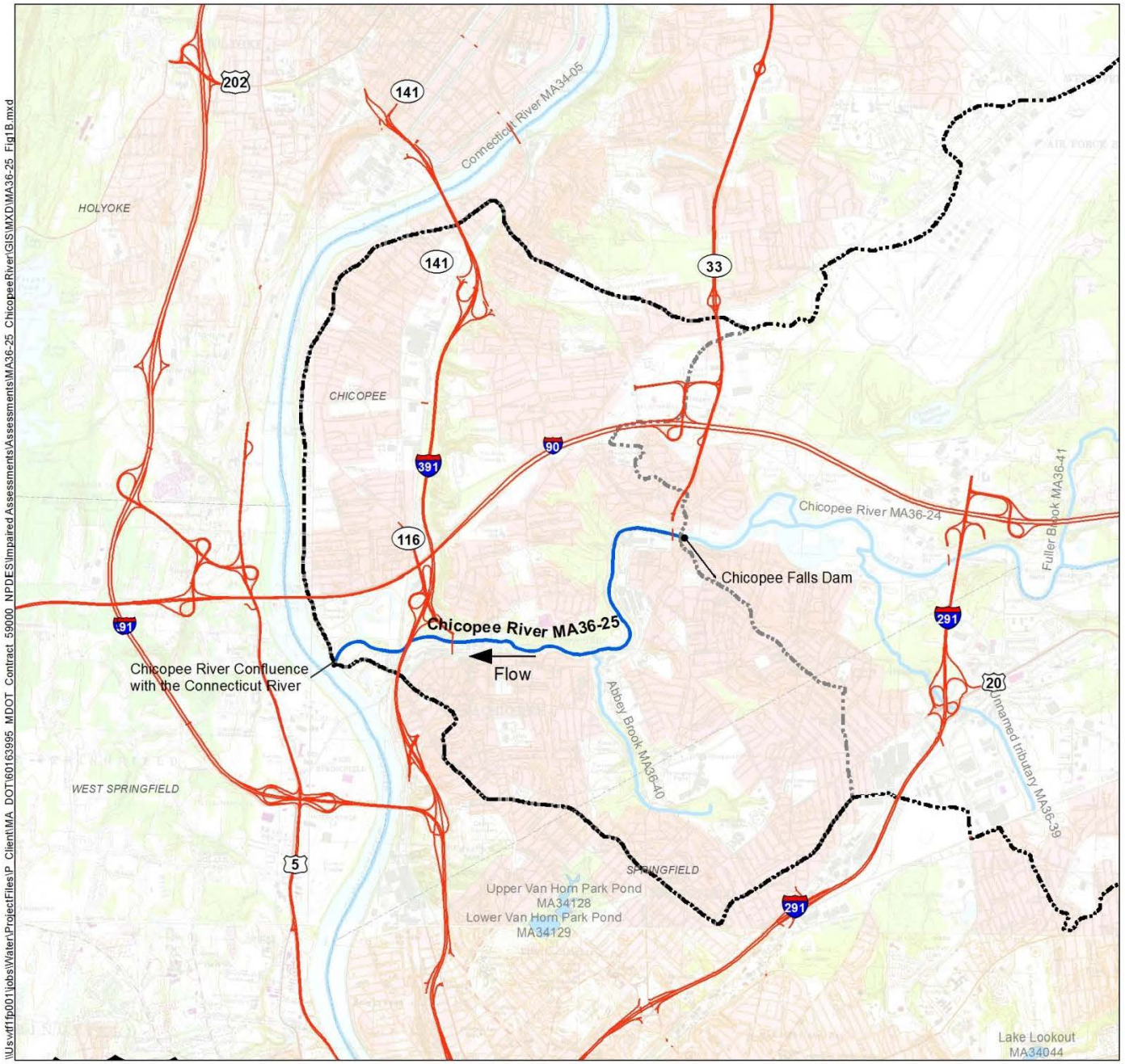
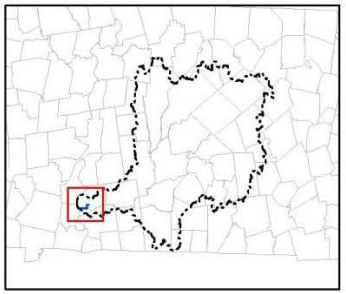


Figure 1A

Chicopee River (MA36-25) Watersheds

December 2014





MassDOT Roadways in Urban Area

MassDOT Roadways

Total Watershed

Subwatershed

Assessed Segment

Impaired Lakes

Impaired Streams

N

0 0.25 0.5 1 Miles

Figure 1B

Chicopee River (MA36-25) Subwatershed

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

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12/08/2014

Impaired Waters Assessment for Quinebaug River (MA41-04)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*French and Quinebaug River Watersheds 2004-2008 Water Quality Assessment Report*[2]
Location	Towns:	*Dudley*
	MassDOT Roads:	*Route 131*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒

Site Description

The Quinebaug River (MA41-04), located in Dudley, is designated as a Class B, Warm Water Fishery. This segment originates from the dam just upstream of West Dudley Road and flows for 2.2 miles to the Connecticut border. The subwatershed of this river (see Figure 1A and 1B) is 6.3 square miles, the vast majority of which is in Dudley with a small portion encroaching south into Connecticut. The land use within the subwatershed is mostly forested land, with some wetlands and low-density residential areas.

According to the *French and Quinebaug River Watersheds 2004-2008 Water Quality Assessment Report*,[2] the Quinebaug River was assessed as "support" for Aesthetics based on lack of objectionable odors, scums or deposits. An "alert" status for Aesthetics was designated due to occasional high turbidity known to be associated with the hydropower plant located upstream and occasional odor and trash/debris as observed by MassDEP workers. This segment is listed with an "alert" status for Aquatic Life due to evidence of water enrichment. This was found mostly in the form of elevated levels dissolved oxygen saturation (up to 112%) and slightly elevated total phosphorous concentrations.

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2009. French and Quinebaug River Watersheds 2004-2008 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/3baapp/4142wqar04.pdf

The MassDOT urban roadway with the potential to directly contribute stormwater to the Quinebaug River is comprised of an approximately two-mile stretch of Route 131. Refer to Figure 1B for the location of this roadway within the subwatershed.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed the Quinebaug River (MA41-04) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[1] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List[5] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of the Quinebaug River is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U[4] of MassDOT's Storm Water Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[7]

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing Stormwater Management Plan (SWMP) including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen

[3] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[4] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[5] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

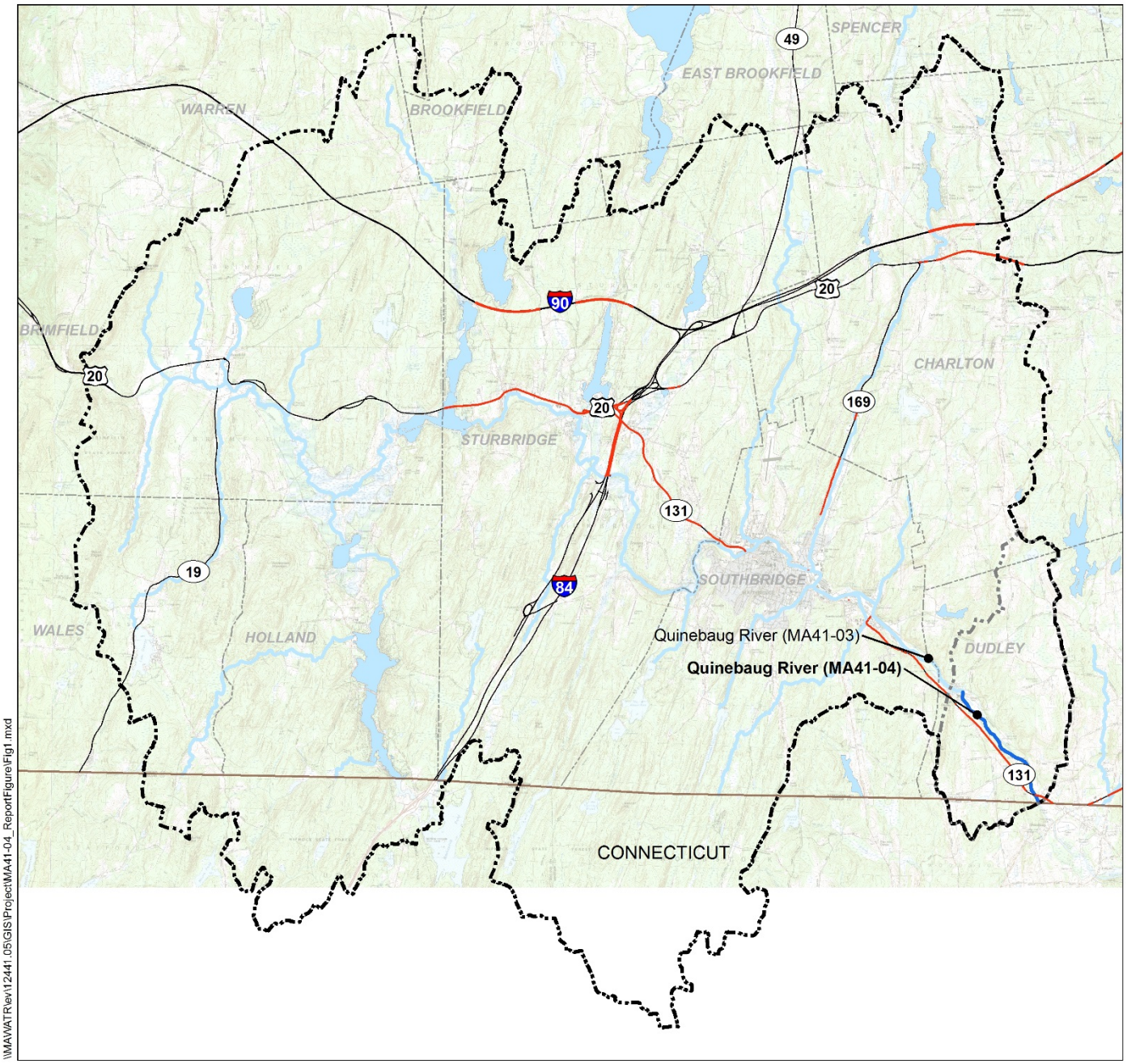
[6] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

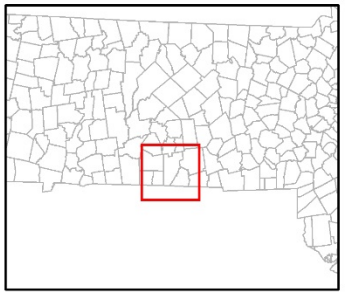
Methodology,[7] MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements.

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for the Quinebaug River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of the Quinebaug River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.





MassDOT Roadways in Urban Area

MassDOT Roadways

Total Watershed

Subwatershed

Assessed Segment

Impaired Lakes

Impaired Streams

N

0 1 2 Miles

Figure 1A

Quinebaug River (MA41-04) Watersheds

December 2014

massDOT Massachusetts Department of Transportation Highway Division

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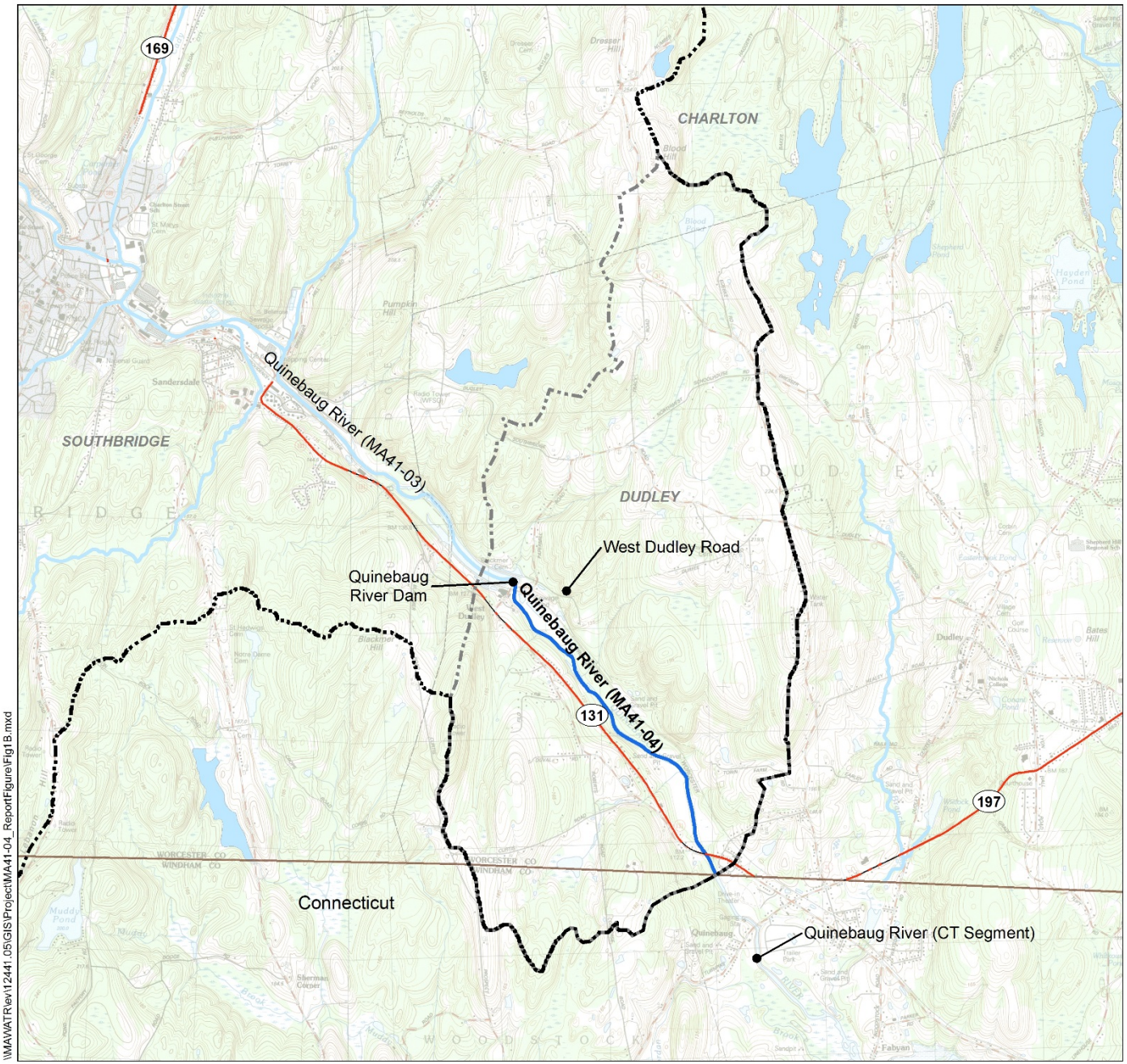

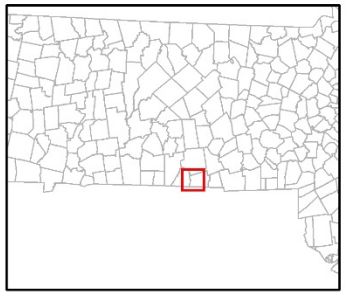

MassDOT Roadways in Urban Area
MassDOT Roadways
Total Watershed
Subwatershed
Assessed Segment
Impaired Lakes
Impaired Streams

N

0 2,000 4,000 Feet

Figure 1B

Quinebaug River (MA41-04) Subwatershed

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

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12/08/2014

Impaired Waters Assessment for Sevenmile River (MA52-08)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Ten Mile River Watershed 2002 Water Quality Assessment Report* [2]
Location	Towns:	*Attleboro*
	MassDOT Roads:	*I-95, I-295, Route 1, Route 1A*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒

Site Description

Sevenmile River (MA52-08) begins in Attleboro, Massachusetts at the outlet of Orrs Pond (MA52029). From Orrs Pond, Sevenmile River flows for 3.4 miles southwest and terminates at its confluence with the Ten Mile River, just over the state line in Pawtucket, Rhode Island. The total watershed for this body of water is coincident with its subwatershed and covers 12.6 square miles. It lies almost entirely in Attleboro and North Attleborough and extends into Plainville and Seekonk. The land use in this watershed is mostly medium to high-density residential and commercial areas.

Within the *Ten Mile River Watershed 2002 Water Quality Assessment Report*,[2] Sevenmile River is listed as Class B, Warm Water Fishery. Although "not assessed" for Fish Consumption, a population sampling found three species of fish in this body of water, and all parameters sampled met surface water quality standards, indicating that the river is good health. Sevenmile River was given a "support" assessment for Aquatic Life because it had acceptable levels of phosphorus, ammonia-nitrogen, and total suspended solids. High levels of fecal coliform were found from sampling, resulting in an "impaired" assessment for Primary Contact. Secondary Contact and Aesthetics were both assessed as "support".

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2006. Ten Mile River Watershed 2002 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/3baapp/52wqar.pdf

MassDOT's urban property with the potential to directly contribute stormwater runoff to Segment MA52-08 is comprised of portions of I-95, I-295, Route 1, and Route 1A. Refer to Figure 1 for the location of these roadways within the watershed to Segment MA52-08.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed Sevenmile River (MA52-08) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[1] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List[5] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of Sevenmile River is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U[4] of MassDOT's Storm Water Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[6]

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing Stormwater Management Plan (SWMP) including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology,[6] MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements in regard to pathogens.

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[3] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[4] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[5] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[6] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

As part of its pet waste management program, MassDOT has determined that two MassDOT targeted rest stops are located within the subwatershed of this water body. These rest stops are located in Attleboro, on the northbound and southbound sides of I-95, in between exits 2B and 3. See Figure 1 for the location of these rest stops within the watershed. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Sevenmile River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Sevenmile River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

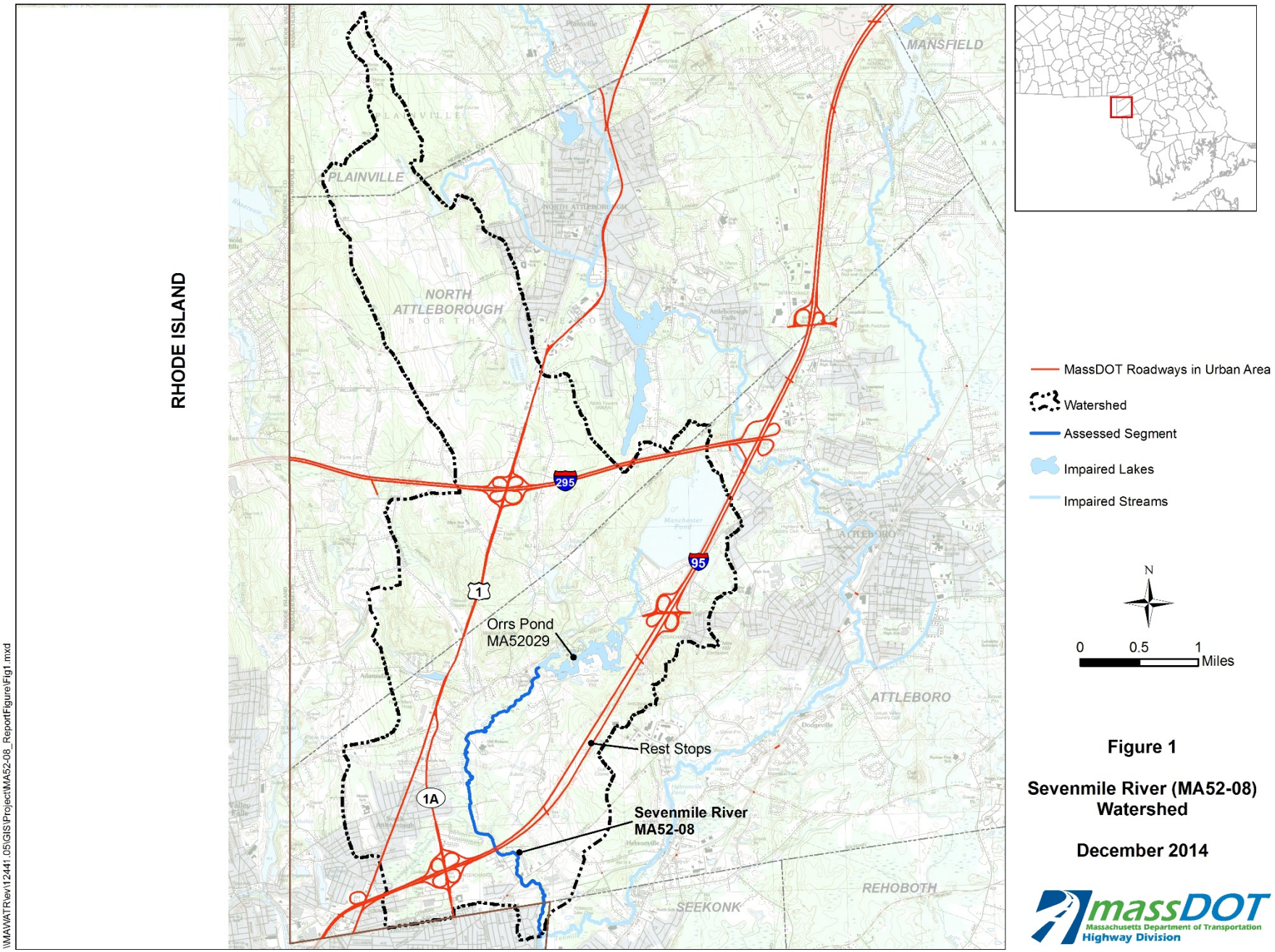

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Figure 1

Sevenmile River (MA52-08) Watershed

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

Impaired Waters Assessment for Wading River (MA62-49)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*4A (TMDL is completed)*
	Final TMDLs:	*Final Pathogen TMDL for the Taunton River Watershed* [2]
	WQ Assessment:	*Taunton River Watershed 2001 Water Quality Assessment Report* [3]
Location	Towns:	*Mansfield and Norton*
	MassDOT Roads:	*Interstates 95 and 495, Routes 123 and 140*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

Wading River (MA69-49) is part of the Threemile River subwatershed. The Threemile River is formed at the confluence of the Wading and Rumford Rivers in the northwest section of the Taunton River Basin. From its headwaters in Foxborough, the Wading River flows in a southeasterly direction through Foxborough and Mansfield and converges with the Rumford River in Norton to form the Threemile River. The Threemile river subwatershed includes seven segments, two of which cover the Wading River.[3]

Segment MA62-49 of Wading River is approximately 9.7 miles in length and is a Class B, warm water fishery, extending from Balcom Street in Mansfield to the confluence with the Threemile River in Norton. There are three individual NPDES permitted discharges currently discharging to this segment. Sinclair Manufacturing Company and Tweave Inc. are permitted to discharge to the Wading River and Sun Chemical Corporation/GPI division is permitted to discharge to a tributary of this segment. Additionally, the communities of Mansfield and Norton have general permit coverage under MS4. Multiple samples of bacteria were taken from points along this segment during dry weather. MassDEP designates each portion of the Wading River Segment MA62-49 as low priority

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2011. Final Pathogen TMDL for the Taunton River Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/taunton1.pdf

[3] MassDEP, 2005. Taunton River Watershed 2001 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/3baapp/62wqar3.pdf

for based on the sampling results. MA62-49 of Wading River is "supported" for Aquatic Life and Aesthetics uses, and no other uses have been assessed.[4] MassDOT investigated an IDDE in this watershed, which has been resolved and removed from the MassDOT Annual Report in 2014.[5]

There is one NPL site located in this subwatershed. The Shpack Landfill of about 8 acres was in operation from 1946 until 1965 and is known to contain waste including volatile organic compounds (VOCs), vinyl chloride and trichloroethylene (TCE), and radioactive waste.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA62-49 of Wading River is comprised of portions of Interstate 95 and 495 and Routes 123 and 140. Refer to Figure 1 for the location of these roadways within the subwatershed to Segment MA62-49.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[6] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[7] MassDOT assessed Wading River (MA62-49) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[8] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[9] The condition of Wading River (MA62-49) is not proposed to change.

BMP 7R for Pathogen TMDL (CN 0256.0)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments

[4] MassDEP, 2005. Taunton River Watershed 2001 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/3baapp/62wqar3.pdf

[5] MassDOT, 2014. NPDES Phase II Small MS4 General Permit Annual Report. Available at: http://www.epa.gov/region1/npdes/stormwater/assets/pdfs/ma/reports/2014/MassDOT14.pdf

[6] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[7] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[9] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

that have been assigned to a water body covered by a final TMDL.[10] Wading River (MA62-49) is covered by the Final Pathogen TMDL for the Taunton River Watershed.[11]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[12]

Numerous point and non-point sources of fecal contamination have been identified in the Taunton River Watershed. Sources of indicator bacteria in the Taunton River watershed were found to be many and varied. Dry weather sources include leaking sewer pipes, illicit connections of sanitary sewers to storm drains, failing septic systems, recreational activities, wildlife including birds, and inadequately treated boat wastes. Wet weather sources include wildlife and domesticated animals, stormwater runoff including municipal separate storm sewer systems (MS4), combined sewer overflows (CSOs), and sanitary sewer overflows (SSOs). Most of the bacteria sources are believed to be stormwater related.

Page 17 of the TMDL states that 100% of the total estuary area assessed was impaired. Several of the Taunton River Segments are prioritized and will require additional bacterial source tracking and implementation of structural and non-structural Best Management Practices (BMP's).[11] In total, there are 20 pathogen impaired segments (12 river and 8 estuary), that contain indicator bacteria concentrations in excess of the Massachusetts water quality standards. The majority of the priority areas are located near downtown Taunton, MA where there are relatively dense residential developments and nearby major roads and highways, including Route 24 and Route 44.

In addition to the generic recommendations provided in the draft NPDES MS4 permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the Taunton River TMDL report (Section 8.0, page 56) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed: [11]

- Correction of failing septic systems
- Controls for stormwater runoff

The TMDL report also indicates that structural BMPs may be appropriate to address runoff from impervious areas in instances where fecal coliform concentrations cannot be reduced by other means.[11]

[10] MassDOT, 22 July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[11] MassDEP, 2011. Final Pathogen TMDL for the Taunton River Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/taunton1.pdf

[12] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the Taunton River: [13]

- Elimination of illicit sewer connections
- Regulate stormwater runoff and develop SWMPs for MS4s
- Documentation of storm drain outfall locations
- Septic tank controls
- Continue to regulate WWTP discharges
- Watershed resident education
- Additional monitoring

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7R Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.[14]

In accordance with the BMPs identified in the TMDL report as planned measures to reach compliance with the Taunton River pathogen TMDL report, MassDOT completed the process of documenting the locations of its stormwater outfalls, per MS4 requirements.[13] In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.[13]

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Wading River (MA62-49). These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its

[13] MassDEP, 2011. Final Pathogen TMDL for the Taunton River Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/taunton1.pdf

[14] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Wading River (MA62-49), including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

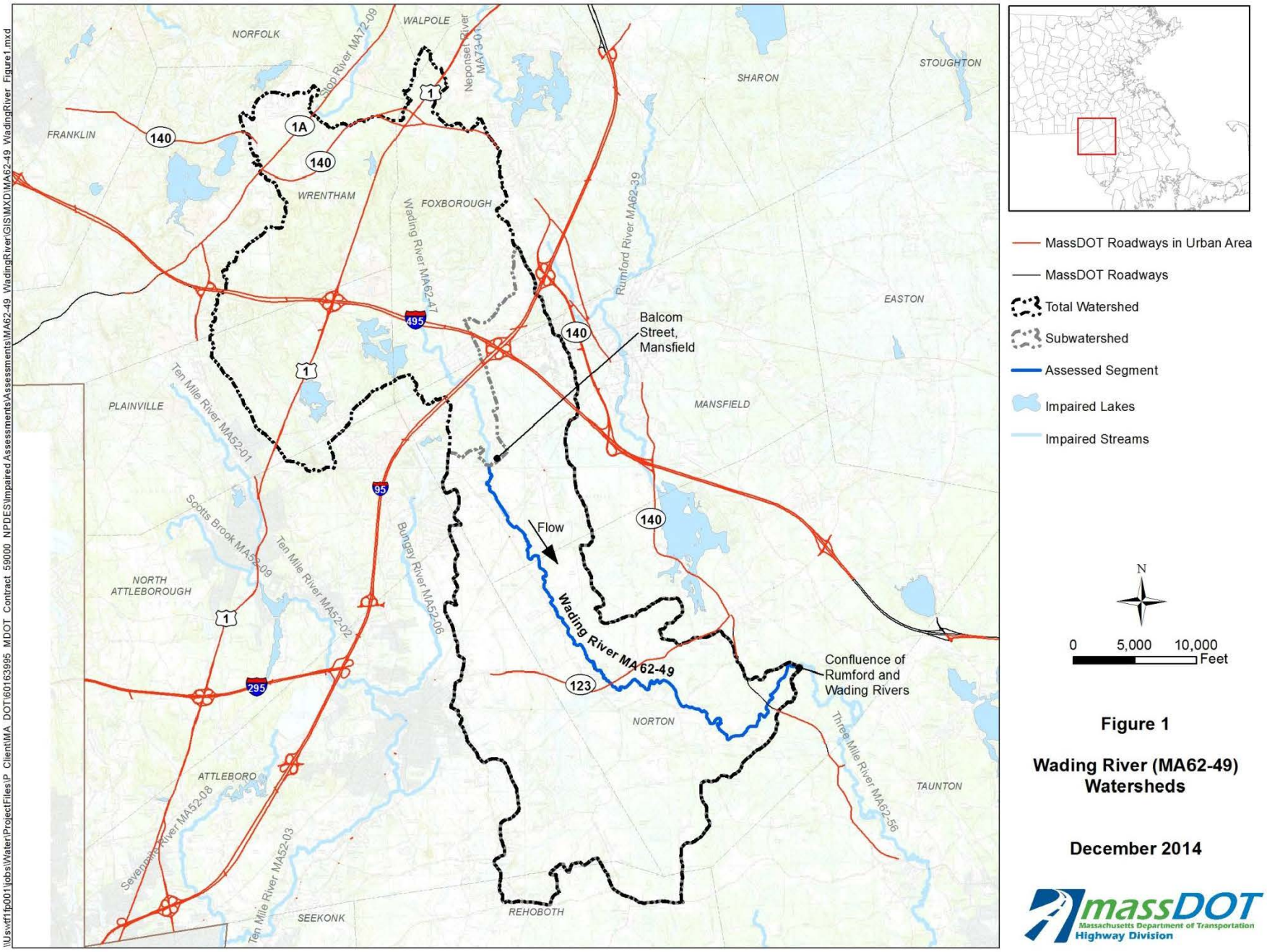

Figure 1

Wading River (MA62-49) Watersheds

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

12/08/2014

Impaired Waters Assessment for Mill Brook (MA71-07)

Summary

Impaired Water[1]	Impairments:	Stormwater:	*Escherichia coli*
		Non-Stormwater:[2]	*Physical substrate habitat alterations*
	Category:	*5 (Waters requiring a TMDL)*	
	Final TMDLs:	*None*	
	WQ Assessment:	*Mystic River Watershed and Coastal Drainage Area 2004-2008 Water Quality Assessment Report*[3]	
Location	Towns:	*Lexington and Arlington*	
	MassDOT Roads:	*Route 2A, Route 2, Route 4 and various small bridges*	
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒	

Site Description

Mill Brook (MA71-07) begins south of Massachusetts Avenue in Lexington and flows to the inlet of Lower Mystic Lake in Arlington. The segment is 3.9 miles in length. MassDEP's Water Quality Assessment Report[3] for this receiving water identified the Primary Contact and Secondary Contact designated Uses as "impaired" due to *Escherichia coli* from unspecified urban stormwater sources. The Aesthetics Use is "supported" and the Aquatic Life and Fish Consumption Uses have not yet been assessed. Aquatic Life has an "alert" status because of biotic index score data.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA71-07 is comprised of portions of Route 2A, Route 2, and Route 4, as well as small

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDOT, December 2012. Impaired Waters Assessment for Impaired Waters with Impairments Unrelated to Stormwater. Available at: http://www.mhd.state.ma.us/downloads/projDev/ImpairedWaters_3/Year3_ImpairedWatersAssessment_1.pdf#page=308 [3] MassDEP, 2010. Mystic River Watershed and Coastal Drainage Area 2004-2008 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/71wqar09.pdf

[3] MassDEP, 2010. Mystic River Watershed and Coastal Drainage Area 2004-2008 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/71wqar09.pdf

portions of Park Street, Lowell Street, Summer Street, and Mystic Valley Parkway. Refer to Figure 1 for the location of these roadways and bridges within the watershed to Segment MA71-07.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[4] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[5] MassDOT assessed Mill Brook (MA71-07) using the methodologies described below.

MassDOT has identified a subset of water body impairments in the Mill Brook watershed which are not related to stormwater runoff. Specific impairments unrelated to stormwater for Mill Brook include physical substrate habitat alterations. In accordance with MassDOT's Impaired Waters Assessment for Impaired Waters with Impairments Unrelated to Stormwater in the December 8, 2012 EPA submittal, the non-stormwater related impairments are not specifically addressed as part of the Impaired Waters Program.[6]

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[7] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List[8] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of Mill Brook is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (Escherichia coli) impairment using the approach described in BMP 7U of MassDOT's Storm Water Management Plan (SWMP)[9] which applies to impairments that have been assigned to a water body not covered by a final TMDL. Mill Brook (MA71-07) is covered by the draft Pathogen TMDL for the Boston Harbor Watershed (excluding the Neponset River sub-basin).[10]

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[4] Massachusetts Department of Transportation (MassDOT), July 22, 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[5] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[6] MassDOT, December 2012. Impaired Waters Assessment for Impaired Waters with Impairments Unrelated to Stormwater. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/impairedWaters/Year3/Year3_ImpairedWatersAssessment_1.pdf#page=308

[7] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[8] MassDEP, 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[9] MassDOT, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.mhd.state.ma.us/downloads/projDev/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[10] MassDEP, No Date. Draft Pathogen TMDL for the Boston Harbor Watershed (excluding the Neponset River sub-basin). Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/bharbor1.pdf

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[11] MassDOT included an informational review of the draft report as part of this assessment even though, due to their draft status, draft TMDLs are not formally part of the Impaired Waters Retrofit program.

The Boston Harbor watershed has numerous suspected sources, which are identified in the draft TMDL report. These suspected sources include failing septic systems, combined sewer overflows (CSO), sanitary sewer overflows (SSO), sewer pipes connected to storm drains, wildlife, recreational activities, and stormwater runoff.[12]

In addition to the generic recommendations provided in the draft NPDES MS4 permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the Boston Harbor watershed draft TMDL report[12] (Section 7.0, page 65) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed:

- Correction of failing septic systems
- Elimination of illicit sewer connections, SSOs, and CSOs

The TMDL report also indicates that structural BMPs may be appropriate to address runoff from impervious areas in instances where fecal coliform concentrations cannot be reduced by other means.

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the Boston Harbor watershed:

- Recreational waters use management practices
- Septic tank controls
- Documentation of storm drain outfall locations
- Watershed resident education
- Additional monitoring

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing Stormwater Management Plan (SWMP) including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7UPathogen Methodology,[13] MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.

[11] MassDOT. December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

[12] MassDEP, Draft Pathogen TMDL for the Boston Harbor Watershed (excluding the Neponset River sub-basin). Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/bharbor1.pdf

[13] MassDOT. December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT targeted rest stops are located within the subwatershed of this water body. At rest stops that have been identified as being within subwatersheds of water bodies impaired for pathogens, MassDOT will be installing signs at rest stops within the subwatershed of impaired water bodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for the MA71-07 Mill Brook. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of the MA71-07 Mill Brook, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Mill Brook. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Mill Brook, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

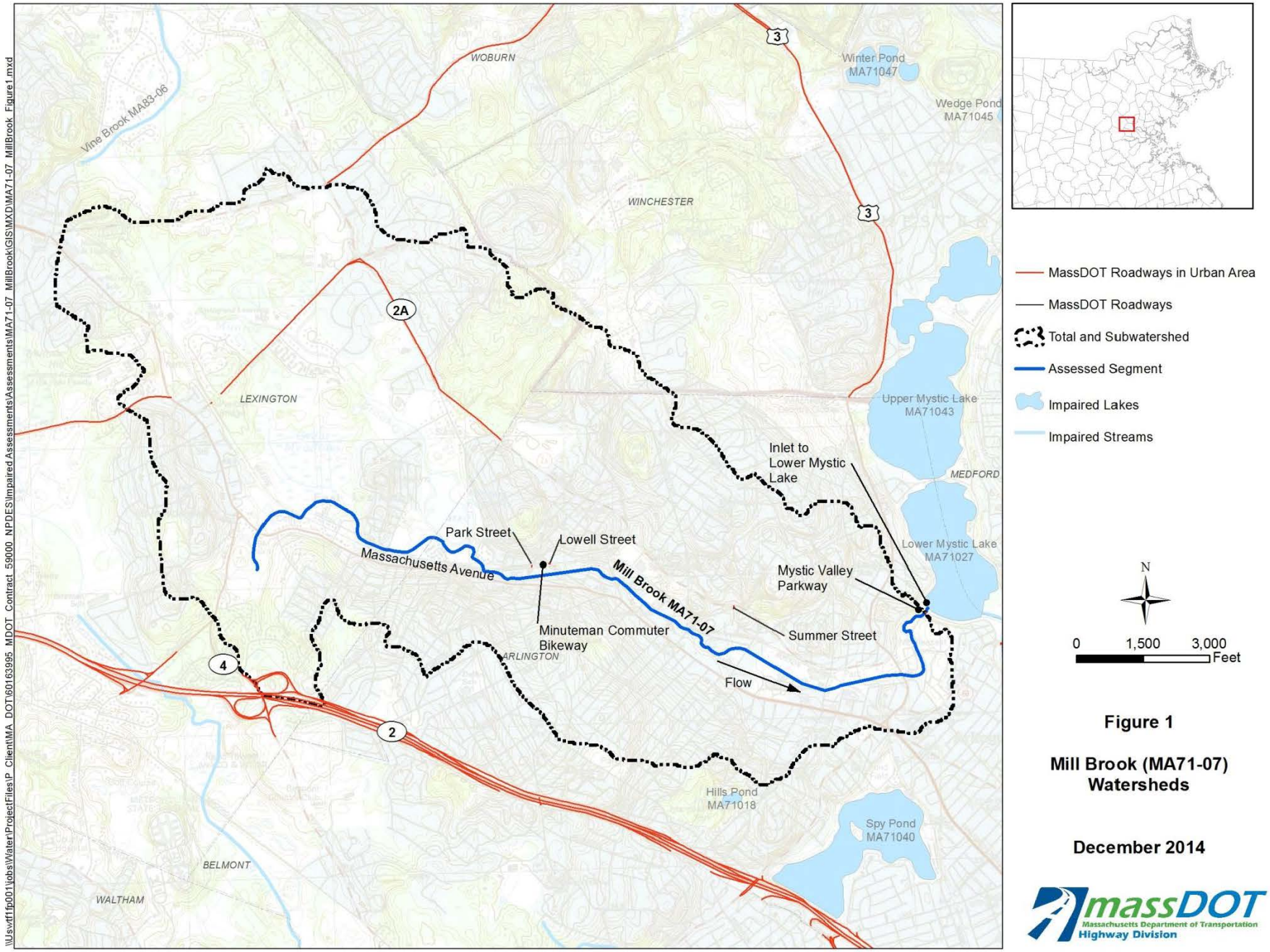

Figure 1

Mill Brook (MA71-07) Watersheds

December 2014

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Massachusetts Department of Transportation
Highway Division

Impaired Waters Assessment for Old Swamp River (MA74-03)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Boston Harbor 1999 Water Quality Assessment Report* [2]
Location	Towns:	*Rockland and Weymouth*
	MassDOT Roads:	*Routes 3 and 53 and Ralph Talbot Street/Oak Street*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒

Site Description

Old Swamp River (MA74-03) flows from the headwaters just west of Pleasant Street and north of Liberty Street in Rockland to the inlet of Whitmans Pond (MA74025) in Weymouth. The segment is approximately 5.2 miles long. The total and subwatersheds for this segment are the same (Figure 1).

MassDEP's Water Quality Assessment Report for this receiving water estimates the subwatershed land use as 41% forest, 34% residential, 7% open land, and 7% industrial.[2] The segment is "supported" for the Aesthetics use; however, an "alert" status has been designated due to riparian disruption and erosion from housing development. The lower 2.0 miles of the segment is "partially supported" for the Aquatic Life use due to suspected SSOs and a slightly impaired benthic community, while the upper portion has not been assessed for the Aquatic Life use. The segment is also "partially supported" for the Primary Contact and Secondary Contact uses due to high bacteria counts and SSOs. The Fish Consumption use has not yet been assessed.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA74-03 is comprised of portions of Route 3, as well as Oak Street, which becomes Ralph Talbot Street, and Route 53. Refer to Figure 1 for the location of these roadways within the subwatershed to Segment MA74-03.

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2002. Boston Harbor 1999 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/3baapp/70wqar3c.pdf

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed Old Swamp River (MA74-03) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[5] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[6] The condition of Old Swamp River is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[7] Old Swamp River (MA74-03) is covered by the Draft Pathogen TMDL for the Boston Harbor Watershed.[8]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[9] MassDOT included an informational review of the draft report as part of this assessment even though, due to their draft status, draft TMDLs are not formally part of the Impaired Waters Retrofit program.

The Boston Harbor watershed has numerous suspected sources, which are identified in the draft TMDL report.[8] These suspected sources include failing septic systems, combined sewer overflows (CSO), sanitary sewer overflows (SSO), sewer pipes connected to storm drains, wildlife, recreational activities, and stormwater runoff.

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[3] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[4] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[5] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[6] MassDEP, 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[7] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDEP. Draft Pathogen TMDL for the Boston Harbor Watershed (excluding the Neponset River sub-basin). Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/bharbor1.pdf

[9] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

In addition to the generic recommendations provided in the draft NPDES municipal separate storm sewer system (MS4) permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the Boston Harbor watershed draft TMDL report (Section 7.0, page 65) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed:[10]

- Correction of failing septic systems
- Elimination of illicit sewer connections, SSOs, and CSOs

The TMDL report also indicates that structural BMPs may be appropriate to address runoff from impervious areas in instances where fecal coliform concentrations cannot be reduced by other means.[10]

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the Boston Harbor watershed: [10]

- Recreational waters use management practices
- Septic tank controls
- Documentation of storm drain outfall locations
- Watershed resident education
- Additional monitoring

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and draft TMDL recommendations in regard to pathogens.[11]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the draft TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls. [10]

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving

[10] MassDEP. Draft Pathogen TMDL for the Boston Harbor Watershed (excluding the Neponset River sub-basin). Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/bharbor1.pdf

[11] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Old Swamp River (MA74-03). These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Old Swamp River (MA74-03), including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

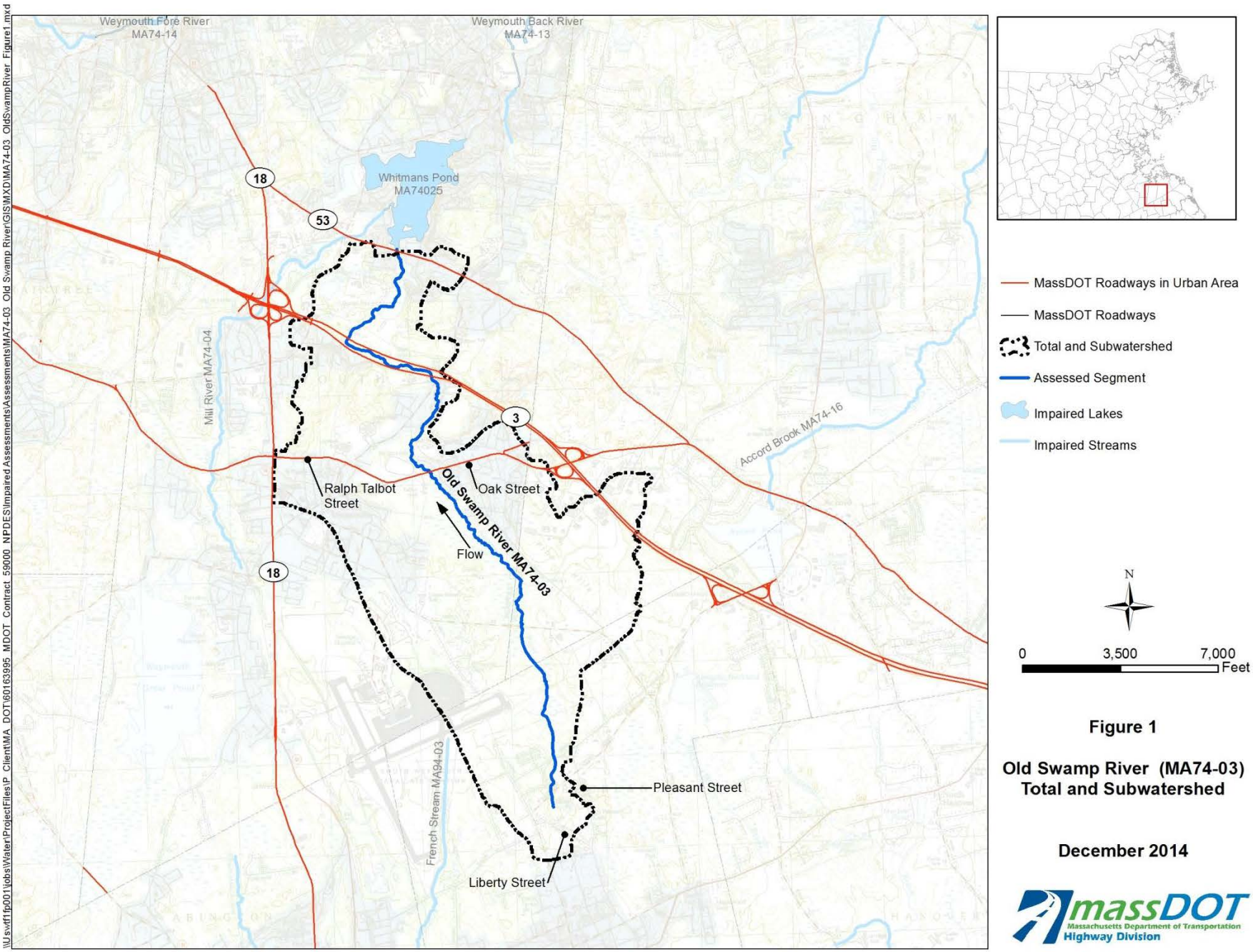

Figure 1

Old Swamp River (MA74-03)
Total and Subwatershed

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

Impaired Waters Assessment for North Nashua River (MA81-01)

Summary

Impaired Water[1]	Stormwater Impairments:	*Escherichia coli*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Nashua River Watershed 2003 Water Quality Assessment Report* [2]
Location	Towns:	*Fitchburg*
	MassDOT Roads:	*Routes 2 and 2A*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒

Site Description

Segment MA81-01 of North Nashua River begins at the outlet of Snows Millpond and flows toward the Fitchburg Paper Company Dam #1 in Fitchburg. The total and subwatershed are shown in Figure 1. The segment is approximately 1.7 miles long, and the subwatershed includes portions of Routes 2 and 2A. There is one NPDES discharge permit held by the City of Fitchburg Wastewater Commission (MA0101281) to discharge 10.5 MGD from the West Fitchburg Wastewater Treatment Facility. The segment is "supported" for the Aquatic Life, Primary Contact, Secondary Contact, and Aesthetics uses, while the Fish Consumption use has not yet been assessed. The Aquatic Life and Primary and Secondary Contact uses have an "alert" status due to low rapid bioassessment protocol (RBP) III metrics and occasional spikes in *Escherichia coli (E. coli)* concentrations.[2]

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA81-01 is comprised of portions of Route 2 and its associated interchange, Route 2A. Refer to Figure 1 for the location of these roadways within the subwatershed to Segment MA81-01.

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2008. Nashua River Watershed. 2003 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/81wqar08.pdf

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed North Nashua River (MA81-01) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[5] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[6] The condition of North Nashua River (MA81-01) is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (*E. coli*) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[7] Nashua River (MA81-01) is covered by the Draft Pathogen TMDL for the Nashua River Watershed.[8]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[9] MassDOT included an informational review of the draft report as part of this assessment even though, due to their draft status, draft TMDLs are not formally part of the Impaired Waters Retrofit program.

The Nashua River watershed has numerous suspected sources, which are identified in the draft TMDL report.[8] These suspected sources include failing septic systems, combined sewer overflows (CSO), sanitary sewer overflows (SSO), sewer pipes connected to storm drains, wildlife, agriculture, recreational activities, and direct stormwater runoff. Specifically for Nashua River (MA81-01),

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[3] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[4] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[5] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[6] MassDEP, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[7] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDEP, No Date. Draft Pathogen TMDL for the Nashua River Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/nashua1.pdf

[9] MassDOT, December 2014. Description of MassDOT's Application of BMP BMP 7U for Pathogen Related Impairments.

potential sources may include urban runoff and CSO discharges. Segment MA81-01 is located in the central portion of the watershed.

In addition to the generic recommendations provided in the draft NPDES municipal separate storm sewer system (MS4) permit for Massachusetts and discussed in the MassDOT Pathogen Methodology, the Nashua River watershed draft TMDL report (Section 7.0, page 36) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed:[10]

- Correction of failing septic systems
- Elimination of illicit sewer connections, SSOs, and CSOs

The draft TMDL report also indicates that structural BMPs may be appropriate to address runoff from impervious areas in instances where fecal coliform concentrations cannot be reduced by other means.[10]

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria draft TMDL for the Nashua River watershed:[10]

- Agricultural BMPs such as field application of manure, animal feeding operations, and managing animal grazing areas
- Detection and elimination of illicit discharges
- Documentation of storm drain outfall locations
- Septic tank controls
- Recreational waters use management practices
- Watershed resident education
- Additional monitoring

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.[11]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving

[10] MassDEP, No Date. Draft Pathogen TMDL for the Nashua River Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/nashua1.pdf

[11] MassDOT, December 2014. Description of MassDOT's Application of BMP BMP 7U for Pathogen Related Impairments.

waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for North Nashua River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of North Nashua River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

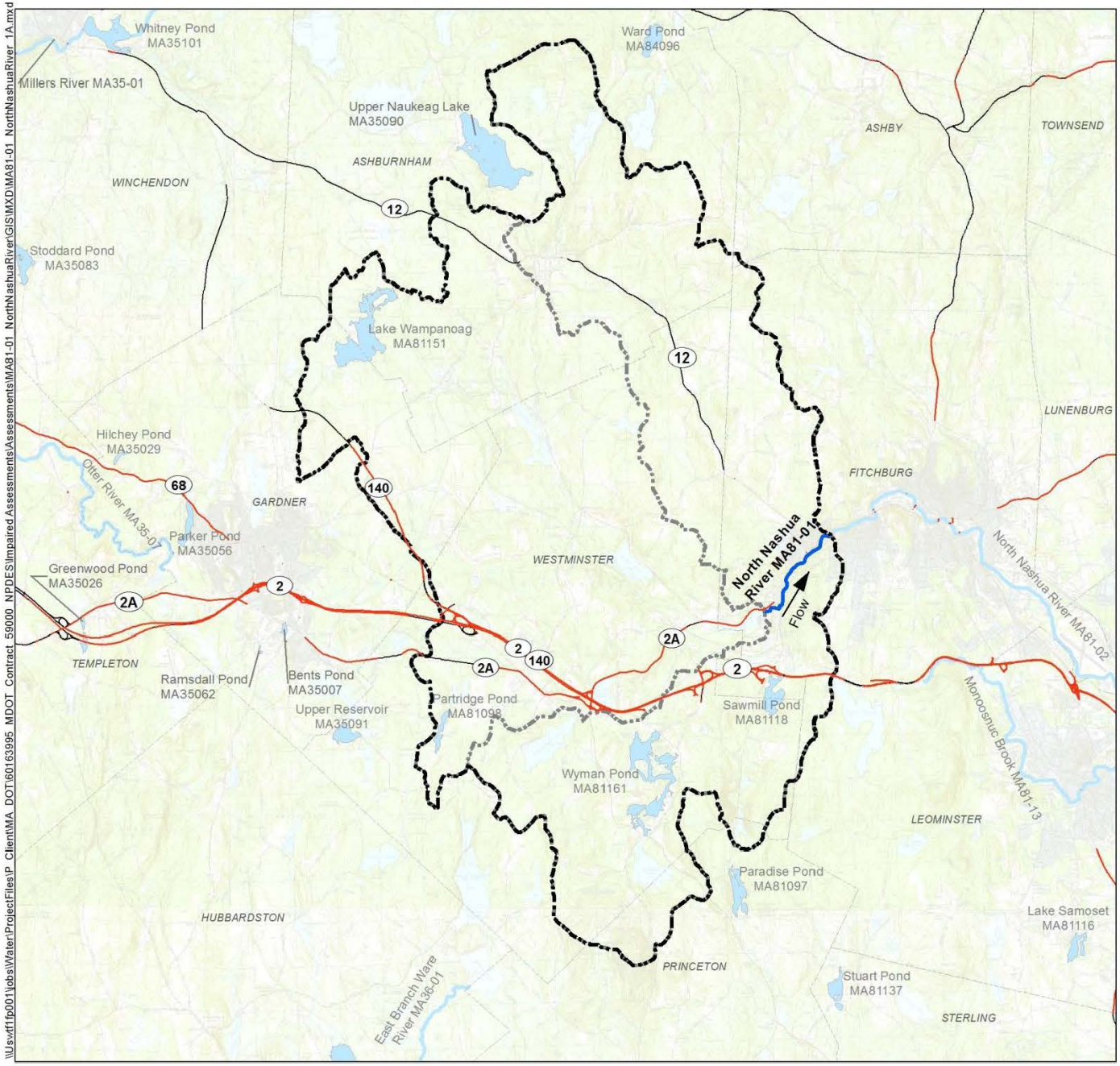

Figure 1

North Nashua River (MA81-01) Watersheds

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

massDOT Massachusetts Department of Transportation Highway Division

12/08/2014

Impaired Waters Assessment for North Nashua River (MA81-03)

Summary

Impaired Water[1]	Stormwater Impairments:	*Escherichia coli*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Nashua River Watershed 2003 Water Quality Assessment Report* [2]
Location	Towns:	*Leominster*
	MassDOT Roads:	*Routes 2 and 13*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒

Site Description

Segment MA81-03 of North Nashua River is located in Leominster from the East Fitchburg WWTP outfall to the Leominster WWTP outfall. Figures 1A and 1B illustrate the total and subwatershed for North Nashua River (MA81-03). The segment is approximately 1.6 miles long. There is one NPDES discharge permit held by the City of Fitchburg Wastewater Commission (MA0100986) to discharge 12.4 MGD from the East Fitchburg Wastewater Treatment Facility. The segment is "supported" for the Aquatic Life, Secondary Contact, and Aesthetics uses, all of which have an "alert" status due to elevated total phosphorous and low rapid bioassessment protocol (RBP) III metrics, occasional spikes in *Escherichia coli* (*E. coli*) concentrations, and moderate filamentous algae, respectively. The segment is "impaired" for the Primary Contact use due to *E. coli*, which may be from wet weather discharges. The Fish Consumption use has not yet been assessed.[2]

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA81-03 is comprised of portions of Routes 2 and 13. The portions of Route 13 within the subwatershed are near the interchanges with Route 2. Refer to Figure 1B for the location of these roadways within the subwatershed to Segment MA81-03.

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2008. Nashua River Watershed. 2003 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/81wqar08.pdf

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed North Nashua River (MA81-03) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[5] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[6] The condition of North Nashua River (MA81-03) is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (*Escherichia coli*) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[7] North Nashua River (MA81-03) is covered by the Draft Pathogen TMDL for the Nashua River Watershed.[8]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[9] MassDOT included an informational review of the draft report as part of this assessment even though, due to their draft status, draft TMDLs are not formally part of the Impaired Waters Retrofit program.

The Nashua River watershed has numerous suspected sources, which are identified in the draft TMDL report.[8] These suspected sources include failing septic systems, combined sewer overflows (CSO), sanitary sewer overflows (SSO), sewer pipes connected to storm drains, wildlife, agriculture, recreational activities, and direct stormwater runoff. Specifically for North Nashua River (MA81-03), potential sources may include urban runoff/storm sewers and CSO discharges.

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[3] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[4] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[5] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[6] MassDEP, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[7] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDEP, No Date. Draft Pathogen TMDL for the Nashua River Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/nashua1.pdf

[9] MassDOT, December 2014. Description of MassDOT's Application of BMP BMP 7U for Pathogen Related Impairments.

In addition to the generic recommendations provided in the draft NPDES municipal separate storm sewer system (MS4) permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the Nashua River watershed draft TMDL report (Section 7.0, page 36) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed:[10]

- Correction of failing septic systems
- Elimination of illicit sewer connections, SSOs, and CSOs

The draft TMDL report also indicates that structural BMPs may be appropriate to address runoff from impervious areas in instances where fecal coliform concentrations cannot be reduced by other means.[10]

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria draft TMDL for the Nashua River watershed:[10]

- Agricultural BMPs such as field application of manure, animal feeding operations, and managing animal grazing areas
- Detection and elimination of illicit discharges
- Documentation of storm drain outfall locations
- Septic tank controls
- Recreational waters use management practices
- Watershed resident education
- Additional monitoring

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.[11]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

[10] MassDEP, No Date. Draft Pathogen TMDL for the Nashua River Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/nashua1.pdf

[11] MassDOT, December 2014. Description of MassDOT's Application of BMP BMP 7U for Pathogen Related Impairments.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for North Nashua River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of North Nashua River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

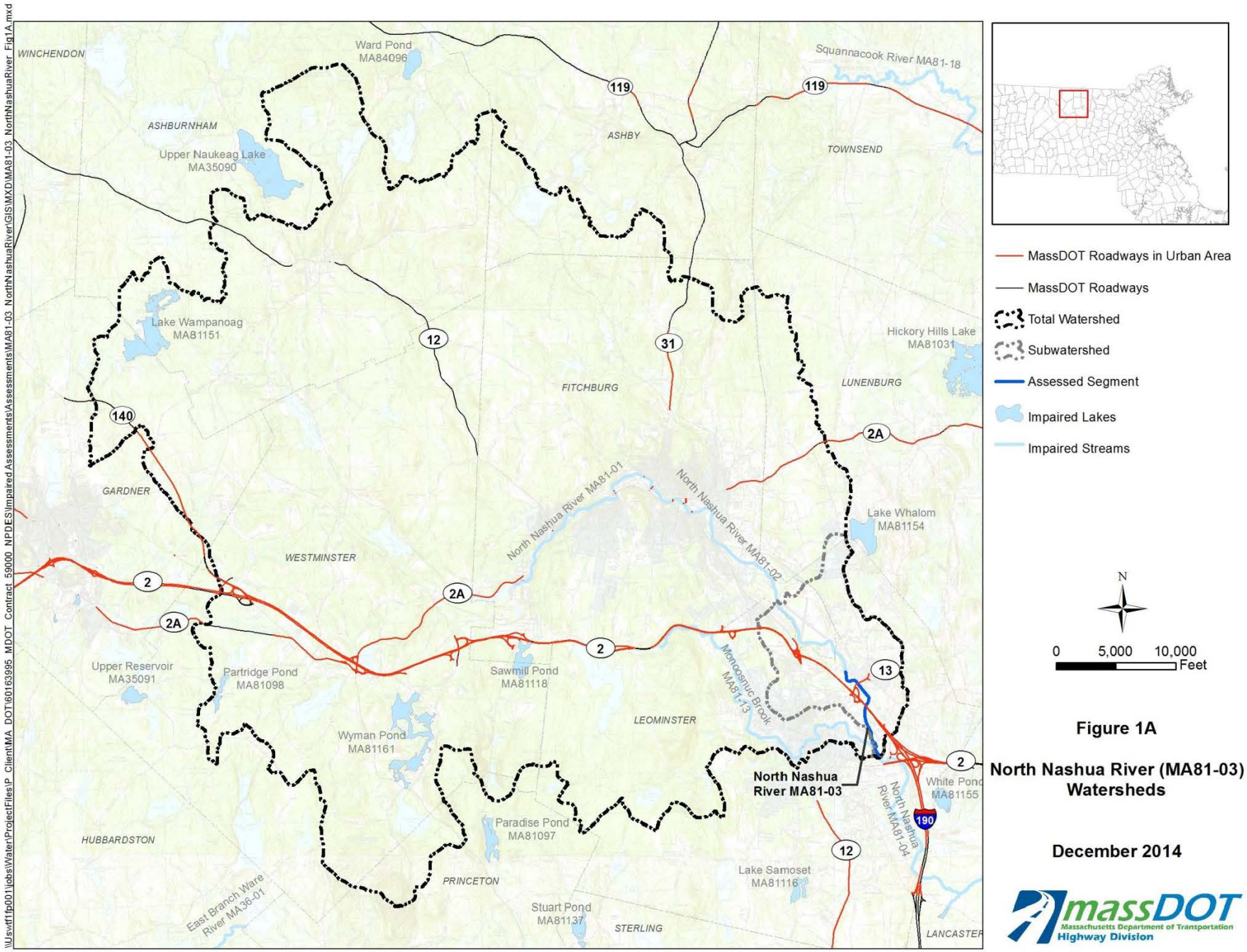

Figure 1A

North Nashua River (MA81-03) Watersheds

December 2014

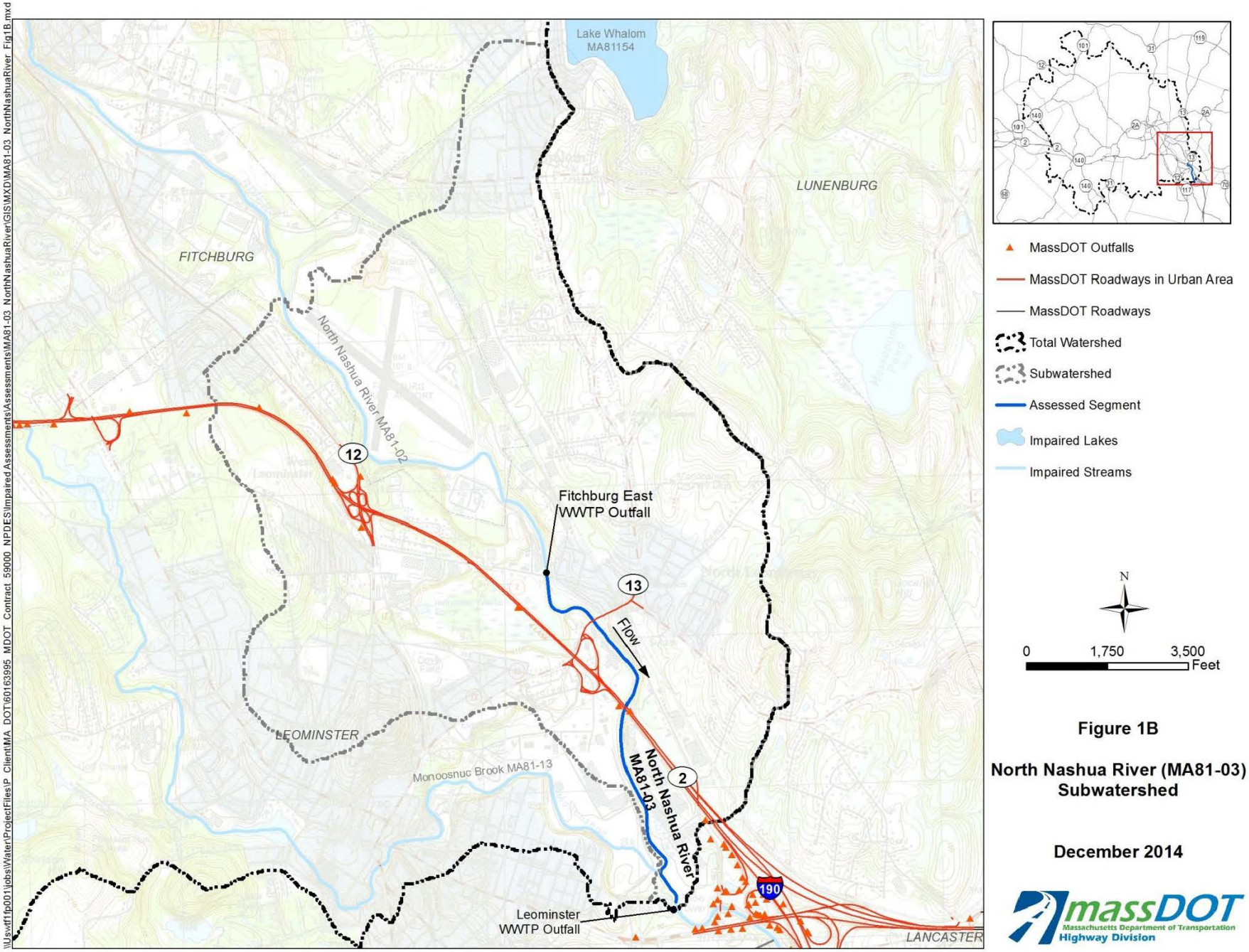

Figure 1B

North Nashua River (MA81-03) Subwatershed

December 2014

12/08/2014

Impaired Waters Assessment for Gates Brook (MA81-24)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Nashua River Watershed 2003 Water Quality Assessment* [2]
Location	Towns:	*West Boylston*
	MassDOT Roads:	*Interstate 190 and Route 12*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒

Site Description

Gates Brook (MA81-24) begins at the headwaters west of Prospect Street and ends at the inlet to the Wachusett Reservoir (Gates Cove) in West Boylston. The segment is approximately 2.4 miles long. MassDEP's Water Quality Assessment Report identified the Aquatic Life and Primary Contact uses with an "alert" status because of evidence of elevated total phosphorus concentrations and elevated *Escherichia coli* concentrations, respectively.[2] The Secondary Contact use was "supported" and all other uses were not assessed. There are no NPDES discharges to this water body.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA81-24 is comprised of portions of Interstate 190 and Route 12. Refer to Figure 1 for the location of these roadways within the subwatershed to Segment MA81-24.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2008. Nashua River Watershed. 2003 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/81wqar08.pdf

[3] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed Gates Brook (MA81-24) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[5] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[6] The condition of Gates Brook is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[7] Nashua River (MA81-24) is covered by the Draft Pathogen TMDL for the Nashua River Watershed.[8]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[9] MassDOT included an informational review of the draft report as part of this assessment even though, due to their draft status, draft TMDLs are not formally part of the Impaired Waters Retrofit program.

The Nashua River watershed has numerous suspected sources, which are identified in the draft TMDL report.[8] These suspected sources include failing septic systems, combined sewer overflows (CSO), sanitary sewer overflows (SSO), sewer pipes connected to storm drains, wildlife, agriculture, recreational activities, and direct stormwater runoff. Specifically for Nashua River (MA81-24), potential sources may include failing septic systems, stormwater discharge pipes, and animal populations. Segment MA81-24 is located in the central portion of the watershed.

In addition to the generic recommendations provided in the draft NPDES MS4 permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the Nashua River watershed draft TMDL report (Section 7.0, page 36) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed: [8]

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[4] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[5] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[6] MassDEP, 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[7] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDEP, No Date. Draft Pathogen TMDL for the Nashua River Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/nashua1.pdf

[9] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

- Correction of failing septic systems
- Elimination of illicit sewer connections, SSOs, and CSOs

The draft TMDL report also indicates that structural BMPs may be appropriate to address runoff from impervious areas in instances where fecal coliform concentrations cannot be reduced by other means.[10]

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria draft TMDL for the Nashua River watershed: [10]

- Agricultural BMPs such as field application of manure, animal feeding operations, and managing animal grazing areas
- Detection and elimination of illicit discharges
- Documentation of storm drain outfall locations
- Septic tank controls
- Recreational waters use management practices
- Watershed resident education
- Additional monitoring

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.[11]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

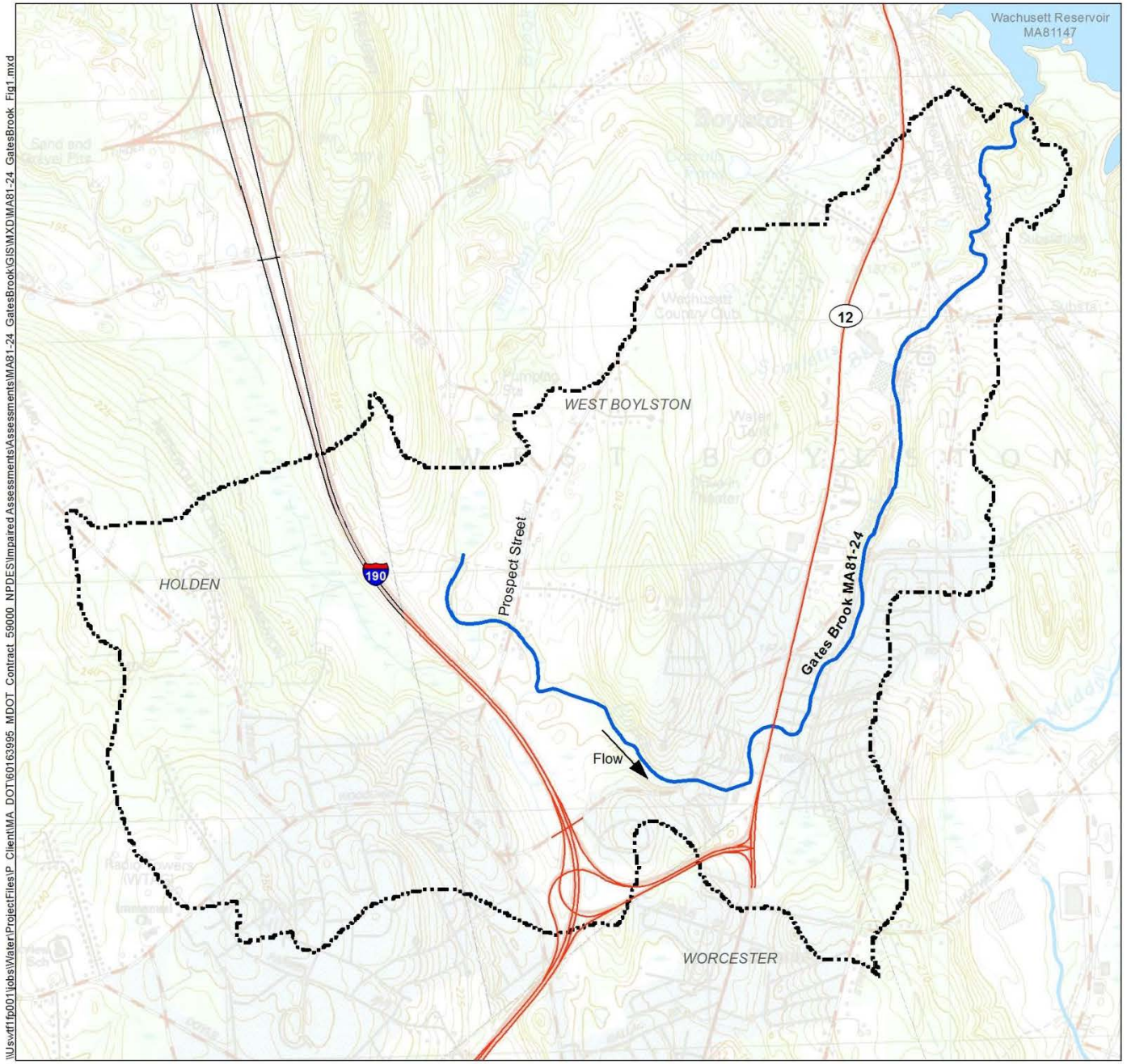
Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Gates Brook (MA81-24). These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT

[10] MassDEP, No Date. Draft Pathogen TMDL for the Nashua River Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/nashua1.pdf

[11] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Gates Brook, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.



MassDOT Roadways in Urban Area

MassDOT Roadways

Total and Subwatershed

Assessed Segment

Impaired Lakes

Impaired Streams

N

0 1,000 2,000 Feet

Figure 1

Gates Brook (MA81-24)
Total and Subwatershed

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

Impaired Waters Assessment for Mill River (MA91-09)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Parker River Watershed and Coastal Drainage Area 2004 – 2008 Water Quality Assessment Report* [2]
Location	Towns:	*Rowley and Newbury*
	MassDOT Roads:	*Route 1A*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒

Site Description

Mill River (MA91-09) flows from Route 1 in Rowley/Newbury to the confluence with the Parker River in Newbury, Massachusetts. This segment is a tidal estuary approximately 0.09 square mile. Figure 1 shows the Total and Subwatershed to the water body.

MassDEP's Water Quality Assessment Report for this receiving water identified the Shellfish Harvesting use with an "impaired" status because of the presence of fecal coliform.[2] The source of the bacteria is unknown so the shellfish area is classified as prohibited. All other uses were not assessed. The report identifies that a Governor Dummer Academy (now referred to as Governor's Academy) discharge has coverage under a NPDES permit (MA0030350, discharge to unnamed tributary of Mill River). A new permit was issued in September 2011.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA91-09 is comprised of portions of Route 1 and Route 1A. Route 1 is just outside the subwatershed boundary while Route 1A runs along the southeastern boundary to the subwatershed. Interstate 95 is also located within the total watershed but is several miles from this segment MA91-09. Refer to Figure 1 for the location of these roadways within the subwatershed to Segment MA91-09.

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2001. Parker River Watershed and Coastal Drainage Area 2004-2008 Water Quality Assessment Report. Available at http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/91wqar10.pdf

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed Mill River (MA91-09) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[5] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[6] The condition of Mill River is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[7] Mill River (MA91-09) is covered by the Draft Pathogen TMDL for the Parker River Watershed.[8]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[9] MassDOT included an informational review of the draft report as part of this assessment even though, due to their draft status, draft TMDLs are not formally part of the Impaired Waters Retrofit program.

The pathogen impairment has been documented at numerous locations throughout the Parker River Watershed. In general, dry weather sources include animal feeding operations and animal grazing in riparian zones; stormwater drainage systems, failing septic systems, recreational activities, wildlife including birds and illicit boat discharges. Wet weather sources include wildlife and domesticated animals (including pets) and stormwater runoff including municipal separate storm

[3] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[4] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[5] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[6] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[7] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDEP, No Date. Draft Pathogen TMDL for the Parker River Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/parker1.pdf

[9] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

sewer systems (MS4s). Specifically for Mill River (MA91-09), potential sources are identified as non-point source pollution, failed septic systems, cesspools, domestic and feral animals, agricultural sources and the wastewater treatment facility.

The draft TMDL states that stormwater runoff (from both pervious and impervious surfaces) is one of the major sources of pathogens in the watershed and that improving stormwater runoff quality is essential to restoring water quality and recreational uses.[10] Intensive application of non-structural BMPs is recommended throughout the watershed and depending on the success of the non-structural BMPs, structural controls are suggested, if necessary. The implementation plan acknowledges that individual sources must be first identified in the field before they can be abated and that pinpointing sources typically requires extensive monitoring of receiving waters and tributary stormwater drainage systems during both dry and wet weather conditions.

In addition to the generic recommendations provided in the draft NPDES MS4 permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the Parker River draft TMDL report (Section 7.0) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed:[10]

- Implement BMPs for field application of manure, animal feeding operations, barnyards and managing animal grazing areas;
- Detect and eliminate sewage discharges to storm sewer systems, including illicit discharges;
- Continued septic system maintenance and/or replacement;
- Reduce recreational contribution of pathogen input by providing shower facilities and encouraging bathers to shower prior to swimming;
- Designate a No Discharge Area to control the pathogen contamination from boats.

The TMDL report also indicates that a long-term monitoring plan is being implemented to capture water quality conditions under varied conditions and establish sampling locations to pin-point sources and assess the efficacy of BMPs.[10]

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and draft TMDL recommendations in regard to pathogens.[11]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

[10] MassDEP, No Date. Draft Pathogen TMDL for the Parker River Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/parker1.pdf

[11] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Mill River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Mill River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

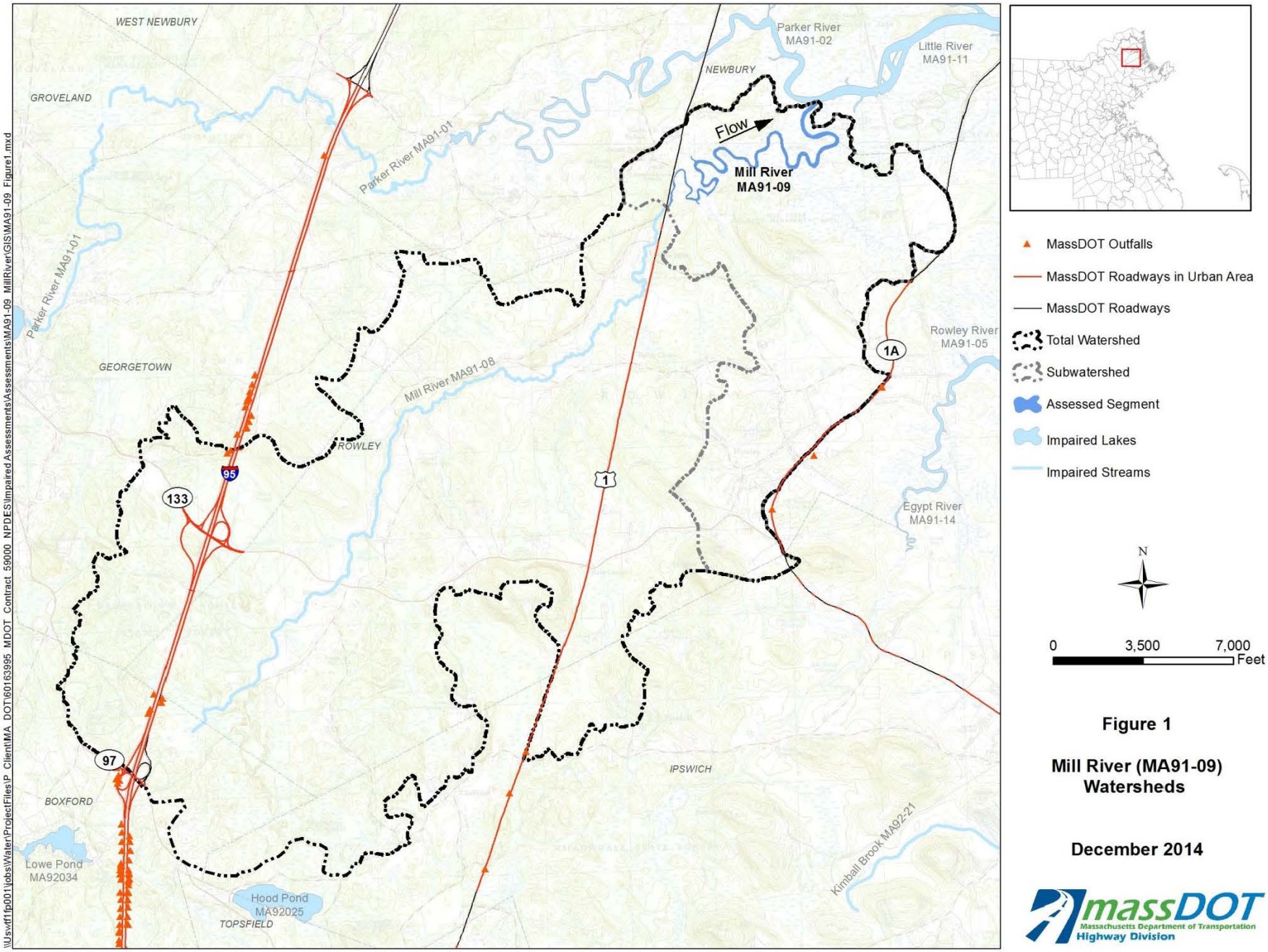


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Figure 1

Mill River (MA91-09) Watersheds

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

12/08/2014

Impaired Waters Assessment for Plum Island Sound (MA91-12)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Parker River Watershed and Coastal Drainage Area 2004 – 2008 Water Quality Assessment Report* [2]
Location	Towns:	*Newbury and Ipswich*
	MassDOT Roads:	*Routes 1A and 133*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒

Site Description

Plum Island Sound (MA91-12) is a 4.7-square-mile water body that extends from the mouth of both the Parker River and Plum Island River in Newbury to the Atlantic Ocean in Ipswich, Massachusetts. This segment also includes Ipswich Harbor. The total and subwatershed to this water body are shown in Figure 1A.

MassDEP's Water Quality Assessment Report for this receiving water identified the Primary Contact and Secondary Contact uses with a 'support' status and the Shellfish Harvesting use as 'impaired'.[2] The Shellfish Harvesting use is designated as "impaired" due to the concentration of fecal coliform from unknown sources. All other uses were not assessed.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA91-12 is comprised of portions of Routes 1A and 133 which are located within the subwatershed. Refer to Figure 1B for the location of this roadway within the subwatershed to Segment MA91-12.

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2001. Parker River Watershed and Coastal Drainage Area 2004-2008 Water Quality Assessment Report. Available at http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/91wqar10.pdf

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed Plum Island Sound (MA91-12) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[5] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[6] The condition of Plum Island Sound is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[7] Plum Island Sound (MA91-12) is covered by the draft Pathogen TMDL for the Parker River Watershed.[8]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[9] MassDOT included an informational review of the draft report as part of this assessment even though, due to their draft status, draft TMDLs are not formally part of the Impaired Waters Retrofit program.

The pathogen impairment has been documented at numerous locations throughout the Parker River Watershed. In general, dry weather sources include animal feeding operations and animal grazing in riparian zones; stormwater drainage systems, failing septic systems, recreational activities, wildlife including birds and illicit boat discharges. Wet weather sources include wildlife and

[3] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[4] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[5] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[6] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[7] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDEP, 2001. Parker River Watershed and Coastal Drainage Area 2004-2008 Water Quality Assessment Report. Available at http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/91wqar10.pdf

[9] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

domesticated animals (including pets) and stormwater runoff including municipal separate storm sewer systems (MS4s). Specifically for Plum Island Sound (MA91-12), potential sources may include water fowl and a vessel sewage pump-out boat which operates on this water body.[10]

The draft TMDL states that stormwater runoff (from both pervious and impervious surfaces) is one of the major sources of pathogens in the watershed and that improving stormwater runoff quality is essential to restoring water quality and recreational uses.[1110] Intensive application of non-structural BMPs is recommended throughout the watershed and depending on the success of the non-structural BMPs, structural controls are suggested, if necessary. The implementation plan acknowledges that individual sources must be first identified in the field before they can be abated and that pinpointing sources typically requires extensive monitoring of receiving waters and tributary stormwater drainage systems during both dry and wet weather conditions.

In addition to the generic recommendations provided in the draft NPDES MS4 permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the Parker River draft TMDL report (Section 7.0) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed: [10]

- Implement BMPs for field application of manure, animal feeding operations, barnyards and managing animal grazing areas;
- Detect and eliminate sewage discharges to storm sewer systems, including illicit discharges;
- Continued septic system maintenance and/or replacement;
- Reduce recreational contribution of pathogen input by providing shower facilities and encouraging bathers to shower prior to swimming;
- Designate a No Discharge Area to control the pathogen contamination from boats.

The TMDL report also indicates that a long-term monitoring plan is being implemented to capture water quality conditions under varied conditions and establish sampling locations to pin-point sources and assess the efficacy of BMPs.[10]

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.[12]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

[10] MassDEP, 2001. Parker River Watershed and Coastal Drainage Area 2004-2008 Water Quality Assessment Report. Available at http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/91wqar10.pdf

[11] MassDEP, No Date. Draft Pathogen TMDL for the Parker River Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/parker1.pdf

[12] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Plum Island Sound. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Plum Island Sound, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

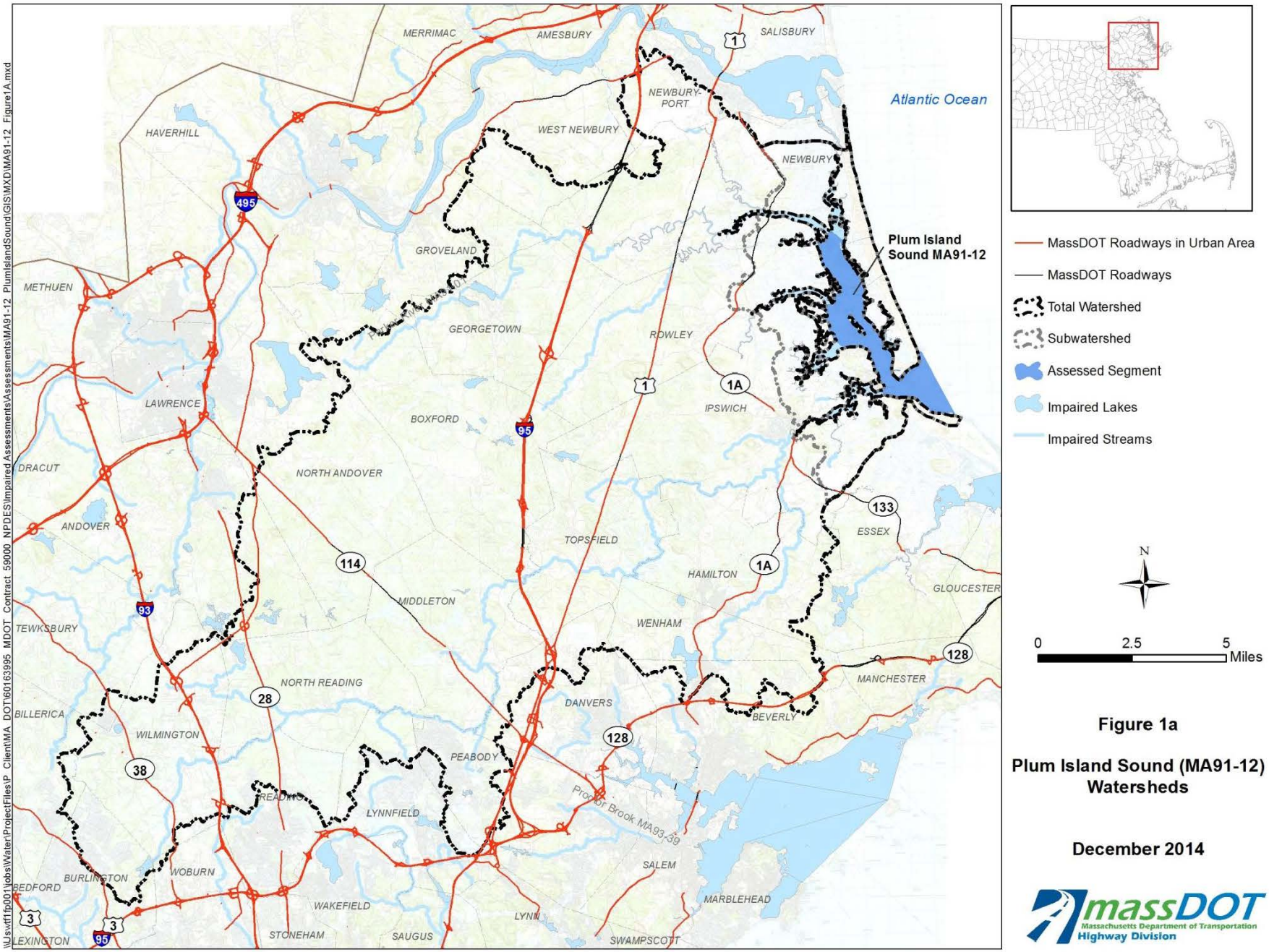
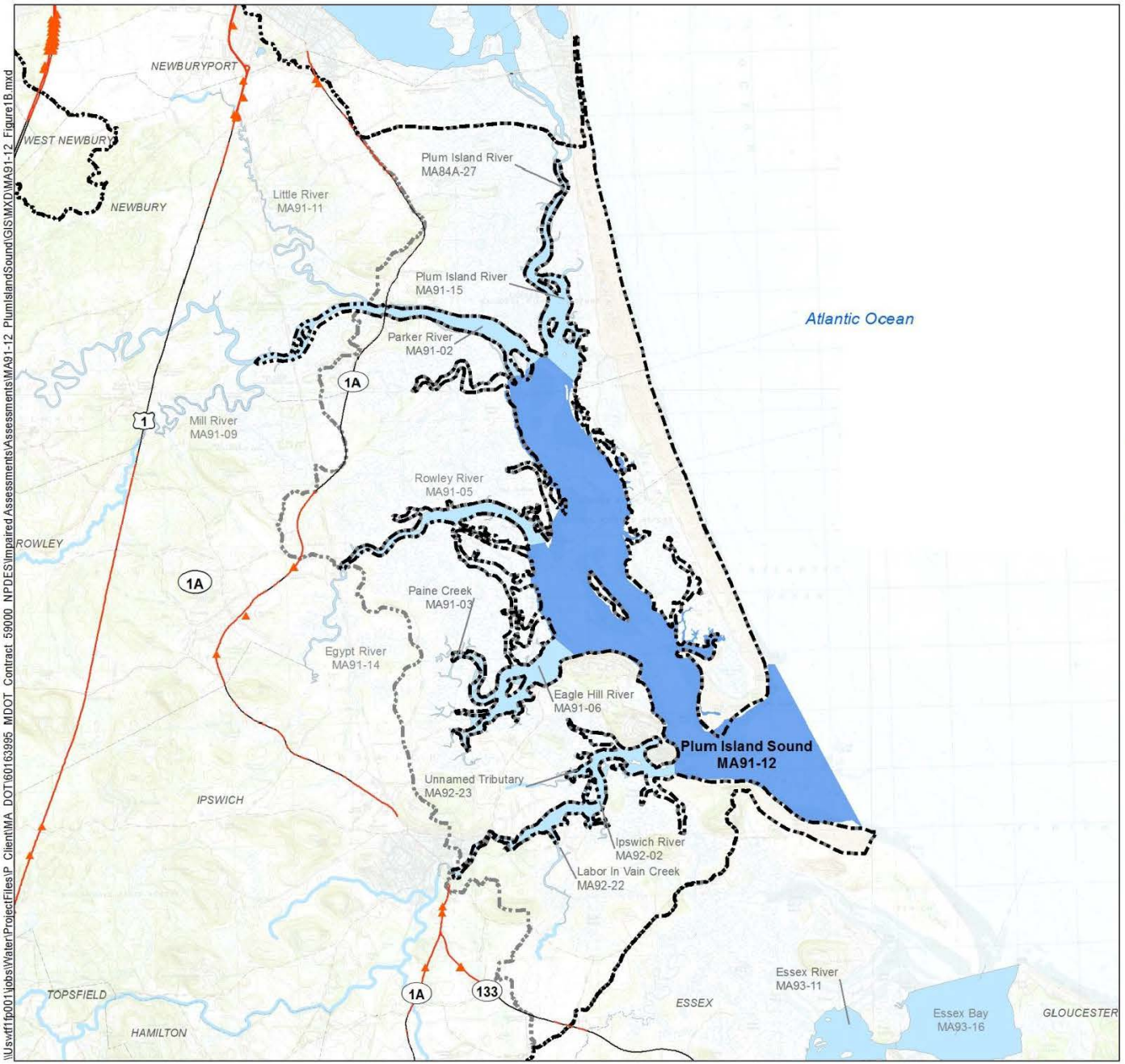
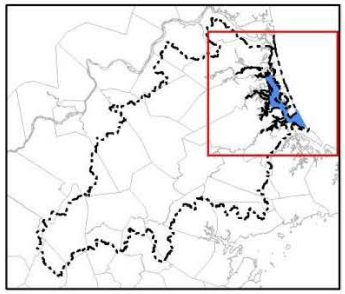


Figure 1a

Plum Island Sound (MA91-12) Watersheds

December 2014





MassDOT Outfalls

MassDOT Roadways in Urban Area

MassDOT Roadways

Total Watershed

Subwatershed

Assessed Segment

Impaired Lakes

Impaired Streams

N

0 1 2 Miles

Figure 1b

Plum Island Sound (MA91-12) Subwatershed

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

Impaired Waters Assessment for Plum Island River (MA91-15)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Parker River Watershed and Coastal Drainage Area 2004 – 2008 Water Quality Assessment Report* [2]
Location	Towns:	*Newbury*
	MassDOT Roads:	*Route 1A*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒

Site Description

Plum Island River (MA91-15) is a 0.41 square mile water body that extends from a sandbar just north of the confluence with Pine Island Creek to the confluence with Plum Island Sound. The total and subwatershed for the water body, which is comprised primarily of wetlands, is shown on Figure 1.

MassDEP's Water Quality Assessment Report for this receiving water identified the Shellfish Harvesting use with an "impaired" status because of evidence of fecal coliform.[2] The shellfish areas are classified as conditionally approved. All other uses were not assessed.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA91-15 is comprised of portions of Route 1A. Refer to Figure 1 for the location of these roadways within the subwatershed to Segment MA91-15.

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2001. Parker River Watershed and Coastal Drainage Area 2004-2008 Water Quality Assessment Report. Available at http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/91wqar10.pdf

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed Plum Island River (MA91-15) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[5] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[6] The condition of Plum Island River is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[7] Plum Island River (MA91-15) is covered by the draft Pathogen TMDL for the Parker River Watershed.[8]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[9] MassDOT included an informational review of the draft report as part of this assessment even though, due to their draft status, draft TMDLs are not formally part of the Impaired Waters Retrofit program.

The pathogen impairment has been documented at numerous locations throughout the Parker River Watershed. In general, dry weather sources include animal feeding operations and animal grazing in riparian zones; stormwater drainage systems, failing septic systems, recreational activities, wildlife including birds and illicit boat discharges. Wet weather sources include wildlife and

[3] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[4] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[5] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[6] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[7] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDEP, No Date. Draft Pathogen TMDL for the Parker River Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/parker1.pdf

[9] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

domesticated animals (including pets) and stormwater runoff including municipal separate storm sewer systems (MS4s). The specific sources for Plum Island River (MA91-15) are unknown.

The draft TMDL states that stormwater runoff (from both pervious and impervious surfaces) is one of the major sources of pathogens in the watershed and that improving stormwater runoff quality is essential to restoring water quality and recreational uses.[10] Intensive application of non-structural BMPs is recommended throughout the watershed and depending on the success of the non-structural BMPs, structural controls are suggested, if necessary. The implementation plan acknowledges that individual sources must be first identified in the field before they can be abated and that pinpointing sources typically requires extensive monitoring of receiving waters and tributary stormwater drainage systems during both dry and wet weather conditions.

In addition to the generic recommendations provided in the draft NPDES MS4 permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the Parker River draft TMDL report (Section 7.0) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed: [10]

- Implement BMPs for field application of manure, animal feeding operations, barnyards and managing animal grazing areas;
- Detect and eliminate sewage discharges to storm sewer systems, including illicit discharges;
- Continued septic system maintenance and/or replacement;
- Reduce recreational contribution of pathogen input by providing shower facilities and encouraging bathers to shower prior to swimming;
- Designate a No Discharge Area to control the pathogen contamination from boats.

The TMDL report also indicates that a long-term monitoring plan is being implemented to capture water quality conditions under varied conditions and establish sampling locations to pin-point sources and assess the efficacy of BMPs.[10]

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.[11]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

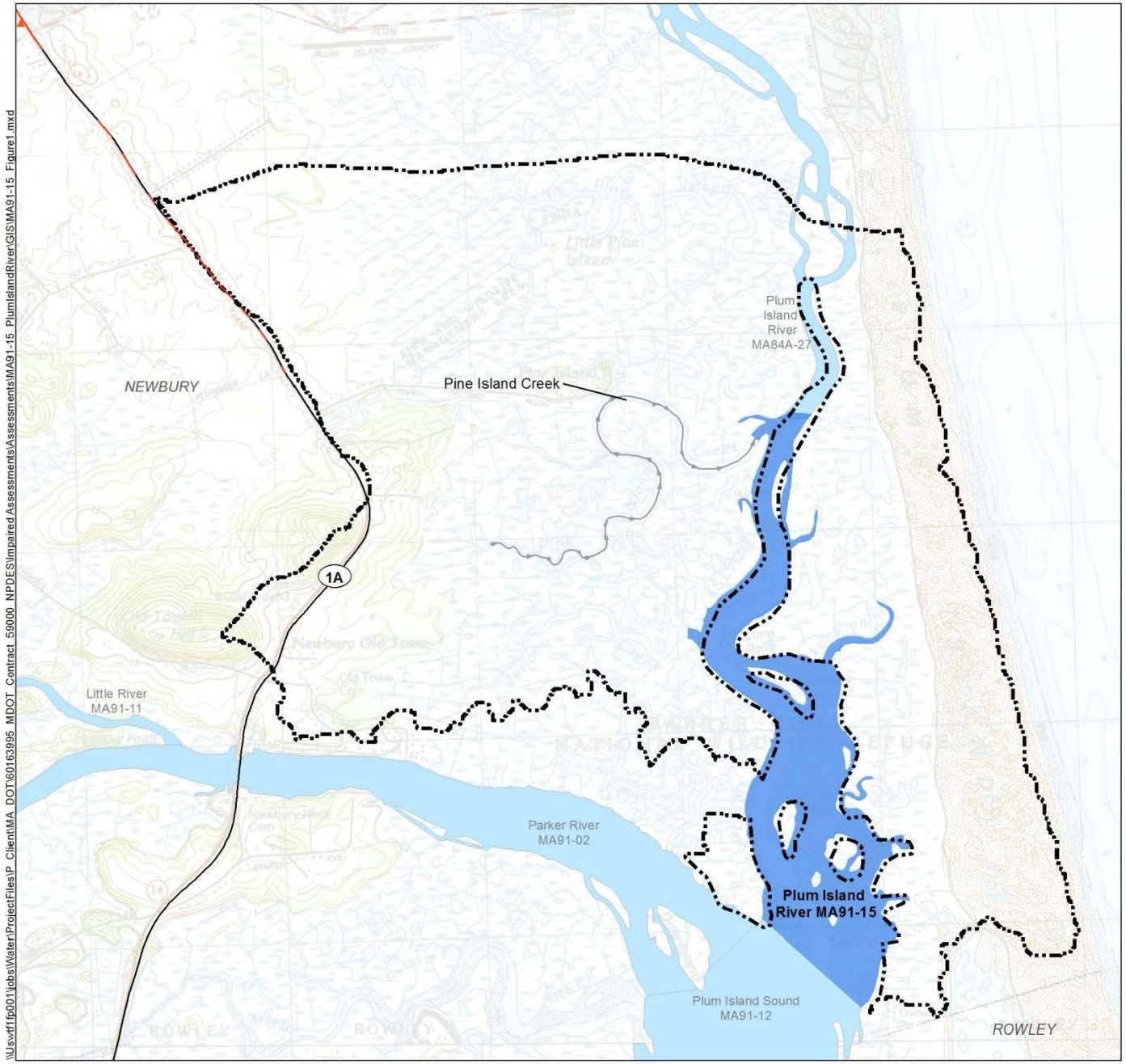
Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to

[10] MassDEP, No Date. Draft Pathogen TMDL for the Parker River Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/parker1.pdf

[11] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Plum Island River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Plum Island River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.



- MassDOT Outfalls
- MassDOT Roadways in Urban Area
- MassDOT Roadways
- Total and Subwatershed
- Assessed Segment
- Impaired Lakes
- Impaired Streams

N

0 0.25 0.5 Miles

Figure 1

Plum Island River (MA91-15) Watersheds

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

12/08/2014

Impaired Waters Assessment for Waters River (MA93-01)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL), pending change to 4A (TMDL is completed) in proposed 2014 list* [2]
	Final TMDLs:	*Final Pathogen TMDL for the North Coastal Watershed* [3]
	WQ Assessment:	*North Shore Coastal Watersheds 2002 Water Quality Assessment Report* [4]
Location	Towns:	*Peabody, Danvers*
	MassDOT Roads:	*Route 128, Route 114*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

Waters River (MA93-01) is a 0.09-square-mile tidal estuary located on the border of Peabody and Danvers, Massachusetts that discharges into Danvers River (MA93-09). The total and subwatershed to Waters River are coincident and cover 2.0 square miles. Figure 1 shows the segment and its watershed. The land use in the watershed is medium to high-density residential, commercial, and industrial.

According to the *North Shore Coastal Watersheds 2002 Water Quality Assessment Report*,[4] the designated use of Shellfish Harvesting is "impaired" due to elevated levels of fecal coliform bacteria suspected to come from separate storm sewer discharges and/or marinas/boating pumpout discharges. The Primary Contact, Secondary Contact, and Aesthetics designated uses are listed as "support" based on observations made by field sampling crews. Waters River is designated as "not assessed" for Aquatic Life and Fish Consumption due to limited data.

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[3] Mass DEP, 2012. Final Pathogen TMDL for the North Coastal Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/ncoastl1.pdf

[4] MassDEP, 2007. North Shore Coastal Watersheds 2002 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/93wqar06.pdf

The MassDOT urban roadway with the potential to discharge to Waters River includes Route 128 and Route 114. Refer to Figure 1 for the location of this roadway within the subwatershed to Segment MA93-01.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[5] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[6] MassDOT assessed Waters River (MA93-01) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[1] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List[2] which has been reviewed for any proposed changes to the condition of the water bodies. Waters River is proposed to change to a Category 4A water (TMDL is completed) because it is now covered under the *Final Pathogen TMDL for the North Coastal Watershed*.[3]

BMP 7R for Pathogen TMDL (CN 155.0)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R[5] of MassDOT's Storm Water Management Plan (SWMP) which applies to impairments that have been assigned to a water body covered by a final TMDL. Waters River (MA93-01) is covered by the *Final Pathogen TMDL for the North Coastal Watershed*.[3]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[7]

The North Coastal River watershed has documented both point and non-point sources of bacteria pollution in the TMDL report. The report states that the "prime bacterial sources in the stormwater appear to be from failing sewer line infrastructure, failing septic systems, and animal (pet, bird) waste. Boat wastes also contribute to water quality issues in the harbor areas". According to three water samples taken by the MassDEP in 1998, 2002, and 2007, the quality of the water has been steadily improving. Segment 93-01 is located along the southern borders of Danvers and Peabody and is listed as medium priority for both dry and wet weather.

[5] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at:
http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[6] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at:
http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[7] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

In addition to the generic recommendations discussed in the MassDOT Pathogen Methodology, the North Coastal TMDL report (Section 8.3, page 105) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed:

- Address pet waste as a water quality issue.
- Reduce public geese feeding, especially along lakes where both geese and people congregate.
- Provide technical and funding assistance for the implementation of municipal stormwater plans and ensure that consent judgments are completed in a timely manner.
- Encourage communities and watershed groups to take advantage of the U.S. Department of Agriculture's Natural Resources Conservation service's interest in working with communities to identify sources of stormwater contamination, and evaluate remedial options.
- Educate communities to consider permit and development strategies that address stormwater runoff – implement BMPs, and Low Impact Development (LID).

The TMDL report also indicates that structural BMPs may be appropriate to address runoff from impervious areas in instances where fecal coliform concentrations cannot be reduced by other means.

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the Pathogen TMDL for North Coastal Watershed in Danvers and Peabody:

- Public education efforts include a stormwater newsletter with information on town regulations sent to residents each year from 2003-2008. (Danvers)
- Fact sheets on dog waste disposal sent out in annual dog license renewal reminders. (Danvers)
- Stormwater conveyance / outfall system mapped in GIS and is available to the public. (Danvers)
- Stormwater brochure developed and mailed out to all residents. (Peabody)
- Stormwater information can be found on the town's website. (Peabody)
- Signed posted for proper animal waste disposal. (Peabody)
- GIS Stormwater mapping effort 90% complete, has identified 8,000 drain structures. (Peabody)

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing Stormwater Management Plan (SWMP) including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7R Pathogen Methodology,[7] MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.

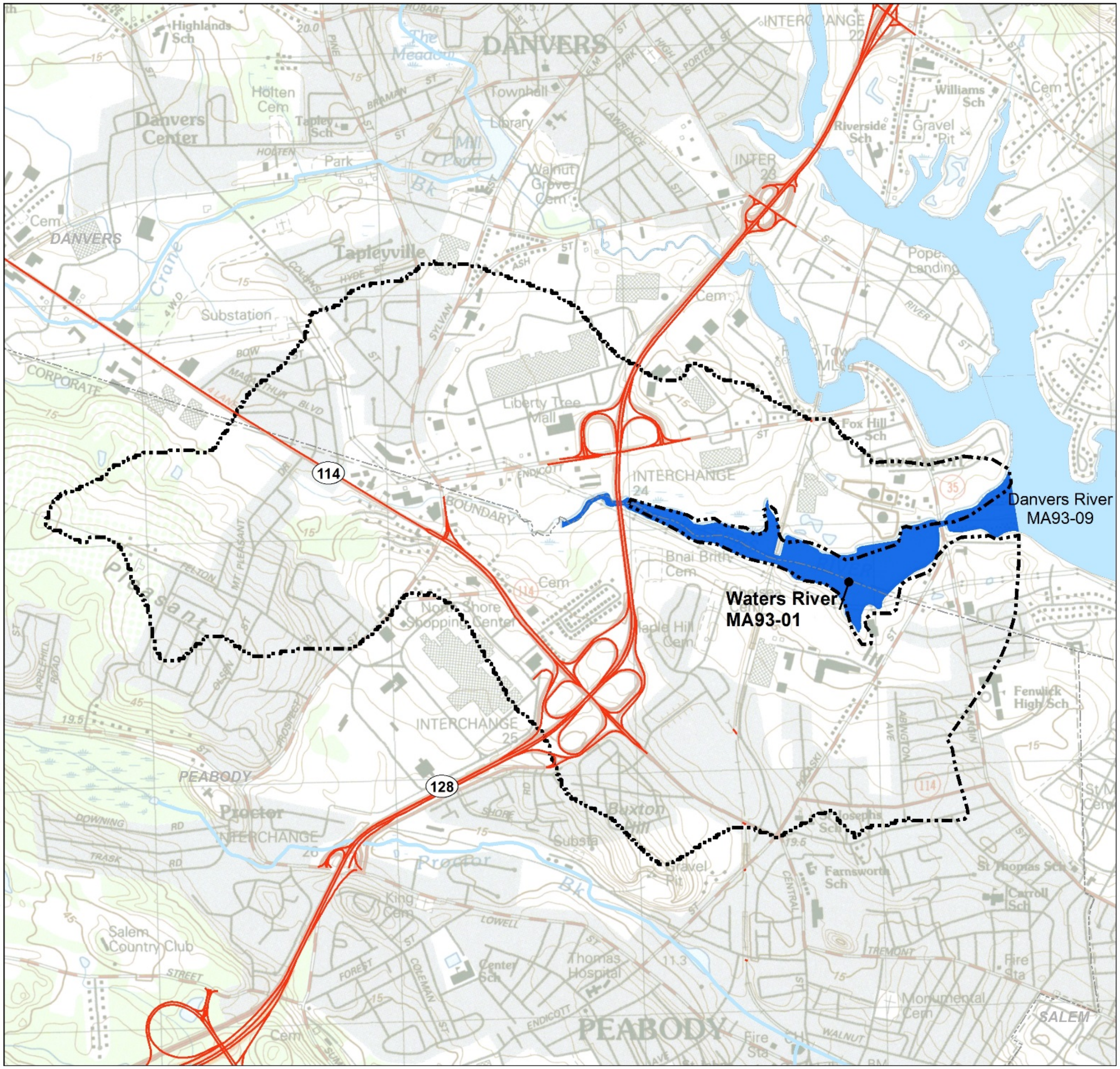
In accordance with the BMPs identified in the TMDL report as planned measures to reach compliance with the *Final Pathogen TMDL for the North Coastal Watershed*,[3] MassDOT has documented the locations of its stormwater outfalls. In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT targeted rest stops are located

within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Waters River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Waters River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.



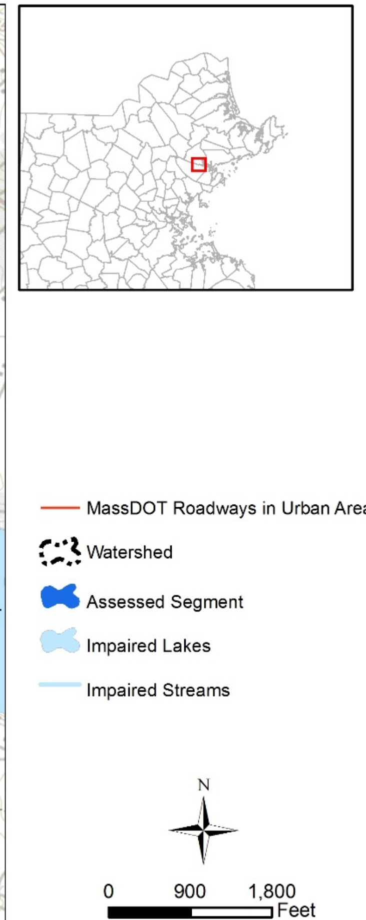


Figure 1

Waters Rivers (MA93-01) Watershed

December 2014

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12/08/2014

Impaired Waters Assessment for Porter River (MA93-04)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL), pending change to 4A (TMDL is completed) in proposed 2014 list* [2]
	Final TMDLs:	*Final Pathogen TMDL for the North Coastal Watershed* [3]
	WQ Assessment:	*North Shore Coastal Watersheds 2002 Water Quality Assessment Report* [4]
Location	Towns:	*Danvers*
	MassDOT Roads:	*Route 128*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

Porter River (MA93-04) is a 0.13-square-mile Class SA estuary located within the North Coastal Watershed in Danvers. The river is fed by Frost Fish Brook (MA93-36) to the north and joins with Danvers River (MA93-09) to the south. Porter River is classified as a Category 5 water body with impairments due to fecal coliform bacteria. The total and subwatersheds to this segment, shown in Figure 1, are the same and occupy approximately 4.3 square miles in the towns of Danvers, Beverly, and Wenham, and the land use is predominantly medium to high-density residential and forest.

The *North Shore Coastal Watersheds 2002 Water Quality Assessment Report*[4] identifies the Shellfish Harvesting and Primary and Secondary Contact uses as "impaired" due to the level of fecal coliform bacteria. All of the "impaired" uses cite discharges from municipal separate storm sewer systems (MS4s) as a source of bacteria and list illicit connections/hookups to storm sewers, marinas/boating pumpout releases, and marinas/boating sanitary on-vessel discharges as

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[3] MassDEP, 2012. Final Pathogen TMDL for the North Coastal Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/ncoastl1.pdf

[4] MassDEP, 2007. North Shore Coastal Watersheds 2002 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/93wqar06.pdf

suspected sources. Aesthetics is listed as "support" with an "alert" status due to septic odor observed during inspection. A survey conducted along the Salem Sound shoreline indicated the presence of six stormwater pipe outfalls 12 inches in diameter or higher within proximity to Segment MA93-04. The Aquatic Life and Fish Consumption uses were listed as "not assessed."

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA93-04 includes a one-mile long portion of Route 128. Refer to Figure 1 for the location of these roadways within the subwatershed to Segment MA93-04.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[5] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[6] MassDOT assessed Porter River (MA93-04) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[1] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List[2] which has been reviewed for any proposed changes to the condition of the water bodies. Porter River is proposed to change to a Category 4A water (TMDL is completed) because it is now covered under the *Final Pathogen TMDL for the North Coastal Watershed*.[3]

BMP 7R for Pathogen TMDL (CN 155.0)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R[5] of MassDOT's Storm Water Management Plan (SWMP) which applies to impairments that have been assigned to a water body covered by a final TMDL. Porter River (MA93-04) is covered by the *Final Pathogen TMDL for the North Coastal Watershed*.[3]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[7]

The North Coastal River watershed has documented both point and non-point sources of bacteria pollution in the TMDL report. The report states that the "prime bacterial sources in the stormwater appear to be from failing sewer line infrastructure, failing septic systems, and animal (pet, bird) waste. Boat wastes also contribute to water quality issues in the harbor areas". According to three water samples taken by the MassDEP in 1998, 2002, and 2007, the quality of the water has been steadily improving. Segment 93-04 is located along the southern borders of Danvers and Beverly

[5] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at:
http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[6] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at:
http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[7] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

and extends north into Wenham. It is listed as high priority for dry weather and medium priority for wet weather.

In addition to the generic recommendations provided in the draft NPDES MS4 permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the North Coastal TMDL report (Section 8.3, page 105) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed:

- Address pet waste as a water quality issue
- Reduce public geese feeding, especially along lakes where both geese and people congregate.
- Provide technical and funding assistance for the implementation of municipal stormwater plans and ensure that consent judgments are completed in a timely manner.
- Encourage communities and watershed groups to take advantage of the U.S. Department of Agriculture's Natural Resources Conservation service's interest in working with communities to identify sources of stormwater contamination, and evaluate remedial options.
- Educate communities to consider permit and development strategies that address stormwater runoff – implement BMPs, and Low Impact Development (LID)

The TMDL report also indicates that structural BMPs may be appropriate to address runoff from impervious areas in instances where fecal coliform concentrations cannot be reduced by other means.

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the Pathogen TMDL for the North Coastal Watershed in the towns of Danvers, Beverly, and Wenham:

- Public education includes a stormwater newsletter with information on town regulations sent to residents each year (Danvers, Beverly), and residents can view updated stormwater information on their town's website (Danvers).
- Fact sheets on dog waste disposal are sent out in annual dog license renewal reminders and waste disposal signs are posted in public parks (Danvers, Beverly).
- The stormwater advisory committee meets twice yearly (Danvers, Beverly).
- Street sweeping is done once or twice annually and catch basin cleaning occurs once annually or as needed (Danvers, Beverly).
- The stormwater collection systems with all major outfalls has been mapped on GIS (Danvers).
- Plans have been developed and/or implemented to detect and correct illicit stormwater connections (Danvers, Beverly).

Proposed Mitigation Plan

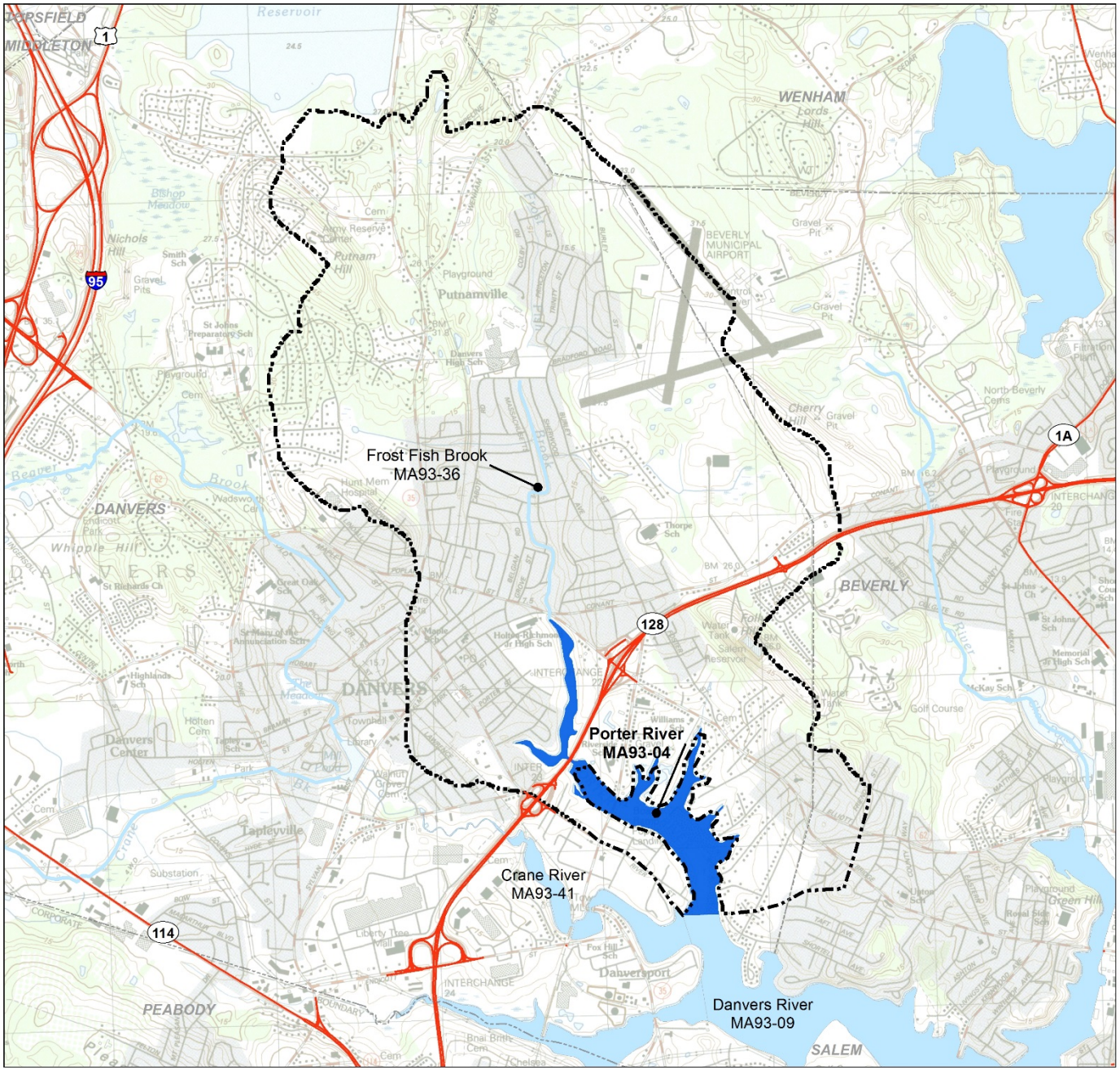
MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing Stormwater Management Plan (SWMP) including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7R Pathogen Methodology,[7] MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.

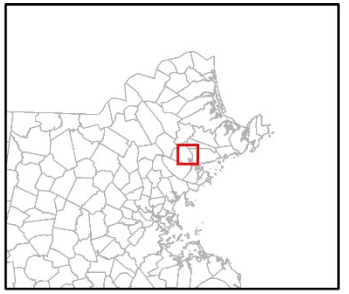
In accordance with the BMPs identified in the TMDL report as planned measures to reach compliance with the North Coastal Watershed Pathogen TMDL report, MassDOT has documented the locations of its stormwater outfalls. In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Porter River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Porter River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.





MassDOT Roadways in Urban Area
Watershed
Assessed Segment
Impaired Lakes
Impaired Streams

N

0 0.25 0.5 Miles

Figure 1

Porter River (MA93-04) Watershed

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

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12/08/2014

Impaired Waters Assessment for Danvers River (MA93-09)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL), pending change to 4A (TMDL is completed) in proposed 2014 list* [2]
	Final TMDLs:	*Final Pathogen TMDL for the North Coastal Watershed* [3]
	WQ Assessment:	*North Shore Coastal Watershed 2002 Water Quality Assessment Report* [4]
Location	Towns:	*Salem, Danvers, Beverly*
	MassDOT Roads:	*Route 107, Route 128, Route 114*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

Danvers River (MA93-09) is a 0.53-square-mile estuary located in Salem, Danvers, and Beverly, Massachusetts. The Danvers River is formed from the confluence of three rivers; Porter River (MA93-04) to the north, Waters River (MA93-01) to the west, and Crane River (MA93-02) to the northwest. Danvers River flows south and outlets into Beverly Harbor (MA93-20). The total watershed to MA93-09 is 29.3 square miles and includes portions of the towns Beverly, Wenham, Danvers, Peabody, Salem, Lynn, and Lynnfield. The subwatershed to MA93-09 is 5.6 square miles and is within the towns of Danvers, Peabody, Beverly, and Salem. Figure 1A shows the segment and its watershed. The land uses within the total and subwatershed are medium-high density residential, commercial, and industrial and forest.

According to the *North Shore Coastal Watershed 2002 Water Quality Assessment Report*,[4] Danvers River is a Class SA water body, which applies to water bodies that are suitable habitat for fish and other aquatic wildlife. Shellfish Harvesting is listed as "impaired" due to the presence of

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[3] MassDEP, 2012. Final Pathogen TMDL for the North Coastal Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/ncoastl1.pdf

[4] MassDEP, 2007. North Shore Coastal Watersheds 2002 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/93wqar06.pdf

elevated levels of fecal coliform bacteria. The Primary and Secondary Contact and Aesthetics uses were studied, but noted as "support" due to the low bacteria concentrations that never exceeded the water quality standards for those uses. Aquatic Life and Fish Consumption uses were "not assessed" due to limited data.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Danvers River (MA93-09) includes portions of Route 107, Route 128, and Route 114. See Figures 1A and 1B for the location of these roadways within the subwatershed of Danvers River.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[5] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[6] MassDOT assessed Danvers River (MA93-09) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[1] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List[2] which has been reviewed for any proposed changes to the condition of the water bodies. Danvers River is proposed to change to a Category 4A water (TMDL is completed) because it is now covered under the *Final Pathogen TMDL for the North Coastal Watershed*.[3]

BMP 7R for Pathogen TMDL (CN 155.0)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R[5] of MassDOT's Storm Water Management Plan (SWMP) which applies to impairments that have been assigned to a water body covered by a final TMDL. Danvers River (MA93-09) is covered by the *Final Pathogen TMDL for the North Coastal Watershed*.[3]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[7]

The North Coastal River watershed has documented both point and non-point sources of bacteria pollution in the TMDL report. The report states that the "prime bacterial sources in the stormwater appear to be from failing sewer line infrastructure, failing septic systems, and animal (pet, bird) waste. Boat wastes also contribute to water quality issues in the harbor areas". According to three water samples taken by the MassDEP in 1998, 2002, and 2007, the quality of the water has been 12/08/2014 steadily improving.

[5] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at:
http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[6] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at:
http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[7] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

Segment 93-09 is located along the borders of Danvers, Peabody, Salem and Beverly and is classified as medium priority for both dry and wet conditions, however the priorities were both elevated due to the water body's proximity to an ORW. The TMDL report cites CSOs as a possible source of pollution for this segment, as well as "discharges from separate storm sewer systems, marinas/boating pumpout releases, and marinas/boating sanitary on-vessel discharges."

In addition to the generic recommendations discussed in the MassDOT Pathogen Methodology, the North Coastal TMDL report (Section 8.3, page 105) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed:

- Address pet waste as a water quality issue.
- Reduce public geese feeding, especially along lakes where both geese and people congregate.
- Provide technical and funding assistance for the implementation of municipal stormwater plans and ensure that consent judgments are completed in a timely manner.
- Encourage communities and watershed groups to take advantage of the U.S. Department of Agriculture's Natural Resources Conservation service's interest in working with communities to identify sources of stormwater contamination, and evaluate remedial options.
- Educate communities to consider permit and development strategies that address stormwater runoff – implement BMPs, and Low Impact Development (LID).

The TMDL report also indicates that structural BMPs may be appropriate to address runoff from impervious areas in instances where fecal coliform concentrations cannot be reduced by other means.

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the Pathogen TMDL for North Coastal Watershed in Beverly, Danvers, Peabody, and Salem:

- Public education efforts include a stormwater newsletter with information on town regulations sent to residents each year from 2003–2008. (Danvers)
- Fact sheets on dog waste disposal sent out in annual dog license renewal reminders. (Danvers)
- Stormwater conveyance / outfall system mapped in GIS and is available to the public. (Danvers)
- Salem Sound Coast Watch (SSCW) established website which allows town to post stormwater related information and data. (Salem)
- SSCW sponsors beach cleanups and volunteer water quality monitoring; results published every two weeks on website. (Salem)
- The City of Salem conducts dry weather flow visual surveys of outfalls each year including weekly sampling at 18 locations between June and August. (Salem)

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing Stormwater Management Plan (SWMP) including educational programs, illicit

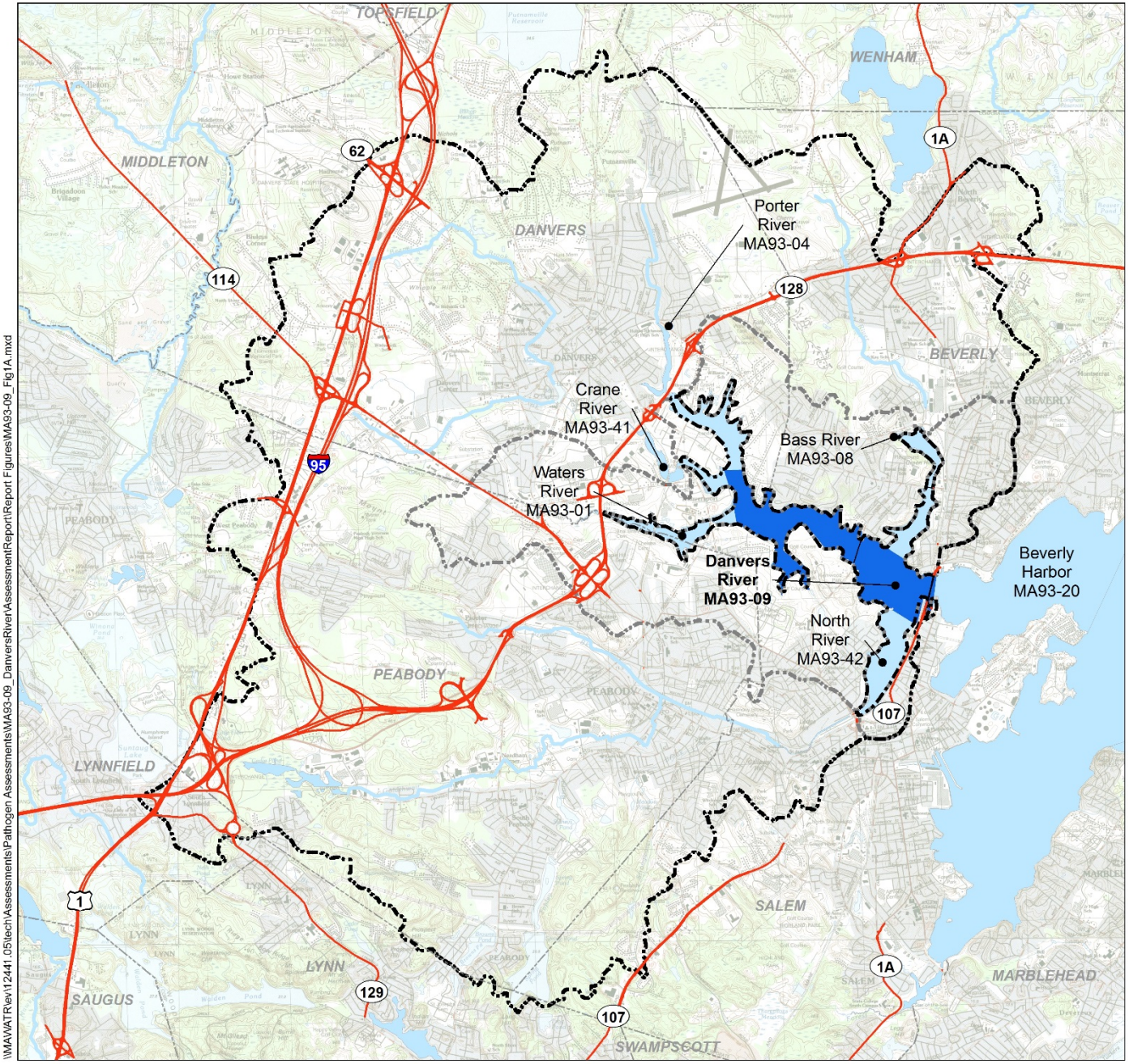
connection review and source control. As discussed in MassDOT's BMP 7R Pathogen Methodology,[7] MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.

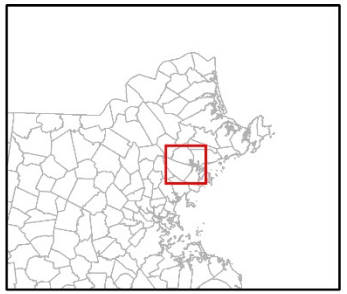
In accordance with the BMPs identified in the TMDL report as planned measures to reach compliance with the North Coastal Watershed TMDL report, MassDOT has documented the locations of its stormwater outfalls. In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Danvers River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Danvers River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.





MassDOT Roadways in Urban Area
MassDOT Roadways
Total Watershed
Subwatershed
Assessed Segment
Impaired Lakes
Impaired Streams

N

0 0.5 1 Miles

Figure 1A

Danvers River (MA93-09) Watersheds

December 2014

massDOT Massachusetts Department of Transportation Highway Division

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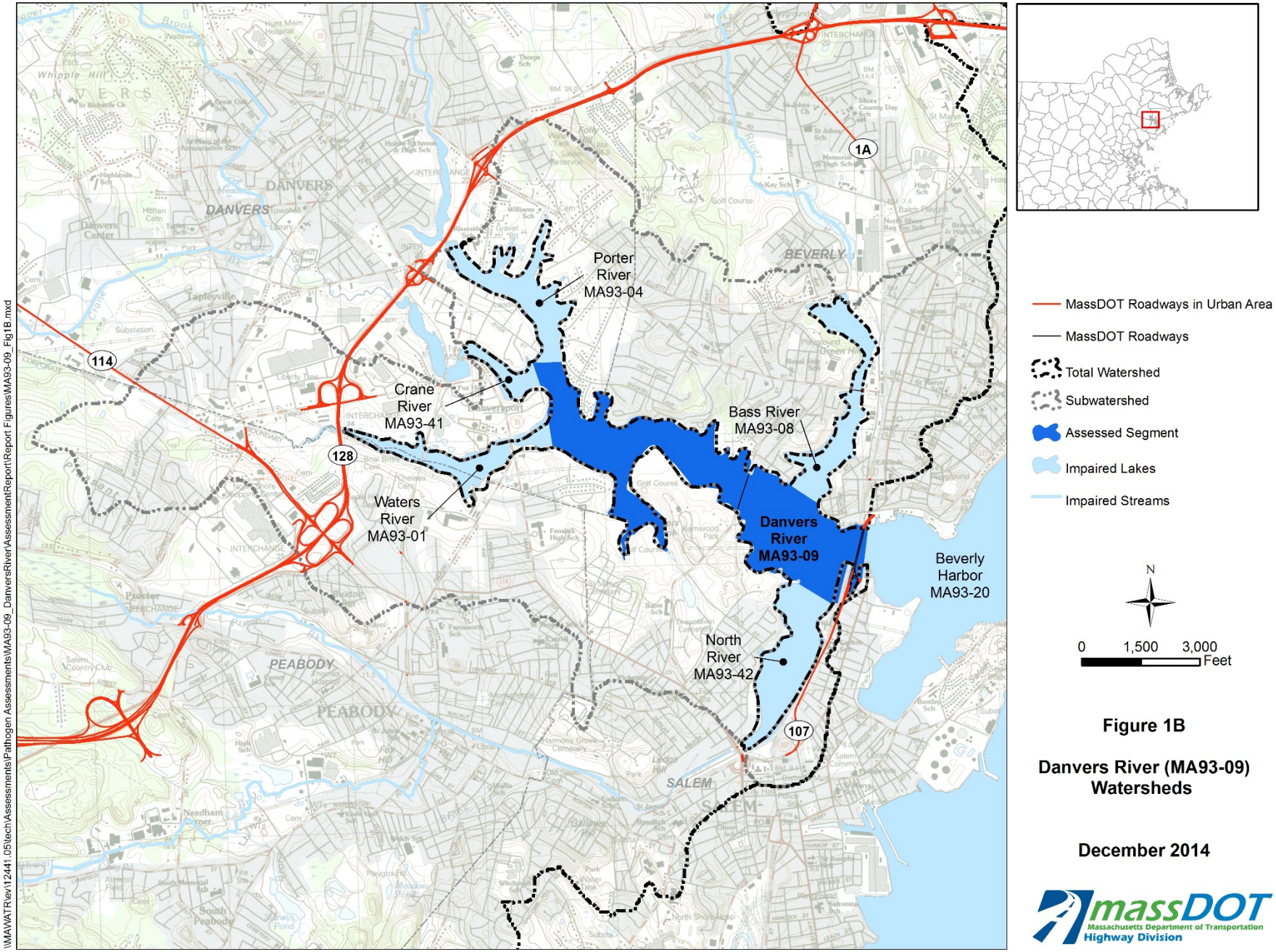

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Figure 1B

Danvers River (MA93-09) Watersheds

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

12/08/2014

Impaired Waters Assessment for Annisquam River (MA93-12)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL), pending change to 4A (TMDL is completed) in proposed 2014 list* [2]
	Final TMDLs:	*Final Pathogen TMDL for the North Coastal Watershed* [3]
	WQ Assessment:	*North Shore Coastal Watersheds 2002 Water Quality Assessment Report* [4]
Location	Towns:	*Gloucester*
	MassDOT Roads:	*Route 128, Route 133, Route 127*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

The Annisquam River (MA93-12) is a 0.8-square-mile tidal estuary located in Gloucester that is bound by Route 127 to the south and by an imaginary line drawn between Bald Rocks and Wigwam Point to the north. The Annisquam River connects two tidal bodies of water: Gloucester Harbor (MA93-16) to the south, and Ipswich Bay to the north. As a Class SA water body, the river is designated as an excellent habitat for fish and other aquatic life. The total watershed for the Annisquam River is coincident with the subwatershed and encompasses approximately 11.5 square miles, primarily in Gloucester, with approximately 0.2 square miles in southwestern Rockport. Refer to Figure 1 for the location of the water body, its watersheds, and the surrounding MassDOT roadways.

The Annisquam River (MA93-12) is covered by the *North Shore Coastal Watersheds 2002 Water Quality Assessment Report*.[4] Although classified as "not assessed" for its Aquatic Life and Fish Consumption designated uses, MassDEP's Wetlands Conservancy Program identified eelgrass

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[3] MassDEP, 2012. Final Pathogen TMDL for the North Coastal Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/ncoastl1.pdf

[4] MassDEP, 2007. North Shore Coastal Watersheds 2002 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/93wqar06.pdf

bed habitats within the Annisquam River, indicating the waters are in good health. The Primary and Secondary Contact and Aesthetic uses were all assessed as "support" because there were no closings due to bacteria throughout the 2002–2004 beach swimming seasons. The Shellfish Harvesting use is "impaired," with the listed cause being elevated levels of fecal coliform and the suspected source being discharges from separate storm sewer systems.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA93-12 is comprised of a three-mile stretch of Route 133, a four-mile stretch of Route 128, and less than a mile of Route 127. Refer to Figure 1 for the location of these roadways within the watershed to Segment MA93-12.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[5] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[6] MassDOT assessed Annisquam River (MA93-12) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[1] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List[2] which has been reviewed for any proposed changes to the condition of the water bodies. Annisquam River is proposed to change to a Category 4A water (TMDL is completed) because it is now covered under the *Final Pathogen TMDL for the North Coastal Watershed*.[3]

BMP 7R for Pathogen TMDL (CN 155.0)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R[5] of MassDOT's Storm Water Management Plan (SWMP) which applies to impairments that have been assigned to a water body covered by a final TMDL. Annisquam River (MA93-12) is covered by the *Final Pathogen TMDL for the North Coastal Watershed*.[3]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[7]

The North Coastal Watershed has both point and non-point sources of bacteria pollution, as identified in the TMDL report. The watershed encompasses densely populated areas that are upwards of 30% impervious and include housing developments, commercial buildings, roads, and

[5] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at:
http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[6] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at:
http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[7] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

parking lots. These impervious areas contribute a high amount of stormwater runoff with moderate to high bacterial loadings that affect the surrounding estuaries. The Annisquam River connects with Gloucester Harbor, one of the North Coastal Watersheds six main harbors. Combined sewer overflows (CSOs) have been an issue in Gloucester Harbor, and may contribute to the Annisquam's increased fecal coliform levels as well. However, due to state and federal regulations, the municipalities are currently eliminating all CSOs and addressing the contaminated stormwater.

Priority levels have not been established for the Annisquam River, although in wet weather conditions two sewer pump stations have been called out as being possible sources of contamination. Also, the City of Gloucester has a municipal separate storm sewer system (MS4) covered by NPDES permit MAR041192 that discharges into the Annisquam River.

In addition to the generic recommendations discussed in the MassDOT Pathogen Methodology, Section 8.3 of the Final Pathogen TMDL for the North Coastal Watershed recommends the following specific BMPs to address elevated fecal coliform levels in the watershed:

- Address pet waste as a water quality issue.
- Reduce public geese feeding, especially along lakes where both geese and people congregate.
- Provide technical and funding assistance for the implementation of municipal stormwater plans and ensure that consent judgments are completed in a timely manner.
- Encourage communities and watershed groups to take advantage of the interest that the Natural Resources Conservation Service (NRCS) has in working with communities to identify sources of stormwater contamination and evaluate remedial options.
- Educate communities to consider permit and development strategies that address stormwater runoff – implement BMPs and Low Impact Development (LID).

The TMDL report also indicates that structural BMPs may be appropriate to address runoff from impervious areas in instances where fecal coliform concentrations cannot be reduced by other means.

The following initiatives are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the North Coastal Watershed in Gloucester and Rockport:

- Stormwater outreach has occurred in schools along with the posting of educational literature. (Gloucester)
- Adopt-a-Stream program developed in 2005. (Gloucester)
- Stormwater steering committee was formed in 2004, meets quarterly. (Gloucester)
- All city departments actively engaged in investigating illicit discharges, particularly on city lands. (Gloucester)
- Consultant helped the city during 2007 to inspect 520 manholes, inspect 1,140 residences or commercial establishments, and conduct 370 dye-tests; resulted in 17 illicit connections being discovered and eliminated. (Gloucester)
- Under administrative order (#835) that restricts number of new connections to the sewer system. (Rockport)
- Under an administrative consent order to remove infiltration and inflow (I/I). (Rockport)

Proposed Mitigation Plan

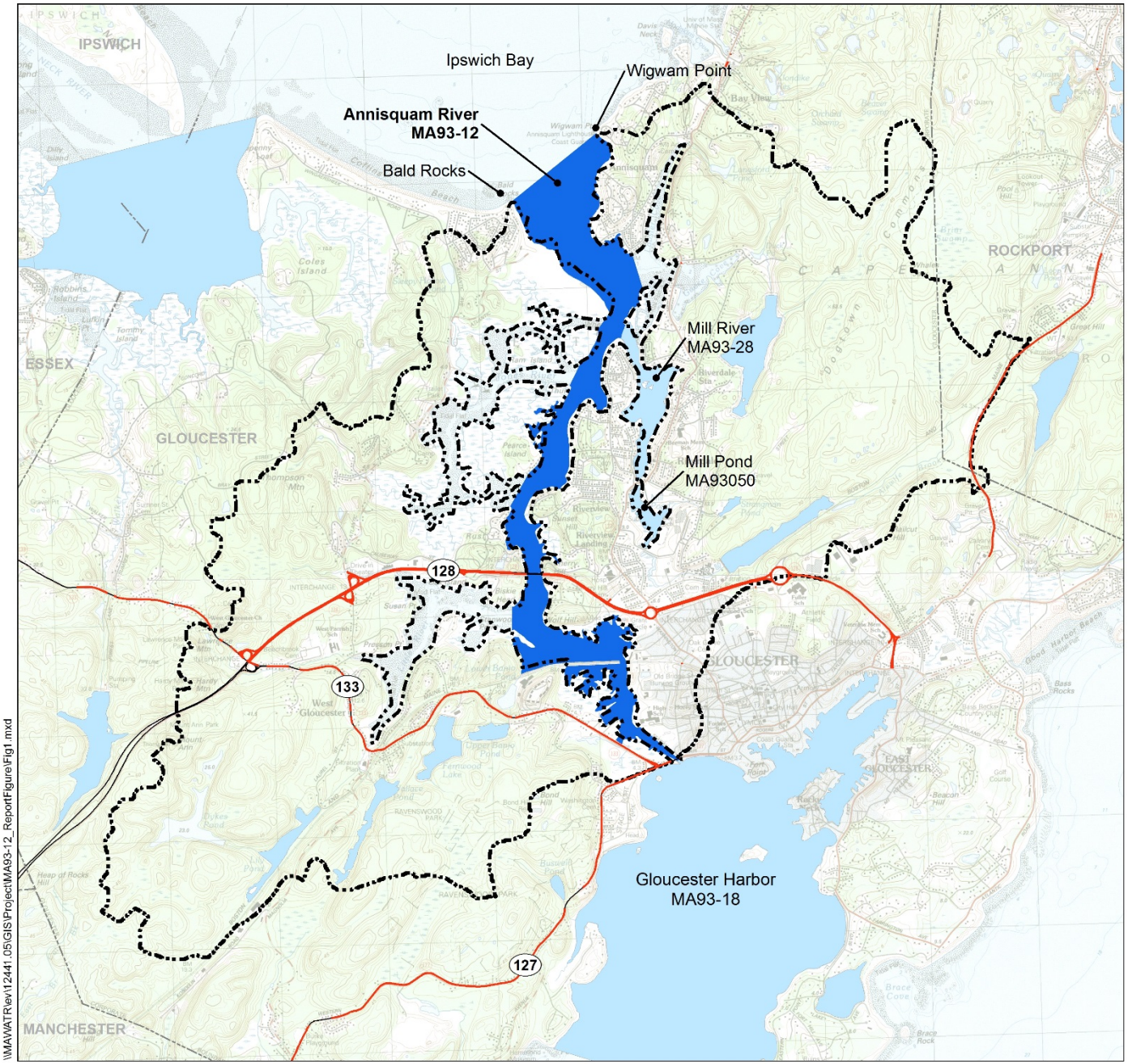
MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing Stormwater Management Plan (SWMP) including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7R Pathogen Methodology,[7] MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.

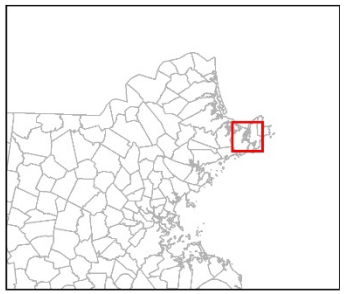
In accordance with the BMPs identified in the TMDL report as planned measures to reach compliance with the North Coastal Pathogen TMDL report, MassDOT has documented the locations of its stormwater outfalls. In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Annisquam River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Annisquam River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.





MassDOT Roadways in Urban Area

MassDOT Roadways

Watershed

Assessed Segment

Impaired Lakes

Impaired Streams

N

0 2,000 4,000 Feet

Figure 1

Annisquam River (MA93-12) Watershed

December 2014

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Highway Division

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12/08/2014

Impaired Waters Assessment for Pines River (MA93-15)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL), pending change to 4A (TMDL is completed) in proposed 2014 list* [2]
	Final TMDLs:	*Final Pathogen TMDL for the North Coastal Watershed* [3]
	WQ Assessment:	*North Shore Coastal Watersheds 2002 Water Quality Assessment Report* [4]
Location	Towns:	*Revere, Saugus*
	MassDOT Roads:	*Route 1, Route 1A, Route 107, Route 60, Route 145*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

The Pines River (MA93-15) headwaters are located in northwest Revere and southwest Saugus where Unnamed Tributary (MA93-51), also known as "Town Line Brook", terminates. The Pines River comprises an area of 0.6 square miles and defines the Revere-Saugus border until it empties into the Saugus River (MA93-44). The river's total watershed is coincident with its subwatershed and occupies 9.6 square miles, with portions in Revere (3.9 square miles), Saugus (2.0 square miles), Malden (2.2 square miles), Everett (0.8 square miles), and Melrose (0.7 square miles). Refer to Figure 1 for the location of this watershed and the surrounding MassDOT roadways.

According to the *North Shore Coastal Watersheds 2002 Water Quality Assessment Report*,[4] the Pines River is an Outstanding Resource Water (ORW) and a Class SB water body because it provides habitat for shellfish farming. Although the river is Class SB, the Division of Marine Fisheries (DMF) assessed this body of water in 2002 and prohibited shellfish farming in all areas

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[3] MassDEP, 2012. Final Pathogen TMDL for the North Coastal Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/ncoastl1.pdf

[4] MassDEP, 2007. North Shore Coastal Watersheds 2002 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/93wqar06.pdf

due to increased levels of fecal coliform. The higher levels of fecal coliform are attributed to discharges from municipal separate storm sewer systems (MS4), upstream sources, and urban runoff/storm sewers. The Water Quality Assessment Report also lists "illicit connections" as a suspected source of bacteria. Pines River is classified as "not assessed" for Aquatic Life and "support" for Aesthetics; however, two conditions have been identified with "alert" statuses: (1) at the Dewey Dagget landfill, located adjacent to the river in between Route 107 and the Saugus landfill, there is partial erosion, and (2) at the headwaters from Town Line Brook (also known as Malden Canal), there is debris that could be a source of bacterial contamination.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA93-15 is comprised of portions of Route 1, Route 1A, Route 107, Route 60, and Route 145. Refer to Figure 1 for the location of these roadways within the watershed to Segment MA93-15.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[5] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[6] MassDOT assessed Pines River (MA93-15) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[1] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List[2] which has been reviewed for any proposed changes to the condition of the water bodies. Pines River is proposed to change to a Category 4A water (TMDL is completed) because it is now covered under the *Final Pathogen TMDL for the North Coastal Watershed*.[3]

BMP 7R for Pathogen TMDL (CN 155.0)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R[5] of MassDOT's Storm Water Management Plan (SWMP) which applies to impairments that have been assigned to a water body covered by a final TMDL. Pines River (MA93-15) is covered by the *Final Pathogen TMDL for the North Coastal Watershed*.[3]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[7]

[5] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at:
http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[6] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at:
http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[7] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

The North Coastal Watershed has both point and non-point sources of bacteria pollution, as identified in the TMDL report. The watershed encompasses densely populated areas that are upwards of 30% impervious and include housing developments, commercial buildings, roads, and parking lots. These impervious areas contribute a high amount of stormwater runoff with moderate to high bacterial loadings that affect the surrounding estuaries. The Pines River empties into the Saugus River, which in turn flows into Lynn Harbor, one of six major harbors in the North Coastal Watershed. Harbors provide multiple services to the boating area (maintaining, mooring, fueling, launching, and storage), which discharge pollutants directly into the harbor areas, affecting the estuaries as well. Samples taken from the area show high bacteria levels, especially after large storms. The main bacteria sources include boat waste, failing sewer line infrastructure, failing septic systems, and animal waste. Also, combined sewer overflows (CSOs) have been an issue in Lynn Harbors, however, due to state and federal regulations, the municipalities are currently eliminating all CSOs and addressing the contaminated stormwater.

Segment MA93-15 is listed as a medium priority for wet weather and high priority for dry-weather, due to possible illicit discharges and this segment's ORW designation. There are also three National Pollutant Discharge Elimination System (NPDES) Permits in the watershed: Refuse Energy Systems Company (RESCO) and MS4 permits for the City of Revere and the City of Saugus.

In addition to the generic recommendations discussed in the MassDOT Pathogen Methodology, Section 8.3 of the Final Pathogen TMDL for the North Coastal Watershed recommends the following specific BMPs to address elevated fecal coliform levels in the watershed:

- Address pet waste as a water quality issue.
- Reduce public geese feeding, especially along lakes where both geese and people congregate.
- Provide technical and funding assistance for the implementation of municipal stormwater plans and ensure that consent judgments are completed in a timely manner.
- Encourage communities and watershed groups to take advantage of the interest that the Natural Resources Conservation Service (NRCS) has in working with communities to identify sources of stormwater contamination and evaluate remedial options.
- Educate communities to consider permit and development strategies that address stormwater runoff – implement BMPs and Low Impact Development (LID).

The TMDL report also indicates that structural BMPs may be appropriate to address runoff from impervious areas in instances where fecal coliform concentrations cannot be reduced by other means.

The following initiatives are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the North Coastal Watershed in Malden, Revere, Saugus, and Melrose:

- Public education and outreach efforts include explanation of city's stormwater plan on town website. (Malden)
- Consultant hired to map stormdrain system, verify outfall locations, and identify and control illicit connections. (Malden)
- Saugus River Watershed Council (SRWC) developed a website, stormwater brochures, and presents information to schools. (Revere)

- SRWC has led the formation of watershed committees for Revere portions of Mystic River, Saugus River, and Bell Isle Marsh, and leads volunteer clean ups and monitoring efforts. (Revere)
- Draft by-law to control illicit discharges is being reviewed by town's attorney. (Saugus)
- Housekeeping activities identified a list of sensitive receptors for priority attention. (Saugus)
- Pet waste signs posted at all public parks and athletic fields. (Melrose)
- Town engineering department mapped the stormwater collection system and outfalls in GIS. (Melrose)

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing Stormwater Management Plan (SWMP) including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7R Pathogen Methodology,[7] MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.

In accordance with the BMPs identified in the TMDL report as planned measures to reach compliance with the North Coastal Watershed TMDL report, MassDOT has documented the locations of its stormwater outfalls. In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. An unauthorized connection MassDOT's storm drain system has been identified in Revere. MassDOT has no reason to suspect that the connection constitutes an illicit discharge as no staining, odors, or debris was witnessed within the system. MassDOT is actively following up with the property owner to determine the origin of the unauthorized connection, and to issue a non-vehicular access permit (i.e. drainage tie-in permit) if warranted.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Pines River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented

within the watershed of Pines River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

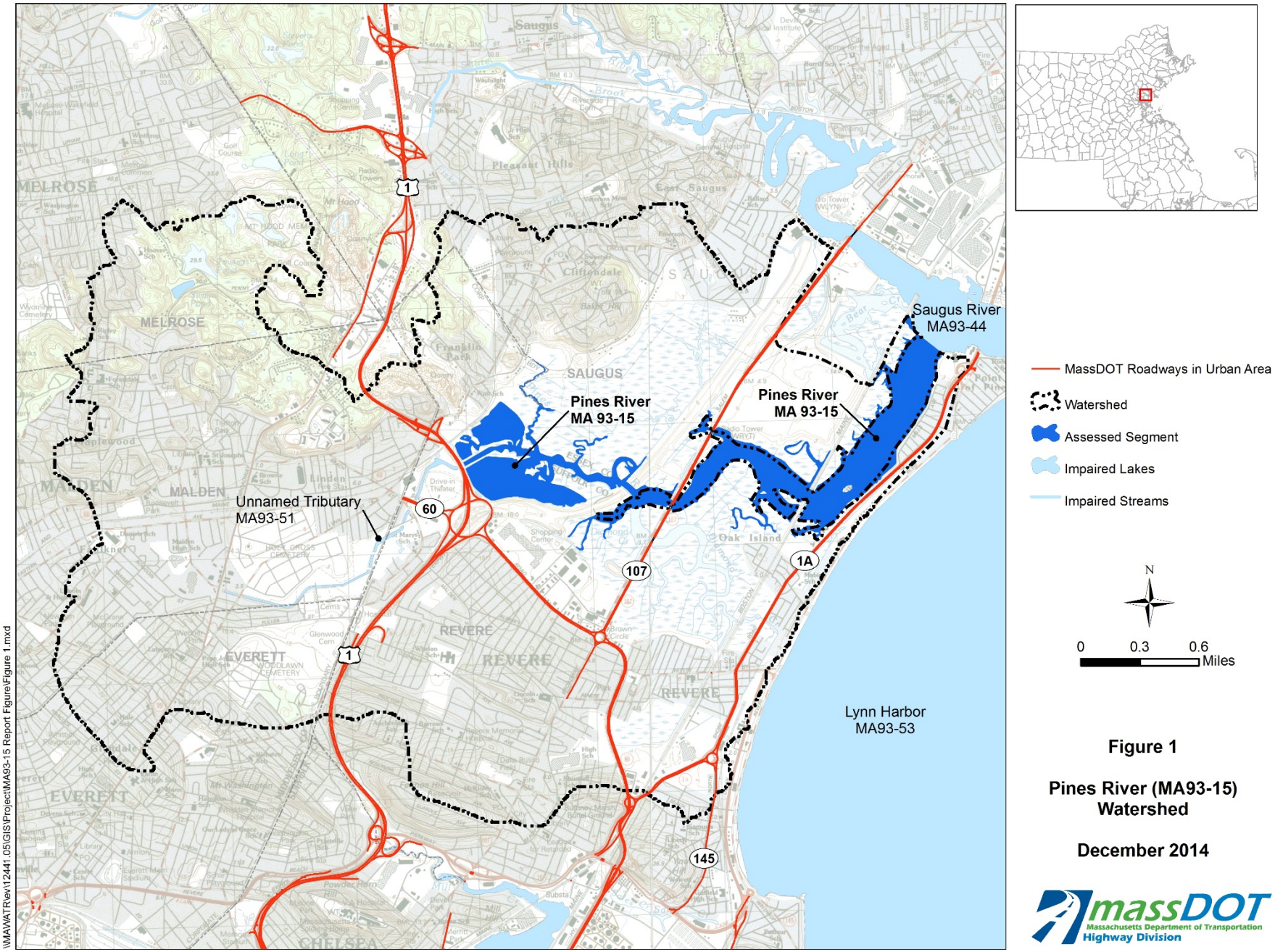

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Figure 1

Pines River (MA93-15) Watershed

December 2014

12/08/2014

Impaired Waters Assessment for Manchester Harbor (MA93-19)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL), pending change to 4A (TMDL is completed) in proposed 2014 list* [2]
	Final TMDLs:	*Final Pathogen TMDL for the North Coastal Watershed* [3]
	WQ Assessment:	*North Shore Coastal Watersheds 2002 Water Quality Assessment Report* [4]
Location	Towns:	*Manchester, Essex, Gloucester*
	MassDOT Roads:	*Route 128, Route 127*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

Manchester Harbor (MA93-19) is located inland from an imaginary line drawn between Chubb Point and Gales Point, Manchester, and downstream from Cat Brook (MA93-29), which enters at the northern tip of the body of water. The harbor covers 0.3 square miles and is a Class SB water body, since it serves as a salt water habitat for fish and shellfish as well as an area for primary and secondary contact recreation. Refer to Figure 1 for the location of this water body and MassDOT roadways within the watershed.

The total watershed for Manchester Harbor, which is coincident with the subwatershed, covers 6.2 square miles. The town of Manchester has the largest portion of the watershed, with 4.6 square miles, followed by Essex with 1.2 square miles, and finally Gloucester with 0.4 square miles. The land use in the watershed is mostly forest and wetland, with some low to medium-density residential and medium to high-density commercial areas.

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[3] MassDEP, 2012. Final Pathogen TMDL for the North Coastal Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/ncoastl1.pdf

[4] MassDEP, 2007. North Shore Coastal Watersheds 2002 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/93wqar06.pdf

The *North Shore Coastal Watersheds 2002 Water Quality Assessment Report*[4] assessed outer Manchester Harbor (defined as seaward of Norton's Point) as "support" for Aquatic Life due to the presence of beds of eelgrass. The Massachusetts Department of Marine Fisheries (DMF) has prohibited shellfishing in Manchester Harbor due to elevated levels of fecal coliform, and for that reason, the Shellfish Harvesting use is assessed as "impaired."

With regards to Primary and Secondary Contact and Aesthetic uses, the outer portion of Manchester Harbor is assessed as "support," due to regular testing for *Enterococci* bacteria, which resulted in only twelve days of beach closings during the 2002–2004 beach bathing seasons. Although assessed as "support," the Water Quality Report posts an "alert" status for these designated uses. This is due to illicit discharges being observed along Manchester Beach during dry weather, one of which was confirmed as having high levels of fecal coliform. The inner portion of Manchester Harbor, defined as the area landward and north of Norton's Point, was not assessed for any designated uses due to a lack of available data.

MassDOT's urban property with the potential to directly contribute stormwater runoff to Segment MA93-19 is comprised of a three-mile portion of Route 128 and a two-mile portion of Route 127. Refer to Figure 1 for the location of these roadways within the subwatershed to Segment MA93-19.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[5] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[6] MassDOT assessed Manchester Harbor (MA93-19) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act[1]. MassDEP has released a Proposed Massachusetts Year 2014 Integrated List[2] which has been reviewed for any proposed changes to the condition of the water bodies. Manchester Harbor is proposed to change to a Category 4A water (TMDL is completed) because it is now covered under the *Final Pathogen TMDL for the North Coastal Watershed*.[3]

BMP 7R for Pathogen TMDL (CN 155.0)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R[5] of MassDOT's Storm Water Management Plan (SWMP) which applies to impairments that have been assigned to a water body covered by a final TMDL. Manchester Harbor (MA93-19) is covered by the *Final Pathogen TMDL for the North Coastal Watershed*.[3]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and

[5] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at:
http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[6] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at:
http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[7]

The North Coastal Watershed has both point and non-point sources of bacteria pollution, as identified in the TMDL report. The watershed encompasses densely populated areas that are upwards of 30% impervious and include housing developments, commercial buildings, roads, and parking lots. These impervious areas contribute a high amount of stormwater runoff with moderate to high bacterial loadings that affect the surrounding estuaries. Manchester Harbor is one of six main harbors in the North Coastal Watershed. Manchester Harbor provides multiple services to the boating area (maintaining, mooring, fueling, launching, and storage), which discharge pollutants directly into the harbor areas, affecting the estuaries as well. Samples taken from the area show high bacteria levels, especially after large storms. The main bacteria sources include boat waste, failing sewer line infrastructure, failing septic systems, and animal waste.

Manchester Harbor (MA93-19) is listed as a medium priority for both dry and wet weather, although illicit discharges have been observed during dry weather.

In addition to the generic recommendations discussed in the MassDOT Pathogen Methodology, Section 8.3 of the Final Pathogen TMDL for the North Coastal Watershed recommends the following specific BMPs to address elevated fecal coliform levels in the watershed:

- Address pet waste as a water quality issue.
- Reduce public geese feeding, especially along lakes where both geese and people congregate.
- Provide technical and funding assistance for the implementation of municipal stormwater plans and ensure that consent judgments are completed in a timely manner.
- Encourage communities and watershed groups to take advantage of the interest that the Natural Resources Conservation Service (NRCS) has in working with communities to identify sources of stormwater contamination and evaluate remedial options.
- Educate communities to consider permit and development strategies that address stormwater runoff – implement BMPs and Low Impact Development (LID).

The TMDL report also indicates that structural BMPs may be appropriate to address runoff from impervious areas in instances where fecal coliform concentrations cannot be reduced by other means.

The following initiatives, also identified in Section 8.3 of the TMDL, are specifically identified as being ongoing or completed, in order to meet the bacteria TMDL for the North Coastal Watershed in Manchester, Essex, and Gloucester:

- Public education efforts including preparation of stormwater information flyers and mailings to all residents. (Manchester)
- Stream team debris cleaning occurred in December of 2004 and 2005 on Sawmill and Causeway Brook. (Manchester)
- GIS mapping of all stormdrains was completed as of September 2007. (Manchester)
- Illicit connection detection and control policy regulations developed in 2008. (Manchester)

[7] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

- In 2008, 45 property owners were informed they need to repair their septic systems. (Manchester)
- New catch basin cleaning and inspection program initiated. (Essex)
- Town completed assessment, and is working with owners to remediate all septic systems. (Essex)
- Improved housekeeping strategies such as bi-weekly street-sweeping on main arteries. (Gloucester)
- MS4 stormwater conveyances monitored by TV and cleaned. (Gloucester)

Proposed Mitigation Plan

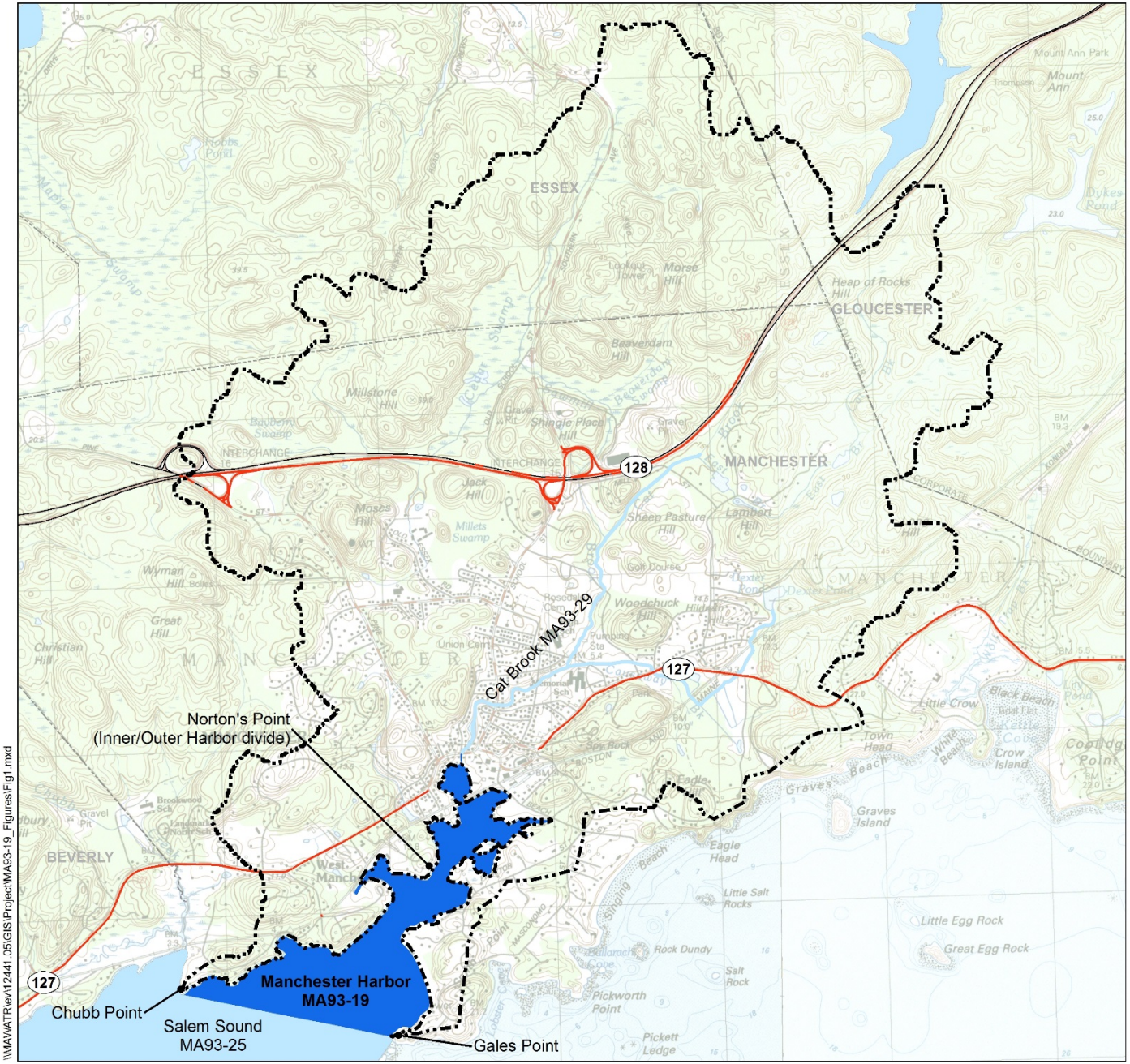
MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing Stormwater Management Plan (SWMP) including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7R Pathogen Methodology,[7] MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.

In accordance with the BMPs identified in the TMDL report as planned measures to reach compliance with the North Coastal bacteria TMDL report, MassDOT has documented the locations of its stormwater outfalls. In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Manchester Harbor. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Manchester Harbor, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.



MassDOT Roadways in Urban Area

MassDOT Roadways

Watershed

Assessed Segment

Impaired Lakes

Impaired Streams

N

0 0.25 0.5 Miles

Figure 1

Manchester Harbor (MA93-19) Watershed

December 2014

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12/08/2014

Impaired Waters Assessment for Beverly Harbor (MA93-20)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL), pending change to 4A (TMDL is completed) in proposed 2014 list* [2]
	Final TMDLs:	*Final Pathogen TMDL for the North Coastal Watershed* [3]
	WQ Assessment:	*North Shore Coastal Watersheds 2002 Water Quality Assessment Report* [4]
Location	Towns:	*Beverly, Salem*
	MassDOT Roads:	*Route 128, Route 1A*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

Beverly Harbor (MA93-20) is located at the mouth of the Danvers River and comprises an area of 1.0 square miles between Salem and Beverly, bound by an imaginary line drawn from Juniper Point, Salem, to Hospital Point, Beverly. North River (MA93-42), Bass River (MA93-08) and Danvers River (MA93-09) discharge into Beverly Harbor, and Salem Harbor (MA93-54) is located downstream. This body of water is classified as Class SB because it serves as a salt water habitat for fish and shellfish as well as an area for primary and secondary contact recreation. The subwatershed for this body of water is 2.4 square miles, 2.1 of which are in Beverly. The land use of the subwatershed is primarily medium-density commercial and residential, with some wetlands and forested areas.

Beverly Harbor is covered in the *North Shore Coastal Watersheds 2002 Water Quality Assessment Report.*[4] MassDEP's Wetland Conservancy Program identified the presence of eelgrass both from aerial photography and through field confirmation in 2001. Due to the stability of these beds of

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[3] MassDEP, 2012. Final Pathogen TMDL for the North Coastal Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/ncoastl1.pdf

[4] MassDEP, 2007. North Shore Coastal Watersheds 2002 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/93wqar06.pdf

eelgrass and the aquatic diversity present within these realms, Beverly Harbor was assessed as "support" for Aquatic Life. The harbor was assessed as "support" for Primary and Secondary Contact due to regular testing for *Enterococci* and minimal beach closings.

Shellfish Harvesting is the only designated use assessed as "impaired" due to increased levels of fecal coliform. The Water Quality Assessment Report notes several possible causes: discharges from separate storm sewer systems, marinas/boating pumpout releases, and marinas/boating sanitary on-vessel discharges.

MassDOT's urban property with the potential to directly contribute stormwater runoff to Segment MA93-20 is comprised of portions of Route 128 and Route 1A. Refer to Figure 1B for the location of these roadways within the subwatershed to Segment MA93-20. Route 128 travels along the northern boundary of the subwatershed for approximately 0.5 miles, and Route 1A briefly enters the subwatershed in the southern portion, dividing Beverly Harbor and the Danvers River.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[5] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[6] MassDOT assessed Beverly Harbor (MA93-20) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[1] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List[2] which has been reviewed for any proposed changes to the condition of the water bodies. Beverly Harbor is proposed to change to a Category 4A water (TMDL is completed) because it is now covered under the *Final Pathogen TMDL for the North Coastal Watershed*.[3]

BMP 7R for Pathogen TMDL (CN 155.0)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R[5] of MassDOT's Storm Water Management Plan (SWMP) which applies to impairments that have been assigned to a water body covered by a final TMDL. Beverly Harbor (MA93-20) is covered by the *Final Pathogen TMDL for the North Coastal Watershed*.[3]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative, adaptive management approach to be consistent with relevant TMDLs and

[5] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at:
http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[6] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at:
http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[7]

The North Coastal Watershed has both point and non-point sources of bacteria pollution, as identified in the TMDL report. The watershed encompasses densely populated areas that are upwards of 30% impervious and include housing developments, commercial buildings, roads, and parking lots. These impervious areas contribute a high amount of stormwater runoff with moderate to high bacterial loadings that affect the surrounding estuaries. Beverly Harbor is one of six major harbors in the North Coastal Watershed. This harbor provides multiple services to the boating area (maintaining, mooring, fueling, launching, and storage), which discharge pollutants directly into the harbor areas, affecting the estuaries as well. Samples taken from the area show high bacteria levels, especially after large storms. The main bacteria sources include boat waste, failing sewer line infrastructure, failing septic systems, and animal waste.

Beverly Harbor (MA93-20) is listed as medium priority for both dry and wet weather, but with a special note of the possible illicit discharges during dry weather.

In addition to the generic recommendations discussed in the MassDOT Pathogen Methodology, Section 8.3 of the Final Pathogen TMDL for the North Coastal Watershed recommends the following specific BMPs to address elevated fecal coliform levels in the watershed:

- Address pet waste as a water quality issue.
- Reduce public geese feeding, especially along lakes where both geese and people congregate.
- Provide technical and funding assistance for the implementation of municipal stormwater plans and ensure that consent judgments are completed in a timely manner.
- Encourage communities and watershed groups to take advantage of the interest that the Natural Resources Conservation Service (NRCS) has in working with communities to identify sources of stormwater contamination and evaluate remedial options.
- Educate communities to consider permit and development strategies that address stormwater runoff – implement BMPs and Low Impact Development (LID).

The TMDL report also indicates that structural BMPs may be appropriate to address runoff from impervious areas in instances where fecal coliform concentrations cannot be reduced by other means.

The following initiatives, also identified in Section 8.3 of the TMDL, are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the North Coastal Watershed in Beverly and Salem:

- Public education on stormwater included in Consumer Confidence reports, mailed out to all residents annually. (Beverly)
- Dog waste disposal procedures included in annual notices to all dog owners. (Beverly)
- Stormwater advisory committee meets 1-2 times per year. (Beverly)
- Stormwater collection system with all major outfalls has been mapped on GIS. (Beverly)
- Plan developed to target illicit connections and remove them. (Beverly)

[7] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

- Salem Sound Coast Watch (SSCW) has established a website which allows town to post stormwater related information and data. (Salem)
- SSCW sponsors beach cleanups and volunteer water quality monitoring with results published every two weeks on website. (Salem)
- City of Salem conducts visual surveys of outfalls during dry weather each year including weekly sampling at 18 locations between June and August. (Salem)

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing Stormwater Management Plan (SWMP) including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7R Pathogen Methodology,[7] MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.

In accordance with the BMPs identified in the TMDL report as planned measures to reach compliance with the North Coastal Watershed Pathogen TMDL report, MassDOT has documented the locations of its stormwater outfalls. In addition, as part of its pet waste management program, MassDOT has determined that one MassDOT targeted rest stop is located within the subwatershed of this water body. Beverly Rest Area is located off Route 128 northbound just north of Exit 19, and it lies just inside the northeast border of the subwatershed. See Figure 1B for a detail of the subwatershed and the location of this rest stop. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Beverly Harbor. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Beverly Harbor, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

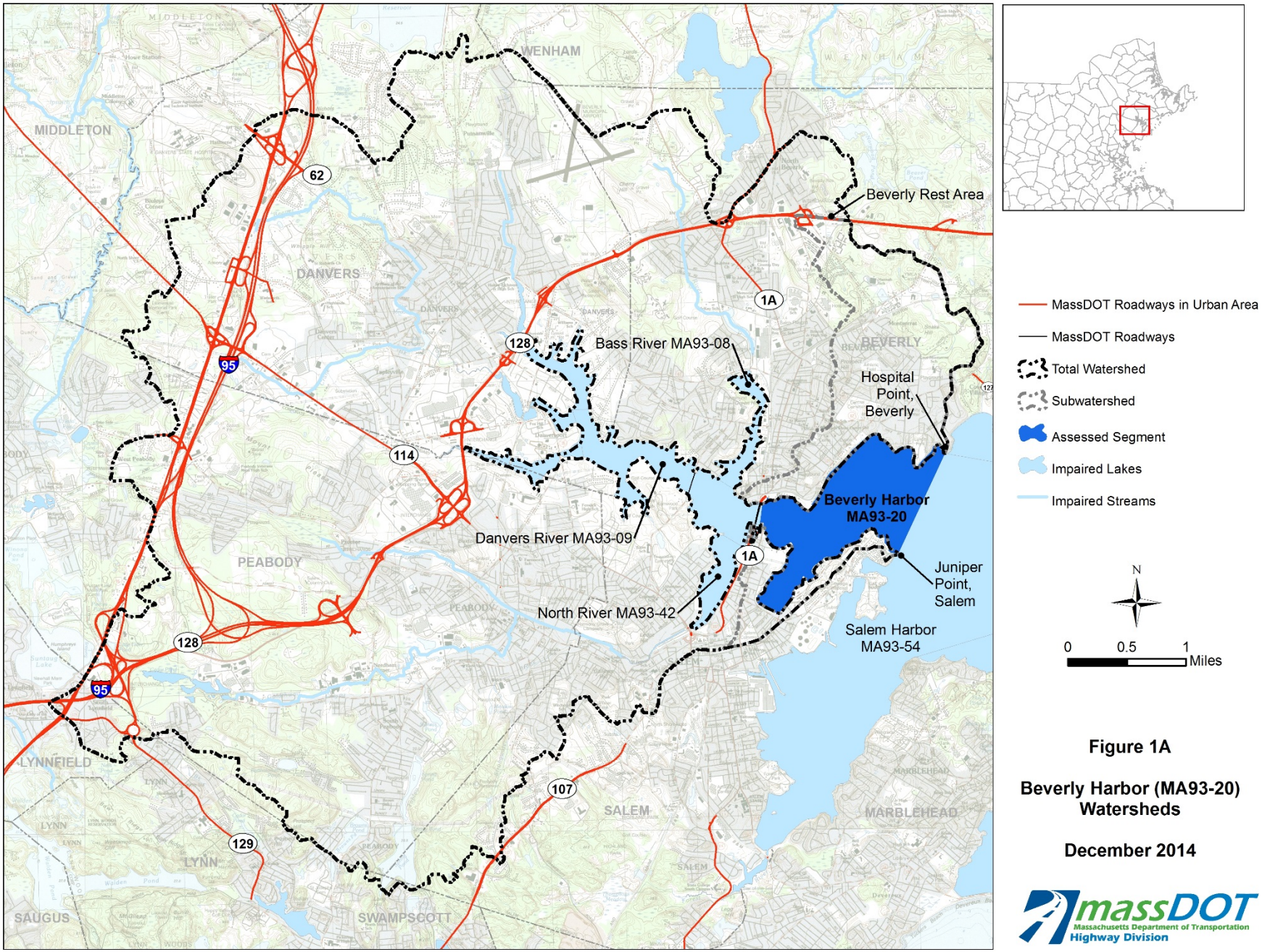
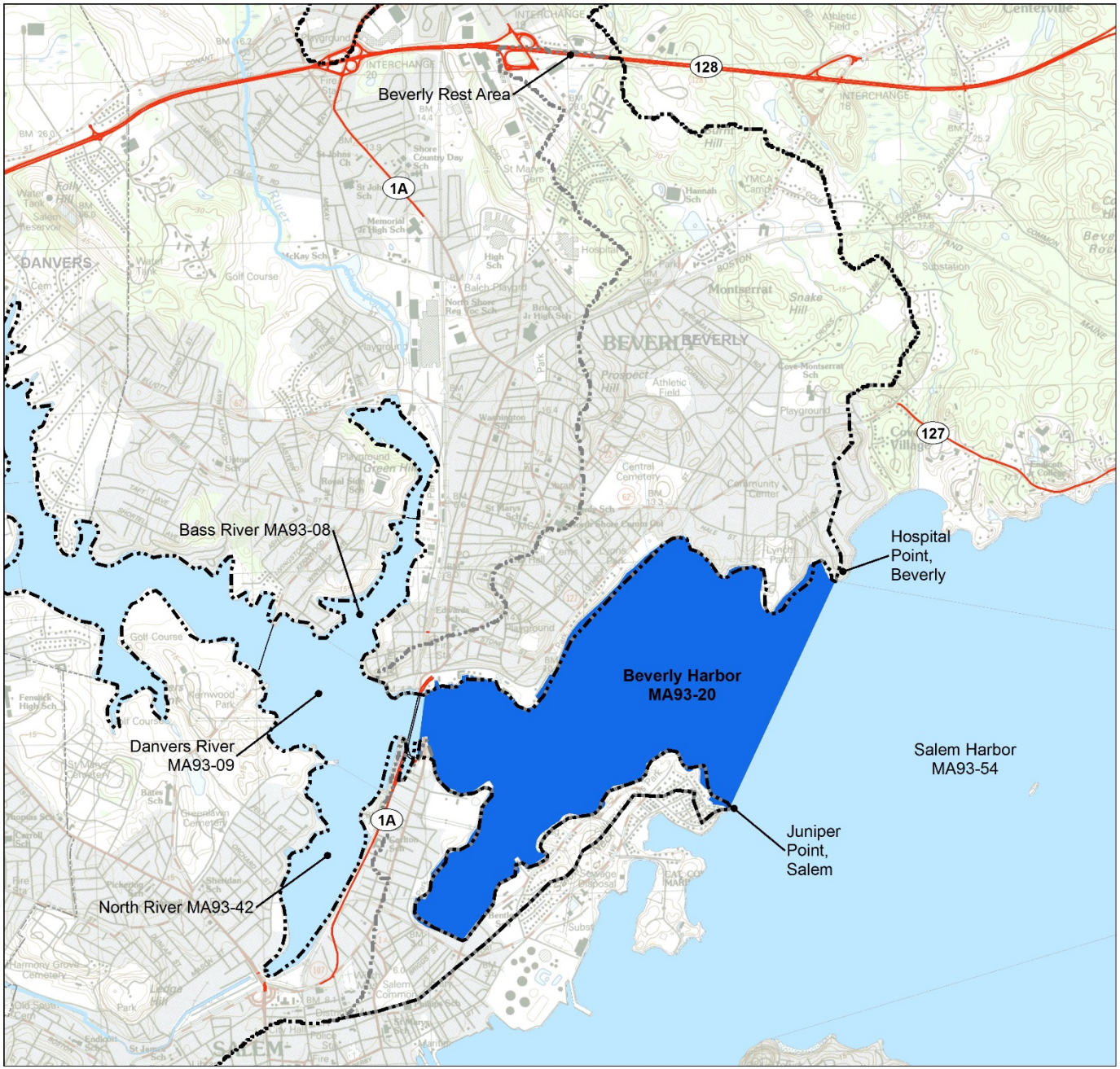


Figure 1A

Beverly Harbor (MA93-20) Watersheds

December 2014



MassDOT Roadways in Urban Area
MassDOT Roadways
Total Watershed
Subwatershed
Assessed Segment
Impaired Lakes
Impaired Streams

N

0 0.25 0.5 Miles

Figure 1B

Beverly Harbor (MA93-20) Subwatersheds

December 2014

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12/08/2014

Impaired Waters Assessment for North River (MA94-06)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*Draft Pathogen TMDL for the South Coastal Watershed* [2]
	WQ Assessment:	*South Shore Coastal Watersheds 2001 Water Quality Assessment Report* [3]
Location		
	Towns:	*Marshfield, Scituate*
	MassDOT Roads:	*Route 3A*
Assessment Method(s)	7R (TMDL Method) ☐	7U (IC Method) ☒

Site Description

The North River (MA94-06) Segment is an estuary that runs from Route 3A (Main Street) in Marshfield/Scituate to the confluence with the Massachusetts Bay in Scituate. This segment is approximately 0.56 square mile and is classified as a Class SA water body. Class SA waters are designated as an excellent habitat for fish, other aquatic life and wildlife. Figure 1A shows the total drainage area (76 square miles) and the subwatershed area to the North River, and the impaired segment (MA94-06). The subwatershed area is shown in more detail on Figure 1B.

MassDEP's Water Quality Assessment Report for this receiving water estimates the land uses as approximately 48% forest, 31% residential and 6% open land.[3] The south bank of the North River is bordered by a 184-acre North River Wildlife Sanctuary on Route 3A owned by the Massachusetts Audubon Society. There are also 443 acres of cranberry bog open space in the total watershed for Segment MA94-06.

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP. Draft Pathogen TMDL for the South Coastal Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/scoastl1.pdf

[3] MassDEP, 2006. South Shore Coastal Watersheds 2001 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/94wqar2.pdf

According to MassDEP's *South Shore Coastal Watersheds 2001 Water Quality Assessment Report*, North River (MA94-06) has been assessed as supporting Aquatic Life and Aesthetics uses.[4] It has not yet been assessed for Fish Consumption, Primary Contact, and Secondary Contact. The Shellfish Harvesting use is assessed as impaired from elevated levels of fecal coliform from unknown sources. Elevated levels are suspected to come from municipal storm sewers and marina/boating sanitary on-vessel discharges. Segment MA94-06 of the North River is covered by a *Draft Pathogen Total Maximum Daily Load (TMDL) for the South Coastal Watershed.*[5]

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA94-06 is comprised of portions of 3A. Refer to Figure 1A and Figure 1B for the location of this roadway within the subwatershed to Segment MA94-06.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[6] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[7] MassDOT assessed North River (MA94-06) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[8] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[9] The condition of North River is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[10] MassDOT included a review of the *Draft Pathogen Total Maximum Daily Load (TMDL) for the South Coastal Watershed* as an informational review as part of this assessment even though, due to their draft status, draft TMDLs are not formally part of the Impaired Waters Retrofit program.[5]

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[4] MassDEP, 2006. South Shore Coastal Watersheds 2001 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/94wqar2.pdf

[5] MassDEP. Draft Pathogen TMDL for the South Coastal Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/scoastl1.pdf

[6] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[7] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[9] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[10] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[11] MassDOT included an informational review of the draft report as part of this assessment even though, due to their draft status, draft TMDLs are not formally part of the Impaired Waters Retrofit program.

The *Draft Pathogen Total Maximum Daily Load (TMDL) for the South Coastal Watershed* identified various sources of fecal contamination.[12] Dry weather sources include animal feeding operations, animal grazing in riparian zones, leaking sewer pipes, stormwater drainage systems (illicit connections), failing septic systems, wildlife, recreational activities, and illicit boat discharges. Wet weather sources include wildlife and domesticated animals, stormwater runoff including municipal separate storm sewer systems (MS4s), combined sewer overflows (CSOs), and sanitary sewer overflows (SSOs).

Section 7.0 of the Draft Pathogen TMDL discussed the need to eliminate sewer connections to drainage systems, leaking sewer pipes, SSOs, and failing septic systems. A program is needed to identify sources and encourage responsible entities to take corrective actions. Due to the impact of stormwater runoff on pathogen levels, the Draft Pathogen TMDL recommends intensive application of non-structural BMPs throughout the watershed. Structural controls may be necessary if non-structural BMPs are not successful. The report recommends a basin-wide implementation strategy to eliminate illicit sources and implement stormwater BMPs.[12]

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the South Coastal watershed, which includes the North River: [12]

- Agricultural BMPs
- Illicit discharge detection and elimination
- Implementation of stormwater management plans by MS4s
- Septic system upgrades
- WWTP BMPs to meet effluent limits
- Watershed resident education
- Additional monitoring

Proposed Draft Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements in regard to pathogens.[11]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of the impaired portion of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired

[11] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

[12] MassDEP. Draft Pathogen TMDL for the South Coastal Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/scoastl1.pdf

waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the Draft Pathogen TMDL report identifies the benefits of non-structural BMPs and structural BMPs, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.[13]

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for North River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of North River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

[13] MassDEP. Draft Pathogen TMDL for the South Coastal Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/scoastl1.pdf

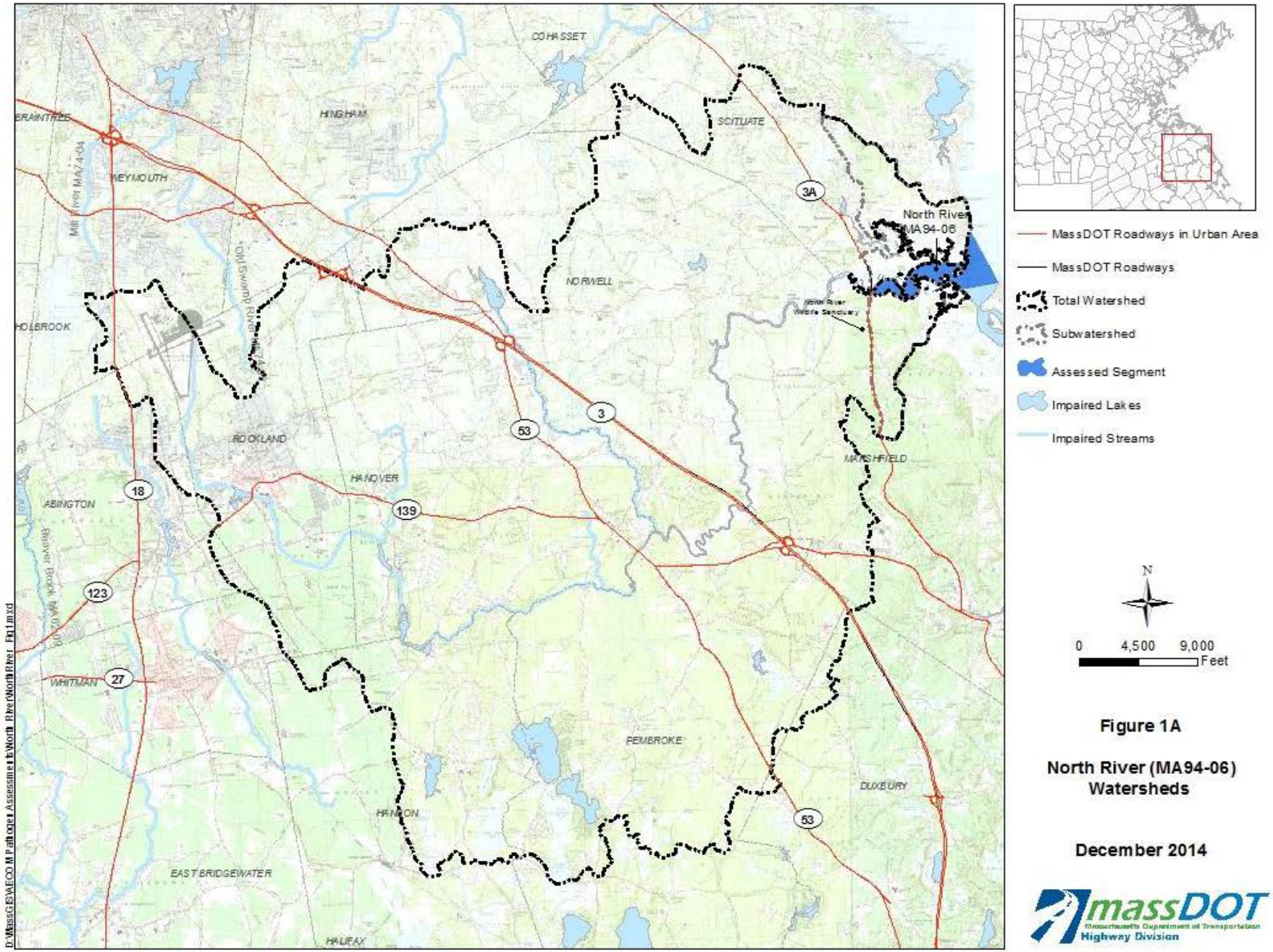

Figure 1A

North River (MA94-06) Watersheds

December 2014

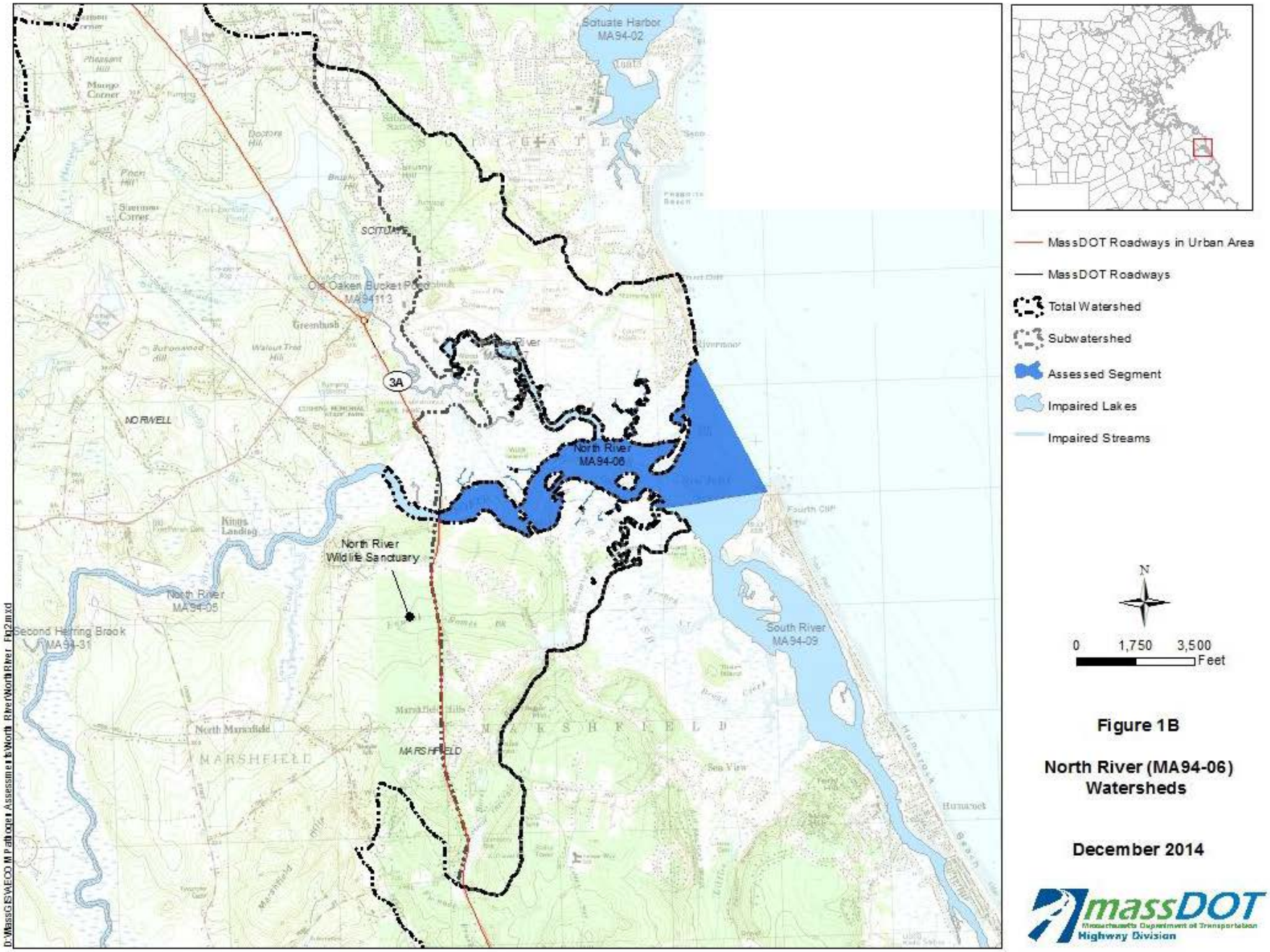

Figure 1B

North River (MA94-06) Watersheds

December 2014

12/08/2014

Impaired Waters Assessment for Herring River (MA94-07)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*Draft Pathogen TMDL for the South Coastal Watershed* [2]
	WQ Assessment:	*South Shore Coastal Watersheds 2001 Water Quality Assessment Report* [3]
Location	Towns:	*Scituate*
	MassDOT Roads:	*Route 3A*
Assessment Method(s)	7R (TMDL Method) ☐	7U (IC Method) ☒

Site Description

The Herring River (MA94-07) impaired segment is an estuary that runs from the outlet of Old Oaken Bucket Pond, Scituate to the confluence with the North River, Scituate. MassDEP's Water Quality Assessment Report for this segment estimates it is approximately 0.08 square mile in size and is classified as a Class SA water body.[3] Class SA waters are designated as an excellent habitat for fish, other aquatic life and wildlife. The total watershed is mostly undeveloped with approximately 44% of the land designated as forest, 30% as residential use, and 11% as open land. The headwaters to the impaired segment originate at Old Oaken Bucket Pond.

Figure 1 shows the total drainage area to the Herring River, approximately 6.9 square miles, along with the subwatershed area associated with only the impaired segment (MA94-07).

According to MassDEP's *South Shore Coastal Watersheds 2001 Water Quality Assessment Report*, the Herring River (MA94-07) is assessed as supporting Aesthetic uses based on the lack of aesthetically objectionable conditions.**Error! Bookmark not defined.** It has not yet been assessed for Aquatic Life, Fish Consumption, Primary Contact, and Secondary Contact. The Shellfish Harvesting use is assessed as impaired from elevated levels of fecal coliform presumed to come

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP. Draft Pathogen TMDL for the South Coastal Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/scoastl1.pdf

[3] MassDEP, 2001. South Shore Coastal Watershed 2001 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/94wqar2.pdf

from the Scituate WWTP discharge, municipal storm sewers, and the marina. Segment MA94-07 of the Herring River is covered by a *Draft Pathogen Total Maximum Daily Load (TMDL) for the South Coastal Watershed.*[4]

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA94-07 is comprised of portions of Route 3A. Refer to Figure 1 for the location of these roadways within the subwatershed to Segment MA94-07.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[5] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[6] MassDOT assessed Herring River (MA94-07) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[7] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[8] The condition of Herring River is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[9] MassDOT included a review of the *Draft Pathogen Total Maximum Daily Load (TMDL) for the South Coastal Watershed* as an informational review as part of this assessment even though, due to their draft status, draft TMDLs are not formally part of the Impaired Waters Retrofit program.[4]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit

[4] MassDEP. Draft Pathogen TMDL for the South Coastal Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/scoastl1.pdf

[5] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[6] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[7] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[8] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[9] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[10]

The *Draft Pathogen Total Maximum Daily Load (TMDL) for the South Coastal Watershed* identified various sources of fecal contamination.[11] Dry weather sources include animal feeding operations, animal grazing in riparian zones, leaking sewer pipes, stormwater drainage systems (illicit connections), failing septic systems, wildlife, recreational activities, and illicit boat discharges. Wet weather sources include wildlife and domesticated animals, stormwater runoff including municipal separate storm sewer systems (MS4s), combined sewer overflows (CSOs), and sanitary sewer overflows (SSOs).

Section 7.0 of the Draft Pathogen TMDL discussed the need to eliminate sewer connections to drainage systems, leaking sewer pipes, SSOs, and failing septic systems. A program is needed to identify sources and encourage responsible entities to take corrective actions. Due to the impact of stormwater runoff on pathogen levels, the Draft Pathogen TMDL recommends intensive application of non-structural BMPs throughout the watershed. Structural controls may be necessary if non-structural BMPs are not successful. The report recommends a basin-wide implementation strategy to eliminate illicit sources and implement stormwater BMPs.[11]

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the South Coastal watershed, which includes the Herring River: [11]

- Agricultural BMPs
- Illicit discharge detection and elimination
- Implementation of stormwater management plans by MS4s
- Septic system upgrades
- WWTP BMPs to meet effluent limits
- Watershed resident education
- Additional monitoring

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and draft TMDL recommendations in regard to pathogens.[10]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the Draft Pathogen TMDL report identifies the benefits of non-structural BMPs and structural BMPs, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls. [11]

[10] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

[11] MassDEP. Draft Pathogen TMDL for the South Coastal Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/scoastl1.pdf

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for the Herring River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of the Herring River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

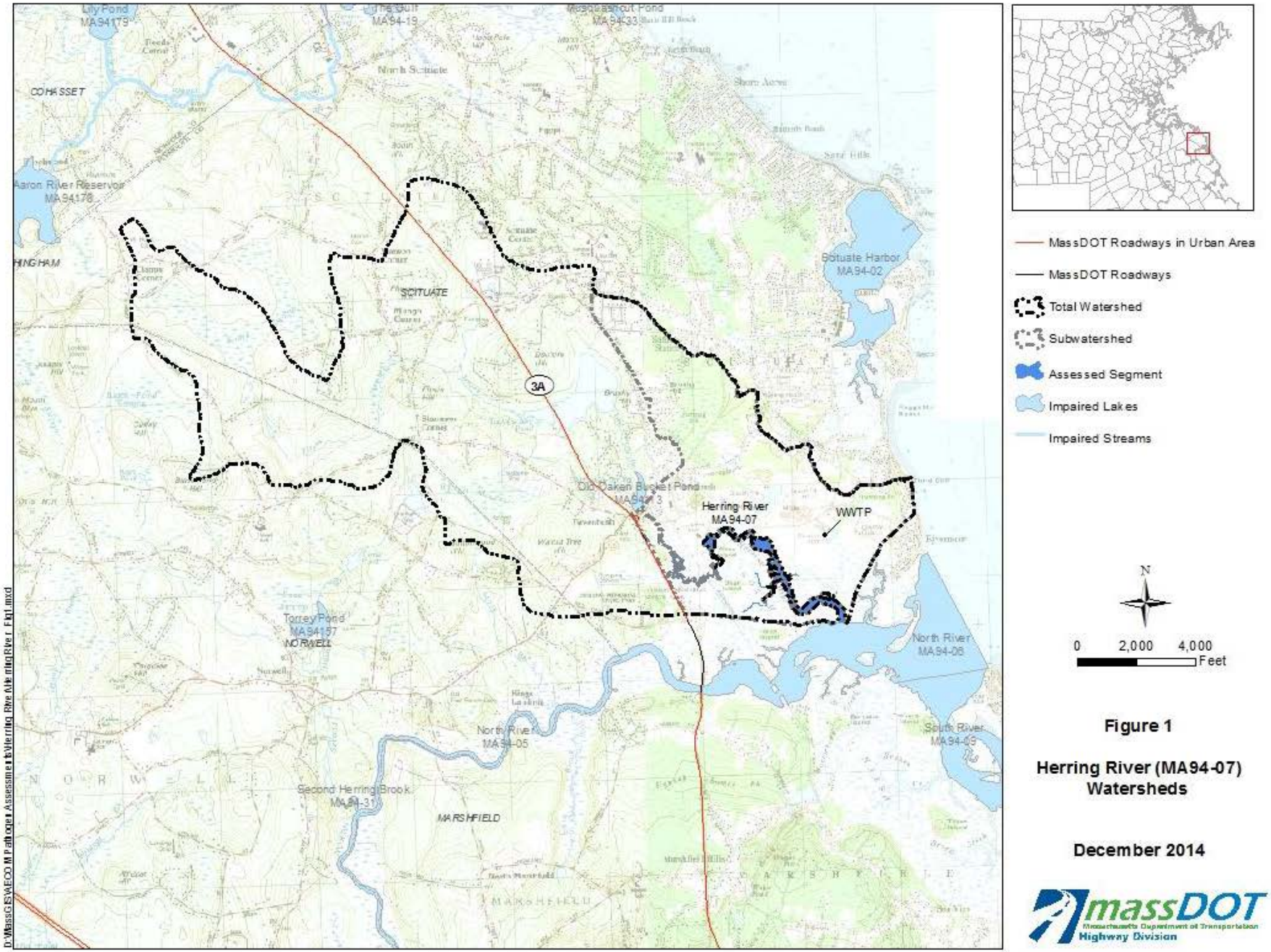

Figure 1

Herring River (MA94-07) Watersheds

December 2014

12/08/2014

Impaired Waters Assessment for South River (MA94-09)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*Draft Pathogen TMDL for the South Coastal Watershed* [2]
	WQ Assessment:	*South Shore Coastal Watersheds 2001 Water Quality Assessment Report* [3]
Location	Towns:	*Marshfield/Scituate*
	MassDOT Roads:	*Routes 3A and 139*
Assessment Method(s)	7R (TMDL Method) ☐	7U (IC Method) ☒

Site Description

The South River (MA94-09) is an estuary that runs from a dam at Main Street in Marshfield to the confluence with the North River/Massachusetts Bay in Marshfield/Scituate. MassDEP's Water Quality Assessment Report for this segment estimates it is approximately 0.63 square mile and is classified as a Class SA, Outstanding Resource Water.[3] Class SA waters are designated as an excellent habitat for fish, other aquatic life and wildlife. Within the South River watershed the surrounding land use includes approximately 31% residential and about 44% forested land. There are also 323 acres of cranberry bog open space in the total watershed for Segment MA94-09. Refer to Figure 1 for the Total Watershed and Subwatershed delineations.

According to MassDEP's *South Shore Coastal Watersheds 2001 Water Quality Assessment Report*, South River (MA94-09) has been assessed as supporting Aquatic Life, Primary Contact, Secondary Contact, and Aesthetics.[3] It has not yet been assessed for Fish Consumption. The Shellfish Harvesting use is assessed as impaired from elevated levels of fecal coliform in from

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP. Draft Pathogen TMDL for the South Coastal Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/scoastl1.pdf

[3] MassDEP, 2006. South Shore Coastal Watersheds 2001 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/94wqar2.pdf

municipal separate storm sewer systems (MS4s) and other suspected sources including on-site septic systems, municipal high density area, and marina/boating discharges. Segment MA94-09 of the South River is covered by a *Draft Pathogen Total Maximum Daily Load (TMDL) for the South Costal Watershed*.[4]

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA94-09 is comprised of portions of Routes 3A and 139. Refer to Figure 1 for the location of these roadways within the subwatershed to Segment MA94-09.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[5] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[6] MassDOT assessed South River (MA94-09) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[7] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[8] The condition of South River is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[9] MassDOT included a review of the *Draft Pathogen Total Maximum Daily Load (TMDL) for the South Coastal Watershed* as an informational review as part of this assessment even though, due to their draft status, draft TMDLs are not formally part of the Impaired Waters Retrofit program.[4]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the

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[5] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[6] MassDOT. December 2014. Description of MassDOT's Application of BMP BMP 7U for Pathogen Related Impairments.

[7] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[8] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[9] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[10] MassDOT included an informational review of the draft report as part of this assessment even though, due to their draft status, draft TMDLs are not formally part of the Impaired Waters Retrofit program

The *Draft Pathogen Total Maximum Daily Load (TMDL) for the South Costal Watershed* identified various sources of fecal contamination.[11] Dry weather sources include animal feeding operations, animal grazing in riparian zones, leaking sewer pipes, stormwater drainage systems (illicit connections), failing septic systems, wildlife, recreational activities, and illicit boat discharges. Wet weather sources include wildlife and domesticated animals, stormwater runoff including MS4s, combined sewer overflows (CSOs), and sanitary sewer overflows (SSOs).

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The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the South Coastal watershed, which includes the South River: [11]

- Agricultural BMPs
- Illicit discharge detection and elimination
- Implementation of stormwater management plans by MS4s
- Septic system upgrades
- WWTP BMPs to meet effluent limits
- Watershed resident education
- Additional monitoring

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.[10]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the Draft Pathogen TMDL report identifies the benefits of non-structural BMPs and structural BMPs, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability

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of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.[11]

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for South River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of South River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

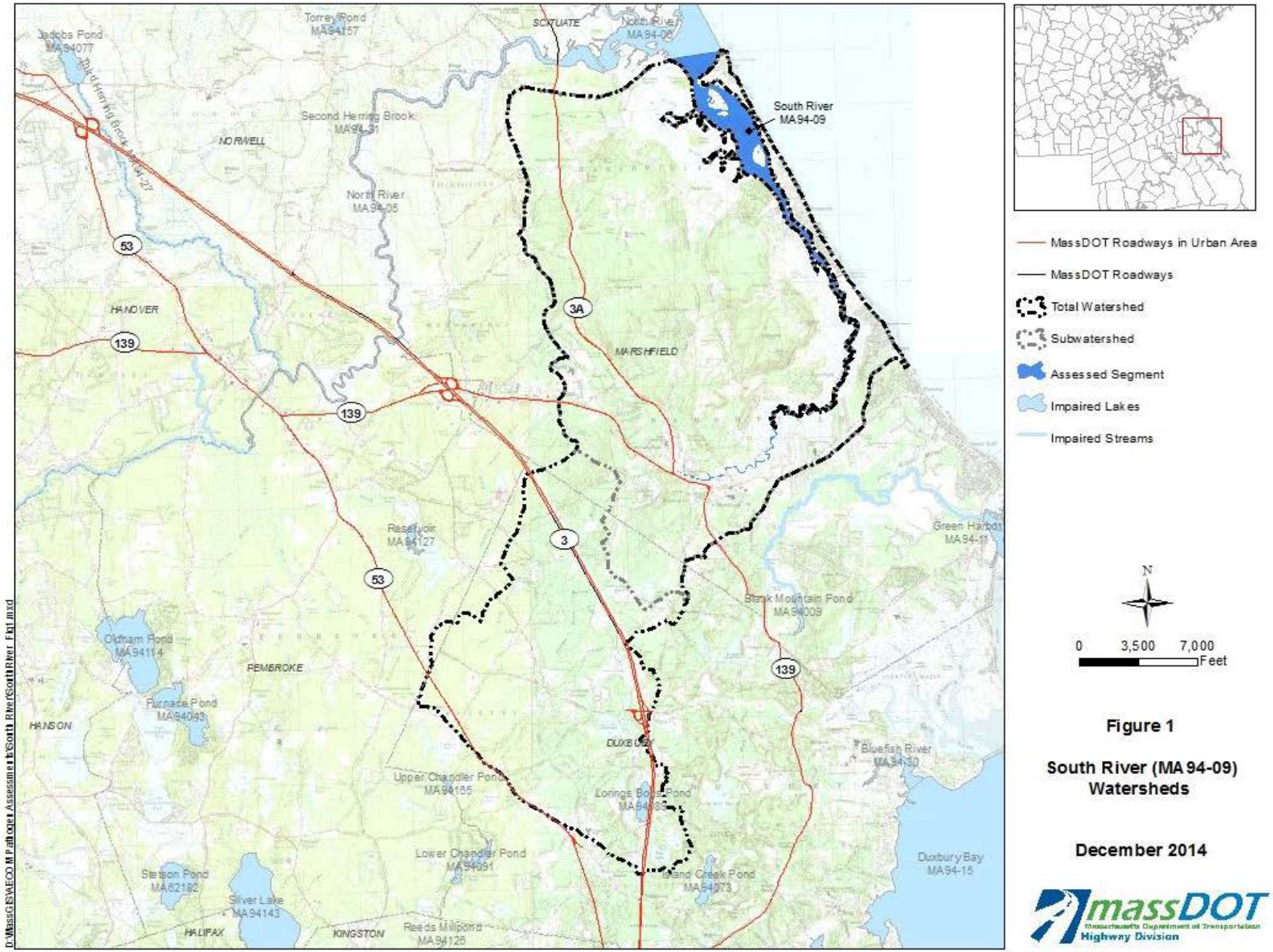

Figure 1

South River (MA 94-09) Watersheds

December 2014

12/08/2014

Impaired Waters Assessment for Jones River (MA94-14)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*Draft Pathogen TMDL for the South Coastal Watershed* [2]
	WQ Assessment:	*South Shore Coastal Watersheds 2001 Water Quality Assessment Report* [3]
Location	Towns:	*Kingston*
	MassDOT Roads:	*Routes 3, 3A, 44, and 53*
Assessment Method(s)	7R (TMDL Method) ☐	7U (IC Method) ☒

Site Description

The Jones River (MA94-14) Estuary Segment runs from a dam at Elm Street in Kingston to the mouth of Duxbury Bay in Kingston. This segment is approximately 0.09 square mile.

The Jones River (segment MA94-14) is part of the Plymouth Bay watershed and is classified as a Class SA, Outstanding Resource Water. Class SA waters are designated as an excellent habitat for fish, other aquatic life and wildlife. The Jones River is a major tributary to Duxbury Bay and is divided into three impaired segments, including segment MA94-14. According to MassDEP's *South Shore Coastal Watersheds 2001 Water Quality Assessment Report,* land use within the total Jones River watershed is approximately 27% residential land use and about 47% forested land.[3] Refer to Figure 1 for the Total Watershed and Subwatershed delineations.

According to MassDEP's *South Shore Coastal Watersheds 2001 Water Quality Assessment Report*, South River (MA94-14) has been assessed as supporting Aquatic Life, Primary Contact, Secondary Contact, and Aesthetics uses.[3] It has not yet been assessed for Fish Consumption. The Shellfish Harvesting use is assessed as impaired from elevated levels of fecal coliform during wet weather. The sources of elevated levels are identified as discharges from municipal separate

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP. Draft Pathogen TMDL for the South Coastal Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/scoastl1.pdf

[3] MassDEP, 2006. South Shore Coastal Watersheds 2001 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/94wqar2.pdf

storm sewer systems (MS4s) and suspected sources include septic system and waterfowl. Segment MA94-14 of Jones River is covered by a *Draft Pathogen Total Maximum Daily Load (TMDL) for the South Coastal Watershed.*[4]

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA94-14 is comprised of portions of Routes 3, 3A, 44, and 53. Refer to Figure 1 for the location of these roadways within the subwatershed to Segment MA94-14.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[5] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[6] MassDOT assessed Jones River (MA94-14) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[7] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[8] The condition of Jones River is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[9] MassDOT included a review of the *Draft Pathogen Total Maximum Daily Load (TMDL) for the South Coastal Watershed* as an informational review as part of this assessment even though, due to their draft status, draft TMDLs are not formally part of the Impaired Waters Retrofit program.[4]

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The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the South Coastal watershed, which includes the Jones River: [11]

- Agricultural BMPs
- Illicit discharge detection and elimination
- Implementation of stormwater management plans by MS4s
- Septic system upgrades
- WWTP BMPs to meet effluent limits
- Watershed resident education
- Additional monitoring

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and draft TMDL recommendations in regard to pathogens.[10]

As part of its pet waste management program, MassDOT has determined that one MassDOT-targeted rest stop is located within the subwatershed of this water body along Route 3 in Kingston. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the Draft Pathogen TMDL report identifies the benefits of non-structural BMPs and that structural BMPs, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability

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of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.[12]

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Jones River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Jones River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

[12] MassDEP. Draft Pathogen TMDL for the South Coastal Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/scoastl1.pdf

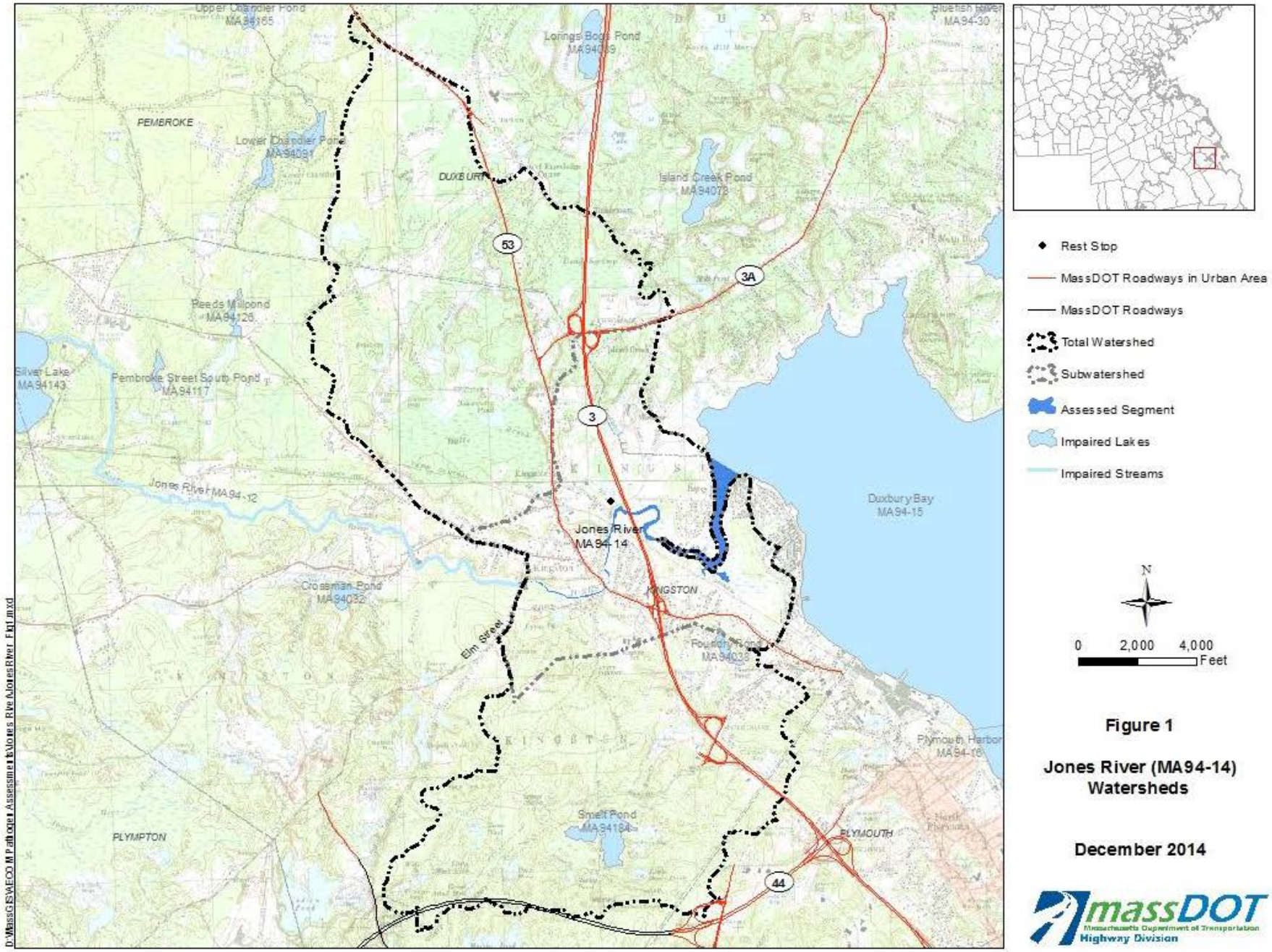

Figure 1

Jones River (MA94-14) Watersheds

December 2014

massDOT Massachusetts Department of Transportation Highway Division

12/08/2014

Impaired Waters Assessment for Duxbury Bay (MA94-15)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*Draft Pathogen TMDL for the South Coastal Watershed* [2]
	WQ Assessment:	*South Shore Coastal Watersheds 2001 Water Quality Assessment Report* [3]
Location	Towns:	*Plymouth, Duxbury, Kingston*
	MassDOT Roads:	*Routes 3A, 3, 44, and 53*
Assessment Method(s)	7R (TMDL Method) ☐	7U (IC Method) ☒

Site Description

The Duxbury Bay (MA94-15) impaired segment includes the waters north and west of a line from Saquish Head to the tip of Plymouth Beach and from there to High Cliff in Plymouth. It excludes Back River and Bluefish River in Duxbury and Jones River in Kingston. This segment is approximately 12.7 square miles.

According to MassDEP's *South Shore Coastal Watersheds 2001 Water Quality Assessment Report,* Duxbury Bay is part of the Plymouth Bay watershed and is classified as Class SA. Class SA waters are designated as an excellent habitat for fish, other aquatic life and wildlife.[3] Jones River and Bluefish River are major tributaries to the west and north of Duxbury Bay. Within the entire Plymouth Bay watershed the surrounding land use is fairly developed with approximately 30% residential land use and about 40% forested land. There are also 1195 acres of cranberry bog open space in the total watershed for Segment MA94-06. Refer to Figure 1 for the Total Watershed and Subwatershed delineations.

According to MassDEP's *South Shore Coastal Watersheds 2001 Water Quality Assessment Report*, Duxbury Bay (MA94-15) has been assessed as support for Aquatic Life, Primary Contact,

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP. Draft Pathogen TMDL for the South Coastal Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/scoastl1.pdf

[3] MassDEP, 2006. South Shore Coastal Watersheds 2001 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/94wqar2.pdf

Secondary Contact, and Aesthetics. [4] It has not yet been assessed for Fish Consumption. The Shellfish Harvesting use is assessed as support for 8.4 square miles and is assessed as impaired for 4.3 square miles from elevated levels of fecal coliform. The source of fecal coliform is identified as discharges from municipal separate storm sewer systems (MS4) with suspected sources including septic systems and waterfowl. Segment MA94-15 of Duxbury Bay is covered by a *Draft Pathogen Total Maximum Daily Load (TMDL) for the South Coastal Watershed.*[5]

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA94-15 is comprised of portions of Routes 3A, 3 and 53 in Duxbury and Route 44 in Plymouth. Refer to Figure 1 for the location of these roadways within the subwatershed to Segment MA94-15.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[6] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[7] MassDOT assessed Duxbury Bay (MA94-15) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[8] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[9] The condition of Duxbury Bay is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[10] MassDOT included a review of the *Draft Pathogen Total Maximum Daily Load (TMDL) for the South Coastal Watershed* as an informational review as part of this assessment even though, due to their draft status, draft TMDLs are not formally part of the Impaired Waters Retrofit program.[5]

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[4] MassDEP, 2006. South Shore Coastal Watersheds 2001 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/94wqar2.pdf

[5] MassDEP. Draft Pathogen TMDL for the South Coastal Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/scoastl1.pdf

[6] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[7] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[9] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[10] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[11] MassDOT included an informational review of the draft report as part of this assessment even though, due to their draft status, draft TMDLs are not formally part of the Impaired Waters Retrofit program.

The *Draft Pathogen Total Maximum Daily Load (TMDL) for the South Coastal Watershed* identified various sources of fecal contamination.[12] Dry weather sources include animal feeding operations, animal grazing in riparian zones, leaking sewer pipes, stormwater drainage systems (illicit connections), failing septic systems, wildlife, recreational activities, and illicit boat discharges. Wet weather sources include wildlife and domesticated animals, stormwater runoff including MS4s, combined sewer overflows (CSOs), and sanitary sewer overflows (SSOs).

Section 7.0 of the Draft Pathogen TMDL discussed the need to eliminate sewer connections to drainage systems, leaking sewer pipes, SSOs, and failing septic systems. A program is needed to identify sources and encourage responsible entities to take corrective actions. Due to the impact of stormwater runoff on pathogen levels, the Draft Pathogen TMDL recommends intensive application of non-structural BMPs throughout the watershed. Structural controls may be necessary if non-structural BMPs are not successful. The report recommends a basin-wide implementation strategy to eliminate illicit sources and implement stormwater BMPs.[12]

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the South Coastal watershed, which includes the Duxbury Bay: [12]

- Agricultural BMPs
- Illicit discharge detection and elimination
- Implementation of stormwater management plans by MS4s
- Septic system upgrades
- WWTP BMPs to meet effluent limits
- Watershed resident education
- Additional monitoring

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and draft TMDL recommendations in regard to pathogens.[11]

As part of its pet waste management program, MassDOT has determined that there is one MassDOT-targeted rest stop located within the subwatershed of this water body along Route 3 in Kingston. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize

[11] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

[12] MassDEP. Draft Pathogen TMDL for the South Coastal Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/scoastl1.pdf

contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the Draft Pathogen TMDL report identifies the benefits of non-structural BMPs and structural BMPs, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.[13]

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Duxbury Bay. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Duxbury Bay, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

[13] MassDEP. Draft Pathogen TMDL for the South Coastal Watershed. Available at http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/scoastl1.pdf

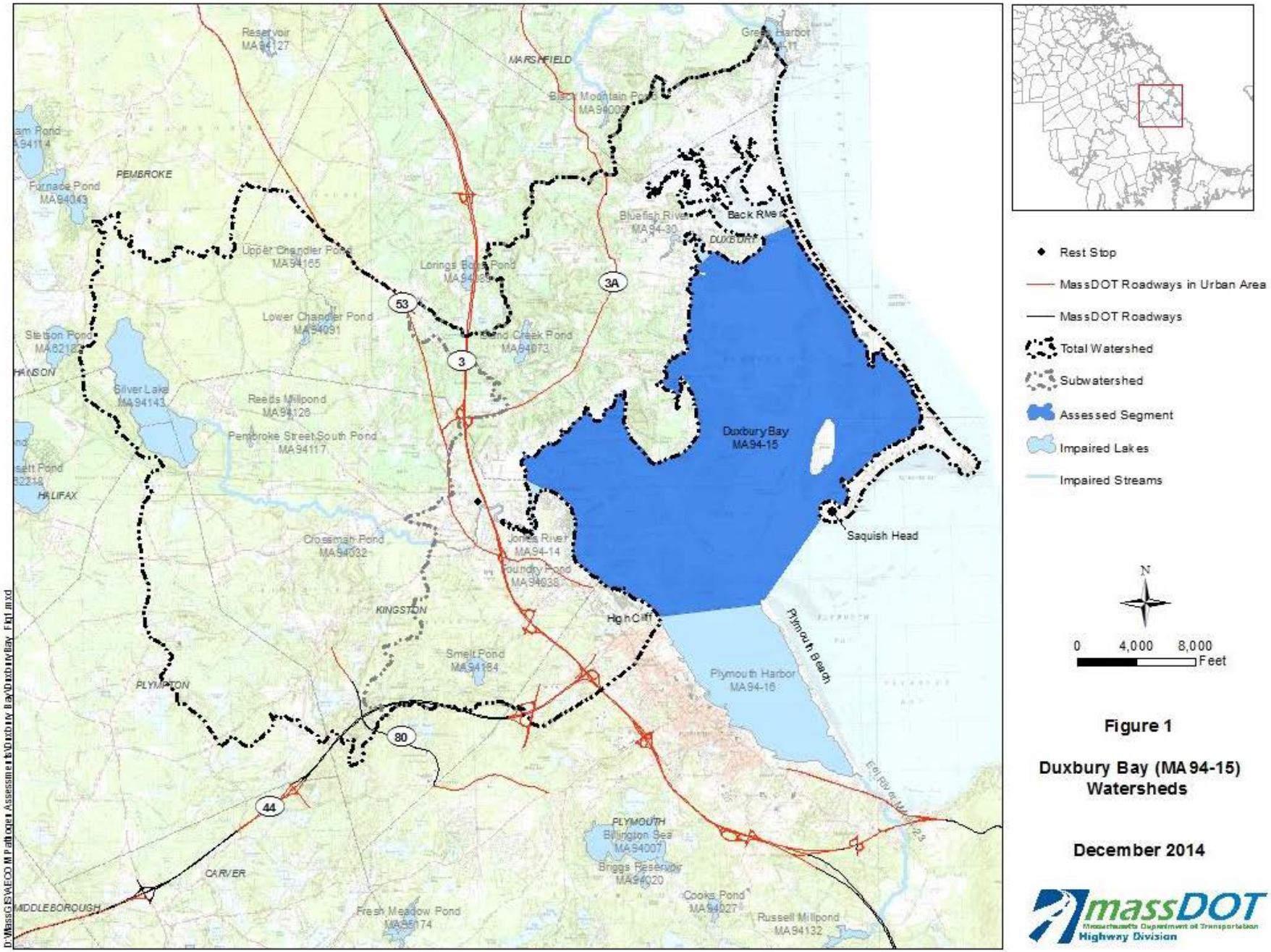

Figure 1

Duxbury Bay (MA94-15) Watersheds

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

12/8/2014

Impaired Waters Assessment for Studleys Pond (MA94151)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*South Shore Coastal Watersheds 2001 Water Quality Assessment Report* [2]
Location	Towns:	*Rockland*
	MassDOT Roads:	*Route 18 and Route 139*
Assessment Method(s)	7R (TMDL Method) ☐	7U (IC Method) ☒

Site Description

Studleys Pond (MA94151) is about 25.5 acres and is fed by French Stream, which runs through the Pond to the confluence with Drinkwater River in Hanover. Refer to Figure 1 for the Total Watershed and Subwatershed delineations. According to MassDEP's *South Shore Coastal Watersheds 2001 Water Quality Assessment Report,* Studleys Pond shares the same watershed as the French Stream, which contains about 31% residential land use and about 44% forested land.[2]

According to MassDEP's *South Shore Coastal Watersheds 2001 Water Quality Assessment Report*, Studleys Pond (MA94151) has not yet been assessed for Aquatic Life, Fish Consumption, Secondary Contact, and Aesthetic uses.[2] The Primary Contact use is assessed as impaired from elevated levels of fecal coliform and is listed in Category 5 of the 2012 Integrated List of Waters.[1] The Primary Contact use is assessed as impaired for Studleys Pond because of elevated fecal coliform bacteria counts, but the source(s) is unknown. Although the bacteria counts were low enough to support the Secondary Contact use, too limited data are available (e.g., lack of aquatic macrophyte/density and transparency) so these uses are not assessed.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Studleys Pond (MA94151) is comprised of portions of Route 18 and Route 139. Refer to Figure 1 for the location of these roadways within the watershed to Studleys Pond (MA94151).

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2006. South Shore Coastal Watersheds 2001 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/94wqar3.pdf

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed Studleys Pond (MA94151) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[5] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[6] The condition of Studleys Pond (MA94151) is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[7]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[8]

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft municipal separate storm sewer system permit requirements in regard to pathogens.[9]

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[3] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[4] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

[5] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[6] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[7] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

[9] MassDOT. December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Studleys Pond. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Studleys Pond, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

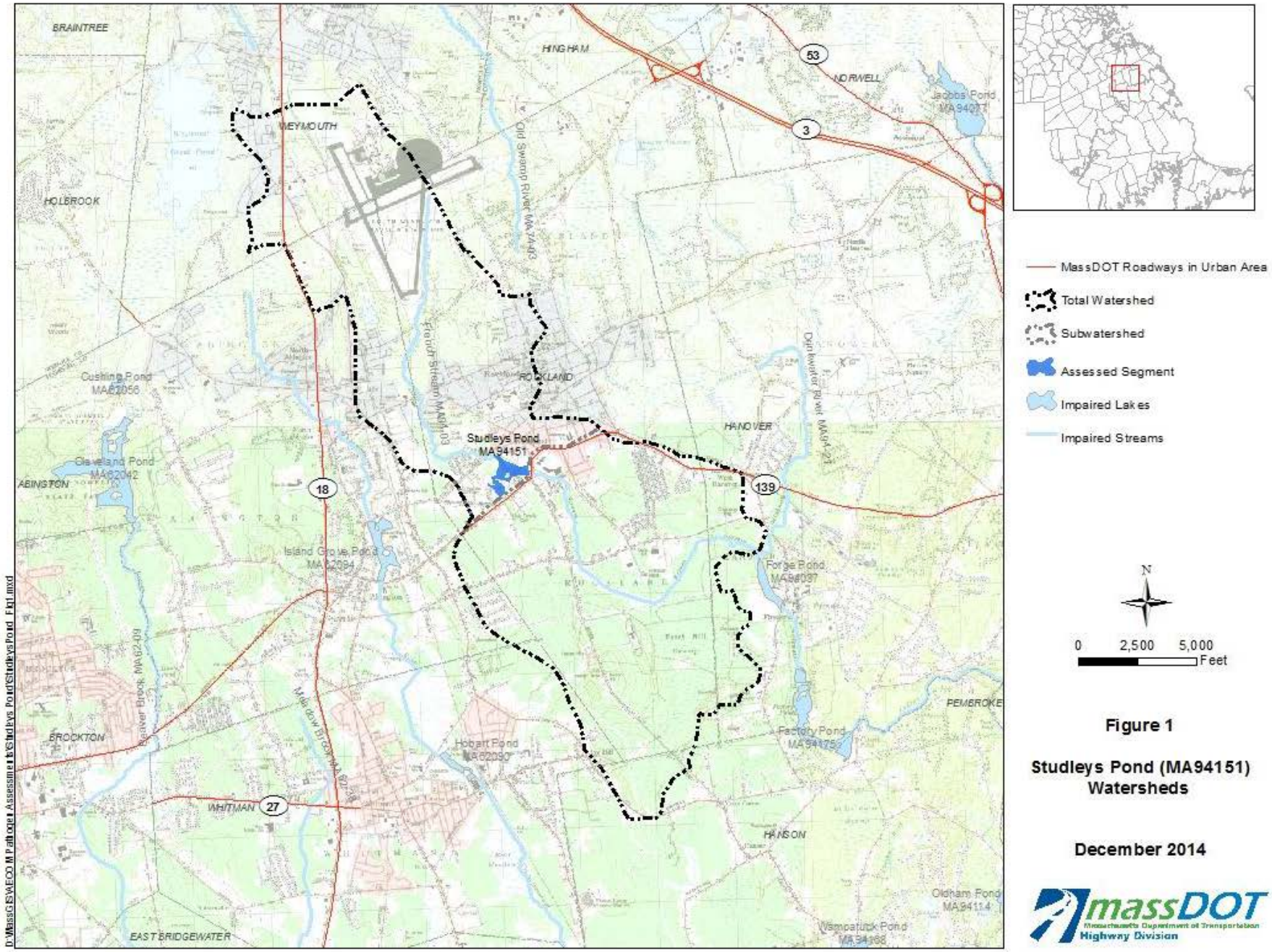


Figure 1

Studleys Pond (MA94151) Watersheds

December 2014

12/08/2014

Impaired Waters Assessment for Iron Mine Brook (MA94-24)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*South Shore Coastal Watersheds 2001 Water Quality Assessment Report* [2]
Location	Towns:	*Hanover*
	MassDOT Roads:	*Routes 53 and 139*
Assessment Method(s)	7R (TMDL Method) ☐	7U (IC Method) ☒

Site Description

The Iron Mine Brook (MA94-24) Segment is a tributary of the Indian Head River that feeds the North River. It extends from its headwaters north of Route 139 in Hanover to the confluence with the Indian Head River. This segment is approximately 1.4 miles.

According to MassDEP's *South Shore Coastal Watersheds 2001 Water Quality Assessment Report,* the Iron Mine Brook is classified as Class B, and a portion of this water body is an Outstanding Resource Water under the North River Protective Order.[2] Class B waters are designated as a habitat for fish, other aquatic life, and for primary and secondary contact recreation. Within the Iron Mine Brook watershed the surrounding land use is fairly undeveloped with 29% residential land use and about 53% forested land. Refer to Figure 1 for the Total Watershed which is the same as the Subwatershed delineation.

According to MassDEP's *South Shore Coastal Watersheds 2001 Water Quality Assessment Report*, Iron Mine Brook (MA94-24) has been assessed as supporting Aquatic Life, Secondary Contact, and Aesthetic uses.[2] It has not yet been assessed for Fish Consumption. The Primary Contact use is listed as impaired from elevated levels of fecal coliform. The cause of the elevated levels is currently unknown but they are suspected to come from discharges from the municipal separate storm sewer system (MS4s).

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2006. South Shore Coastal Watersheds 2001 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/94wqar2.pdf

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA94-24 is comprised of portions of Routes 53 and 139. Refer to Figure 1 for the location of these roadways within the subwatershed to Segment MA94-24.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed Iron Mine Brook (MA94-24) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[5] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[6] The condition of Iron Mine Brook is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[7]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[8]

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that

[3] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[4] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[5] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[6] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[7] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

existing efforts are consistent with the current and draft MS4 permit requirements and draft TMDL recommendations in regard to pathogens.[9]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired water bodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Iron Mine Brook. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Iron Mine Brook, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

[9] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

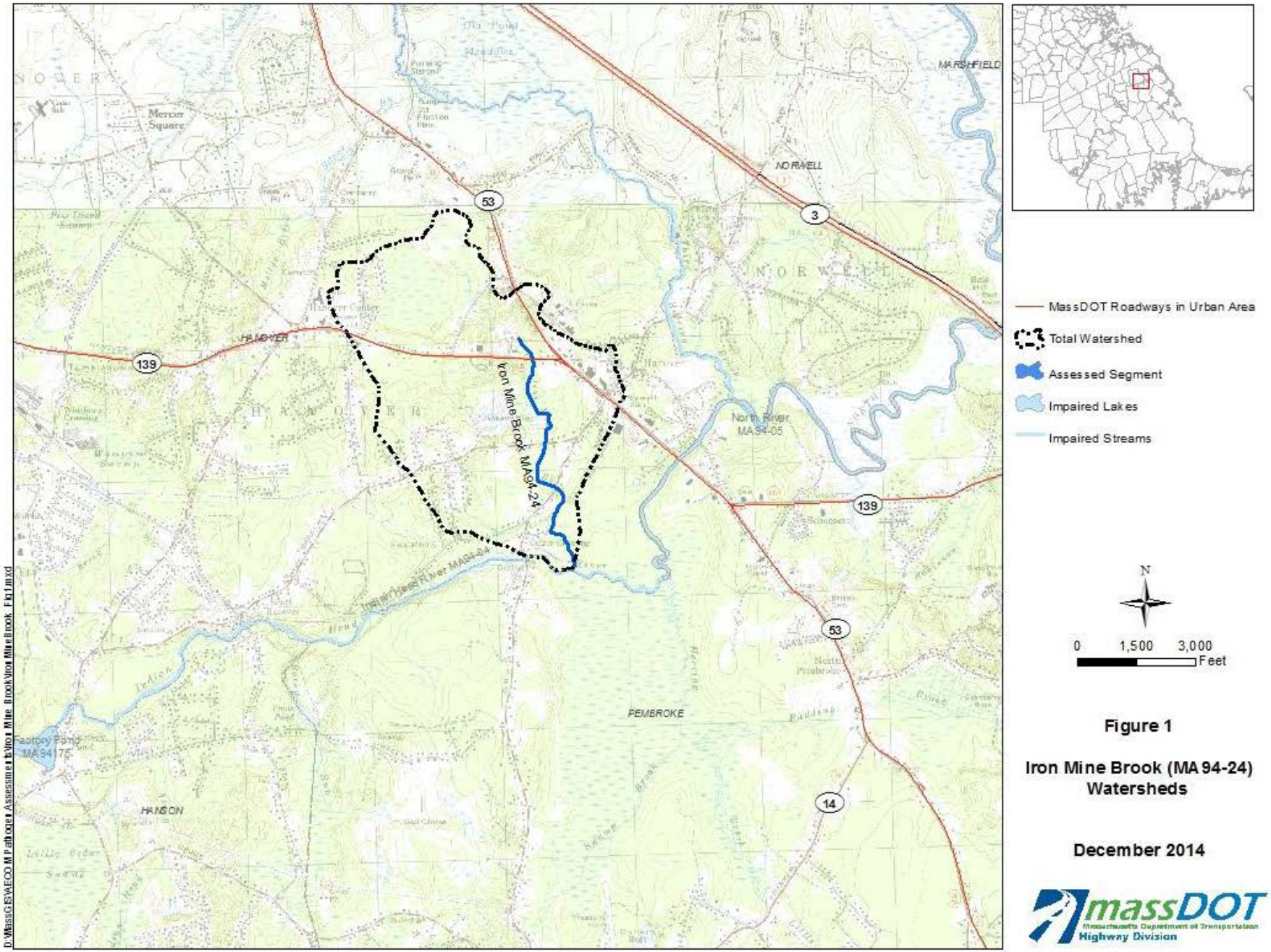


Figure 1

Iron Mine Brook (MA 94-24) Watersheds

December 2014

12/08/2014

Impaired Waters Assessment for Third Herring Brook (MA94-27)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*South Shore Coastal Watersheds 2001 Water Quality Assessment Report* [2]
Location	Towns:	*Norwell, Hanover*
	MassDOT Roads:	*Route 3, Route 53, and Route 139*
Assessment Method(s)	7R (TMDL Method) ☐	7U (IC Method) ☒

Site Description

The Third Herring Brook (MA94-27) Segment begins at the outlet of Jacobs Pond in Norwell/Hanover. Third Herring Brook flows from Jacobs Pond to the confluence with the North River in Norwell/Hanover. This segment is approximately 5.3 miles.

According to MassDEP's *South Shore Coastal Watersheds 2001 Water Quality Assessment Report,* the Third Herring Brook is classified as a Class B water body, and a portion of this water body is an Outstanding Resource Water under the North River Protective Order.[2] Class B waters are designated as a habitat for fish, other aquatic life, and for primary and secondary contact recreation. Within the Third Herring Brook watershed the surrounding land use consists of 27% residential land use and about 57% forested land. Refer to Figure 1 for the Total Watershed and Subwatershed delineations.

According to MassDEP's *South Shore Coastal Watersheds 2001 Water Quality Assessment Report*, Third Herring Brook (MA94-27) has been assessed as supporting Aquatic Life, Secondary Contact, and Aesthetic uses.[2] It has not yet been assessed for Fish Consumption. The Primary Contact is listed as impaired from elevated levels of fecal coliform bacteria counts. The cause of the elevated fecal coliform levels is currently unknown but is suspected to come from discharges from municipal separate storm sewer systems (MS4s).

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2006. South Shore Coastal Watersheds 2001 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/94wqar2.pdf

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Third Herring Brook MA94-27 is comprised of portions of Routes 3, 53, and 139. Refer to Figure 1 for the location of these roadways within the subwatershed to Third Herring Brook MA94-27.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed Third Herring Brook MA94-27 using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[5] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[6] The condition of Third Herring Brook is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[7]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[8]

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that

[3] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[4] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[5] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[6] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[7] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

existing efforts are consistent with the current and draft MS4 permit requirements in regard to pathogens.[9]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Third Herring Brook. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Third Herring Brook, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

[9] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

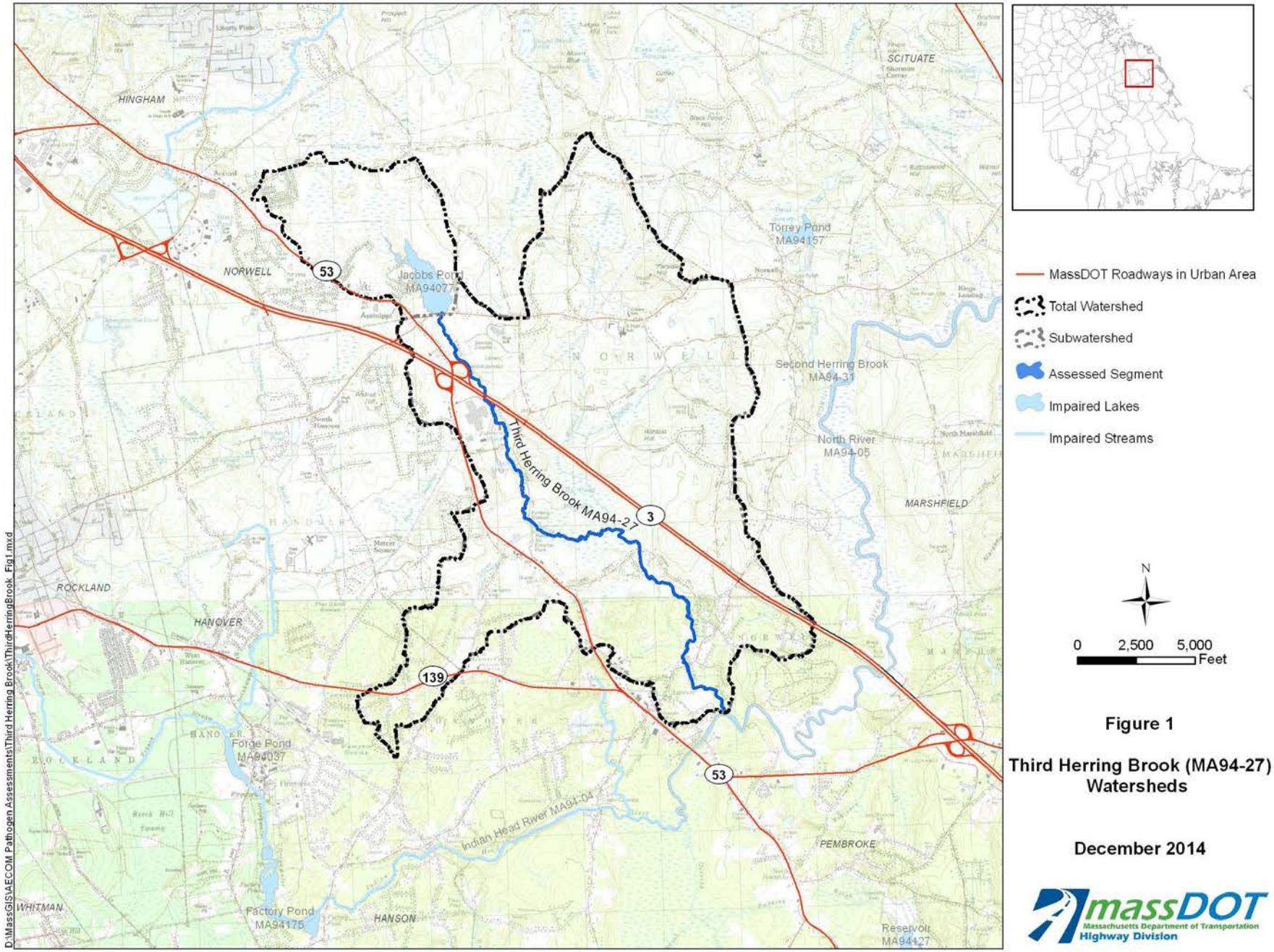


Figure 1

Third Herring Brook (MA94-27) Watersheds

December 2014

12/08/2014

Impaired Waters Assessment for Bluefish River (MA94-30)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*South Shore Coastal Watersheds 2001 Water Quality Assessment Report* [2]
Location	Towns:	*Duxbury*
	MassDOT Roads:	*Route 3A*
Assessment Method(s)	7R (TMDL Method) ☐	7U (IC Method) ☒

Site Description

The Bluefish River (MA94-30) is a part of the Plymouth Bay Subwatershed. The location of the water body is from a saltmarsh north of Harrison Street in Duxbury to the mouth at Duxbury Bay. This segment is approximately 0.06 square mile.

The Bluefish River is classified as a Class SA water body. Class SA waters are designated as an excellent habitat for fish, other aquatic life and wildlife. Within the Bluefish River watershed the surrounding land use includes about 41% residential land use and about 31% forested land. Refer to Figure 1 for the Total Watershed which is the same as the Subwatershed delineation.

According to MassDEP's *South Shore Coastal Watersheds 2001 Water Quality Assessment Report*, Bluefish River (MA94-30) has been assessed as supporting Aquatic Life, Primary Contact, Secondary Contact, and Aesthetic uses.[2] It has not yet been assessed for Fish Consumption. Shellfish Harvesting is listed as impaired from elevated levels of fecal coliform. The cause of the elevated levels is currently unknown but the suspected source is from discharges from the municipal separate storm sewer system (MS4s).

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2006. South Shore Coastal Watersheds 2001 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/94wqar2.pdf

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA94-30 is comprised of portions of Route 3A. Refer to Figure 1 for the location of this roadway within the subwatershed to Segment MA94-30.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed Bluefish River (MA94-30) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[5] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[6] The condition of Bluefish River is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[7]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[8]

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that

[3] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[4] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[5] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[6] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[7] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

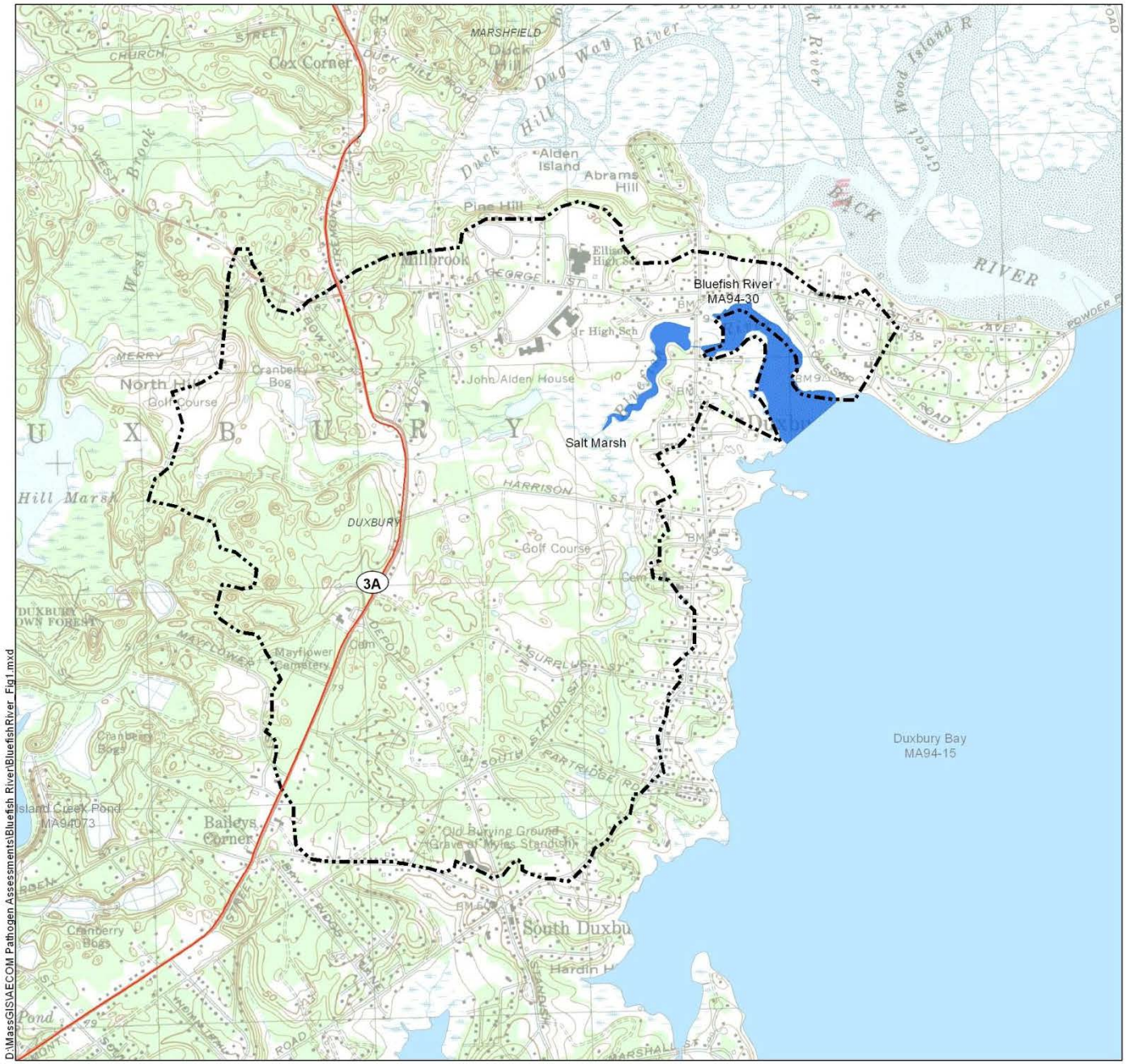
existing efforts are consistent with the current and draft MS4 permit requirements and draft TMDL recommendations in regard to pathogens.[9]

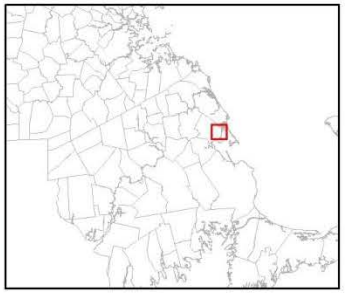
In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Bluefish River. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Bluefish River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

[9] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.





MassDOT Roadways in Urban Area

Total Watershed and Subwatershed

Assessed Segment

Impaired Lakes

Impaired Streams

N

0 1,000 2,000 Feet

Figure 1

Bluefish River (MA94-30) Watersheds

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

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12/8/2014

Impaired Waters Assessment for Ellisville Harbor (MA94-34)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*South Shore Coastal Watersheds 2001 Water Quality Assessment Report* [2]
Location	Towns:	*Plymouth*
	MassDOT Roads:	*Route 3A*
Assessment Method(s)	7R (TMDL Method) ☐	7U (IC Method) ☒

Site Description

The Ellisville Harbor (MA94-34) impaired segment is an isolated harbor that does not have a large drainage area or river system. It is located entirely within Plymouth and discharges directly to the ocean. According to MassDEP's *South Shore Coastal Watersheds 2001 Water Quality Assessment Report,* this segment is approximately 0.01 square mile and is classified as a Class SA waterbody.[2] Class SA waters are designated as an excellent habitat for fish, other aquatic life and wildlife. It is also designated as an Area of Critical Environmental Concern (ACEC).

Figure 1 shows the total drainage area to the Ellisville Harbor, impaired segment (MA94-34). The total watershed is mostly undeveloped with approximately 60% of the land designated as forest and 17% as residential use, and 11% as open land. The headwaters to the impaired segment originate at the surrounding tidal salt marsh.

According to MassDEP's *South Shore Coastal Watersheds 2001 Water Quality Assessment Report*, the Ellisville Harbor (MA94-34) is assessed as supporting Primary Contact and Secondary Contact uses based on low fecal bacteria counts. [2] It has not yet been assessed for Aquatic Life, Fish Consumption, and Aesthetics. The Shellfish Harvesting use is assessed as impaired from elevated levels of fecal coliform bacteria. The source of the bacteria is currently

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2001. South Shore Coastal Watershed 2001 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/94wqar2.pdf

unknown but it is suspected to come from nearby septic systems, wet weather discharges, waterfowl, and poor tidal flushing.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA94-34 is comprised of portions of Route 3A. Refer to Figure 1 for the location of this roadway within the subwatershed to Segment MA94-34.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed Ellisville Harbor MA94-34 using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[5] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[6] The condition of Ellisville Harbor is not proposed to change.

BMP 7U for Pathogen Impairment

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body not covered by a final TMDL.[7]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to address impaired waters and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7U Pathogen Methodology.[8]

[3] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[4] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[5] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[6] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[7] MassDOT, 6 April, 2011. Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method). http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7U Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft municipal separate storm sewer system permit requirements and TMDL recommendations in regard to pathogens.[9]

As part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Ellisville Harbor. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Ellisville Harbor, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

[9] MassDOT, December 2014. Description of MassDOT's Application of BMP 7U for Pathogen Related Impairments.

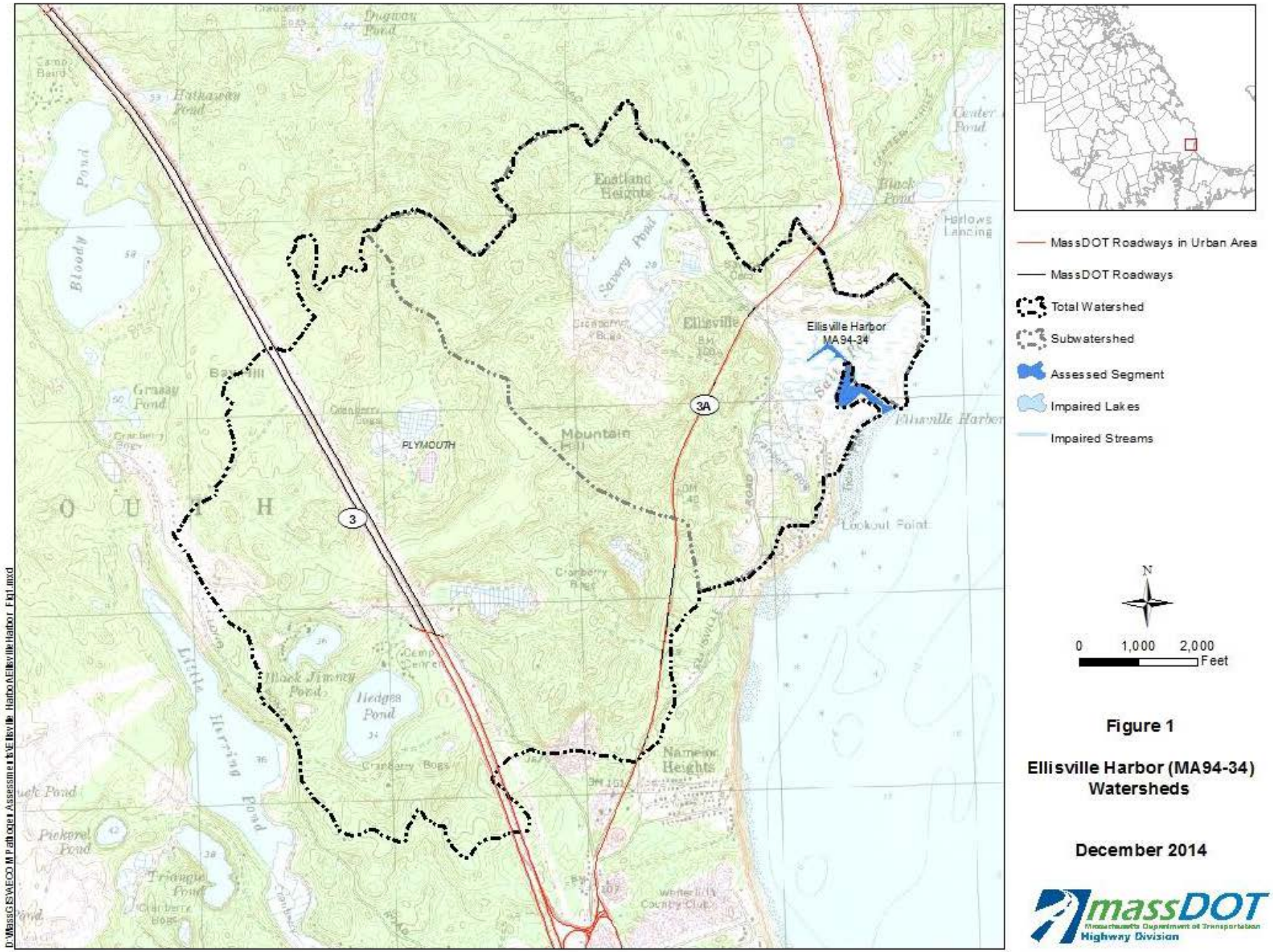


Figure 1

Ellisville Harbor (MA94-34) Watersheds

December 2014

12/08/2014

Impaired Waters Assessment for Great Harbor (MA96-18)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*4A (TMDL is complete)*
	Final TMDLs:	*Final Pathogen TMDL for the Cape Cod Watershed* [2]
	WQ Assessment:	*Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report* [3]
Location	Towns:	*Falmouth*
	MassDOT Roads:	*Woods Hole Road and Crane Street Bridge*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

Great Harbor (MA96-18) is comprised of the waters in an area north of a transect from Devils Foot to Juniper Point, Falmouth. The segment area covers approximately 0.31 square mile. Based upon the available information, there are no Water Management Act regulated water withdrawals, cranberry bogs, or NPDES regulated discharges in the recharge area for Great Harbor.[3] See Figure 1 for the location of this roadway in relation to the groundwatershed to Segment MA96-18. The watersheds and subwatersheds for Cape Cod were provided by USGS based on groundwater modeling developed under the Massachusetts Estuary Program (MEP) and contributing groundwater areas as delineated and published in the USGS 451 groundwater contributing areas data.[4,5] The Cape Cod watersheds are based on groundwater delineations and not ground surface topography. For groundwatershed assessments, if a discharge occurs inside the groundwatershed boundary, it is considered to be a discharge that contributes to the impaired segment. If the

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[3] MassDEP, 2011. Cape Cod Drainage Areas 2004-2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

[4] Walter, D.A., Masterson, J.P., and Hess, K.M., 2004. Ground-Water Recharge Areas and Traveltimes to Pumped Wells, Ponds, Streams, and Coastal Water Bodies, Cape Cod, Massachusetts. Scientific Investigations Map I-2857, 1 sheet. Available at: http://pubs.water.usgs.gov/sim20042857

[5] U.S. Geological Survey (USGS), 2009. Groundwater contributing areas for Cape Cod and Plymouth-Carver Regions of Massachusetts. Data Series 451 (1 of 3).

discharge point is outside of the groundwatershed boundary, it is not considered to contribute to the impaired segment.

Due to the proximity of the MassDOT-owned roadway to the water body and groundwatershed, a field visit was conducted to determine if drainage from the roadway was discharged within the groundwatershed. The field visit indicated that the Crane Street Bridge drains down Luscombe Ave and into the Steamship Authority parking lot, where it is collected via several catch basins that discharge directly to Great Harbor.

According to MassDEP's *Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report*, approximately 0.04 square miles of Great Harbor is "impaired" for the Shellfish Harvesting use, while the remaining portion is "supported", due to elevated fecal coliform levels.[6] Great Harbor is "supported" for the Aquatic Life, Primary Contact, and Secondary Contact uses, while no other uses have been assessed.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA96-18 is comprised of portions of Woods Hole Road and Crane Street Bridge. Refer to Figure 1 for the location of this roadway in relation to the groundwatershed to Segment MA96-18.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[7] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[8] MassDOT assessed Great Harbor (MA96-18) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[9] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[10] The condition of Great Harbor is not proposed to change.

BMP 7R for Pathogen TMDL (CN 252.0)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments

[6] MassDEP, 2011. Cape Cod Drainage Areas 2004-2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

[7] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[8] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[9] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[10] MassDEP, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

that have been assigned to a water body covered by a final TMDL.[11] Great Harbor (MA96-18) is covered by the Pathogen TMDL for the Cape Cod Watershed.[12]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[13]

According to the *Final Pathogen TMDL for the Cape Cod Watershed* Report, sources of indicator bacteria in the Cape Cod watershed are believed to be primarily from boat wastes, failing septic systems, pets, wildlife, birds, and stormwater.[12] The report contains bacteria sampling results and shoreline survey data collected by the Massachusetts Department of Fish & Game Division of Marine Fisheries (DMF). Within MA96-18, DMF data reports that fecal coliform bacteria data was collected from 115 samples collected between the years 1996-2004; 79 of the samples were collected during the primary contact recreation season (1 April through 15 October). The results ranged from 1.9 – >51 CFU/100ml. The geometric mean is not available.

The TMDL states that several impaired segments carry a higher priority due to their location, use, and risk to human health.[11] The higher priority areas in the Cape Cod watershed stand out as likely priority areas to address bacteria pollution sources. These segments tend to be located nearest to sensitive areas such as Outstanding Resource Waters or designated uses that require higher water quality standards than Class B. Great Harbor (MA96-18) is listed as a medium priority for both dry and wet weather due to its designation as Class SA and its use as a shellfishing resource.[12]

In addition to the generic recommendations provided in the draft NPDES municipal separate storm sewer system (MS4) permit for Massachusetts and discussed in the MassDOT Pathogen Methodology, the Cape Cod Watershed TMDL report (Section 8.0) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed: [12]

- Correction of failing septic systems
- Public education regarding illicit sewer connection and failing infrastructure, as well as stormwater runoff and boat wastes
- Identification and elimination of prohibited sources such as leaky or improperly connected sanitary sewer flows
- Best management practices to mitigate stormwater runoff volume.

The TMDL report also indicates that structural BMPs may be appropriate if less costly non-structural BMPs are not effective.[12] Many non-structural BMPs are in place, including public education and outreach, street sweeping, and catch basin cleanouts. In addition to practices like these, many communities have formed advisory committees to help resolve existing stormwater issues. Many of the communities on Cape Cod practice their own stormwater BMPs. Additionally, the TMDL states that implementation to achieve the TMDL goals should be an iterative process with selection and

[11] MassDOT, 2012. Description of MassDOT's TMDL Method in BMP 7R. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[12] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[13] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

implementation of mitigation measures followed by monitoring to determine the extent of water quality improvement realized.[14]

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the Falmouth regulations and the *Final Pathogen TMDL for the Cape Cod Watershed*: [1414]

- Agricultural BMPs
- Septic tank controls
- Documentation of storm drain outfall locations
- Recreational Waters use management
- Watershed resident education
- Additional monitoring
- Stormwater guidance tools

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7R Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.[15]

In accordance with the BMPs identified in the TMDL report as planned measures to reach compliance with the Cape Cod Watershed bacteria TMDL report, MassDOT and other local organizations are in the process of documenting the locations of its stormwater outfalls.[14] In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.[14]

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

[14] MassDEP. 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[15] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Great Harbor (MA96-18). These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the groundwatershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the groundwatershed of Great Harbor (MA96-18), including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

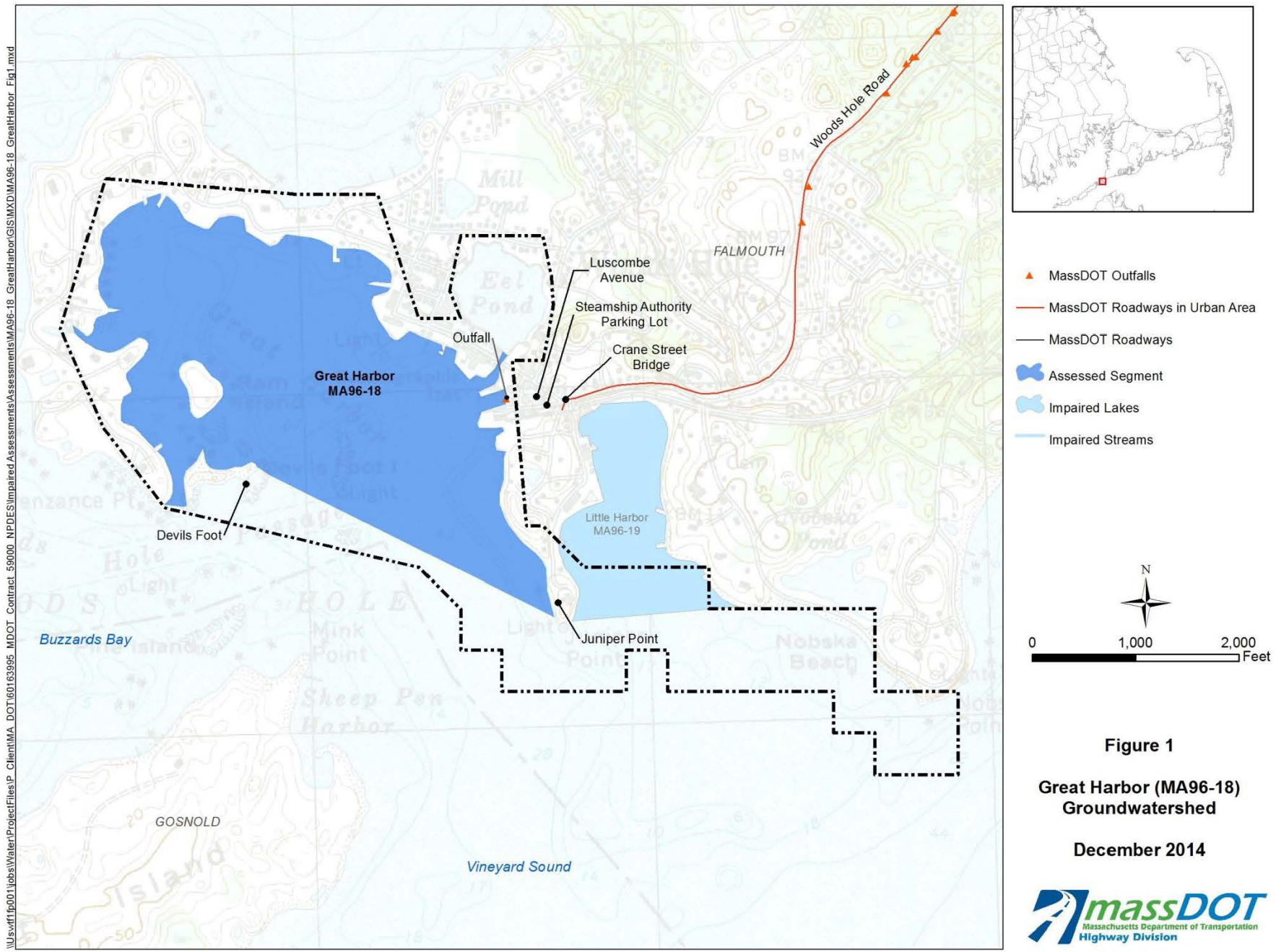


Figure 1

Great Harbor (MA96-18) Groundwatershed

December 2014

massDOT Massachusetts Department of Transportation Highway Division

12/08/2014

Impaired Waters Assessment for Namskaket Creek (MA96-27)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*4A (TMDL is complete)*
	Final TMDLs:	*Final Pathogen TMDL for the Cape Cod Watershed* [2]
	WQ Assessment:	*Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report* [3]
Location	Towns:	*Orleans*
	MassDOT Roads:	*Routes 6 and 6A, and West Road Bridge*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

Namskaket Creek (MA96-27) is a small tidal estuary in Orleans, Massachusetts that covers approximately 0.03 square mile. The water body extends from the outlet of an unnamed pond north of Route 6A in Orleans to the creek's mouth at Cape Cod Bay in Brewster/Orleans. See Figure 1 for the location of these roadways within the groundwatershed to Segment MA96-27. The groundwatersheds are based on technical reports developed by the Massachusetts Estuaries Project (MEP) which serve as the basis for the development of Total Maximum Daily Loads.[4] The MEP team includes technical staff from USGS and the Cape Cod Commission and works collaboratively with MassDEP and the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST). For groundwatershed assessments, if a discharge occurs inside the groundwatershed boundary, it is considered to be a discharge that contributes to the impaired segment. If the discharge point is outside of the groundwatershed boundary, it is not

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP. 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[3] MassDEP, 2011. Cape Cod Drainage Areas 2004-2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

[4] University of Massachusetts Dartmouth and MassDEP, 2006. Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Namskaket Marsh Estuarine System, Orleans MA. Available at: http://www.oceanscience.net/estuaries/report/Orleans/Namskaket_MEPrpt_final.pdf

considered to contribute to the impaired segment. A field visit indicated that a portion of Route 6A and portions of the Route 6/6A interchange drain to a 30" outfall that discharges into an unnamed pond. There are two discharges to Namskaket Creek covered by NPDES permits: Town of Brewster (MAR041096) and Town of Orleans (MAR041146).[5]

According to MassDEP's *Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report*, the Massachusetts Department of Fish & Game Division of Marine Fisheries (DMF) indicates that the Shellfish Harvesting use in Namskaket Creek is "prohibited".[5] The cause is indicated as elevated fecal coliform bacteria and the source is cited as waterfowl and/or stormwater discharges from the municipal stormwater systems. Namskaket Creek is indicated as an Outstanding Resource Water (ORW).

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA96-27 of Namskaket Creek is comprised of portions of Route 6, Route 6A, and West Road Bridge. Refer to Figure 1 for the location of these roadways within the groundwatershed to Segment MA96-27.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[6] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[7] MassDOT assessed Namskaket Creek (MA96-27) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[8] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[9] The condition of Namskaket Creek is not proposed to change.

BMP 7R for Pathogen TMDL (CN 252.0)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments

[5] MassDEP, 2011. Cape Cod Drainage Areas 2004-2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

[6] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[7] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[8] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[9] MassDEP, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

that have been assigned to a water body covered by a final TMDL.[10] Namskaket Creek (MA96-27) is covered by the Pathogen TMDL for the Cape Cod Watershed.[11]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[12]

According to the *Final Pathogen TMDL for the Cape Cod Watershed Report*, sources of indicator bacteria in the Cape Cod watershed are believed to be primarily from boat wastes, failing septic systems, pets, wildlife, birds, and stormwater.[11] The report contains bacteria sampling results and shoreline survey data collected by the DMF.

Suspected and known dry-weather sources evaluated in the TMDL report include failing septic systems, direct wildlife, recreational activities, stormwater drainage systems, leaking sewer pipes, and illicit boat discharges.[11] Suspected and known wet weather sources include wildlife and domesticated animals, stormwater runoff including municipal separate storm sewer systems (MS4s), and sanitary sewer overflows.

The TMDL states that several impaired segments carry a higher priority due to their location, use, and risk to human health.[11] The higher priority areas in the Cape Cod watershed stand out as likely priority areas to address bacteria pollution sources. These segments tend to be located nearest to sensitive areas such as Outstanding Resource Waters or designated uses that require higher water quality standards than Class B. Namskaket Creek (MA96-27) is listed as a medium priority due to its designation as Class SA and its uses for public swimming and shellfishing.

In addition to the generic recommendations provided in the draft NPDES MS4 permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the Cape Cod Watershed TMDL report (Section 8.0) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed: [11]

- Correction of failing septic systems
- Public education regarding illicit sewer connection and failing infrastructure, as well as stormwater runoff and boat wastes
- Identification and elimination of prohibited sources such as leaky or improperly connected sanitary sewer flows
- Best management practices to mitigate stormwater runoff volume.

The TMDL report also indicates that structural BMPs may be appropriate if less costly non-structural BMPs are not effective.[11] Many non-structural BMPs are in place, including public education and outreach, street sweeping, and catch basin cleanouts. In addition to practices like these, many communities have formed advisory committees to help resolve existing stormwater issues. Many of

[10] MassDOT, 2012. Description of MassDOT's TMDL Method in BMP 7R. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[11] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[12] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

the communities on Cape Cod practice their own stormwater BMPs. Additionally, the TMDL states that implementation to achieve the TMDL goals should be an iterative process with selection and implementation of mitigation measures followed by monitoring to determine the extent of water quality improvement realized.[13]

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the Cape Cod Watershed and Orleans: [13]

- Septic tank controls
- Documentation of storm drain outfall locations
- Stormwater improvements
- Resident education
- Additional water quality monitoring
- Designation of "No Discharge" areas in high priority coastal waters

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7R Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.[14]

In accordance with the BMPs identified in the TMDL report as planned measures to reach compliance with the Cape Cod Watershed bacteria TMDL report, MassDOT and other local organizations are in the process of documenting the locations of its stormwater outfalls.[13] In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.[13]

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-

[13] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[14] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Namskaket Creek (MA96-27). These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the groundwatershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the groundwatershed of Namskaket Creek (MA96-27), including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

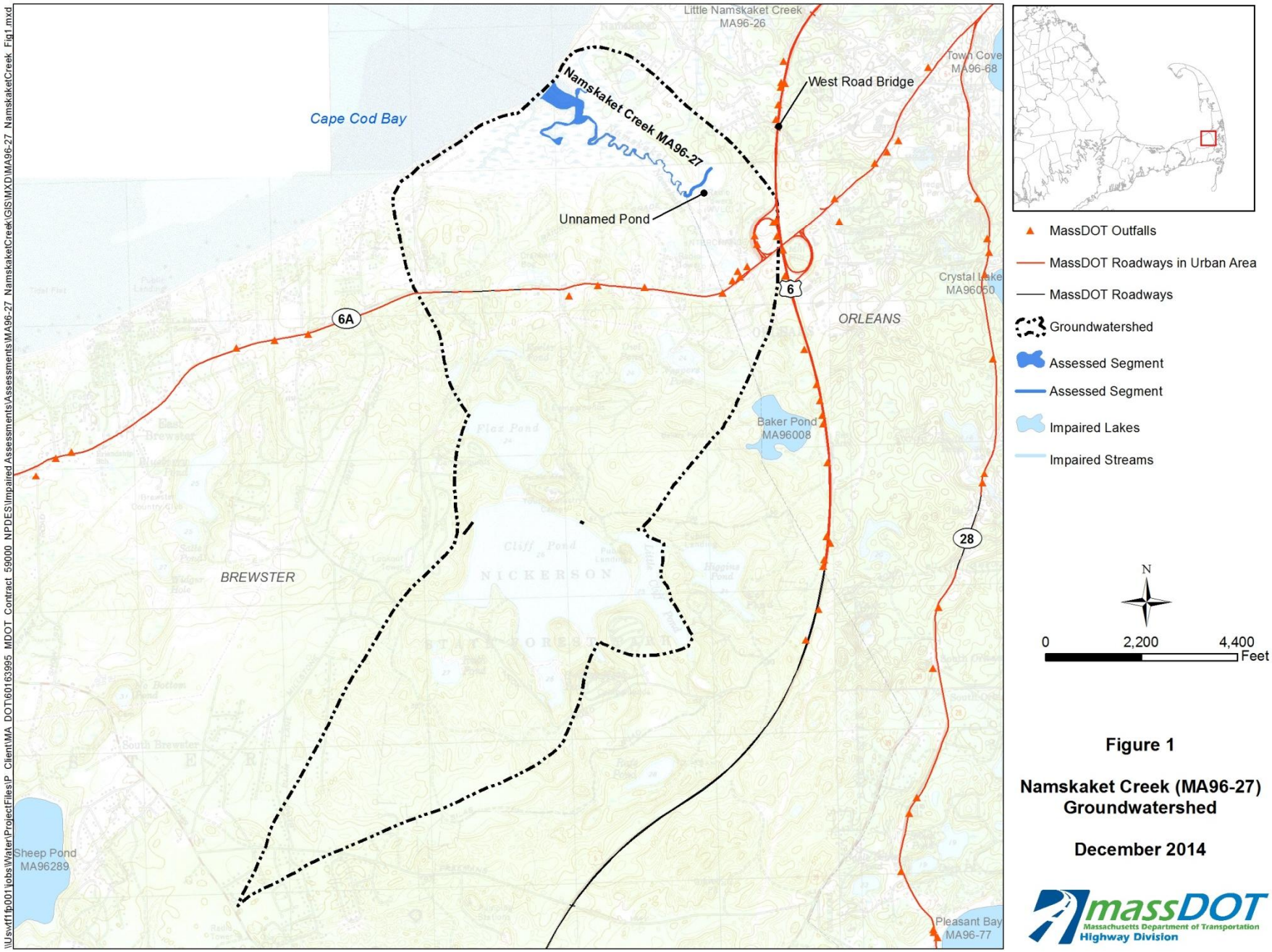


Figure 1

Namskaket Creek (MA96-27) Groundwatershed

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

12/08/2014

Impaired Waters Assessment for Duck Creek (MA96-32)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*4A (TMDL is complete)*
	Final TMDLs:	*Final Pathogen TMDL for the Cape Cod Watershed* [2]
	WQ Assessment:	*Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report* [3]
Location	Towns:	*Wellfleet*
	MassDOT Roads:	*Route 6*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

Duck Creek (MA96-32) is a small tidal estuary in Wellfleet, Massachusetts that covers approximately 0.15 square mile. Figure 1 illustrates the groundwatershed for Duck Creek (MA96-32). The water body extends from its source to the west of Route 6 and flows south to Wellfleet Harbor. The boundary between Duck Creek (MA96-32) and Wellfleet Harbor extends from Shirttail Point to Taylor Road (as shown on Figure 1). The watersheds and subwatersheds for Cape Cod were provided by USGS based on groundwater modeling developed under the Massachusetts Estuary Program (MEP) and contributing groundwater areas as delineated and published in the USGS 451 groundwater contributing areas data.[4,5] The Cape Cod watersheds are based on groundwater delineations and not ground surface topography. For groundwatershed assessments, if a discharge occurs inside the groundwatershed boundary, it is considered to be a

[1]MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP. 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[3] MassDEP, 2011. Cape Cod Drainage Areas 2004-2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

[4]Walter, D.A., Masterson, J.P., and Hess, K.M., 2004. Ground-Water Recharge Areas and Travel Times to Pumped Wells, Ponds, Streams, and Coastal Water Bodies, Cape Cod, Massachusetts. Scientific Investigations Map I-2857, 1 sheet. Available at: http://pubs.water.usgs.gov/sim20042857

[5]U.S. Geological Survey (USGS), 2009. Groundwater contributing areas for Cape Cod and Plymouth-Carver Regions of Massachusetts. Data Series 451 (1 of 3).

discharge that contributes to the impaired segment. If the discharge point is outside of the groundwatershed boundary, it is not considered to contribute to the impaired segment.

Land use in the Duck Creek watershed is primarily residential and forested, with recreation and salt water wetland in the vicinity of the coastline and commercial in the vicinity of Route 6. The closest MassDOT urban roadway is Route 6, approximately 0.8 miles southeast. There are no regulated NPDES discharges in the Duck Creek (MA96-32) groundwatershed.[6]

According to MassDEP's *Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report*, Duck Creek is impaired for shellfish harvesting and no other uses have been assessed.[7] The Massachusetts Department of Fish & Game Division of Marine Fisheries (DMF) indicates that shellfish harvesting in Duck Creek is prohibited within 7% of this water body and conditionally approved within 53% of this water body; cause is indicated as elevated fecal coliform bacteria, source is cited as waterfowl, waste from pets, on-site (septic) systems, and unspecified urban stormwater.[7]

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA96-32 of Duck Creek is comprised of portions of Route 6, which is located southeast of Duck Creek. Refer to Figure 1 for the location of this roadway within the groundwatershed to Segment MA96-32.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[8] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[9] MassDOT assessed Duck Creek (MA96-32) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[10] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[11] The condition of Duck Creek is not proposed to change.

[6] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[7] MassDEP, 2011. Cape Cod Drainage Areas 2004-2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

[8] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[9] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[10] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[11] MassDEP, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

BMP 7R for Pathogen TMDL (CN 252.0)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body covered by a final TMDL. Duck Creek (MA96-32) is covered by the *Final Pathogen TMDL for the Cape Cod Watershed.*[12]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[13]

According to the *Final Pathogen TMDL for the Cape Cod Watershed Report*, sources of indicator bacteria in the Cape Cod watershed are believed to be primarily from boat wastes, failing septic systems, pets, wildlife, birds, and stormwater. [12] The report contains bacteria sampling results collected by the DMF. Within Segment MA96-32, DMF reported that fecal coliform bacteria data was collected from 273 samples collected between 1996 and 2003. The results ranged from 1.9 to 51 CFU/100ml (the geometric mean was 2.6 to 3.8 CFU/100ml).

The *Final Pathogen TMDL for the Cape Cod Watershed* states that several impaired segments carry a higher priority due to their location, use, and risk to human health.[12] The higher priority areas in the Cape Cod watershed stand out as likely priority areas to address bacteria pollution sources. These segments tend to be located nearest to sensitive areas such as Outstanding Resource Waters or designated uses that require higher water quality standards than Class B. Duck Creek (MA96-32) is listed as a low priority for dry weather and medium priority for wet weather due to its designation as Class SA and its use as a public swimming and shellfishing resource.[12]

Segment MA96-32 is located in the south central portion of the watershed.

In addition to the generic recommendations provided in the draft NPDES municipal separate storm sewer system (MS4) permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the *Final Pathogen TMDL for the Cape Cod Watershed* (Section 8.0) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed:[12]

- Correction of failing septic systems
- Public education regarding illicit sewer connection and failing infrastructure, as well as stormwater runoff and boat wastes
- Identification and elimination of prohibited sources such as leaky or improperly connected sanitary sewer flows
- Best management practices to mitigate stormwater runoff volume.

The TMDL report also indicates that structural BMPs may be appropriate if less costly non-structural BMPs are not effective. Many non-structural BMPs are in place, including public education and outreach, street sweeping, and catch basin cleanouts. In addition to practices like these, many communities have formed advisory committees to help resolve existing stormwater issues. Many of

[12] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[13] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

the communities on Cape Cod practice their own stormwater BMPs. Additionally, the TMDL states that implementation to achieve the TMDL goals should be an iterative process with selection and implementation of mitigation measures followed by monitoring to determine the extent of water quality improvement realized.[14]

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the Cape Cod Watershed:[14]

- Septic tank controls
- Documentation of storm drain outfall locations
- Resident education
- Additional water quality monitoring
- Designation of "No Discharge" areas in high priority coastal waters

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7R Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.[15]

In accordance with the BMPs identified in the TMDL report as planned measures to reach compliance with the Cape Cod bacteria TMDL report, MassDOT has documented the locations of its stormwater outfalls.[14] In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

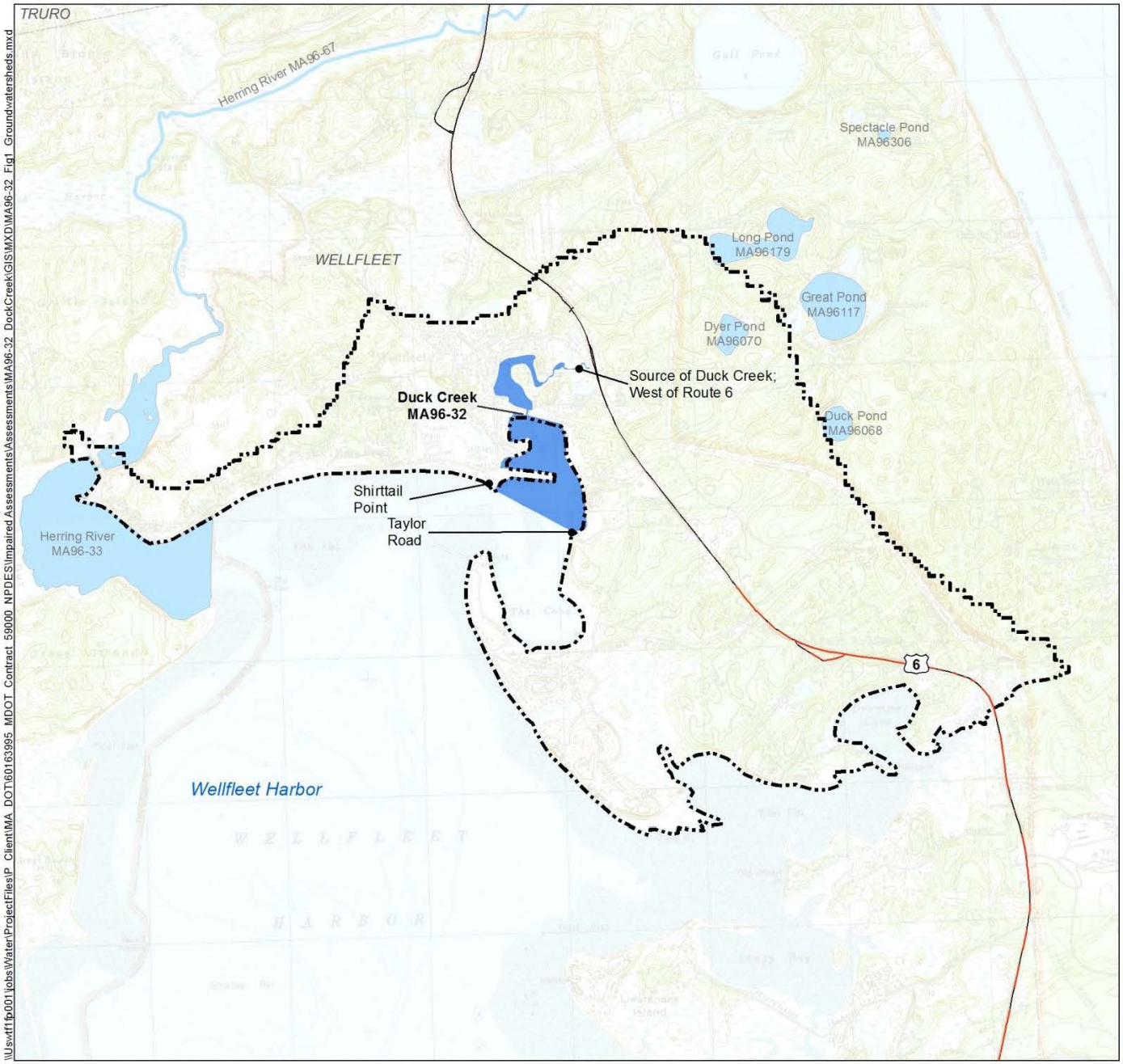
Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls. [14]

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

[14] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[15] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Duck Creek (MA96-32). These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the groundwatershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the groundwatershed of Duck Creek (MA96-32), including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.



MassDOT Roadways in Urban Area

MassDOT Roadways

Groundwatershed

Assessed Segment

Impaired Lakes

Impaired Streams

N

0 2,000 4,000 Feet

Figure 1
Duck Creek (MA96-32)
Groundwatershed

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

\\Uswtf1fp001\jobs\Water\ProjectFiles\P Client\MA DOT\60163995 MDOT Contract 59000 NPDES\Impaired Assessments\Assessments\MA96-32 DockCreek\GIS\MXD\MA96-32 Fig1 Groundwatersheds.mxd

12/08/2014

Impaired Waters Assessment for Mill Creek (MA96-37)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*4A (TMDL is complete)*
	Final TMDLs:	*Final Pathogen TMDL for the Cape Cod Watershed* [2]
	WQ Assessment:	*Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report* [3]
Location	Towns:	*Barnstable and Yarmouth*
	MassDOT Roads:	*Route 6A*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

Mill Creek (MA96-37) is a water body in Barnstable and Yarmouth, Massachusetts that covers approximately 0.03 square mile. The water body extends from Keveny/Mill Lane north to the confluence with Cape Cod Bay, near Barnstable Harbor. The closest MassDOT roadway is Route 6A (Main Street). Refer to Figure 1 for the location of this roadway in relation to the groundwatershed to Segment MA96-37. The watersheds and subwatersheds for Cape Cod were provided by USGS based on groundwater modeling developed under the Massachusetts Estuary Program (MEP) and contributing groundwater areas as delineated and published in the USGS 451 groundwater contributing areas data.[4,5] The Cape Cod watersheds are based on groundwater delineations and not ground surface topography. For groundwatershed assessments, if a discharge occurs inside the groundwatershed boundary, it is considered to be a discharge that contributes to

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[3] MassDEP, 2011. Cape Cod Drainage Areas 2004-2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

[4] Walter, D.A., Masterson, J.P., and Hess, K.M., 2004. Ground-Water Recharge Areas and Traveltimes to Pumped Wells, Ponds, Streams, and Coastal Water Bodies, Cape Cod, Massachusetts. Scientific Investigations Map I-2857, 1 sheet. Available at: http://pubs.water.usgs.gov/sim20042857

[5] U.S. Geological Survey (USGS), 2009. Groundwater contributing areas for Cape Cod and Plymouth-Carver Regions of Massachusetts. Data Series 451 (1 of 3).

the impaired segment. If the discharge point is outside of the groundwatershed boundary, it is not considered to contribute to the impaired segment.

Due to the proximity of the MassDOT-owned roadway to the water body and groundwatershed, a field visit was conducted to determine if drainage from the roadway was discharged within the groundwatershed. The field visit indicated that there is a headwall discharging stormwater from a portion of Route 6A directly into the groundwatershed to Mill Creek. The outfall is located on Mill Lane in Yarmouth. There are two discharges to Mill Creek covered by NPDES Phase II General permit: Town of Barnstable (MAR041090) and Town of Yarmouth (MAR041176).[6]

According to MassDEP's *Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report*, Mill Creek is "impaired" for the Shellfish Harvesting use and no other uses have been assessed.[6] The Massachusetts Department of Fish & Game Division of Marine Fisheries (DMF) indicates that shellfish harvesting in Mill Creek is prohibited; cause is indicated as elevated fecal coliform bacteria, and the source is cited as waterfowl, pet waste, on-site (septic) systems, and/or stormwater discharges from the municipal stormwater systems.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA96-37 of Mill Creek is comprised of portions of Route 6A. Although Rout 6A is located outside the watershed boundary, a field visit confirmed that drainage is discharged within the groundwatershed boundary. Refer to Figure 1 for the location of this roadway in relation to the watershed for Segment MA96-37.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[7] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[8] MassDOT assessed Mill Creek (MA96-37) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[9] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[10] The condition of Mill Creek is not proposed to change.

[6] MassDEP, 2011. Cape Cod Drainage Areas 2004-2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

[7] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[8] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[9] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Prsuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[10] MassDEP, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

BMP 7R for Pathogen TMDL (CN 252.0)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body covered by a final TMDL.[11] Mill Creek (MA96-37) is covered by the Pathogen TMDL for the Cape Cod Watershed.[12]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[13]

According to the *Final Pathogen TMDL for the Cape Cod Watershed Report*, sources of indicator bacteria in the Cape Cod watershed are believed to be primarily from boat wastes, failing septic systems, pets, wildlife, birds, and stormwater.[12] The report contains bacteria sampling results and shoreline survey data collected by the DMF.

The TMDL states that several impaired segments carry a higher priority due to their location, use, and risk to human health.[12] The higher priority areas in the Cape Cod watershed stand out as likely priority areas to address bacteria pollution sources. These segments tend to be located nearest to sensitive areas such as Outstanding Resource Waters or designated uses that require higher water quality standards than Class B. Mill Creek (MA96-37) is listed as a shellfishing resource and designated as Class SA, however, there is not sufficient information to assign a priority level.[10]

In addition to the generic recommendations provided in the draft NPDES municipal separate storm sewer system (MS4) permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the Cape Cod Watershed TMDL report (Section 8.0) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed: [12]

- Correction of failing septic systems
- Public education regarding illicit sewer connection and failing infrastructure, as well as stormwater runoff and boat wastes
- Identification and elimination of prohibited sources such as leaky or improperly connected sanitary sewer flows
- Best management practices to mitigate stormwater runoff volume.

The TMDL report also indicates that structural BMPs may be appropriate if less costly non-structural BMPs are not effective.[12] Many non-structural BMPs are in place, including public education and outreach, street sweeping, and catch basin cleanouts. In addition to practices like these, many communities have formed advisory committees to help resolve existing stormwater issues. Many of the communities on Cape Cod practice their own stormwater BMPs. Additionally, the TMDL states that implementation to achieve the TMDL goals should be an iterative process with selection and

[11] MassDOT, 2012. Description of MassDOT's TMDL Method in BMP 7R. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[12] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[13] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

implementation of mitigation measures followed by monitoring to determine the extent of water quality improvement realized.[14]

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the Cape Cod Watershed and the communities of Barnstable and Yarmouth: [14]

- Septic tank controls
- Documentation of storm drain outfall locations
- Resident education
- Additional water quality monitoring
- Designation of "No Discharge" areas in high priority coastal waters

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7R Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.[15]

In accordance with the BMPs identified in the TMDL report as planned measures to reach compliance with the Cape Cod Watershed bacteria TMDL report, MassDOT and other local organizations are in the process of documenting the locations of its stormwater outfalls.[14] In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.[14]

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Mill Creek (MA96-37). These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its

[14] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[15] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the groundwatershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the groundwatershed of Mill Creek (MA96-37), including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

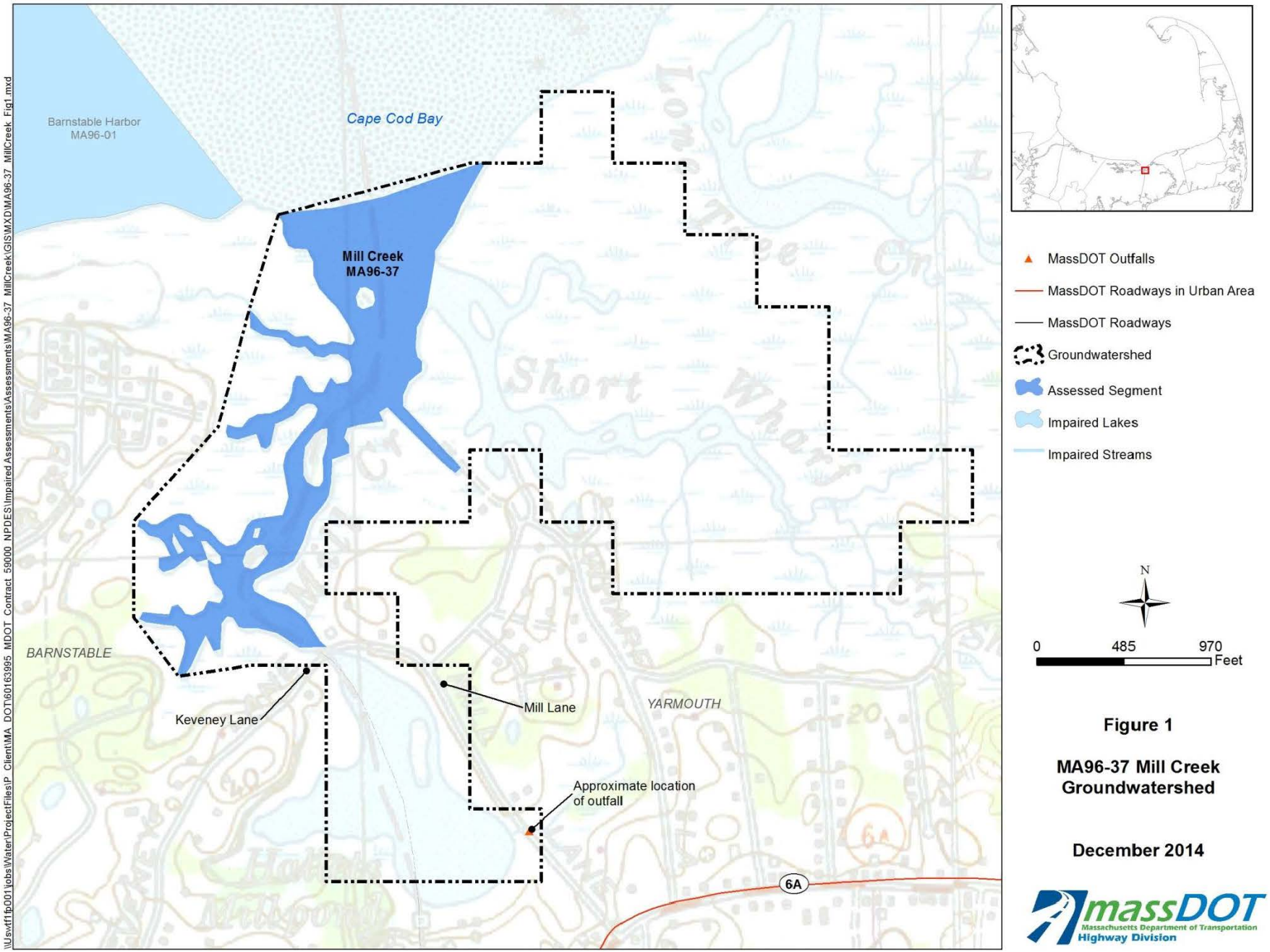


Figure 1

MA96-37 Mill Creek Groundwatershed

December 2014

12/08/2014

Impaired Waters Assessment for Cockle Cove Creek (MA96-79)

Summary

Impaired Water[1]	Stormwater Impairments:	*Enterococcus, Fecal Coliform*
	Category:	*4A (TMDL is completed)*
	Final TMDLs:	*Addendum: Final Pathogen TMDL for the Cape Cod Watershed (CN 252.5)* [2]
	WQ Assessment:	*Cape Cod Coastal Drainage Areas 2004 - 2008 Surface Water Quality Assessment Report* [3]
Location	Towns:	*Chatham*
	MassDOT Roads:	*Route 28 (Main Street)*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

Cockle Cove Creek (MA96-79) is a small tidal estuary located in Chatham, Massachusetts that covers approximately 4.5 acres. A non-impaired freshwater stream segment begins north of Route 28 and flows south into Cockle Cove Creek (MA96-79). The assessed water body extends from the northeast of the bend near Cockle Drive and flows south to its confluence with Bucks Creek as shown in Figure 1.The closest MassDOT roadway is Route 28 (Main Street) located approximately 1,800 feet to the north of the northern extent of this water body. The groundwatershed is primarily residential land use with some commercial and rural land as well. Treated wastewater effluent is primarily discharged to Cockle Cove Creek from the Town of Chatham's Waste Water Treatment Facility (WWTF).[2] The Town of Chatham holds a municipal separate storm sewer system (MS4) permit (MAR041101).

According to MassDEP's *Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report*, Cockle Cove Creek is "impaired" for the Shellfish Harvesting use as a result of elevated fecal coliform bacteria, "impaired" for Primary Contact as a result of elevated enterococcus bacteria, "supported" for Aquatic Life use, and no other uses have been assessed.[3]

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[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2012. Addendum: Final Pathogen TMDL for the Cape Cod Watershed (CN 252.5). Available at: http://www.epa.gov/waters/tmdldocs/42372_CN252.5%20%20-%20Cape%20Cod.pdf

[3] MassDEP, 2011. Cape Cod Coastal Drainage Areas 2004 - 2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

Sources of shellfish harvesting impairment are cited as waterfowl, waste from pets, on-site (septic) systems, and unspecified urban stormwater. The source for primary contact impairment was cited as unknown.

The groundwatersheds are based on technical reports developed by the Massachusetts Estuaries Project (MEP) which serve as the basis for the development of Total Maximum Daily Loads.[4] The MEP team includes technical staff from USGS and the Cape Cod Commission and works collaboratively with MassDEP and the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST). For groundwatershed assessments, if a discharge occurs inside the groundwatershed boundary, it is considered to be a discharge that contributes to the impaired segment. If the discharge point is outside of the groundwatershed boundary, it is not considered to contribute to the impaired segment.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA96-79 is comprised of a portion of Route 28 (Main Street). Refer to Figure 1 for the location of this roadway within the groundwatershed to Segment MA96-79.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[5] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[6] MassDOT assessed Cockle Cove Creek (MA96-79) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[7] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[8] The condition of Cockle Cove Creek is not proposed to change.

BMP 7R for Pathogen TMDL (CN 252.5)

MassDOT assessed the indicator bacteria (fecal coliform and enterococcus) impairment using the approach described in BMP 7R of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body covered by a final TMDL.[9] Cockle

[4] University of Massachusetts Dartmouth and MassDEP, 2006. Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Stage Harbor, Sulphur Springs, Taylors Pond, Bassing Harbor, and Muddy Creek, Chatham, Massachusetts. Available at: http://www.oceanscience.net/estuaries/report/Chatham/ChathamMEPrpt_final.pdf

[5] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[6] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[7] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[8] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[9] MassDOT, July 22, 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

Cove Creek (MA96-79) is covered by the *Final Pathogen TMDL for the Cape Cod Watershed* as unimpaired but was subsequently classified as impaired by the *Addendum: Final Pathogen TMDL for the Cape Cod Watershed*.[10,11]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[12]

The Cockle Cove Creek watershed has one documented point source of bacterial pollution and numerous non-point contributions are identified in the TMDL report.[10] As indicated above and in the TMDL report, the Town of Chatham's WWTF discharges treated wastewater effluent to the aquifer near the freshwater stream that forms the headwaters of the central salt marsh creek of the assessed segment. Natural sources of bacteria are thought to be major contributors including wildlife and accumulation of vegetation and other material along shorelines. Wildlife presence noted included foxes, birds, feces, and remnants of meals, and other wildlife observations that are associated with marshland. A study referenced in the TMDL report indicated that a significant source of bacterial contributors may be animal by-products in the marsh. The study did not report that any principal human factors were the cause of bacterial impairment as septic systems in Chatham are strictly controlled by the Town and stormwater run-off from roadways does not appear to be a significant factor.[10]

In addition to the generic recommendations provided in the draft NPDES MS4 permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the Cape Cod (Addendum) TMDL report (page 6) recommends re-checking all currently operating septic systems to insure their proper operation and investigating possible stormwater runoff contributor factors from roadways to determine if these may include bacterial contributors.[11]

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for Chatham: [10]

- Development of a public education program
- Installation of dog waste storage bins on Town owned public land
- Mapping of stormwater infrastructure
- Additional monitoring

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7R Pathogen Methodology, MassDOT believes that

[10] MassDEP. 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[11] MassDEP, 2012. Addendum: Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capeadd.pdf

[12] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.[13]

In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

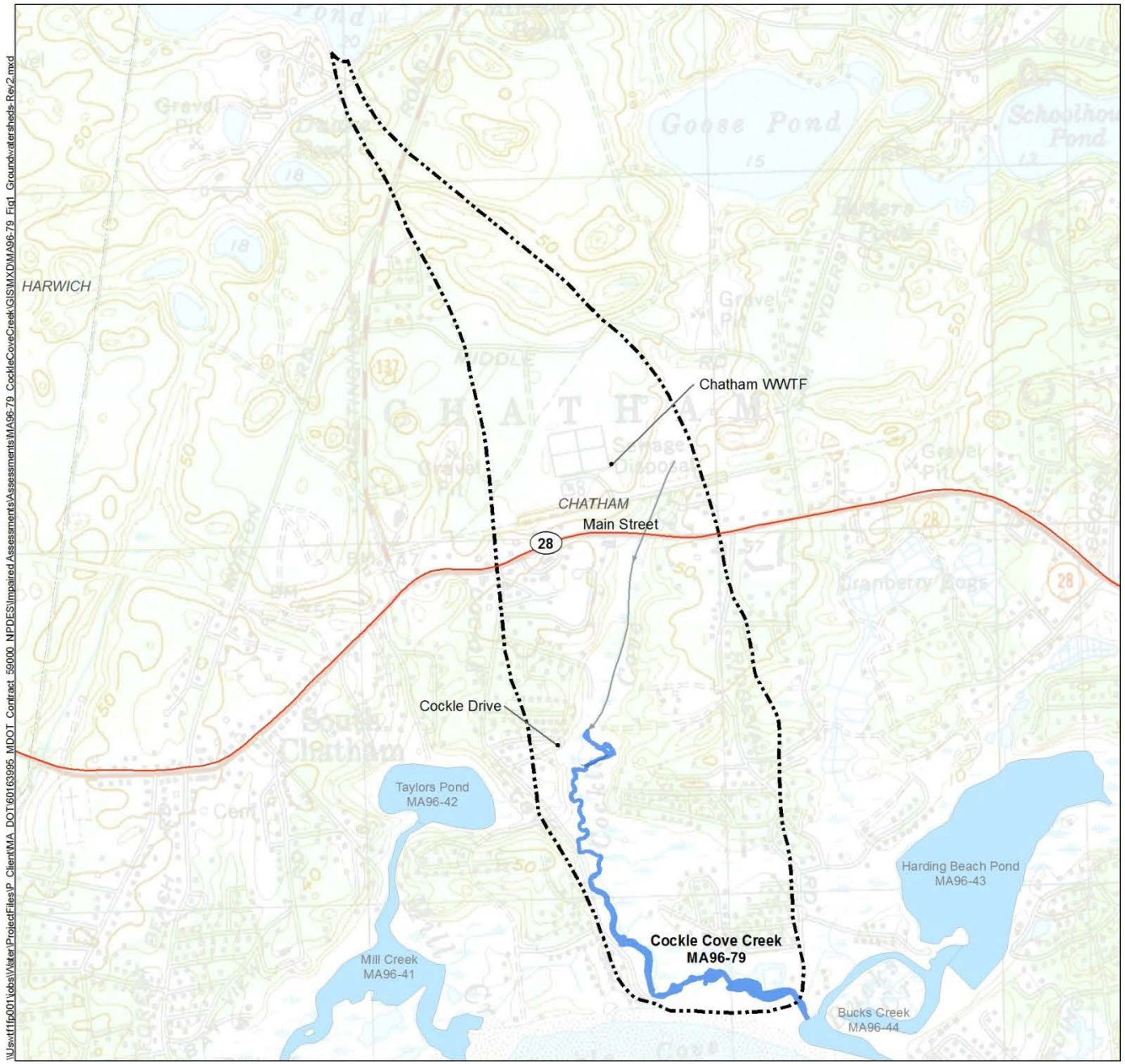
Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.[14]

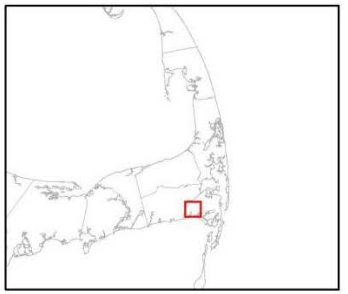
Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Cockle Cove Creek (MA96-79). These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the groundwatershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the groundwatershed of Cockle Cove Creek (MA96-79), including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

[13] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

[14] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf





MassDOT Roadways in Urban Area

MassDOT Roadways

Groundwatershed

Assessed Segment

Impaired Lakes

Impaired Streams

Non-Impaired Streams

N

0 1,000 2,000 Feet

Figure 1
Cockle Cove Creek (MA96-79)
Groundwatershed

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

Impaired Waters Assessment for Snows Creek (MA96-81)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*4A (TMDL is complete)*
	Final TMDLs:	*Final Pathogen TMDL for the Cape Cod Watershed* [2] *Addendum: Final Pathogen TMDL for the Cape Cod Watershed* (CN 252.5) [3]
	WQ Assessment:	*Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report* [4]
Location	Towns:	*Barnstable*
	MassDOT Roads:	*Route 28*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

Snows Creek (MA96-81) is a small tidal estuary in Barnstable, Massachusetts that covers approximately 0.02 square mile. Figure 1 illustrates the groundwatershed for Snows Creek (MA96-81). The water body extends east of Old Colony Road and flows east to the mouth at Lewis Bay. Land use in the Snows Creek groundwatershed is primarily residential and commercial, with recreation and salt water wetland in the vicinity of the water body. The closest MassDOT roadway is Route 28, approximately 1.5 miles north. Discharge to Snows Creek from the Town of Barnstable is covered by NPDES permit (MAR041090).[4]

According to MassDEP's *Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report*, Snows Creek is "impaired" for the Shellfish Harvesting use and no other uses have been assessed. [4] The Massachusetts Department of Fish & Game Division of Marine

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[3] MassDEP, 2012. Addendum: Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capeadd.pdf

[4] MassDEP, 2011. Cape Cod Drainage Areas 2004-2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

Fisheries (DMF) indicates that shellfish harvesting in Snows Creek is prohibited within 10% of this water body; cause is indicated as elevated fecal coliform bacteria, source is cited as waterfowl, waste from pets, on-site (septic) systems, and discharges from municipal separate storm sewer systems (MS4s).[5]

The groundwatersheds are based on technical reports developed by the Massachusetts Estuaries Project (MEP) which serve as the basis for the development of Total Maximum Daily Loads.[6] The MEP team includes technical staff from USGS and the Cape Cod Commission and works collaboratively with MassDEP and the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST). For groundwatershed assessments, if a discharge occurs inside the groundwatershed boundary, it is considered to be a discharge that contributes to the impaired segment. If the discharge point is outside of the groundwatershed boundary, it is not considered to contribute to the impaired segment.

MassDOT's property with the potential to directly contribute stormwater runoff to Segment MA96-81 Snows Creek is comprised of portions of Route 28 which is located north of Snows Creek. Refer to Figure 1 for the location of this roadway within the groundwatershed to Segment MA96-81.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[7] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[8] MassDOT assessed Snows Creek (MA96-81) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[9] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[10] The condition of Snows Creek is not proposed to change.

[5] MassDEP, 2011. Cape Cod Drainage Areas 2004-2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

[6] University of Massachusetts Dartmouth and MassDEP, 2006. Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for the Lewis Bay Embayment System, Barnstable/Yarmouth, MA. Available at: http://www.oceanscience.net/estuaries/report/Lewis_Bay/Lewis_Bay_MEP_Final.pdf

[7] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[8] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[9] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[10] MassDEP, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

BMP 7R for Pathogen TMDL (CN 252.0)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body covered by a final TMDL.[11] Snows Creek (MA96-81) is covered by the *Final Pathogen TMDL for the Cape Cod Watershed* as unimpaired but was subsequently classified as impaired by the *Addendum: Final Pathogen TMDL for the Cape Cod Watershed*.[12,13]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[14]

According to the *Final Pathogen TMDL for the Cape Cod Watershed* report, sources of indicator bacteria in the Cape Cod watershed are believed to be primarily from boat wastes, failing septic systems, pets, wildlife, birds, and stormwater.[12]

The *Final Pathogen TMDL for the Cape Cod Watershed* and the *Addendum: Final Pathogen TMDL for the Cape Cod Watershed* state that several impaired segments carry a higher priority due to their location, use, and risk to human health.[12, 12] The higher priority areas in the Cape Cod watershed stand out as likely priority areas to address bacteria pollution sources. These segments tend to be located nearest to sensitive areas such as Outstanding Resource Waters or designated uses that require higher water quality standards than Class B. Snows Creek was not assigned a prioritization due to insufficient data.

In addition to the generic recommendations provided in the draft NPDES MS4 permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the *Final Pathogen TMDL for the Cape Cod Watershed* (Section 8.0) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed: [12]

- Correction of failing septic systems
- Public education regarding illicit sewer connection and failing infrastructure, as well as stormwater runoff and boat wastes
- Identification and elimination of prohibited sources such as leaky or improperly connected sanitary sewer flows
- Best management practices to mitigate stormwater runoff volume.

[11] MassDOT, 2012. Description of MassDOT's TMDL Method in BMP 7R. Available at: http://www.mhd.state.ma.us/downloads/projDev/BMP_7R_TMDL_WatershedReview.pdf

[12] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[13] MassDEP, 2012. Addendum: Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capeadd.pdf

[14] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

The TMDL report also indicates that structural BMPs may be appropriate if less costly non-structural BMPs are not effective.[15] Many non-structural BMPs are in place, including public education and outreach, street sweeping, and catch basin cleanouts. In addition to practices like these, many communities have formed advisory committees to help resolve existing stormwater issues. Many of the communities on Cape Cod practice their own stormwater BMPs. Additionally, the TMDL states that implementation to achieve the TMDL goals should be an iterative process with selection and implementation of mitigation measures followed by monitoring to determine the extent of water quality improvement realized.[15]

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the Cape Cod Watershed: [15]

- Septic tank controls
- Documentation of storm drain outfall locations
- Resident education
- Additional water quality monitoring
- Designation of "No Discharge" areas in high priority coastal waters

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7R Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.[16]

In accordance with the BMPs identified in the TMDL report as planned measures to reach compliance with the Cape Cod bacteria TMDL report, MassDOT has documented the locations of its stormwater outfalls.[15] In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the groundwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the groundwatershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.[15]

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving

[15] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[16] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the groundwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Snows Creek (MA96-81). These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the watershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Snows Creek (MA96-81), including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

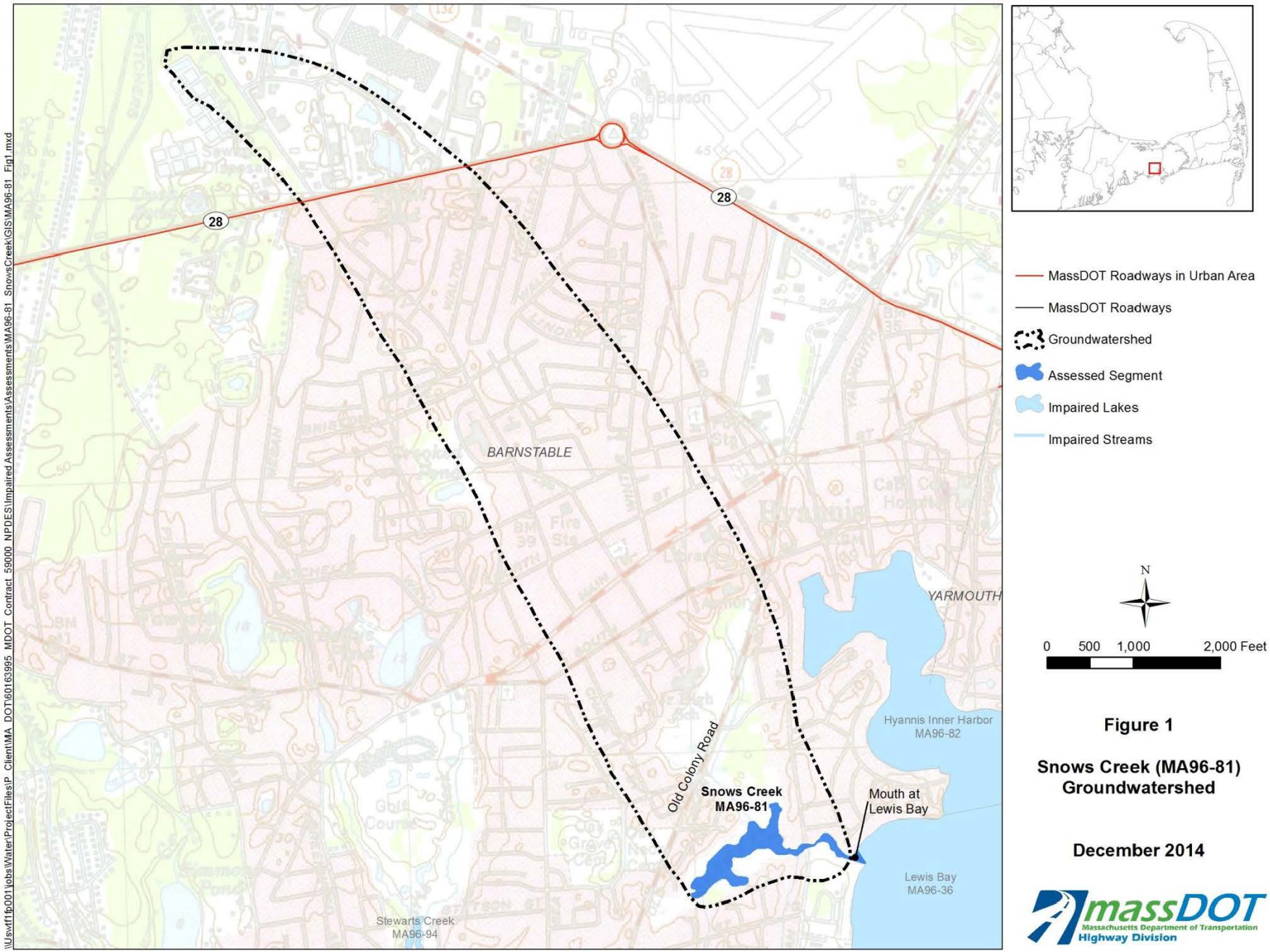


Figure 1

Snows Creek (MA96-81) Groundwatershed

December 2014

Impaired Waters Assessment for Old Harbor Creek (MA96-84), Springhill Creek (MA96-87), Dock Creek (MA96-86), and Mill Creek (MA96-85)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*4A (TMDL is completed)*
	Final TMDLs:	*Final Pathogen TMDL for the Cape Cod Watershed* [2]
		Addendum: Final Pathogen TMDL for the Cape Cod Watershed (CN 252.5) [3]
	WQ Assessment:	*Cape Cod Coastal Drainage Areas 2004 - 2008 Surface Water Quality Assessment Report* [4]
Location	Towns:	*Sandwich*
	MassDOT Roads:	*Routes 6, 6A, and 130*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

Old Harbor Creek (MA96-84), Mill Creek (MA96-85), Dock Creek (MA96-86), and Springhill Creek (MA96-87) are the subject of this assessment and are hereafter collectively referred to as "the assessed waterbodies." The assessed waterbodies are located in the Town of Sandwich within the Cape Cod watershed between Route 6 and Cape Cod Bay, as shown in Figure 1. They are being assessed together because they share a common groundwatershed. The source of the assessed waterbodies is mostly groundwater from the immediately surrounding area and the upgradient area within the groundwatershed. Water generally drains through the assessed waterbodies in a northeastern direction and discharges from Old Harbor Creek to Cape Cod Bay via Sandwich Harbor. Old Harbor Creek acts as the main stem water body in this watershed and begins at the

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[3] MassDEP, 2012. Addendum: Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capeadd.pdf

[4] MassDEP, 2011. Cape Cod Coastal Drainage Areas 2004 - 2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

eastern end of the watershed at a culvert under Foster Road; its area is approximately 0.06 square mile. Old Harbor Creek flows generally in the northwest direction, parallel to Springhill Beach; the other assessed waterbodies merge on the south side and downstream. Listed in downstream order following the direction of flow during ebb tide; Springhill Creek, Dock Creek, and Mill Creek join with Old Harbor Creek before the outlet to Cape Cod Bay. Springhill Creek (MA96-87) and Dock Creek (MA96-86) are both bounded upstream by railroad crossings of the Cape Cod Railroad. The headwater for Mill Creek is the outlet of Shawme Lake Lower. Most of the groundwatershed is residential area, and the area in the northern portion of the watershed is salt marshes associated with the assessed waterbodies. Springhill Creek is 0.01 square mile, Dock Creek is 0.02 square mile, Mill Creek is 0.02 square mile and Old Harbor Creek is 0.06 square mile. Discharges to the assessed waterbodies from the Town of Sandwich are covered by NPDES permit (MAR041155). Dock Creek has two additional discharges covered by NPDES permit (MA0110027) for the Sandwich State Fish Hatchery, and NPDES permit (MA0101656) for Henry T. Wing School.

Springhill Creek, Dock Creek, and Mill Creek were added to the Massachusetts Year 2012 Integrated List of Waters because of the results of new assessment efforts.[5] The assessed watershed that is the subject of this assessment and the Shawme Lakes watershed make up the Sandwich Harbor system as noted in the MassDEP's *Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report.*[6] This Water Quality Assessment report and the TMDL report (*Addendum: Final Pathogen TMDL for the Cape Cod Watershed*) described a bacterial tracking study in the Sandwich Harbor system conducted in 2007, 2008, and 2009.[6,7] The study concluded that Old Harbor Creek is not a significant dry weather bacteria source and Springhill Creek is also not a significant human dry weather bacteria source but is a significant bacteria source. A possible source for dry weather bacteria was found at Dock Creek in the form of a fish waste feeding site. The state fish hatchery discharge and local school were eliminated from consideration as sources to Dock Creek but some areas that require further investigation were identified. Mill Creek dry weather source investigations were overall inconclusive, but did identify that there were no dry weather contributors of bacteria upstream of Route 6A.

All of the assessed waterbodies presented here are "impaired" because of elevated fecal coliform levels. Shellfishing is also impacted by this pathogen, and so they are also all "impaired" for the Shellfish Harvesting use.[6,7] No other uses were assessed for these waterbodies. The sources of fecal coliform for all four of the assessed waterbodies included waterfowl and discharges from municipal separate storm sewer systems (MS4s). Mill Creek additionally listed pet waste as a contributor, and Dock Creek additionally listed septic system effluent in its source list.

The groundwatersheds and subwatersheds for Cape Cod were provided by USGS based on groundwater modeling developed under the Massachusetts Estuary Program (MEP) and contributing groundwater areas as delineated and published in the USGS 451 groundwater contributing areas data.[8,9] The Cape Cod watersheds are based on groundwater delineations and not ground surface topography. For groundwatershed assessments, if a discharge occurs inside the

[5] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[6] MassDEP, 2011. Cape Cod Coastal Drainage Areas 2004 - 2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

[7] MassDEP, 2012. Addendum: Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capeadd.pdf

[8] Walter, D.A., Masterson, J.P., and Hess, K.M., 2004. Ground-Water Recharge Areas and Traveltimes to Pumped Wells, Ponds, Streams, and Coastal Water Bodies, Cape Cod, Massachusetts. Scientific Investigations Map I-2857, 1 sheet. Available at: http://pubs.water.usgs.gov/sim20042857

[9] U.S. Geological Survey (USGS), 2009. Groundwater contributing areas for Cape Cod and Plymouth-Carver Regions of Massachusetts. Data Series 451 (1 of 3).

groundwatershed boundary, it is considered to be a discharge that contributes to the impaired segment. If the discharge point is outside of the groundwatershed boundary, it is not considered to contribute to the impaired segment.

MassDOT's property in the urban area with the potential to contribute stormwater runoff to the assessed waterbodies is comprised of portions of Route 130, Route 6, and Route 6A. The closest proximity of the assessed waterbodies to MassDOT's property in an urban area is the crossing of Route 6A over Mill Creek. A portion of this roadway contributes stormwater runoff to Mill Creek via storm drains. Refer to Figure 1 for the location of these roadways within the groundwatershed to Old Harbor Creek (MA96-84), Springhill Creek (MA96-87), Dock Creek (MA96-86), and Mill Creek (MA96-85).

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[10] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[11] MassDOT assessed Old Harbor Creek (MA96-84), Mill Creek (MA96-85), Dock Creek (MA96-86), and Springhill Creek (MA96-87) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[12] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[13] The conditions of the assessed waterbodies are not proposed to change.

BMP 7R for Pathogen TMDL (CN 252.5)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body covered by a final TMDL.[14] The assessed waterbodies are covered by the Pathogen TMDL for the Cape Cod Watershed.[15]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific

[10] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[11] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[12] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[13] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

[14] Massachusetts Department of Transportation (MassDOT). (2012). Description of MassDOT's TMDL Method in BMP 7R. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[15] MassDEP. 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

assessments of pathogen loading for each water body impaired for pathogens, but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[16]

The assessed waterbodies are located in the northern portion of the watershed. As discussed above, the watershed has no documented point sources of bacterial pollution but numerous non-point contributions are identified in the TMDL report.[17] Information in the Water Quality report and the TMDL report are very similar and is summarized in the Site Description above.

In addition to the generic recommendations provided in the draft NPDES MS4 permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the *Final Pathogen TMDL for the Cape Cod Watershed* (Section 8.0) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed: [17]

- Correction of failing septic systems
- Public education regarding illicit sewer connection and failing infrastructure, as well as stormwater runoff and boat wastes
- Identification and elimination of prohibited sources such as leaky or improperly connected sanitary sewer flows
- Best management practices to mitigate stormwater runoff volume.

The TMDL report also indicates that structural BMPs may be appropriate if less costly non-structural BMPs are not effective.[17] Many non-structural BMPs are in place, including public education and outreach, street sweeping, and catch basin cleanouts. In addition to practices like these, many communities have formed advisory committees to help resolve existing stormwater issues. Many of the communities on Cape Cod practice their own stormwater BMPs. Additionally, the TMDL states that implementation to achieve the TMDL goals should be an iterative process with selection and implementation of mitigation measures followed by monitoring to determine the extent of water quality improvement realized.[17]

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the Cape Cod Watershed:[17]

- Septic tank controls
- Documentation of storm drain outfall locations
- Resident education
- Additional water quality monitoring
- Designation of "No Discharge" areas in high priority coastal waters

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7R Pathogen Methodology, MassDOT believes that

[16] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

[17] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.[18]

In accordance with the BMPs identified in the TMDL report as planned measures to reach compliance with the Cape Cod bacteria TMDL report, MassDOT has documented the locations of its stormwater outfalls.[19] In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.[19]

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Old Harbor Creek (MA96-84), Mill Creek (MA96-85), Dock Creek (MA96-86), and Springhill Creek (MA96-87). These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the groundwatershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the groundwatershed of Old Harbor Creek, Mill Creek, Dock Creek, and Springhill Creek, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

[18] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

[19] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

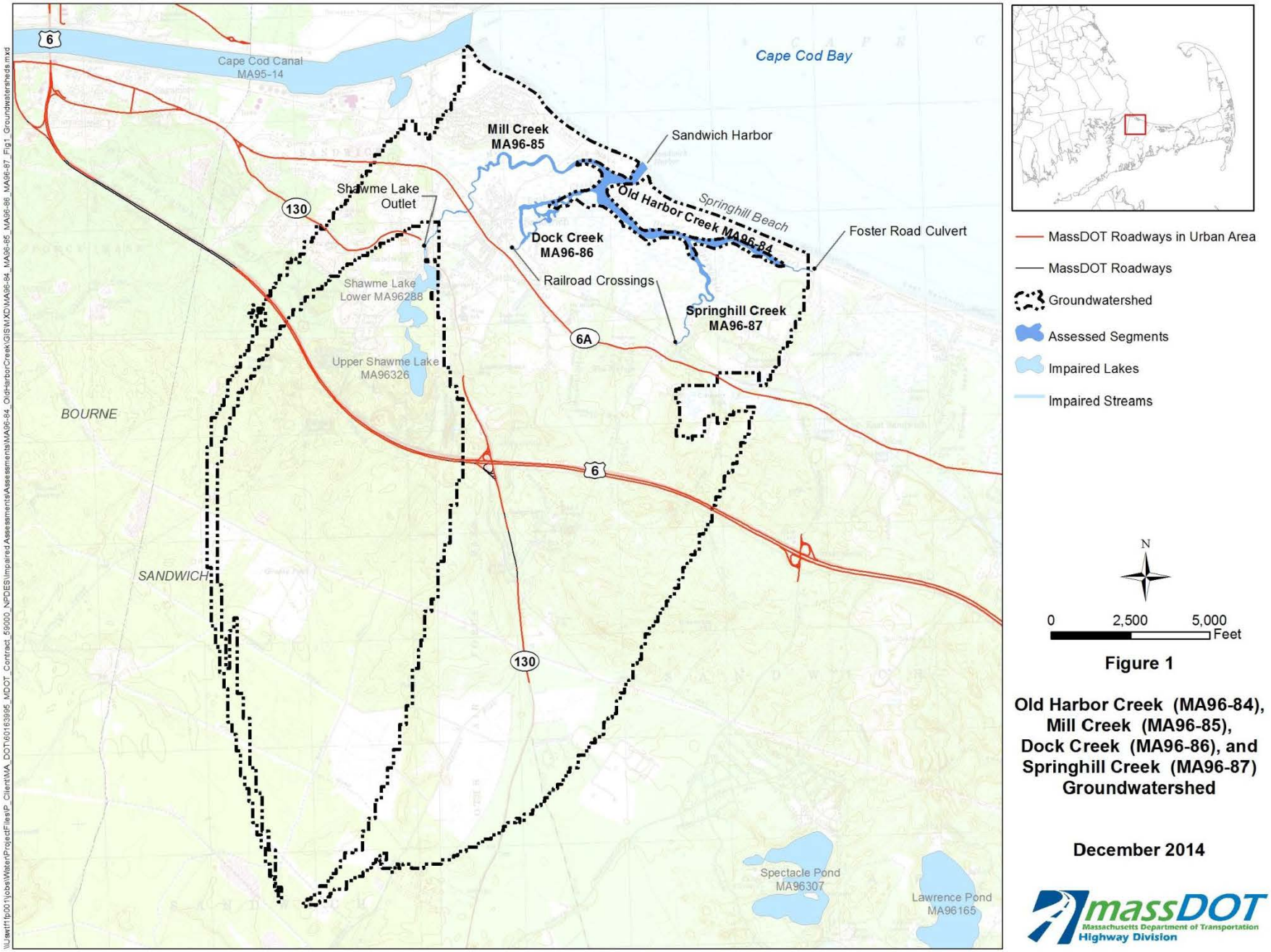


Figure 1

Old Harbor Creek (MA96-84), Mill Creek (MA96-85), Dock Creek (MA96-86), and Springhill Creek (MA96-87) Groundwatershed

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

Impaired Waters Assessment for Santuit River (MA96-92)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*4A (TMDL is completed)*
	Final TMDLs:	*Addendum: Final Pathogen TMDL for the Cape Cod Watershed (CN 252.5)* [2]
	WQ Assessment:	*Cape Cod Coastal Drainage Areas 2004 - 2008 Surface Water Quality Assessment Report* [3]
Location	Towns:	*Mashpee/Barnstable*
	MassDOT Roads:	*Routes 28 and 130*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

Santuit River (MA96-92) is a water body located along a portion of the Mashpee/Barnstable, Massachusetts town boundary. This water body segment covers approximately 5.1 acres. Figure 1 illustrates the groundwatershed for the Santuit River (MA96-92). The watersheds are based on technical reports developed by the Massachusetts Estuaries Project (MEP) which serve as the basis for the development of Total Maximum Daily Loads.[4] The MEP team includes technical staff from USGS and the Cape Cod Commission and works collaboratively with MassDEP and the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST). For groundwatershed assessments, if a discharge occurs inside the groundwatershed boundary, it is considered to be a discharge that contributes to the impaired segment. If the discharge point is outside of the groundwatershed boundary, it is not considered to contribute to the impaired segment.

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2012. Addendum: Final Pathogen TMDL for the Cape Cod Watershed (CN 252.5). Available at: http://www.epa.gov/waters/tmdldocs/42372_CN252.5%20%20-%20Cape%20Cod.pdf

[3] MassDEP, 2011. Cape Cod Coastal Drainage Areas 2004 - 2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

[4] University of Massachusetts Dartmouth and MassDEP, 2006. Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Popponesset Bay, Mashpee and Barnstable, Massachusetts. Available at: http://www.oceanscience.net/estuaries/report/Popponesset/PopponessetMEPrpt_final.pdf

The assessed water body extends from the confluence with the freshwater portion of Santuit River south of Old Mill Road, south to its confluence with Shoestring Bay, and flows in a southerly direction. The closest MassDOT roadway is Route 28 located approximately 3,400 feet to the north of Segment MA96-92 where the Santuit River passes underneath. There are NPDES discharges covered under the municipal separate storm sewer systems (MS4) General Permit in the Town of Barnstable (MAR041090) and the Town of Mashpee (MAR041129) allowing discharge to this water body.[5]

According to MassDEP's *Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report*, Santuit River is "impaired" for the Shellfish Harvesting use as a result of elevated fecal coliform bacteria; no other uses have been assessed.[6] Sources of shellfish harvesting impairment are cited as waterfowl, waste from pets, onsite (septic) systems, discharges from MS4s.

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA96-92 is comprised of portions of Route 28 and Route 130. Refer to Figure 1 for the location of this roadway within the groundwatershed to Segment MA96-92.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[7] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[8] MassDOT assessed Santuit River (MA96-92) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[9] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[10] The condition of Santuit River is not proposed to change.

BMP 7R for Pathogen TMDL (CN 252.5)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments

[5] MassDEP, 2012. Addendum: Final Pathogen TMDL for the Cape Cod Watershed (CN 252.5). Available at: http://www.epa.gov/waters/tmdldocs/42372_CN252.5%20%20-%20Cape%20Cod.pdf

[6] MassDEP, 2011. Cape Cod Coastal Drainage Areas 2004 - 2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

[7] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[8] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[9] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[10] MassDOT, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

that have been assigned to a water body covered by a final TMDL.[11] Santuit River (MA96-92) is covered by the fecal coliform TMDL for the Cape Cod Watershed.[12]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[13]

Santuit River (MA96-92) is located in the southern portion of the watershed. As discussed above, the Santuit River watershed has no documented point sources of bacterial pollution but numerous non-point contributions are identified in the TMDL report.[12]

In addition to the generic recommendations provided in the draft NPDES MS4 permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the Cape Cod TMDL report (Section 8) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed:[12]

- Bacterial source tracking
- Repair of failing infrastructure
- Correction of failing septic systems

The TMDL report also indicates that structural BMPs may be appropriate to address runoff from impervious areas in instances where fecal coliform concentrations cannot be reduced by other means.[12]

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the Cape Cod watershed in Mashpee and/or Barnstable:[12]

- Development of a public education program
- Installation of dog waste storage bins on Town-owned public properties
- Mapping of stormwater infrastructure
- Initiation of a storm drain stenciling effort
- Reduction of direct roadway ditch runoff via catch basins, swales, etc.
- Additional housekeeping and monitoring

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source

[11] MassDOT, July 22, 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[12] MassDEP, 2012. Addendum: Final Pathogen TMDL for the Cape Cod Watershed (CN 252.5). Available at: http://www.epa.gov/waters/tmdldocs/42372_CN252.5%20%20-%20Cape%20Cod.pdf

[13] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

control. As discussed in MassDOT's BMP 7R Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.[14]

In accordance with the BMPs identified in the TMDL report as planned measures to reach compliance with the Cape Cod bacteria TMDL report, MassDOT has documented the locations of its stormwater outfalls.[15] In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.[15]

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Santuit River (MA96-92). These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the groundwatershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the groundwatershed of Santuit River (MA96-92), including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

[14] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

[15] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed (CN 252.0). Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

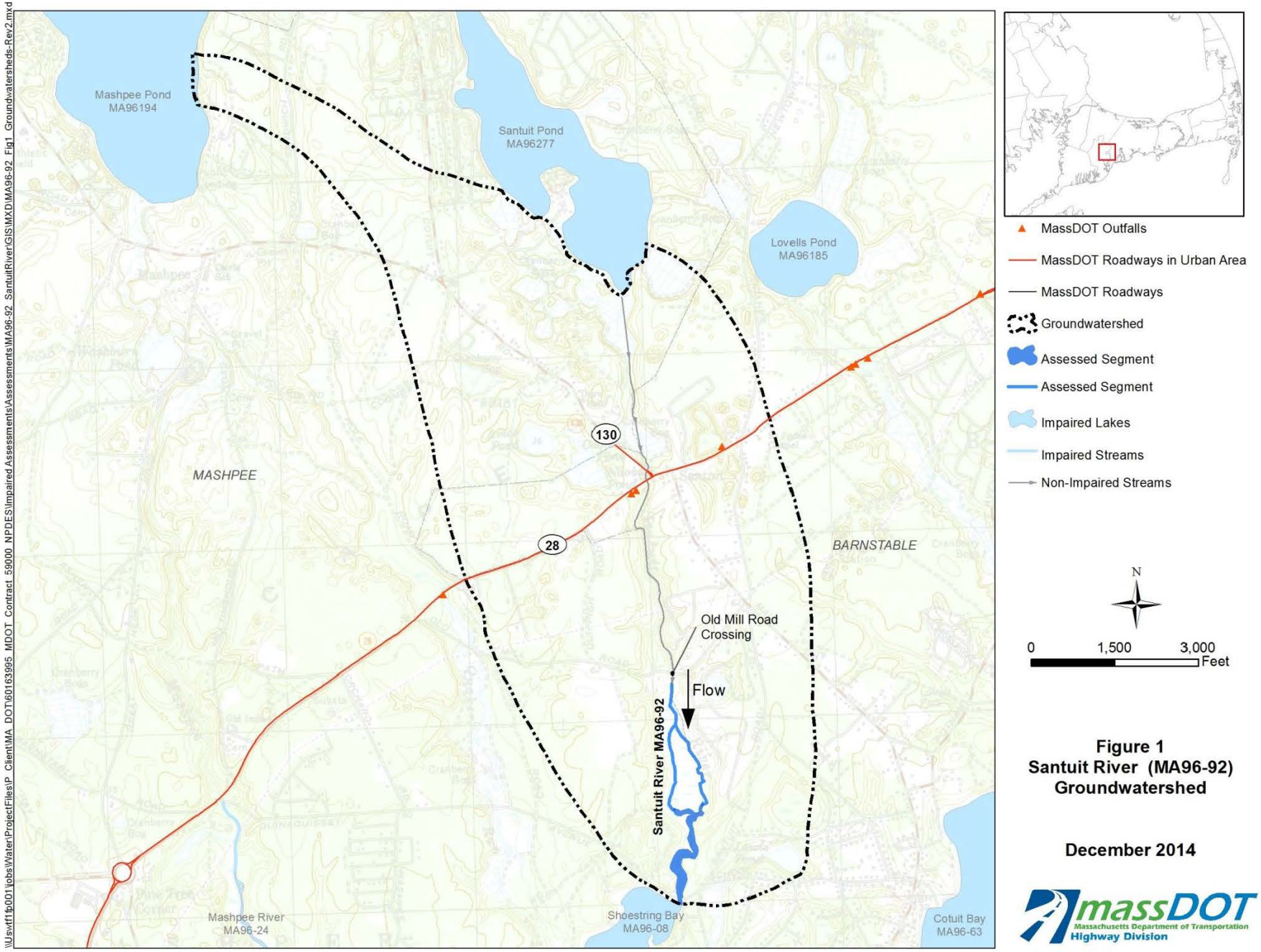


Figure 1
Santuit River (MA96-92)
Groundwatershed

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

Impaired Waters Assessment for Halls Creek (MA96-93)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*4A (TMDL is complete)*
	Final TMDLs:	*Final Pathogen TMDL for the Cape Cod Watershed* [2] *Addendum: Final Pathogen TMDL for the Cape Cod Watershed* (CN 252.5) [3]
	WQ Assessment:	*Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report* [4]
Location	Towns:	*Barnstable*
	MassDOT Roads:	*Route 28*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

Halls Creek (MA96-93) is a small tidal estuary located in Barnstable, Massachusetts that covers approximately 0.07 square mile. Figure 1 illustrates the groundwatershed for Halls Creek (MA96-93). The groundwatersheds are based on technical reports developed by the Massachusetts Estuaries Project (MEP) which serve as the basis for the development of Total Maximum Daily Loads.[5] The MEP team includes technical staff from USGS and the Cape Cod Commission and works collaboratively with MassDEP and the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST). For groundwatershed assessments, if a discharge

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[3] MassDEP, 2012. Addendum: Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capeadd.pdf

[4] MassDEP, 2011. Cape Cod Drainage Areas 2004-2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

[5] University of Massachusetts Dartmouth and MassDEP, 2006. Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Lewis Bay Embayment System, Barnstable/Yarmouth, MA. Available at: http://www.oceanscience.net/estuaries/report/Lewis_Bay/Lewis_Bay_MEP_Final.pdf

occurs inside the groundwatershed boundary, it is considered to be a discharge that contributes to the impaired segment. If the discharge point is outside of the groundwatershed boundary, it is not considered to contribute to the impaired segment.

The estuarine portion of Halls Creek is impaired and begins at Craigville Beach Road and flows to the mouth at Centerville Harbor. The closest MassDOT roadway is Route 28, approximately 1.8 miles north. Land use in the Halls Creek groundwatershed is primarily residential, with wetland and recreation in the vicinity of the water body and commercial in the vicinity of Route 28. Discharge to Halls Creek from the Town of Barnstable is covered by NPDES permit (MAR041090).[6]

According to MassDEP's *Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report*, Halls Creek is "impaired" for the Shellfish Harvesting use due to elevated fecal coliform bacteria associated with waterfowl, waste from pets, on-site (septic) systems, and stormwater discharges from municipal separate storm sewer systems (MS4s).[6] Halls Creek has one semi-public beach that is frequently tested for Enterococci bacteria, and there were no postings at this beach between 2002 and 2007.[6]

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA96-93 of Halls Creek is comprised of portions of Route 28, which is located north of Halls Creek. Refer to Figure 1 for the location of this roadway within the groundwatershed to Segment MA96-93.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[7] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[8] MassDOT assessed Halls Creek (MA96-93) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[9] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[10] The condition of Halls Creek is not proposed to change.

[6] MassDEP, 2011. Cape Cod Drainage Areas 2004-2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

[7] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[8] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[9] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[10] MassDEP, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

BMP 7R for Pathogen TMDL (CN 252.0)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments that have been assigned to a water body covered by a final TMDL.[11] Halls Creek (MA96-93) is covered by the *Final Pathogen TMDL for the Cape Cod Watershed* as unimpaired but was subsequently classified as impaired by the *Addendum: Final Pathogen TMDL for the Cape Cod Watershed*.[12,13]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[14]

According to the *Final Pathogen TMDL for the Cape Cod Watershed* report, sources of indicator bacteria in the Cape Cod watershed are believed to be primarily from boat wastes, failing septic systems, pets, wildlife, birds, and stormwater.[12]

Segment MA96-93 is located in the southern portion of the watershed.

In addition to the generic recommendations provided in the draft NPDES MS4 permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the *Final Pathogen TMDL for the Cape Cod Watershed* (Section 8.0) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed: [12]

- Correction of failing septic systems
- Public education regarding illicit sewer connection and failing infrastructure, as well as stormwater runoff and boat wastes
- Identification and elimination of prohibited sources such as leaky or improperly connected sanitary sewer flows
- Best management practices to mitigate stormwater runoff volume.

The TMDL report also indicates that structural BMPs may be appropriate if less costly non-structural BMPs are not effective.[12] Many non-structural BMPs are in place, including public education and outreach, street sweeping, and catch basin cleanouts. In addition to practices like these, many communities have formed advisory committees to help resolve existing stormwater issues. Many of the communities on Cape Cod practice their own stormwater BMPs. Additionally, the TMDL states that implementation to achieve the TMDL goals should be an iterative process with selection and implementation of mitigation measures followed by monitoring to determine the extent of water quality improvement realized.[12]

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[11] MassDOT, 2012. Description of MassDOT's TMDL Method in BMP 7R. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[12] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[13] MassDEP, 2012. Addendum: Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capeadd.pdf

[14] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the Cape Cod Watershed:[15]

- Septic tank controls
- Documentation of storm drain outfall locations
- Resident education
- Additional water quality monitoring
- Designation of "No Discharge" areas in high priority coastal waters

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7R Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.[16]

In accordance with the BMPs identified in the TMDL report as planned measures to reach compliance with the Cape Cod bacteria TMDL report, MassDOT has documented the locations of its stormwater outfalls.[15] In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.[15]

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the subwatershed of this water body that could be contributing pathogens to the impaired water body.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Halls Creek (MA96-93). These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of

[15] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[16] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

pathogens in the groundwatershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the groundwatershed of Halls Creek (MA96-93), including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

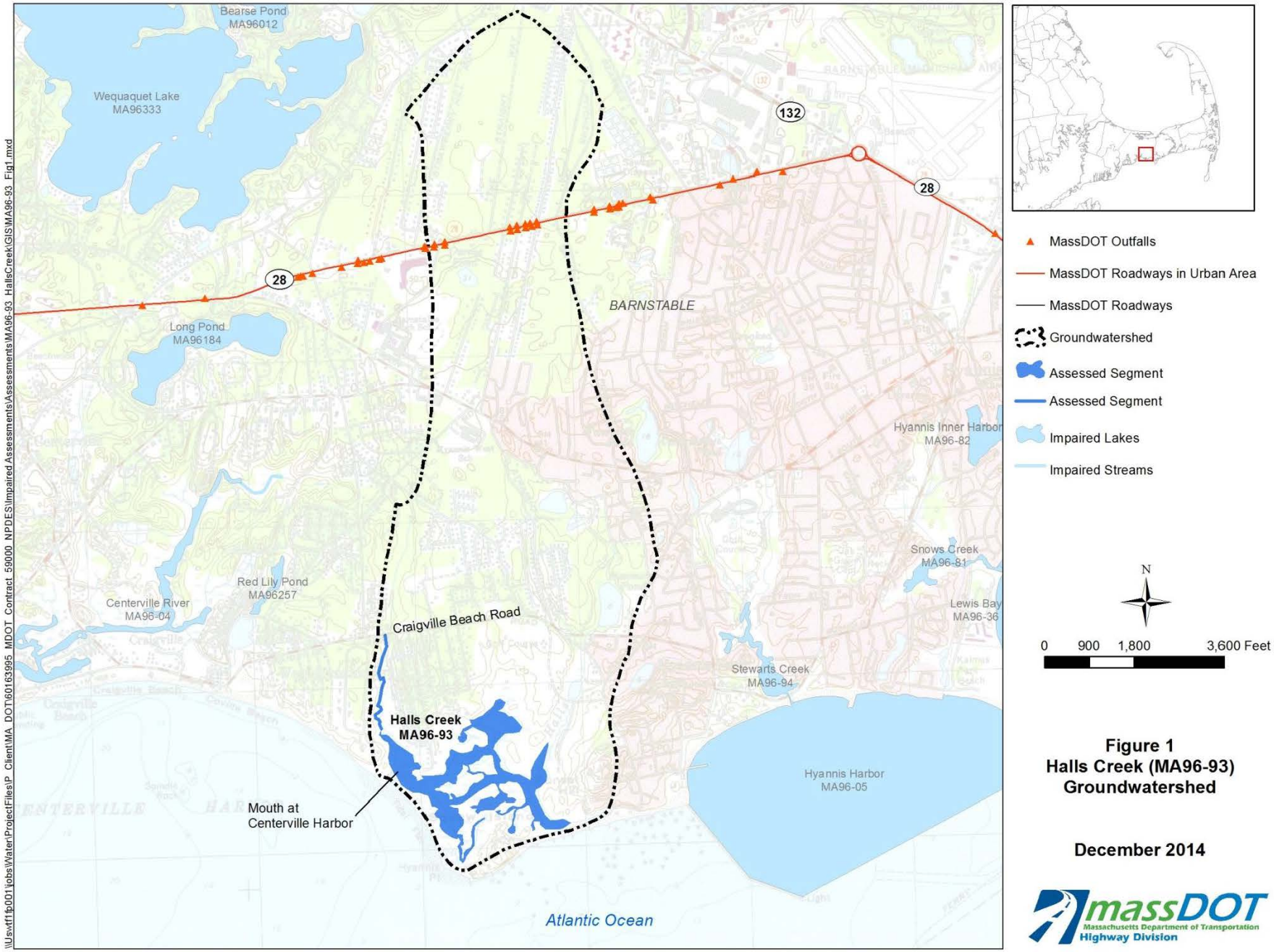

Figure 1
Halls Creek (MA96-93)
Groundwatershed

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

Impaired Waters Assessment for Stewarts Creek (MA96-94)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform*
	Category:	*4A (TMDL is complete)*
	Final TMDLs:	*Final Pathogen TMDL for the Cape Cod Watershed* [2] *Addendum: Final Pathogen TMDL for the Cape Cod Watershed* (CN 252.5) [3]
	WQ Assessment:	*Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report* [4]
Location	Towns:	*Barnstable*
	MassDOT Roads:	*Route 28*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☐

Site Description

Stewarts Creek (MA96-94) is a small tidal estuary located in Barnstable, Massachusetts that covers approximately 0.01 square mile. Figure 1 illustrates the groundwatershed for Stewarts Creek (MA96-94). The watersheds are based on technical reports developed by the Massachusetts Estuaries Project (MEP) which serve as the basis for the development of Total Maximum Daily Loads.[5] The MEP team includes technical staff from USGS and the Cape Cod Commission and works collaboratively with MassDEP and the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST). For groundwatershed assessments, if a discharge

[1] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[2] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[3] MassDEP, 2012. Addendum: Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capeadd.pdf

[4] MassDEP, 2011. Cape Cod Drainage Areas 2004-2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

[5] University of Massachusetts Dartmouth and MassDEP, 2006. Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Lewis Bay Embayment System, Barnstable/Yarmouth, MA. Available at: http://www.oceanscience.net/estuaries/report/Lewis_Bay/Lewis_Bay_MEP_Final.pdf

occurs inside the groundwatershed boundary, it is considered to be a discharge that contributes to the impaired segment. If the discharge point is outside of the groundwatershed boundary, it is not considered to contribute to the impaired segment. The estuarine portion of Stewarts Creek is impaired and begins west of Stetson Street and flows south to the mouth at Hyannis Harbor. The closest MassDOT roadway is Route 28, approximately 1.5 miles north. Land use in the Stewarts Creek groundwatershed is primarily residential and commercial, with salt water wetland and recreation in the vicinity of the water body. Discharge to Stewarts Creek from the Town of Barnstable is covered by the municipal separate storm sewer system (MS4) General Permit (MAR041090).[6]

According to MassDEP's *Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report*, Stewarts Creek is "impaired" for the Shellfish Harvesting use due to elevated fecal coliform bacteria associated with waterfowl, waste from pets, on-site (septic) systems, and stormwater discharges from MS4s.[6]

MassDOT's property in the urban area with the potential to directly contribute stormwater runoff to Segment MA96-94 of Stewarts Creek is comprised of portions of Route 28, which is located north of Stewarts Creek. Refer to Figure 1 for the location of this roadway within the groundwatershed to Segment MA96-94.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the water body for the impairments covered by the TMDL under the BMP 7R methodology.[7] MassDOT separately assesses the water body for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[8] MassDOT assessed Stewarts Creek (MA96-94) using the methodologies described below.

This assessment has been completed based on the Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.[9] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List which has been reviewed for any proposed changes to the condition of the water bodies.[10] The condition of Stewarts Creek is not proposed to change.

BMP 7R for Pathogen TMDL (CN 252.0)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R of MassDOT's Stormwater Management Plan (SWMP) which applies to impairments

[6] MassDEP, 2011. Cape Cod Drainage Areas 2004-2008 Surface Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/96wqar12.pdf

[7] MassDOT, July 2010. BMP 7R: TMDL Watershed Review. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[8] MassDOT, April 2010. BMP 7U: Water Quality Impaired Waters Assessment and Mitigation Plan. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7U_ImpairedWaterbodiesAssessment.pdf

[9] MassDEP, 2013. Massachusetts Year 2012 Integrated List of Waters – Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

[10] MassDEP, June 2014. Massachusetts Year 2014 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts. Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/14iwlistp.pdf

that have been assigned to a water body covered by a final TMDL.[11] Stewarts Creek (MA96-94) is covered by the *Final Pathogen TMDL for the Cape Cod Watershed* as unimpaired but was subsequently classified as impaired by the *Addendum: Final Pathogen TMDL for the Cape Cod Watershed*.[12,13]

Pathogen concentrations in stormwater vary widely and concentrations can vary by an order of magnitude within a given storm event at a single location making it difficult to predict pathogen concentrations in stormwater with accuracy. MassDOT generally will not conduct site specific assessments of pathogen loading for each water body impaired for pathogens but instead developed an iterative adaptive management approach to be consistent with relevant TMDLs and permit condition requirements and an approach to stormwater management. Greater detail of the assessment methodology is provided in MassDOT's BMP 7R Pathogen Methodology.[14]

According to the *Final Pathogen TMDL for the Cape Cod Watershed* report, sources of indicator bacteria in the Cape Cod watershed are believed to be primarily from boat wastes, failing septic systems, pets, wildlife, birds, and stormwater.[12]

The *Final Pathogen TMDL for the Cape Cod Watershed* and the *Addendum: Final Pathogen TMDL for the Cape Cod Watershed* state that several impaired segments carry a higher priority due to their location, use, and risk to human health.[12, 13] The higher priority areas in the Cape Cod watershed stand out as likely priority areas to address bacteria pollution sources. These segments tend to be located nearest to sensitive areas such as Outstanding Resource Waters or designated uses that require higher water quality standards than Class B. Stewarts Creek was not assigned a prioritization due to insufficient data.

Segment MA96-94 is located in the southern portion of the watershed.

In addition to the generic recommendations provided in the draft NPDES MS4 permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the *Final Pathogen TMDL for the Cape Cod Watershed* (Section 8.0) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed: [12]

- Correction of failing septic systems
- Public education regarding illicit sewer connection and failing infrastructure, as well as stormwater runoff and boat wastes
- Identification and elimination of prohibited sources such as leaky or improperly connected sanitary sewer flows
- Best management practices to mitigate stormwater runoff volume.

The TMDL report also indicates that structural BMPs may be appropriate if less costly non-structural BMPs are not effective.[12] Many non-structural BMPs are in place, including public education and outreach, street sweeping, and catch basin cleanouts. In addition to practices like these, many communities have formed advisory committees to help resolve existing stormwater issues. Many of

[11] MassDOT, 2012. Description of MassDOT's TMDL Method in BMP 7R. Available at: http://www.massdot.state.ma.us/Portals/8/docs/environmental/npdes/BMP_7R_TMDL_WatershedReview.pdf

[12] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[13] MassDEP, 2012. Addendum: Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capeadd.pdf

[14] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

the communities on Cape Cod practice their own stormwater BMPs. Additionally, the TMDL states that implementation to achieve the TMDL goals should be an iterative process with selection and implementation of mitigation measures followed by monitoring to determine the extent of water quality improvement realized.[15]

The following BMPs are specifically identified as being ongoing and/or planned in order to meet the bacteria TMDL for the Cape Cod Watershed:[15]

- Septic tank controls
- Documentation of storm drain outfall locations
- Resident education
- Additional water quality monitoring
- Designation of "No Discharge" areas in high priority coastal waters

Proposed Mitigation Plan

MassDOT implements a variety of non-structural BMP programs across their system in accordance with their existing SWMP including educational programs, illicit connection review and source control. As discussed in MassDOT's BMP 7R Pathogen Methodology, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.[16]

In accordance with the BMPs identified in the TMDL report as planned measures to reach compliance with the Cape Cod bacteria TMDL report, MassDOT has documented the locations of its stormwater outfalls.[15] In addition, as part of its pet waste management program, MassDOT has determined that no MassDOT-targeted rest stops are located within the groundwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the groundwatershed, given the documented variability of pathogen concentrations in highway runoff, and the low probability of achieving substantial gains towards meeting the TMDL with solely implementing IC reductions and controls.[15]

Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and thereby minimize the possibility of pathogen contributions to receiving waters. At present, there are no suspected or known illicit discharges, or unauthorized drainage tie-ins, within the groundwatershed of this water body that could be contributing pathogens to the impaired water body.

[15] MassDEP, 2009. Final Pathogen TMDL for the Cape Cod Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/capecod1.pdf

[16] MassDOT, December 2014. Description of MassDOT's Application of BMP 7R for Pathogen Related Impairments.

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Stewarts Creek (MA96-94). These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit and the applicable Pathogen TMDLs. As stated previously, pathogen loadings are highly variable and although there is potential for stormwater runoff from MassDOT roadways to be a contributing source it is unlikely to warrant action relative to other sources of pathogens in the groundwatershed. MassDOT will continue to ensure proper non-structural BMPs are being implemented within the groundwatershed of Stewarts Creek (MA96-94), including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education.

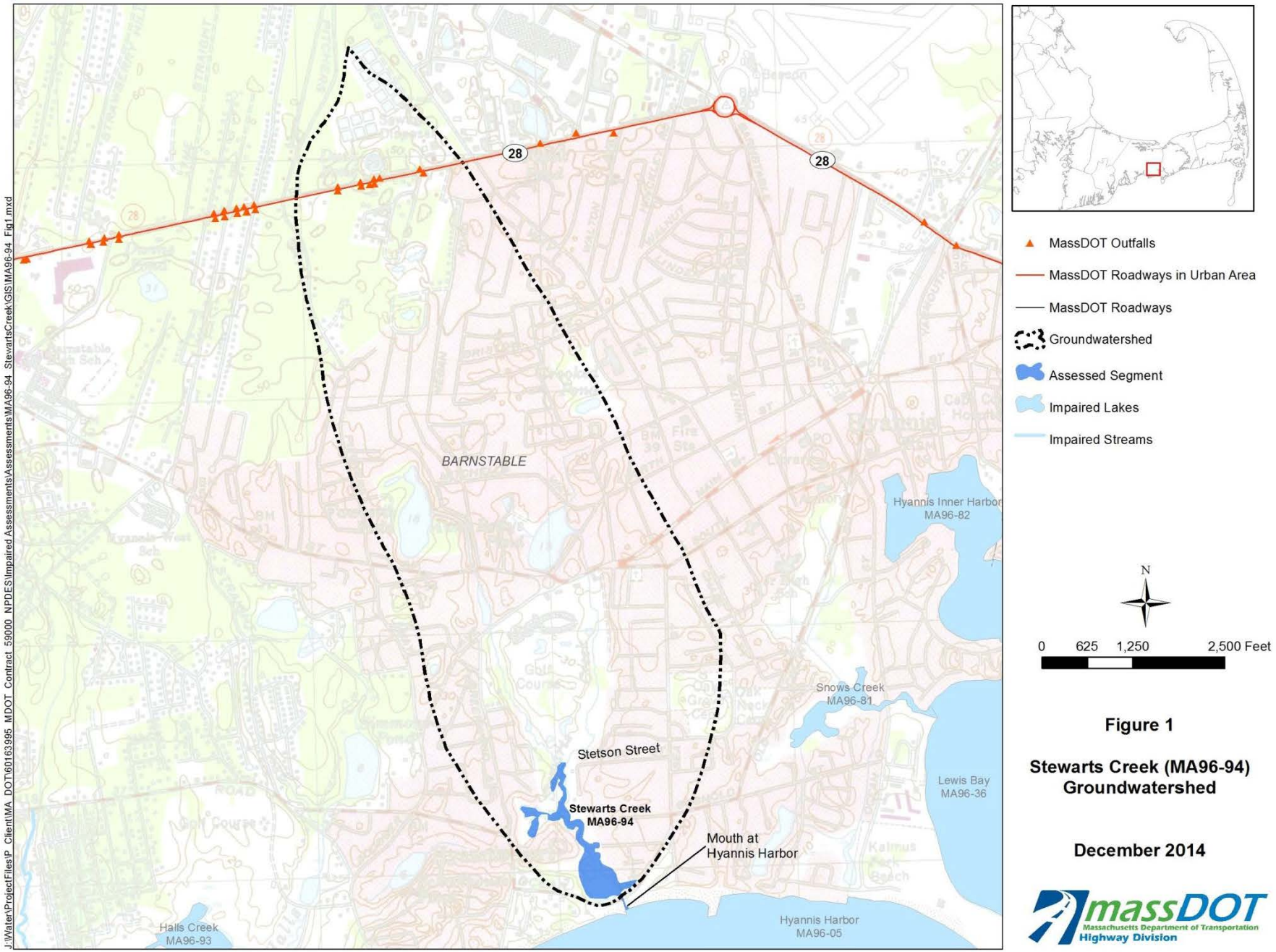

Figure 1

Stewarts Creek (MA96-94)
Groundwatershed

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division