Attachment 1:

Impaired Waters Assessments – Final Reports (IC/TMDL)

List of Impaired Water Bodies

MA52010	Lake Como
MA52-02	Ten Mile River
MA52-03	Ten Mile River
MA52-10	Fourmile Brook
MA71-14	Belle Isle Inlet*
MA73-33	Unnamed Tributary
MA74-11	Weir River
MA74-13	Weymouth Back River
MA74-14	Weymouth Fore River
MA81-04	North Nashua River
MA94-03	French Stream
MA94-21	Drinkwater River
MA95-56	Hammett Cove
MA95-61	Eel Pond
MA95-63	Outer New Bedford Harbor
MA95-67	Nasketucket River
MA95-70	"Inner" Sippican Harbor

*Not on original L-1 List.

12/08/2014

Impaired Waters Assessment for Lake Como (MA52010)

Summary

Impaired Water[1]	Impairments:	Stormwater:	*Excess Algal Growth, Turbidity*
		Non-Stormwater:[2]	*Non-Native Aquatic Plants*
	Category:	*5 (Waters requiring a TMDL)*	
	Final TMDLs:	*None*	
	WQ Assessment:	*Ten Mile River Watershed 2002 Water Quality Assessment Report* [3]	
Location	Towns:	*Attleboro*	
	MassDOT Roads:	*Route 1*	
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒	
BMPs	Existing:	*None*	
MassDOT Area and Targets			Impervious Cover (IC)
	Directly Contributing Area		*1.5 acres*
	Contributing Area Reduction Target:		*0.7 acres*
	Existing BMPs Reduction:		*0.0 acres*
	Remaining Reduction to Meet Target:		*0.7 acres*

[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.massdot.state.ma.us/Portals/8/docs/environmental/impairedWaters/Year3/Year3_ImpairedWatersAssessment_1.pdf#page=308

[3] 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

Site Description

Lake Como (MA52010) is a 4.8-acre lake located in Attleboro, Massachusetts. The Lake receives water from a small stream entering on its western side. Lake Como outlets on its eastern side through a culvert that runs under Route 1. The stream formed at the outlet to Lake Como discharges to Seven Mile River (MA52-08) after passing through a large wetland system.

The total watershed and the subwatershed to Lake Como are the same. Figure 1 shows the watershed draining to Lake Como. The 259-acre watershed, which lies within Attleboro and North Attleborough, consists mainly of residential neighborhoods, wetland systems, and forested areas. Plots of commercial land and a short segment of Route 1 also lie within the watershed.

According to the *Ten Mile River Watershed 2002 Water Quality Assessment Report*,[3] Aquatic Life within Lake Como is "impaired" for non-native aquatic plant species, which is not considered a pollutant. Fish Consumption, Primary Contact, Secondary Contact, and Aesthetics are all "not assessed."

Figure 2 shows the portion of MassDOT property that discharges directly to Lake Como. The directly discharging roadway includes 0.3 miles of Route 1 southbound and a semicircular paved area along Route 1 southbound near its intersection with May Street. This area is used by large vehicles for U-turns. This section of Route 1 has two lanes of travel for both the north and southbound traffic. The road does not have shoulders but does have a small sidewalk on the southbound side. The roadway is immediately bordered by commercial properties and Lake Como. Route 1 is crowned in the center of the road. The grading directs stormwater to catch basins located on the edges of the outside lane. The water flows into the catch basins and then into one of two trunk lines that run under Route 1. Stormwater from the southbound side discharges directly into Lake Como, but stormwater from the northbound side discharges downstream of Lake Como to an unimpaired stream.

Existing BMPs

MassDOT did not identify any existing BMPs in place to treat roadway runoff from the directly discharging area before reaching the impaired water segment.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the waterbody for the impairments covered by the TMDL under the BMP 7R methodology.[4] MassDOT separately assesses the waterbody for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[5] MassDOT assessed Lake Como (MA52010) using the methodologies described below.

MassDOT has identified a water body impairment in the Lake Como watershed which is not related to stormwater runoff. The specific impairment unrelated to stormwater for Lake Como is non-native aquatic plants. In accordance with MassDOT's Impaired Waters Assessment for Impaired Waters

[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

with Impairments Unrelated to Stormwater[2] in the December 8, 2012 EPA submittal, the non-stormwater related impairments are not specifically addressed as part of the Impaired Waters Program.

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[6] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of Lake Como is not proposed to change.

BMP 7U for Impervious Cover Related Impairments

A Final TMDL is not in place to address Lake Como's (MA52010) following impairments: excess algal growth and turbidity. Therefore, MassDOT assessed the stormwater-related impairments not addressed by a TMDL using the approach outlined in the Description of MassDOT's Application of Impervious Cover Method in BMP 7U[5] which was developed using the EPA Region I's Impervious Cover (IC) Method, described in EPA's Stormwater TMDL Implementation Support Manual.[7] Consistent with the findings of EPA and others, MassDOT concluded that when a watershed had less than 9% IC, stormwater was not the likely cause of the impairment.

MassDOT calculated the following values for the total contributing watershed and the subwatershed of the impaired water (Lake Como) to determine the IC area and set a reduction target. Watersheds are based on the USGS Dataset 451[8] and modified as necessary using topography. MassGIS's impervious surfaces data layer[9] was used to determine the IC of the watersheds. The total and subwatershed to Lake Como are one and the same, which is shown in Figure 1.

Table 1 Impaired Segment Watershed*

	Total/Sub Watershed
Watershed Area	259 acres
Impervious Cover (IC) Area	44 acres
Percent Impervious	16.9%
IC Area at 9% Effective IC Target	23 acres
Target Effective IC Reduction	46.7%

*Rounding accounts for differences in calculations.

The total and subwatershed's percent impervious are greater than 9% indicating that stormwater is a likely contributor to the impairment. To meet the 9% effective IC target, the effective IC within the

[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] ENSR, 2006. Stormwater TMDL Implementation Support Manual for US EPA Region 1. ENSR International & EPA Region 1, Boston, MA. Available at http://www.epa.gov/region1/eco/tmdl/regionalpgrfs.html

[8] USGS Data Series 451 Local and Cumulative Impervious Cover of Massachusetts Stream Basins Available at: http://pubs.usgs.gov/ds/451/

[9] MassGIS Impervious Surfaces datalayer taken from 2005 orthoimagery. Available at: http://www.mass.gov/mgis/impervious_surface.htm

subwatershed will need to be reduced by the percentage calculated in Table 1. MassDOT then uses the same target percent reduction for their directly contributing watershed as shown in Table 2.

Table 2 MassDOT Directly Contributing Watershed

Directly Contributing Area	1.5 acres
Directly Contributing IC Area	1.5 acres
Percent Impervious	100.0%
Directly Contributing Area Effective IC Reduction Target (46.7% Target Effective IC Reduction of MassDOT Directly Contributing IC Area)	0.7 acres
Target Effective IC	53.3%
Target Effective IC	0.8 acres

Under existing conditions, MassDOT's estimated effective IC exceeds the target as described above. To mitigate the effects of IC, MassDOT will implement stormwater BMPs to the maximum extent practical given site constraints.

This assessment was not able to identify practical locations for stormwater management improvements within the current MassDOT right-of-way. The Proposed Mitigation Plan section discusses the site constraints and mitigation plan.

Proposed Mitigation Plan

During this assessment phase of the Impaired Waters Program, MassDOT has focused on directly contributing areas and identified BMPs that can be constructed entirely on MassDOT property without resulting in substantial wetland impacts or resulting in an adverse impact on historical or archeological resources. Projects that meet these requirements can be implemented under the Impaired Waters Program Retrofit initiative.

The primary site limitation in the Lake Como watershed is limited MassDOT right-of-way. In this area, Route 1 is bordered by commercial properties. The roadway has narrow (if any) shoulders and generally does not have sidewalks along the route. MassDOT's property line runs within 5 feet of the edge of the road, which eliminates the potential for BMPs.

Based on the review of MassDOT's directly contributing drainage area, no BMPs have been identified that can be implemented on MassDOT property to address the impairments of the Lake Como given the site constraints.

MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Lake Como, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education. Further work by MassDOT on programmed projects, which often include broader scale road layout changes, may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to address impairments. MassDOT will include an update in NPDES permit annual reports to EPA regarding proposed BMP design either through retrofit or programmed projects, plans for construction of BMPs, reduction achieved by finalized BMP designs and progress made towards meeting target effective IC reductions.

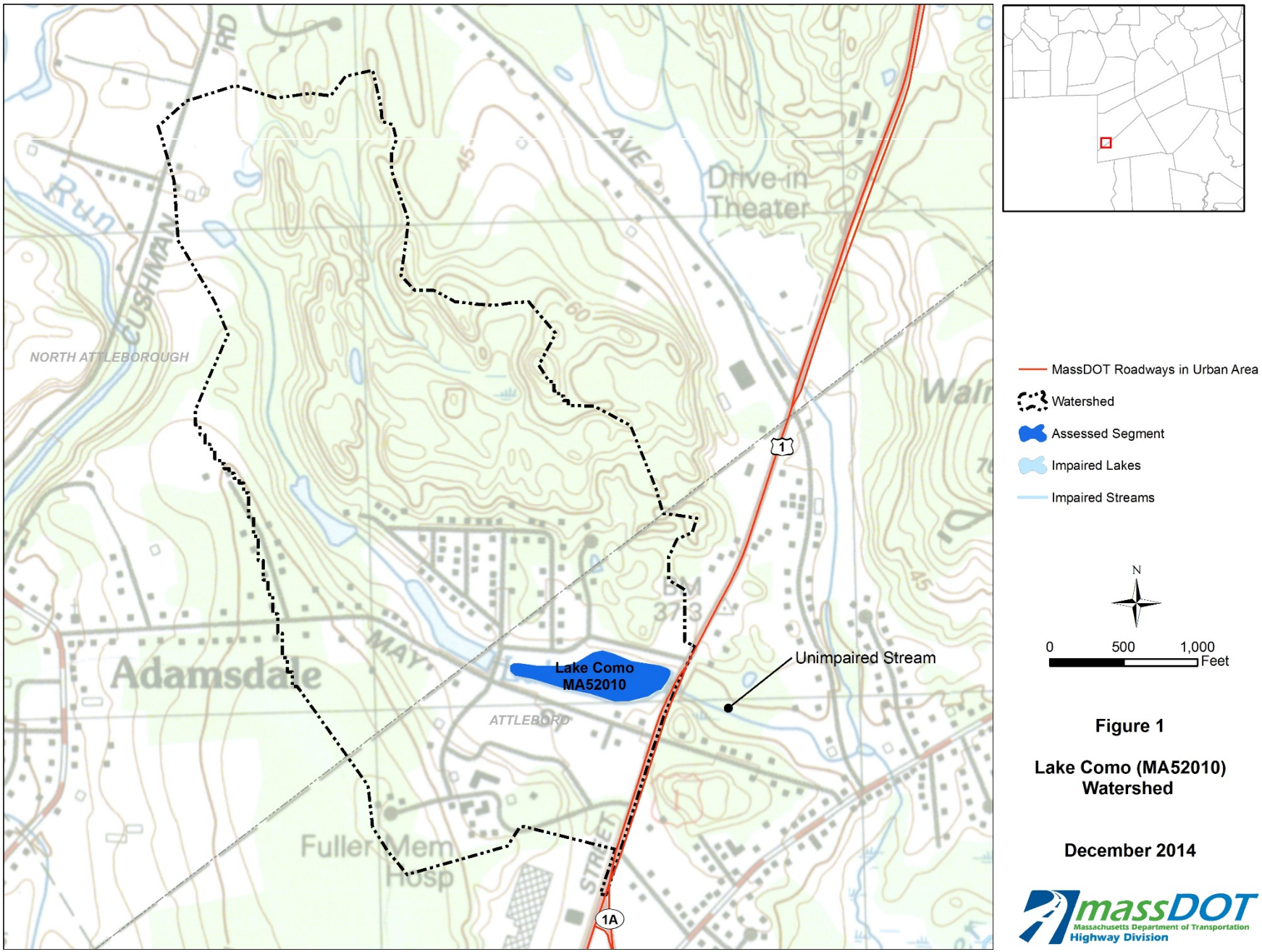

Figure 1

Lake Como (MA52010) Watershed

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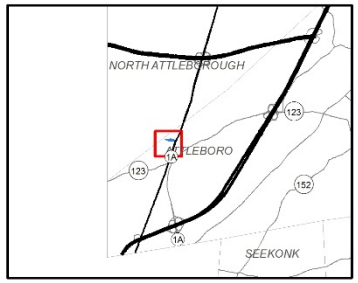

MassDOT Outfalls
MassDOT Roadways in Urban Area
Subwatershed
MassDOT Directly Discharging Area
Assessed Segment
Impaired Streams
Impaired Lakes

N

0 150 300 Feet

Figure 2

Lake Como (MA52010)
Directly Contributing
MassDOT Watershed

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12/08/2014

Impaired Waters Assessment for Ten Mile River (MA52-02)

Summary

Impaired Water[1]	Stormwater Impairments:	*Excess Algal Growth, Fecal Coliform, Other, Phosphorus (Total), Turbidity*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Ten Mile River Watershed 2002 Water Quality Assessment Report*[2]
Location	Towns:	*Attleboro, North Attleborough, Plainville*
	MassDOT Roads:	*Route 1, Route 1A, I-295*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒
BMPs	Existing:	*None*
MassDOT Area and Targets		Impervious Cover (IC)
	Directly Contributing Area:	*22.3 acres*
	Contributing Area Reduction Target:	*13.2 acres*
	Existing BMPs Reduction:	*0.0 acres*
	Remaining Reduction to Meet Target:	*13.2 acres*

Site Description

Ten Mile River (MA52-02) is a 5.0-mile-long river segment located in Attleboro, North Attleborough, and Plainville, Massachusetts. The entire Ten Mile River is 15.6 miles long and ultimately joins with the Seekonk River in Providence, Rhode Island. Segment MA52-02 begins where the Ten Mile River crosses under Route 106, north of the Plainville/North Attleborough town line. The river flows southeast, running parallel to and crossing under Route 1. Segment MA52-02 flows in and out 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] MassDEP, June 2006. Ten Mile River Watershed 2002 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/3baapp/52wqar.pdf

Falls Pond North Basin (MA52013), which is also on MassDEP 2012 Integrated List of Waters and assessed separately.

The total watershed and subwatershed to Ten Mile River (MA52-02) are the same. The watershed is shown in Figure 1. The 11.0-square-mile watershed encompasses parts of Wrentham, Plainville, North Attleborough, and Attleboro and consists mainly of residential neighborhoods, wetland systems, and forested areas. Commercial properties and a 3.0-mile-segment of Route 1 also lie within the watershed.

According to the *Ten Mile River Watershed 2002 Water Quality Assessment Report*,[2] Aquatic Life has an "alert" status because of elevated total phosphorus and occasional low oxygen measurements. Fish Consumption has been labeled "not assessed." Primary Contact is "impaired" based on elevated fecal coliform counts with urbanized high density municipal areas as the suspected source. The Secondary Contact and Aesthetic uses are in "alert" status because of occasional turbidity and trash/debris in isolated areas.

Figures 2A and 2B show the portion of MassDOT urban property that discharges directly to the Ten Mile River. The directly discharging roadway includes 2.7 miles of Route 1 and 0.1 miles of Route 1A. The section of Route 1 has two lanes of travel for both the north and southbound traffic with minimal shoulder areas in either direction. The roadway is immediately bordered by commercial and residential properties. In general, Route 1 is crowned along the center of the road. The grading directs runoff towards the catch basins along the edges of the road, which connect to a central drain line under Route 1. The central drain line discharges directly to the Ten Mile River (MA52-02) in several locations along Route 1. In the southern sections of Route 1, the stormwater sheet flows off the roadway and into the Ten Mile River wetland system.

Existing BMPs

MassDOT did not identify any existing BMPs in place to treat roadway runoff from the directly discharging area before reaching the impaired water segment.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the waterbody for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the waterbody for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed Ten Mile River (MA52-02) 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

[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

Integrated List[5] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of Ten Mile 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]

BMP 7U for Impervious Cover Related Impairments

A Final TMDL is not in place to address Ten Mile River's (MA52-02) following impairments: excess algal growth, phosphorus (total), turbidity, and other. Therefore, MassDOT assessed the stormwater-related impairments not addressed by a TMDL using the approach outlined in the Description of MassDOT's Application of Impervious Cover Method in BMP 7U[4] which was developed using the EPA Region I's Impervious Cover (IC) Method, described in EPA's Stormwater TMDL Implementation Support Manual.[7] Consistent with the findings of EPA and others, MassDOT concluded that when a watershed had less than 9% IC, stormwater was not the likely cause of the impairment.

MassDOT calculated the following values for the total contributing watershed and the subwatershed of the impaired water (Ten Mile River) to determine the IC area and set a reduction target. Watersheds are based on the USGS Dataset 451[8] and modified as necessary using topography. MassGIS's impervious surfaces data layer[9] was used to determine the IC of the watersheds. For Ten Mile River (MA52-02), the subwatershed is the same as the total watershed, which is shown in Figure 1.

[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.

[7] ENSR, 2006. Stormwater TMDL Implementation Support Manual for US EPA Region 1. ENSR International & EPA Region 1, Boston, MA. Available at http://www.epa.gov/region1/eco/tmdl/regionalpgrfs.html

[8] USGS Data Series 451 Local and Cumulative Impervious Cover of Massachusetts Stream Basins Available at: http://pubs.usgs.gov/ds/451/

[9] MassGIS Impervious Surfaces datalayer taken from 2005 orthoimagery. Available at: http://www.mass.gov/mgis/impervious_surface.htm

Table 1 Impaired Segment Watershed

	Total/Sub Watershed
Watershed Area	7,040 acres
Impervious Cover (IC) Area	1,545 acres
Percent Impervious	21.9%
IC Area at 9% Effective IC Target	634 acres
Target Effective IC Reduction	59.0%

The total and subwatershed's percent impervious are greater than 9%, indicating that stormwater is a likely contributor to the impairment. To meet the 9% effective IC target, the effective IC within the subwatershed will need to be reduced by the percentage calculated in Table 1. MassDOT then uses the same target percent reduction for their directly contributing watershed as shown in Table 2.

Table 2 MassDOT Directly Contributing Watershed

Directly Contributing Area	22.3 acres
Directly Contributing IC Area	22.3 acres
Percent Impervious	100.0%
Directly Contributing Area Effective IC Reduction Target (59.0% Target Effective IC Reduction of MassDOT Directly Contributing IC Area)	13.2 acres
Target Effective IC	41.0%
Target Effective IC	9.1 acres

Under existing conditions, MassDOT's estimated effective IC exceeds the target as described above. To mitigate the effects of IC, MassDOT will implement stormwater BMPs to the maximum extent practical given site constraints.

This assessment was not able to identify practical locations for stormwater management improvements within the current MassDOT right-of-way. The Proposed Mitigation Plan section discusses the site constraints and mitigation plan.

Proposed Mitigation Plan

During this assessment phase of the Impaired Waters Program, MassDOT has focused on directly contributing areas and identified BMPs that can be constructed entirely on MassDOT property without resulting in substantial wetland impacts or resulting in an adverse impact on historical or archeological resources. Projects that meet these requirements can be implemented under the Impaired Waters Program Retrofit initiative.

The primary site limitation in the Ten Mile River watershed is limited MassDOT right-of-way. Route 1 weaves through residential and commercial spaces. The roadway has very narrow, if any,

shoulders and generally does not have sidewalks. MassDOT's property line is 2–5 feet from the edge of the road, which eliminates the potential for any BMPs. The two wetland systems that abut Route 1, shown in Figure 2B, are another site limitation. High groundwater is likely to prevent infiltration in the existing soils.

Based on the review of MassDOT's directly contributing drainage area, no BMPs have been identified that can be implemented on MassDOT property to address the impairments of the Ten Mile River given the site constraints.

With respect to the fecal coliform impairment, 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.

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 Ten Mile 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 Ten Mile River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education. Further work by MassDOT on programmed projects, which often include broader scale road layout changes, may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to address impairments. MassDOT will include an update in NPDES permit annual reports to EPA regarding proposed BMP design either through retrofit or programmed projects, plans for construction of BMPs, reduction achieved by finalized BMP designs and progress made towards meeting target effective IC reductions.

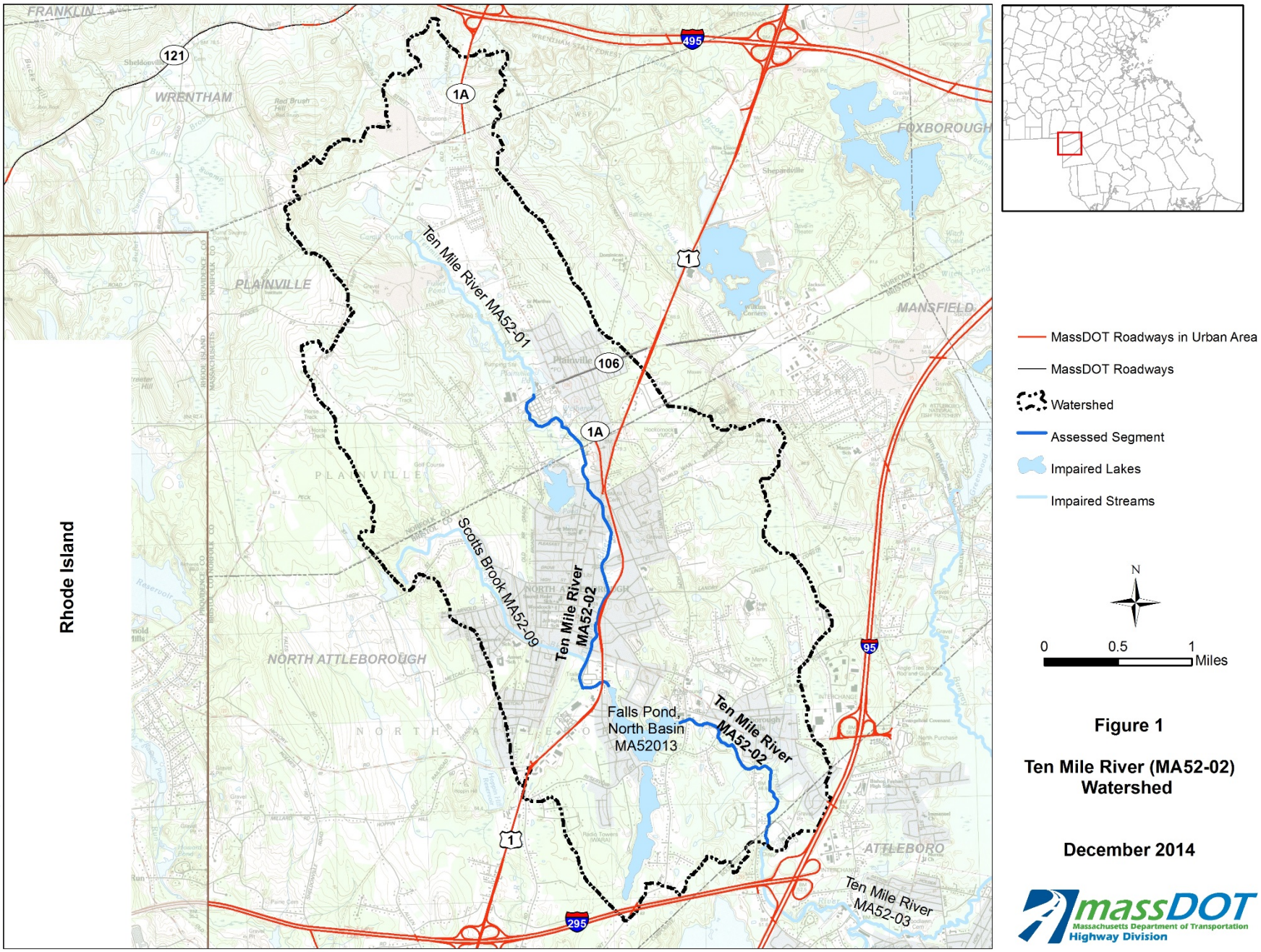

Figure 1

Ten Mile River (MA52-02) Watershed

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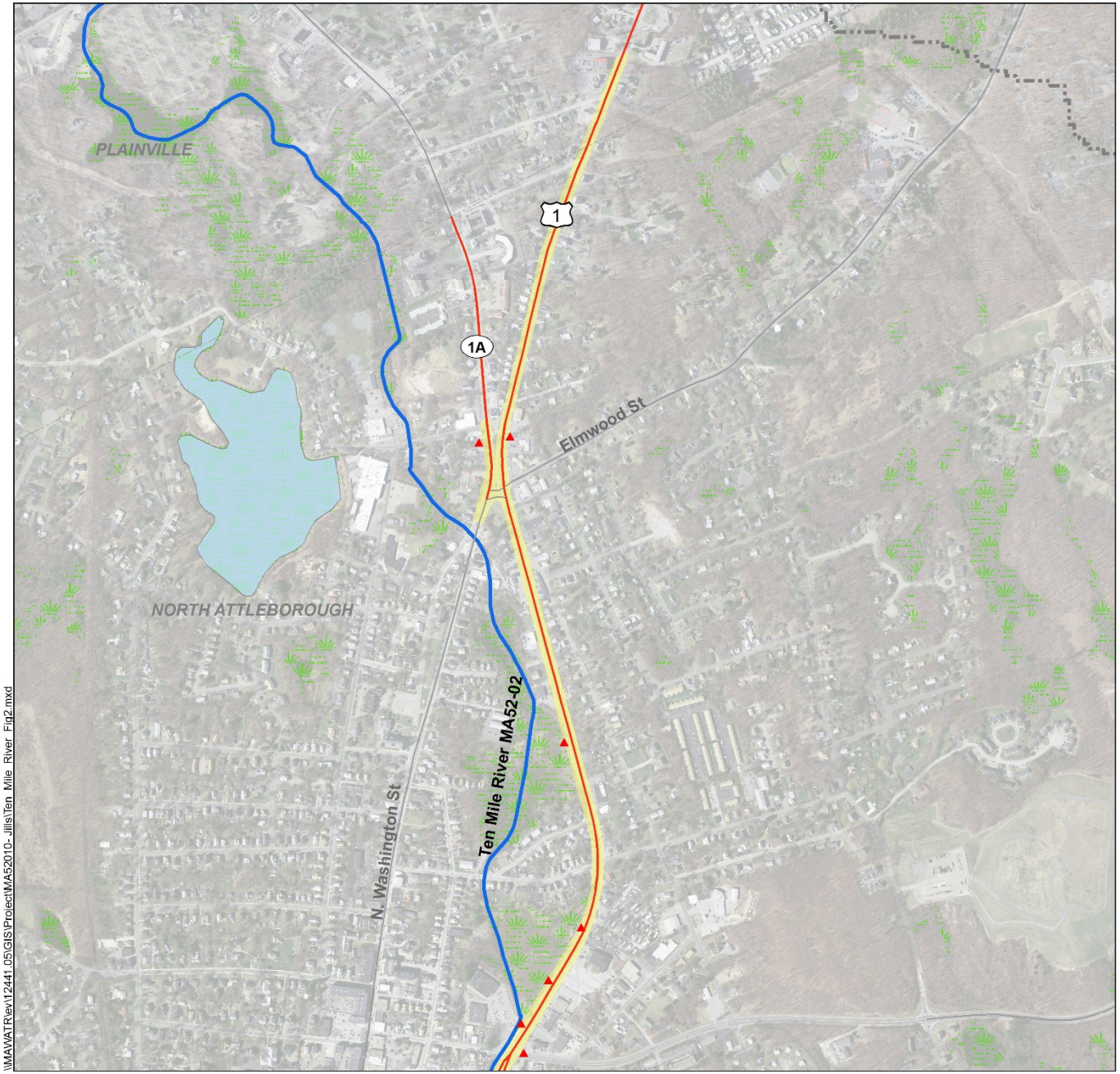

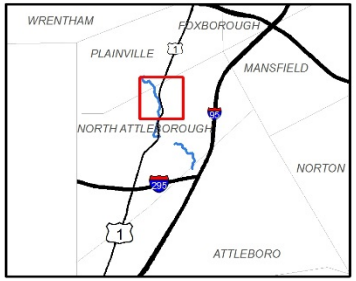

- MassDOT Outfalls
- MassDOT Roadways in Urban Area
- Subwatershed
- MassDOT Directly Discharging Area
- Assessed Segment
- Impaired Streams
- Impaired Lakes
- DEP Wetlands

N

0 500 1,000 Feet

Figure 2A

Ten Mile River (MA52-02)
Directly Contributing
MassDOT Watershed

December 2014

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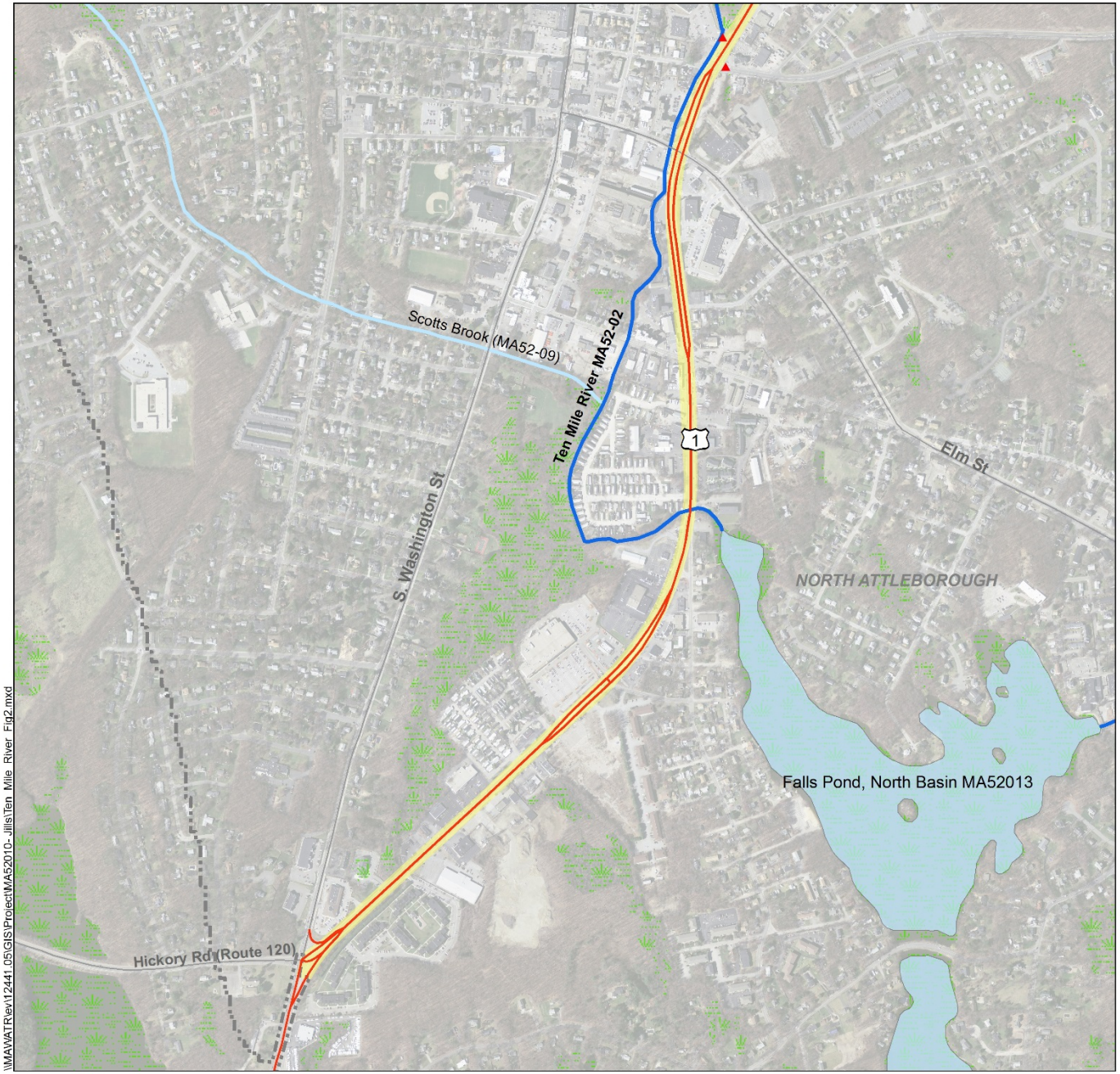

- MassDOT Outfalls
- MassDOT Roadways in Urban Area
- Subwatershed
- MassDOT Directly Discharging Area
- Assessed Segment
- Impaired Streams
- Impaired Lakes
- DEP Wetlands

N

0 500 1,000 Feet

Figure 2B

Ten Mile River (MA52-02) Directly Contributing MassDOT Watershed

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12/08/2014

Impaired Waters Assessment for Ten Mile River (MA52-03)

Summary

Impaired Water[1]	Impairments:	Stormwater:	*Aquatic Plants (Macrophytes), Dissolved Oxygen Saturation, Excess Algal Growth, Fecal Coliform, Organic Enrichment (Sewage) Biological Indicators, Other, Dissolved Oxygen, Phosphorous (Total)*
		Non-Stormwater: [2]	*Chlordane*
	Category:	*5 (Waters requiring a TMDL)*	
	Final TMDLs:	*None*	
	WQ Assessment:	*Ten Mile River Watershed 2002 Water Quality Assessment Report*[3]	
Location	Towns:	*Attleboro*	
	MassDOT Roads:	*I-95, I-295*	
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒	
BMPs	Existing:	*None*	
MassDOT Area and Targets			Impervious Cover (IC)
	Directly Contributing Area:		*26.4 acres*
	Contributing Area Reduction Target:		*16.1 acres*
	Existing BMPs Reduction:		*0.0 acres*
	Remaining Reduction to Meet Target:		*16.1 acres*

[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.massdot.state.ma.us/Portals/8/docs/environmental/impairedWaters/Year3/Year3_ImpairedWatersAssessment_1.pdf#page=308

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

Site Description

Ten Mile River (MA52-03) is a 9.1-mile-long stream that flows from Attleboro, Massachusetts to Seekonk, Rhode Island. The segment originates from Ten Mile River (MA52-02) in Plainville and flows southwest under I-295 and I-95. Ten Mile River (MA52-03) is fed by Bungay River (MA52-06), Speedway Brook (MA52-05), and Sevenmile River (MA52-07) and ends at its confluence with Seekonk River in Providence, Rhode Island.

The total watershed and subwatershed to Ten Mile River (52-03) cover 42.1 square miles and 18.5 square miles, respectively, and are shown in Figure 1. The total watershed encompasses parts of Mansfied, Attleborough, North Attleborough, Wrentham, Foxborough, Rehoboth and Seekonk. The subwatershed encompasses parts of Wrentham, Plainville, North Attleborough, Attleborough and Seekonk and is primarily medium to high-density residential, commercial and industrial.

According to MassDEP's *Ten Mile River Watershed 2002 Water Quality Assessment Report*,[3] Ten Mile River is "impaired" for Aquatic Life, Primary and Secondary Contact, and Aesthetics, and the suspected source is discharges from municipal separate storm sewer systems (MS4s). The causes of impairments to Aquatic Life include elevated levels of total phosphorous and low dissolved oxygen and supersaturation condition. The causes of impairments to Primary and Secondary Contact in this segment include elevated fecal coliform counts, excess algal growth, elevated total phosphorous levels, and occasional observations of turbidity and objectionable deposits. The Aesthetics impairments to this segment cover 1.6 miles and include the presence of fecal coliform bacteria, excess algal growth, aquatic plants/macrophytes, and elevated levels of total phosphorous. These impounded reaches also have dense duckweed and filamentous green algae cover. The remaining 7.5 miles of the segment are assessed as "support" with an "alert" status based on turbidity and isolated areas of trash and debris accumulation. Additionally, Fish Consumption is "impaired" for chlordane, the source of which is unknown.

MassDOT's directly discharging area to Ten Mile River (MA52-03) includes the interchange of I-95 and I-295 and stretches of both roadways beyond the interchange in Attleboro. Figure 2 shows the directly discharging watershed to the segment. The north and southbound lanes of I-95 each have three travel lanes and a breakdown lane and are crowned between the left and middle travel lanes. From North Avenue southward, both sides of I-95 are curbed along the outside lane and are not curbed along the median. Catch basins on the inside and outside of both the north and southbound roadways outlet stormwater into the median, where a ditch carries the water south to Ten Mile River. Another ditch carries stormwater south alongside the southbound shoulder of I-95 within the Ramp A infield and continues across the infield of Ramp B. Upon reaching the entrance ramp to I-95 southbound, the ditch is culverted below the roadway and outfalls to Ten Mile River. This Ramp A/B ditch collects stormwater from the middle, right and breakdown lanes of I-95 southbound via catch basins within the interchange at I-295. This ditch also collects a small amount of flow from the overpass of I-295. The stormwater from Ramp A is collected in catch basins and outlets to a ditch along the north side of the roadway that outlets to Ten Mile River.

The median of Ramp D, on the northbound side of I-95, has a ditch that flows east and is culverted under the ramp to a wetland system; the stormwater that flows to this ditch is an indirect discharge to Ten Mile River.

All direct discharges from I-95 south of the interchange to the southern watershed boundary drains north. The outside lanes of I-95 southbound drain to a ditch along the roadway via catch basins. This ditch is culverted under the overpass of Clifton Street and outlets to Ten Mile River. The outside lanes of I-95 northbound drain to a pipe system along the edge of the roadway that outlets

to Ten Mile River. The interior lanes of I-95 drain to two parallel, north-flowing ditches in the median. Drain inlets along these ditches direct ponded stormwater to the exterior of I-95.

The runoff from the exterior lanes of I-295 sheet flows to ditches on the outside of the roadway. These ditches are culverted under Clifton Street and outlet to Ten Mile River. The interior lanes sheet flow to the median, where ditches bring water toward Ten Mile River and outlet to the exterior ditches.

As shown on Figure 2, there are portions of North Avenue and Clifton Street that are MassDOT urban roadways. The MassDOT-owned portion of North Avenue discharges east, away from Ten Mile River, and is not a direct discharge. The MassDOT-owned portions of Clifton Street run parallel to Ten Mile River and appear to directly discharge.

A site visit conducted in September, 2014 identified areas that may be suitable for potential BMPs to treat stormwater along this roadway system. Opportunities include installing check dams in the ditches within the median of I-95, as well as infiltration swales and basins in the exit ramp medians. The feasibility of potential BMPs will be investigated further and confirmed during the design phase.

MassDOT project number 606733 has recently been designed to straighten the curvature of Ramp A. This project would involve some changes to the current drainage patterns at this location. Project 606733 is currently out to bid and construction has not yet started. The effective IC reduction that may be provided by BMPs constructed as part of this project has not been accounted for in this report, but it will be investigated during later stages of the assessment and design process.

Existing BMPs

MassDOT did not identify any existing BMPs in place to treat roadway runoff from the directly discharging area before reaching the impaired water segment.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the waterbody for the impairments covered by the TMDL under the BMP 7R methodology.[4] MassDOT separately assesses the waterbody for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[5] MassDOT assessed Ten Mile River (MA52-03) using the methodologies described below.

MassDOT has identified a water body impairment in the Ten Mile River watershed which is not related to stormwater runoff. The specific impairment unrelated to stormwater for the Ten Mile River is chlordane. In accordance with MassDOT's Impaired Waters Assessment for Impaired Waters with Impairments Unrelated to Stormwater[2] in the December 8, 2012 EPA submittal, the non-stormwater related impairments are not specifically addressed as part of the Impaired Waters Program.

[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

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[6] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of Ten Mile 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[5] 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]

BMP 7U for Impervious Cover Related Impairments

A Final TMDL is not in place to address Ten Mile River's (MA52-03) following impairments: aquatic plants (macrophytes), dissolved oxygen saturation, excess algal growth, organic enrichment (sewage) biological indicators, other, dissolved oxygen, and phosphorus (total). Therefore, MassDOT assessed the stormwater-related impairments not addressed by a TMDL using the approach outlined in the Description of MassDOT's Application of Impervious Cover Method in BMP 7U[5] which was developed using the EPA Region I's Impervious Cover (IC) Method, described in EPA's Stormwater TMDL Implementation Support Manual.[8] Consistent with the findings of EPA and others, MassDOT concluded that when a watershed had less than 9% IC, stormwater was not the likely cause of the impairment.

MassDOT calculated the following values for the total contributing watershed and the subwatershed of the impaired water (Ten Mile River) to determine the IC area and set a reduction target. Watersheds are based on the USGS Dataset 451[9] and modified as necessary using topography. MassGIS's impervious surfaces data layer[10] was used to determine the IC of the watersheds. The total watershed and the subwatershed are shown in Figure 1.

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

[8] ENSR 2006. Stormwater TMDL Implementation Support Manual for US EPA Region 1. ENSR International & EPA Region 1, Boston, MA. Available at http://www.epa.gov/region1/eco/tmdl/regionalpgrfs.html

[9] USGS Data Series 451 Local and Cumulative Impervious Cover of Massachusetts Stream Basins Available at: http://pubs.usgs.gov/ds/451/

[10] MassGIS Impervious Surfaces datalayer taken from 2005 orthoimagery. Available at: http://www.mass.gov/mgis/impervious_surface.htm

Table 1 Impaired Segment Watershed

	Total Watershed	Subwatershed
Watershed Area	26,915 acres	11,871 acres
Impervious Cover (IC) Area	5,419 acres	2,748 acres
Percent Impervious	20.1%	23.2%
IC Area at 9% Effective IC Target	2,422 acres	1,068 acres
Target Effective IC Reduction	55.3%	61.1%

The total and subwatersheds percent impervious are greater than 9% indicating that stormwater is a likely contributor to the impairment. To meet the 9% effective IC target, the effective IC within the subwatershed will need to be reduced by the percentage calculated in Table 1. MassDOT then uses the same target percent reduction for their directly contributing watershed as shown in Table 2.

Table 2 MassDOT Directly Contributing Watershed

Directly Contributing Area	82.3 acres
Directly Contributing IC Area	26.4 acres
Percent Impervious	32.1%
Directly Contributing Area Effective IC Reduction Target (61.1% Target Effective IC Reduction of MassDOT Directly Contributing IC Area)	16.1 acres
Target Effective IC	12.5%
Target Effective IC	10.3 acres

Under existing conditions, MassDOT's estimated effective IC exceeds the target as described above. To mitigate the effects of IC, MassDOT will implement stormwater BMPs to the maximum extent practical given site constraints.

This assessment has identified locations for potential stormwater BMPs. The Proposed Mitigation Plan section describes the next steps for the potential BMPs to reduce the effective IC.

Proposed Mitigation Plan

During this assessment phase of the Impaired Waters Program, MassDOT has focused on directly contributing areas and identified BMPs that can be constructed entirely on MassDOT property without resulting in substantial wetland impacts or resulting in an adverse impact on historical or archeological resources. Projects that meet these requirements can be implemented under the Impaired Waters Program Retrofit initiative.

MassDOT has identified that additional control measures are needed to reduce its effective IC within the directly contributing watershed to achieve the targeted reduction and that appropriate locations are potentially available for control measures. MassDOT will now work with its design consultants to identify locations suitable for construction of additional BMPs to treat stormwater

runoff from directly contributing IC as part of MassDOT's Impaired Waters Retrofit Initiative. The project designer will gather additional information in this phase, such as soil data, wetland delineations, and site survey, to further refine the proposed BMPs.

MassDOT will review programmed project 606733 to account for stormwater treatment and reductions to effective IC provided by BMPs installed as part of the project, and additional BMPs may be proposed in order to meet the remaining IC reduction target. Once the design of the proposed BMPs is finalized, MassDOT will provide an update in the NPDES permit annual report with BMP information and summarize the final effective IC reduction. The design consultants will develop construction plans for BMPs that will aim to provide the target IC reduction to the maximum extent practical.

With respect to the fecal coliform impairment, 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,[7] MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements in regard to pathogens.

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 Ten Mile 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 Ten Mile River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education. Further work by MassDOT on programmed projects, which often include broader scale road layout changes, may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to address impairments. MassDOT will include an update in NPDES permit annual reports to EPA regarding proposed BMP design either through retrofit or programmed projects, plans for construction of BMPs, reduction achieved by finalized BMP designs and progress made towards meeting target effective IC reductions.

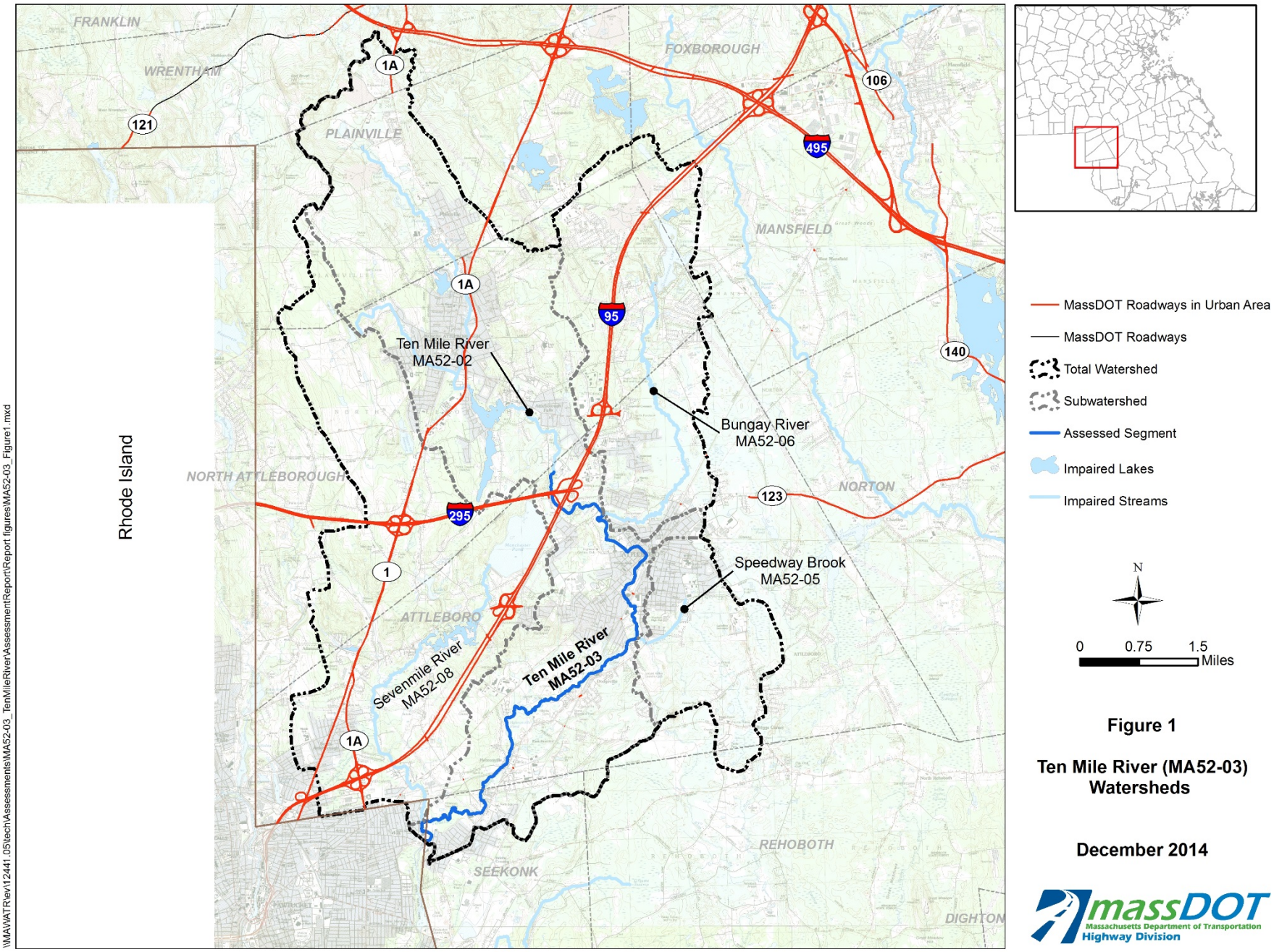

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Figure 1

Ten Mile River (MA52-03) Watersheds

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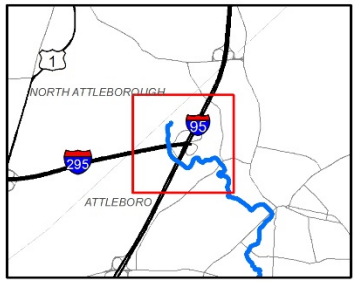

Channel/Ditch
Culvert/Pipe
MassDOT Directly Discharging Area
MassDOT Roadways in Urban Area
Subwatershed
Assessed Segment
Impaired Streams
Non-Impaired Lakes
DEP Wetlands

N

0 375 750
Feet

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Figure 2

Ten Mile River (MA52-03)
Directly Contributing
MassDOT Watershed

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Impaired Waters Assessment for Fourmile Brook (MA52-10)

Summary

Impaired Water[1]	Stormwater Impairments:	*Sedimentation/Siltation*
	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, Route 123*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒
BMPs	Existing:	*None*
MassDOT Area and Targets		Impervious Cover (IC)
	Directly Contributing Area:	*25.4 acres*
	Contributing Area Reduction Target:	*4.1 acres*
	Existing BMPs Reduction:	*0.0 acres*
	Remaining Reduction to Meet Target:	*4.1 acres*

Site Description

Fourmile Brook (MA52-10) is a 1.0-mile-long stream in Attleboro, Massachusetts located just west of the interchange of I-95 and Route 123. The stream originates from the southern end of the Manchester Pond Reservoir (an unimpaired lake) and outlets to Orrs Pond (MA52029). Fourmile Brook is classified as a Class A Public Water Supply and an Outstanding Water Resource and is part of the Ten Mile Watershed, which is part of the larger Narragansett Bay Watershed. The land

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

use within Fourmile Brook's watershed (shown in Figure 1) is a combination of medium-density residential and forest.

According to the *Ten Mile River Watershed 2002 Water Quality Assessment Report*,[2] Fourmile Brook is "impaired" for the designated use of Aquatic Life due to heavy sedimentation, which compromises all types of aquatic habitat throughout the entire reach. The stream was assessed as "support" for Aesthetics, Primary Contact, and Secondary Contact uses because field observations indicated lack of objectionable aesthetic conditions, and bacteria testing determined fecal coliform counts to be low. Water quality monitoring determined that total dissolved solids, total suspended solids, phosphorous, and dissolved oxygen levels in the stream meet MassDEP water quality standards.

The interchange of I-95 and Route 123 directly discharges to Fourmile Brook via conveyance ditches as shown in Figure 2A. The north and southbound sides of I-95 each have three travel lanes and a breakdown lane. On both sides of I-95, the roadway is curbed along the breakdown lane and is not curbed along the median. Catch basins on both sides of the southbound and northbound roadway outlet to the main conveyance ditch shown in Figure 2B. Drain inlets along the center of the median collect sheet flow and outlet to the conveyance ditch. All lanes of I-95 in the subwatershed directly discharge to Fourmile Brook. This drainage pattern continues south from the northern edge of the watershed until the interchange at Route 123. Figure 2B shows the channels, ditches, and drain pipes of the exit ramp system in more detail. The conveyance ditch is culverted under I-95 and forms an open channel through the infield of Ramp A. All stormwater from Ramp A is directed toward this channel. The channel is then culverted under the ramp and into a straight, open channel along Prescott Street, which flows west and outlets into Fourmile Brook.

Each ramp is graded so that stormwater along the curves enters the ramp infield. Stormwater from Ramp B and Ramp C is directed to the Prescott Street channel via an open channel that crosses the I-95 median and the Ramp B infield. Stormwater from I-95 south of the Route 123 is directed to the median and into this open channel. The channel is piped under Route 123 and into the Prescott Street channel. Stormwater from MassDOT's section of Route 123 is collected in catch basins that direct stormwater either to the main conveyance ditch (via a pipe system under Ramp D) or directly to the Prescott Street channel.

A site visit conducted in September 2014 identified areas that may be suitable for potential BMPs to treat stormwater along this roadway system. Opportunities include installing swales in the median of I-95, check dams along the main conveyance ditch, and infiltration basins in some open areas of the exit ramp infields. The feasibility of potential BMPs will be investigated further and confirmed during the design phase.

Existing BMPs

MassDOT did not identify any existing BMPs in place to treat roadway runoff from the directly discharging area before reaching the impaired water segment. While the main conveyance ditch has retrofit potential to provide water quality improvements, it does not currently detain the water, so it was not considered as an existing BMP.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the waterbody for the impairments covered by the TMDL under the BMP 7R methodology.[3] MassDOT separately assesses the waterbody for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[4] MassDOT assessed Fourmile Brook (MA52-10) 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 Fourmile Brook is not proposed to change.

BMP 7U for Impervious Cover Related Impairments

A Final TMDL is not in place to address Fourmile Brook's (MA52-10) following impairments: sedimentation/siltation. Therefore, MassDOT assessed the stormwater-related impairments not addressed by a TMDL using the approach outlined in the Description of MassDOT's Application of Impervious Cover Method in BMP 7U[4] which was developed using the EPA Region I's Impervious Cover (IC) Method, described in EPA's Stormwater TMDL Implementation Support Manual.[6] Consistent with the findings of EPA and others, MassDOT concluded that when a watershed had less than 9% IC, stormwater was not the likely cause of the impairment.

MassDOT calculated the following values for the total contributing watershed and the subwatershed of the impaired water (Fourmile Brook) to determine the IC area and set a reduction target. Watersheds are based on the USGS Dataset 451[7] and modified as necessary using topography. MassGIS's impervious surfaces data layer was used to determine the IC of the watersheds.[8] The total watershed and the subwatershed are one and the same and are shown in Figure 1.

[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] ENSR, 2006. Stormwater TMDL Implementation Support Manual for US EPA Region 1. ENSR International & EPA Region 1, Boston, MA. Available at http://www.epa.gov/region1/eco/tmdl/regionalpgrfs.html

[7] USGS Data Series 451 Local and Cumulative Impervious Cover of Massachusetts Stream Basins Available at: http://pubs.usgs.gov/ds/451/

[8] MassGIS Impervious Surfaces datalayer taken from 2005 orthoimagery. Available at: http://www.mass.gov/mgis/impervious_surface.htm

Table 1 Impaired Segment Watershed

	Total/Sub Watershed
Watershed Area	1,045 acres
Impervious Cover (IC) Area	112 acres
Percent Impervious	10.7%
IC Area at 9% Effective IC Target	94 acres
Target Effective IC Reduction	16.2%

*Rounding accounts for differences in calculations.

The total and subwatersheds percent impervious are greater than 9% indicating that stormwater is a likely contributor to the impairment. To meet the 9% effective IC target, the effective IC within the subwatershed will need to be reduced by the percentage calculated in Table 1. MassDOT then uses the same target percent reduction for their directly contributing watershed as shown in Table 2.

Table 2 MassDOT Directly Contributing Watershed

Directly Contributing Area	83.0 acres
Directly Contributing IC Area	25.4 acres
Percent Impervious	30.6%
Directly Contributing Area Effective IC Reduction Target (16.2% Target Effective IC Reduction of MassDOT Directly Contributing IC Area)	4.1 acres
Target Effective IC	25.6%
Target Effective IC	21.3 acres

*Rounding accounts for differences in calculations.

Under existing conditions, MassDOT's estimated effective IC exceeds the target as described above. To mitigate the effects of IC, MassDOT will implement stormwater BMPs to the maximum extent practical given site constraints.

This assessment has identified locations for potential stormwater BMPs. The Proposed Mitigation Plan section describes the next steps for the potential BMPs to reduce the effective IC.

Proposed Mitigation Plan

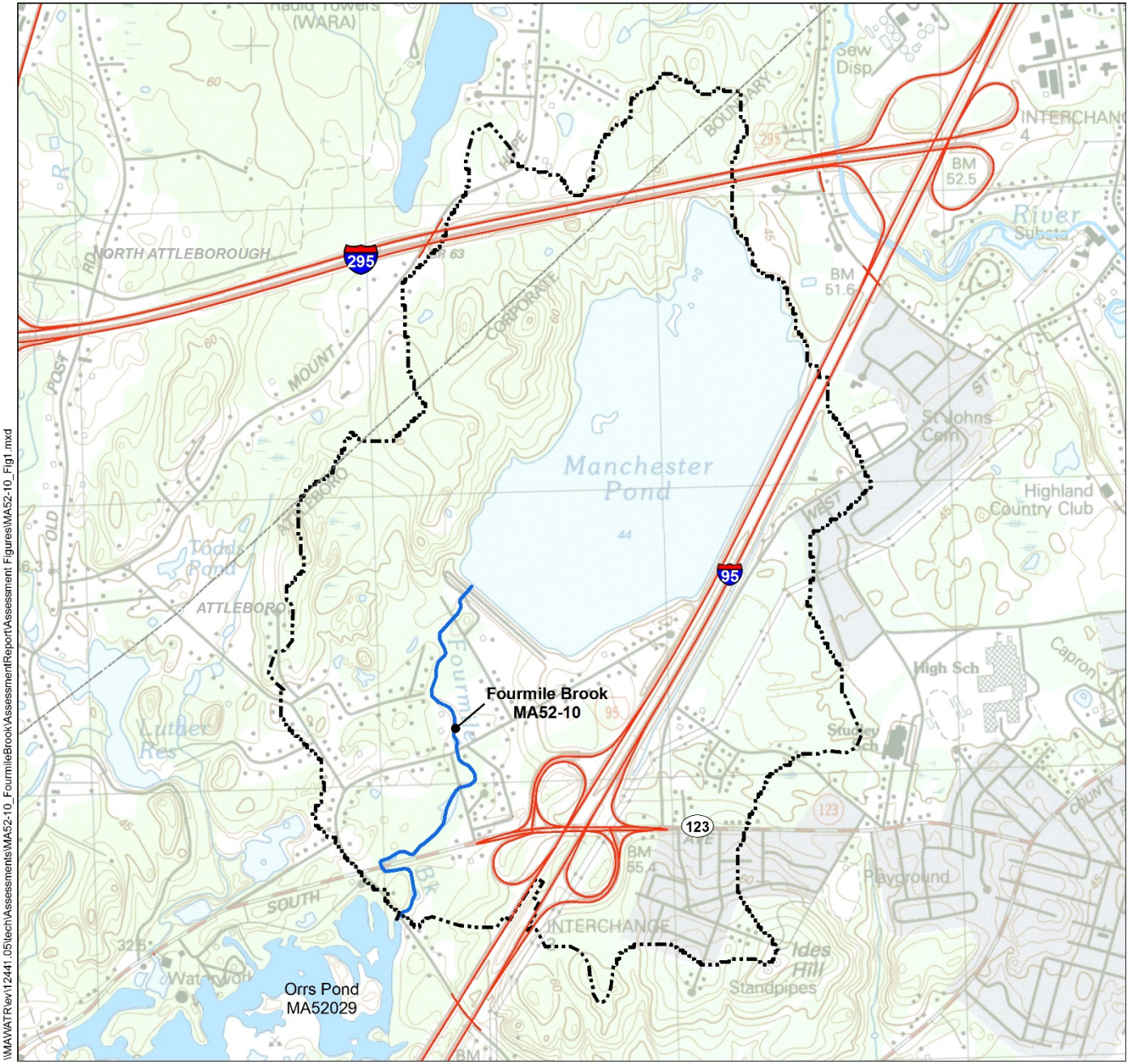
During this assessment phase of the Impaired Waters Program, MassDOT has focused on directly contributing areas and identified BMPs that can be constructed entirely on MassDOT property without resulting in substantial wetland impacts or resulting in an adverse impact on historical or archeological resources. Projects that meet these requirements can be implemented under the Impaired Waters Program Retrofit initiative.

MassDOT has identified that additional control measures are needed to reduce its effective IC within the directly contributing watershed to achieve the targeted reduction and that appropriate locations are potentially available for control measures. MassDOT will now work with its design

consultants to identify locations suitable for construction of additional BMPs to treat stormwater runoff from directly contributing IC as part of MassDOT's Impaired Waters Retrofit Initiative. The project designer will gather additional information in this phase, such as soil data, wetland delineations, and site survey, to further refine the proposed BMPs. The design consultants will develop construction plans for BMPs that will aim to provide the target IC reduction or pollutant load reduction to the maximum extent practical.

Once the design of the proposed BMPs is finalized, MassDOT will provide an update in the NPDES permit annual report with BMP information and summarize the final effective IC reduction.

MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Fourmile Brook, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education. Further work by MassDOT on programmed projects, which often include broader scale road layout changes, may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to address impairments. MassDOT will include an update in NPDES permit annual reports to EPA regarding proposed BMP design either through retrofit or programmed projects, plans for construction of BMPs, reduction achieved by finalized BMP designs and progress made towards meeting target effective IC reduction



MassDOT Roadways in Urban Area

Watershed

Assessed Segment

Impaired Lakes

Impaired Streams

N

0 750 1,500 Feet

Figure 1

Fourmile Brook (MA52-10) Watershed

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- Conveyance Ditch/Channels
- MassDOT Roadways in Urban Area
- Watershed
- MassDOT Directly Discharging Area
- Assessed Segment
- Impaired Lakes
- Non-Impaired Lakes

N

0 450 900 Feet

Figure 2A

Fourmile Brook (MA52-10) Directly Contributing MassDOT Watershed

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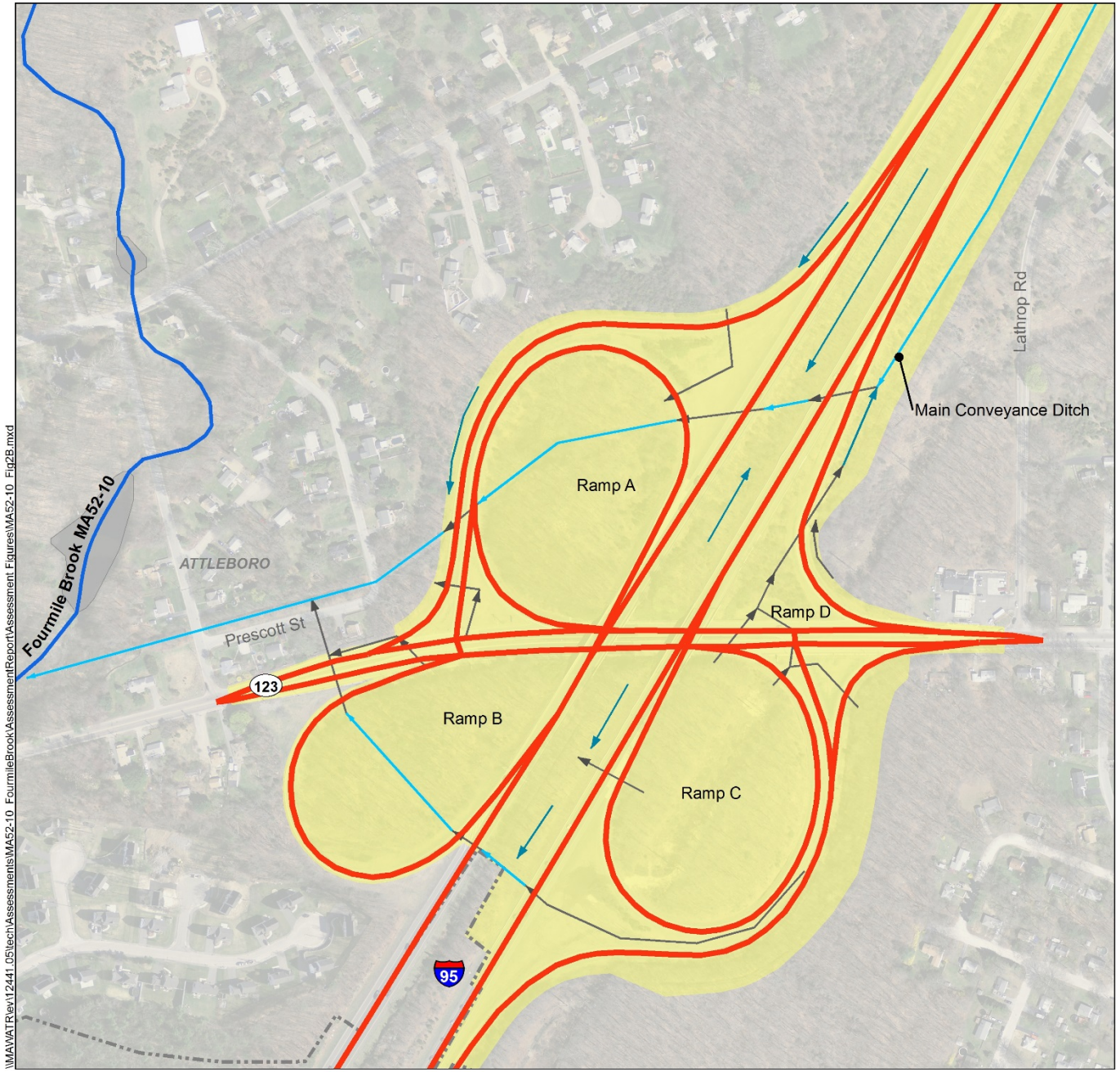

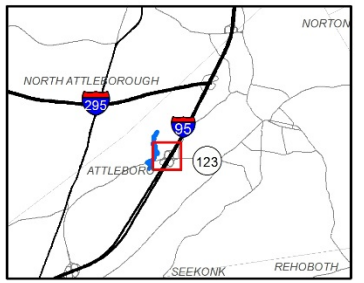

- Conveyance Ditch/Channels
- Ditch Flow
- Drainpipes/Culverts
- MassDOT Roadways in Urban Area
- Watershed
- MassDOT Directly Discharging Area
- Assessed Segment

N

0 175 350 Feet

Figure 2B

Fourmile Brook (MA52-10)
Stormwater Flowpaths
I-95 & Route 123

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massDOT Massachusetts Department of Transportation Highway Division

12/08/2014

Impaired Waters Assessment for Belle Isle Inlet (MA71-14)

Summary

Impaired Water[1]	Impairments:	Stormwater:	*Fecal coliform, Other (contaminants in fish and shellfish)*
		Non-Stormwater:[2]	*PCB in fish tissue*
	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:	*Boston, Revere and Winthrop*	
	MassDOT Roads:	*Route 1A, Route 16, Route 60, Bennington Street, State Road, Eliot Circle, North Shore Road, and the Revere Beach Parkway Bridge*	
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒	
BMPs	Existing:	*None*	

MassDOT Area and Targets	Impervious Cover (IC)
Directly Contributing Area:	*3.0 acres*
Contributing Area Reduction Target:	*2.3 acres*
Existing BMPs Reduction:	*0.0 acres*
Remaining Reduction to Meet Target:	*2.3 acres*

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.massdot.state.ma.us/Portals/8/docs/environmental/impairedWaters/Year3/Year3_ImpairedWatersAssessment_1.pdf#page=308

3 MassDEP, March 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

Site Description

Belle Isle Inlet (MA71-14) has a surface area of approximately 0.12 square miles and originates at the Bennington Street tide gate at the Boston/Revere City Line to its confluence with Winthrop Bay (MA70-10) at the Boston/Winthrop Town Line in Massachusetts. MassDEP's Water Quality Assessment Report[4] for this receiving water identified the Fish Consumption Use with an "impaired" status due to PCBs and other contaminants. The receiving water also is identified with an "impaired" status for the Shellfish Harvesting Use based upon a Division of Marine Fisheries prohibition due to fecal coliform. All other uses were "not assessed".

The total and subwatersheds of Belle Isle Inlet, which are the same, are shown on Figure 1 and include the cities of Boston and Revere as well as the town of Winthrop. The MassDOT roadways in the Belle Isle Inlet watershed, which includes portions of Route 1A, Route 16, Route 60, Bennington Street, State Road, Eliot Circle, North Shore Road and the Revere Beach Parkway Bridge are also shown on Figure 1. The watershed to Belle Isle Inlet is comprised mainly of commercial, industrial, high density and multifamily residential land with some spectator recreation and open space including Suffolk Downs Race Track.

Figure 2 shows the MassDOT directly discharging area, the limits of which were determined by the existing drainage infrastructure and roadway high points. The only MassDOT-owned road within the watershed that directly discharges into Belle Isle Inlet (MA71-14) is Bennington Street. Stormwater runoff is primarily collected by catch basins along the edge of the road and is discharged to Belle Isle Inlet via a MassDOT stormwater outfall at the culvert under Bennington Street. The Bennington Street right-of-way is eighty-feet wide, consists of four undivided lanes, two ten-foot wide shoulders and two sidewalks. The roadway is curbed and generally bounded by commercial and residential uses.

Stormwater runoff from Eliot Circle and the portion of the Revere Beach Parkway Bridge east of the high point located in the middle of the bridge gets collected by a drainage network that discharges into the Lynn Harbor (MA93-53) which is assessed separately. Stormwater runoff from State Road, North Shore Boulevard and the portion of the Revere Beach Parkway Bridge west of the high point located in the middle of the bridge gets collected by a drainage network that discharges into Sales Creek (MA71-12).

Belle Isle Inlet is located within the Rumney Marshes Area of Critical Environmental Concern (ACEC) as shown on Figure 2.

Existing BMPs

MassDOT did not identify any existing BMPs in place to treat roadway runoff from the directly discharging area before reaching the impaired water segment.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the waterbody for the impairments covered by the TMDL under the BMP 7R methodology.[5] MassDOT separately

[4] MassDEP, March 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

[5] 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

assesses the waterbody for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[6] MassDOT assessed Belle Isle Inlet (MA71-14) using the methodologies described below.

MassDOT has identified a water body impairment in the Belle Isle Inlet watershed that is not related to stormwater runoff. The specific impairment unrelated to stormwater for the Belle Isle Inlet is PCB in fish tissue. 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.[7]

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[9] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of Belle Isle Inlet 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 Storm Water Management Plan (SWMP)[10] 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.[11]

BMP 7U for Impervious Cover Related Impairments

A Final TMDL is not in place to address Belle Isle Inlet's (MA71-14) following impairments: other (contaminants in fish and shellfish). Therefore, MassDOT assessed the stormwater-related impairments not addressed by a TMDL using the approach outlined in the Description of

[6] 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

[7] 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

[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

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

MassDOT's Application of Impervious Cover Method in BMP 7U[12] which was developed using the EPA Region I's Impervious Cover (IC) Method, described in EPA's Stormwater TMDL Implementation Support Manual.[13] Consistent with the findings of EPA and others, MassDOT concluded that when a watershed had less than 9% IC, stormwater was not the likely cause of the impairment.

MassDOT calculated the following values for the total contributing watershed of the impaired water (Belle Isle Inlet) to determine the IC area and set a reduction target. The Watershed is based on the USGS Dataset 451 and modified as necessary using topography.[14] MassGIS's impervious surfaces data layer was used to determine the IC of the watershed.[15] The total watershed is shown on Figure 1.

Table 1 Impaired Segment Watershed

	Total Watershed
Watershed Area	1,110 acres
Impervious Cover (IC) Area	558 acres
Percent Impervious	50 %
IC Area at 9% Effective IC Target	100 acres
Target Effective IC Reduction	82 %

The total watershed percent impervious is greater than 9% indicating that stormwater is a likely contributor to the impairment. To meet the 9% effective IC target, the effective IC within the watershed will need to be reduced by the percentage calculated in Table 1. MassDOT then uses the same target percent reduction for their directly contributing watershed as shown in Table 2.

Table 2 MassDOT Directly Contributing Watershed

Directly Contributing Area	3.0 acres
Directly Contributing IC Area	2.8 acres
Percent Impervious	93%
Directly Contributing Area Effective IC Reduction Target (82% Target Effective IC Reduction of MassDOT Directly Contributing IC Area)	2.3 acres
Target Effective IC	17%
Target Effective IC	0.5 acres

[12] 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

[13] ENSR 2006. Stormwater TMDL Implementation Support Manual for US EPA Region 1. ENSR International & EPA Region 1, Boston, MA. Available at http://www.epa.gov/region1/eco/tmdl/regionalpgrfs.html

[14] USGS Data Series 451 Local and Cumulative Impervious Cover of Massachusetts Stream Basins Available at: http://pubs.usgs.gov/ds/451/

[15] MassGIS Impervious Surfaces datalayer taken from 2005 orthoimagery. Available at: http://www.mass.gov/mgis/impervious_surface.htm

Under existing conditions, MassDOT's estimated effective IC exceeds the target as described above. To mitigate the effects of IC, MassDOT will implement stormwater BMPs to the maximum extent practical given site constraints.

This assessment was not able to identify practical locations for stormwater management improvements within the current MassDOT right-of-way. The Proposed Mitigation Plan section discusses the site constraints and mitigation plan.

Proposed Mitigation Plan

During this assessment phase of the Impaired Waters Program, MassDOT has focused on directly contributing areas and identified BMPs that can be constructed entirely on MassDOT property without resulting in substantial wetland impacts or resulting in an adverse impact on historical or archeological resources. Projects that meet these requirements can be implemented under the Impaired Waters Program Retrofit initiative.

Site limitations in the Belle Isle Inlet watershed include limited MassDOT property, consisting of an eighty-foot wide right-of-way made up of four undivided twelve-foot travel lanes, two ten-foot wide shoulders and two six-foot wide sidewalks which are generally bounded by commercial and residential uses.

Based on the review of MassDOT's directly contributing drainage area, no BMPs have been identified that can be implemented on MassDOT property to address the impairments of the Belle Isle Inlet given the site constraints.

With respect to the fecal coliform impairment, 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[16], MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements in regard to pathogens.

As part of its pet waste management program, MassDOT has determined that no MassDOT targeted rest stops are located within the watershed 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.

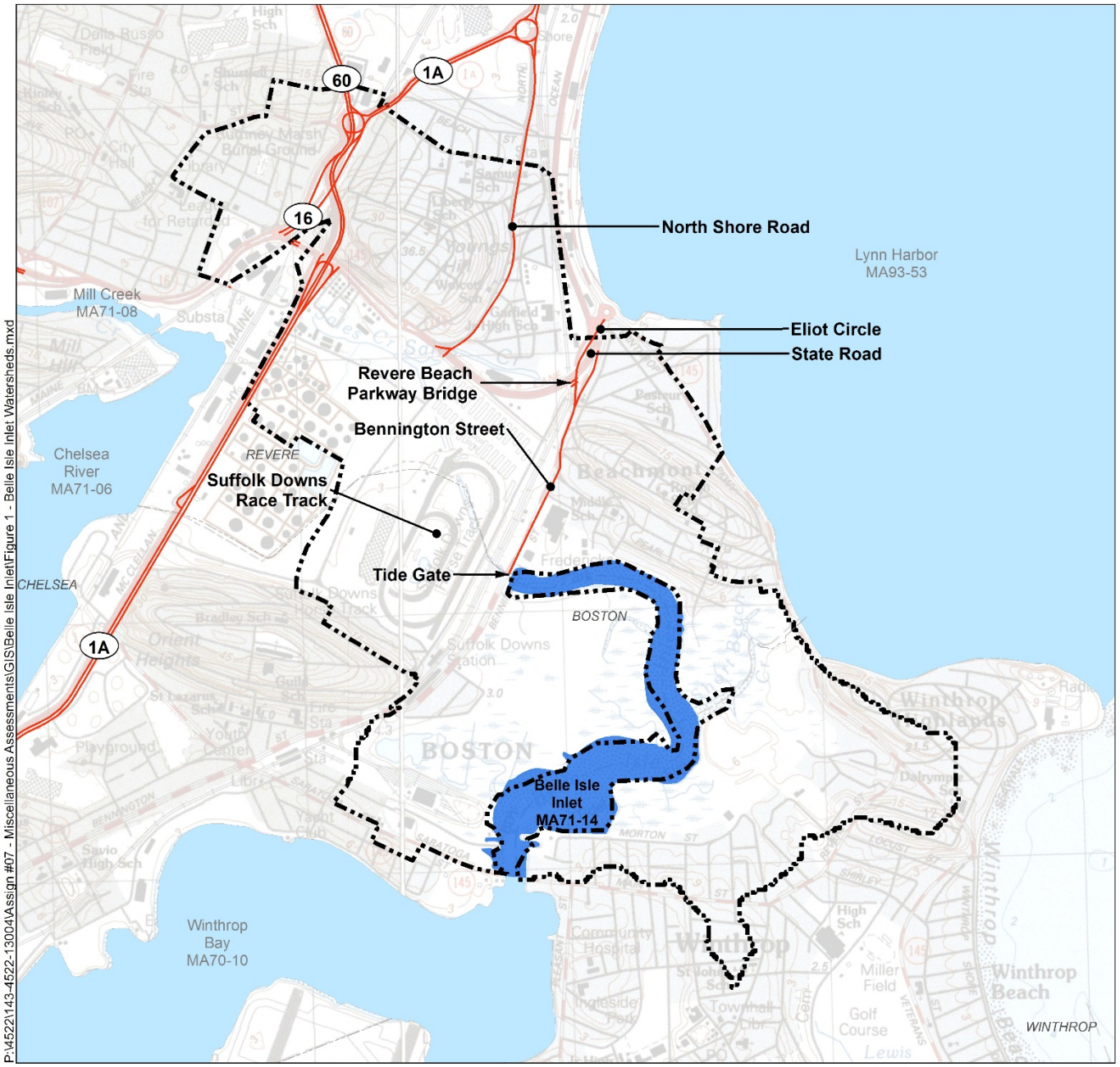
Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and 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 watershed of this water body that could be contributing pathogens to the impaired water body.

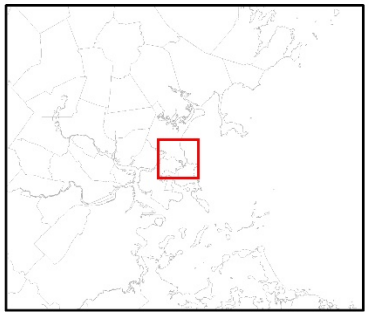
MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Belle Isle Inlet. These measures achieve pathogen reductions (including fecal coliform) to the maximum extent practicable and are consistent with the intent of its existing stormwater permit. As stated previously, pathogen loadings are highly variable and although there

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

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 Belle Isle Inlet, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education. Further work by MassDOT on programmed projects, which often include broader scale road layout changes, may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to address impairments. MassDOT will include an update in NPDES permit annual reports to EPA regarding proposed BMP design either through retrofit or programmed projects, plans for construction of BMPs, reduction achieved by finalized BMP designs and progress made towards meeting target effective IC reductions.





MassDOT Roadways in Urban Area

MassDOT Roadways

Watershed

Assessed Segment

Impaired Lakes

Impaired Streams

N

0 1,000 2,000 Feet

Figure 1

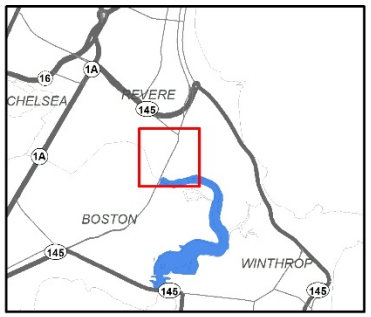
Belle Isle Inlet (MA71-14) Watersheds

December 2014

massDOT Massachusetts Department of Transportation Highway Division

P:\4522\143-4522-13004\Assign #07 - Miscellaneous Assessments\GIS\Belle Isle Inlet\Figure 1 - Belle Isle Inlet Watersheds.mxd

P:\45221\43-4522-13004\Assign #07 - Miscellaneous Assessments\GIS\Belle Isle Inlet\Figure 2 - Belle Isle Inlet Directly Discharging Watershed.mxd



- MassDOT Outfalls
- MassDOT Roadways in Urban Area
- Assessed Segment
- Impaired Streams
- Impaired Lakes
- MassDOT Directly Discharging Area
- DEP Wetlands
- Hydrologic Connection
- Areas of Critical Environmental Concern (ACEC)

N

0 150 300 Feet

Figure 2

Belle Isle Inlet (MA71-14) Directly Contributing MassDOT Watershed

December 2014

MassDOT Massachusetts Department of Transportation Highway Division

Impaired Waters Assessment for Unnamed Tributary (MA73-33)

Summary

Impaired Water[1]	Stormwater Impairments:	*Color, Escherichia coli, Phosphorus (Total), Taste and Odor*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Neponset River Watershed 2004 Water Quality Assessment Report*[2]
Location	Towns:	*Norwood*
	MassDOT Roads:	*Route 1*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL) ☒
BMPs	Existing:	*None*
MassDOT Area and Targets		Impervious Cover (IC)
	Directly Contributing Area:	*4.2 acres*
	Contributing Area Reduction Target:	*3.4 acres*
	Existing BMPs Reduction:	0 *acres*
	Remaining Reduction to Meet Target:	*3.4 acres*

Site Description

Unnamed Tributary (MA73-33) is located in Norwood, Massachusetts, and is locally known as Meadow Brook. Unnamed Tributary flows in a mostly southeast direction for approximately 0.6-miles, beginning where the underground/culverted stream emerges east of Pleasant Street to the confluence with the Neponset River east of Route 1 as shown in Figure 1. The total and subwatershed of Unnamed Tributary are the same and consist mostly of medium to high density

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. *Neponset River Watershed 2004 Water Quality Assessment Report*. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/73wqar10.pdf

residential and commercial area. MassDEP's Water Quality Assessment Report[3] lists Primary and Secondary Contact Uses as "Impaired" due to E. coli samples collected in 2007 and 2008. The assessment report lists the source of impairment as being "Source Unknown" for both uses.

The total watershed and subwatershed for Unnamed Tributary is approximately 744-acres (Figure 1). The MassDOT-owned roadways located within the Unnamed Tributary watershed include portions of Route 1 and Route 1A. Only runoff from Route 1 directly contributes to Unnamed Tributary (Figure 2). Route 1 consists of two lanes, a paved shoulder, and curbing for both the northbound and southbound directions. A concrete median with guardrail divides the north and southbound travel lanes. Unnamed Tributary flows under Route 1 through a box culvert.

Runoff is collected in a series of catch basins along the median and shoulders of Route 1, and outfalls to the Unnamed Tributary through outlet pipes within the box culvert. This was verified by reviewing record plans and during a site visit on August 14, 2014.

The area of Route 1 adjacent to Unnamed Tributary is a high density commercial area. Site constraints within Unnamed Tributary watershed include limited right-of-way along Route 1 and existing infrastructure and utilities.

Existing BMPs

MassDOT did not identify any existing BMPs in place to treat roadway runoff from the directly discharging area before reaching the impaired water segment during a site visit on August 14, 2014.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the waterbody for the impairments covered by the TMDL under the BMP 7R methodology.[4] MassDOT separately assesses the waterbody for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[5] MassDOT assessed Unnamed Tributary (MA73-33) 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

[3] MassDEP, 2008. *Neponset River Watershed 2004 Water Quality Assessment Report*. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/73wqar10.pdf

[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] 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

Integrated List[7] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of Unnamed Tributary 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)[8] 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.[9]

BMP 7U for Impervious Cover Related Impairments

A Final TMDL is not in place to address Unnamed Tributary's (MA73-33) following impairments: color, phosphorus (total), taste and odor. Therefore, MassDOT assessed the stormwater-related impairments not addressed by a TMDL using the approach outlined in the Description of MassDOT's Application of Impervious Cover Method in BMP 7U[10] which was developed using the EPA Region I's Impervious Cover (IC) Method, described in EPA's Stormwater TMDL Implementation Support Manual.[11] Consistent with the findings of EPA and others, MassDOT concluded that when a watershed had less than 9% IC, stormwater was not the likely cause of the impairment.

MassDOT calculated the following values for the total contributing watershed and the subwatershed of the impaired water (Unnamed Tributary) to determine the IC area and set a reduction target. Watersheds are based on the USGS Dataset 451 and modified as necessary using topography.[12] MassGIS's impervious surfaces data layer was used to determine the IC of the watersheds.[13] The total watershed and subwatershed are shown in Figure 1 and Figure 2.

[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.

[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

[11] ENSR 2006. Stormwater TMDL Implementation Support Manual for US EPA Region 1. ENSR International & EPA Region 1, Boston, MA. Available at http://www.epa.gov/region1/eco/tmdl/regionalpgrfs.html

[12] USGS Data Series 451 Local and Cumulative Impervious Cover of Massachusetts Stream Basins Available at: http://pubs.usgs.gov/ds/451/

[13] MassGIS Impervious Surfaces datalayer taken from 2005 orthoimagery. Available at: http://www.mass.gov/mgis/impervious_surface.htm

Table 1 Impaired Segment Watershed

	Total and Subwatershed
Watershed Area	744 acres
Impervious Cover (IC) Area	343 acres
Percent Impervious	46%
IC Area at 9% Effective IC Target	67 acres
Target Effective IC Reduction	80.5%

The total and subwatersheds percent impervious are greater than 9% indicating that stormwater is a likely contributor to the impairment. To meet the 9% effective IC target, the effective IC within the watershed will need to be reduced by the percentage calculated in Table 1. MassDOT then uses the same target percent reduction for their directly contributing watershed as shown in Table 2.

Table 2 MassDOT Directly Contributing Watershed

Directly Contributing Area	4.2 acres
Directly Contributing IC Area	4.2 acres
Percent Impervious	100%
Directly Contributing Area Effective IC Reduction Target (80.5% Target Effective IC Reduction of MassDOT Directly Contributing IC Area)	3.4 acres
Target Effective IC	19%
Target Effective IC	0.8 acres

Under existing conditions, MassDOT's estimated effective IC exceeds the target as described above. To mitigate the effects of IC, MassDOT will implement stormwater BMPs to the maximum extent practical given site constraints.

This assessment was not able to identify practical locations for surface stormwater BMPs within the current MassDOT right-of-way. However, a subsurface BMP, such as an infiltration trench, could be a potential stormwater BMP for use within the limited right-of-way. The Proposed Mitigation Plan section discusses the site constraints and describes the next steps for evaluating the potential for BMPs to reduce effective IC.

Proposed Mitigation Plan

During this assessment phase of the Impaired Waters Program, MassDOT has focused on directly contributing areas and identified BMPs that can be constructed entirely on MassDOT property without resulting in substantial wetland impacts or resulting in an adverse impact on historical or archeological resources. Projects that meet these requirements can be implemented under the Impaired Waters Program Retrofit initiative.

MassDOT has identified that additional control measures are needed to reduce its effective IC within the directly contributing watershed to achieve the targeted reduction. With more investigation as described below, potential locations may be available for subsurface control measures. Site limitations in the Unnamed Tributary watershed include limited right-of-way, existing utilities and

infrastructure. Based on the review of MassDOT's directly contributing drainage area, no surface BMPs have been identified that can be implemented on MassDOT property to address the impairments of the Unnamed Tributary given the limited right-of-way site constraints.

MassDOT will now work with its design consultants to identify locations suitable for construction of additional subsurface BMPs to treat stormwater runoff from directly contributing IC as part of MassDOT's Impaired Waters Retrofit Initiative. The project designer will gather additional information in this phase, such as soil data, wetland delineations, and site survey, to further refine the proposed BMPs. The design consultants will develop construction plans for subsurface BMPs that will aim to provide the target IC reduction to the maximum extent practical.

Once the design of the proposed subsurface BMPs is finalized, if feasible, MassDOT will provide an update in the NPDES permit annual report with BMP information and summarize the final effective IC reduction.

With respect to the Escherichia coli impairment, 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,[14] MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements in regard to pathogens.

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 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.

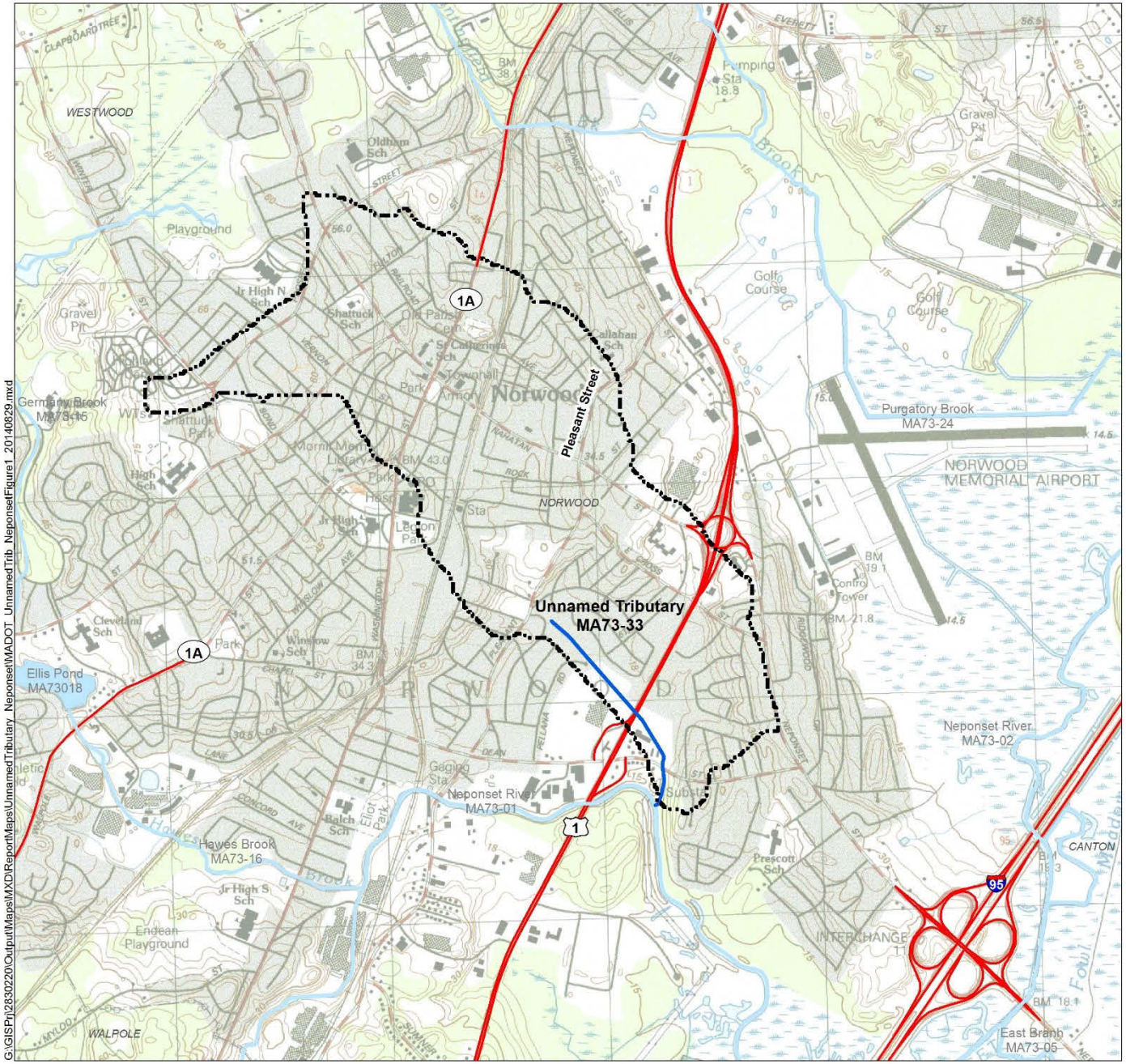
Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and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

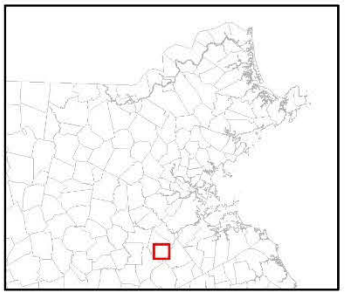
MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for Unnamed Tributary. These measures achieve pathogen reductions (including Escherichia coli) to the maximum extent practicable and are consistent with the intent of its existing stormwater 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 Unnamed Tributary, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education. Further work by MassDOT on programmed projects, which often include broader scale road layout changes, may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to address impairments. MassDOT will include an update in NPDES permit annual reports to EPA regarding proposed BMP design either through retrofit or

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

programmed projects, plans for construction of BMPs, reduction achieved by finalized BMP designs and progress made towards meeting target effective IC reductions.





MassDOT Roadways in Urban Area

Watershed

Assessed Segment

Impaired Lakes

Impaired Streams

N

0 1,000 2,000 Feet

Figure 1

Unnamed Tributary (MA73-33) Watershed

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

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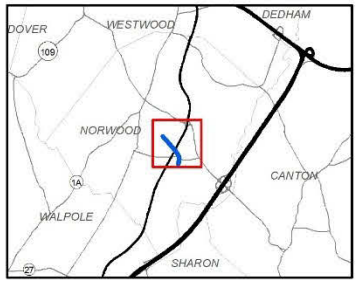

- MassDOT Outfalls
- MassDOT Roadways in Urban Area
- MassDOT Roadways
- MassDOT Directly Discharging Area
- Impaired Streams
- Impaired Lakes
- Areas of Critical Environmental Concern

N

0 300 600 Feet

Figure 2

Unnamed Tributary (MA73-33)
Directly Contributing
MassDOT Watershed

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

Impaired Waters Assessment for Weir River (MA74-11)

Summary

Impaired Water[1]	Impairments:	Stormwater:	***Fecal Coliform, Other***
		Non-Stormwater[2]:	***PCB in Fish Tissue***
	Category:		***5 (Waters requiring a TMDL)***
	Final TMDLs:		***None***
	WQ Assessment:		***Weymouth and Weir River Basin 2004 Water Quality Assessment Report***[3]
Location	Towns:		***Hingham, Hull***
	MassDOT Roads:		***George Washington Boulevard, Rockland Street, Route 3A***
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒	
BMPs	Existing:		***None***
MassDOT Area and Targets			Impervious Cover (IC)
	Directly Contributing Area:		***15.2 acres***
	Contributing Area Reduction Target:		***6.1 acres***
	Existing BMPs Reduction:		***0.0 acres***
	Remaining Reduction to Meet Target:		***6.1 acres***

[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.massdot.state.ma.us/Portals/8/docs/environmental/impairedWaters/Year3/Year3_ImpairedWatersAssessment_1.pdf#page=308

[3] MassDEP, 2010. Weymouth and Weir River Basin 2004 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/74wqar04.pdf

Site Description

Weir River (MA74-11) begins at the outlet of Foundry Pond in Hingham, Massachusetts with connections to Straits Pond to the east and Hingham Bay (MA70-07) to the north (Figure 1A, Figure 1B). MassDEP's Water Quality Assessment Report[4] for this receiving water identified the other impairment as being related to contaminants in fish and shellfish. According to the EPA Assessment TMDL Tracking and Implementation System (ATTAINS) description,[5] other cause is a miscellaneous reporting category used for dissolved gases, floating debris and foam, leachate, stormwater pollutants, and many other uncommon causes lumped together.

MassDOT-owned roadways within the subwatershed include George Washington Boulevard, Rockland Street, and Route 3A. George Washington Boulevard is a four-lane, crowned roadway, with sidewalk and curbing along the entire western side. The majority of the eastern side of the roadway does not have sidewalk or curbing. Rockland Street is a two-lane roadway with sidewalk on the south side. Land use directly abutting MassDOT right-of-way is primarily residential. Existing site constraints include steep slopes, limited right-of-way, high groundwater, and wetlands.

During a site visit on October 9, 2014, portions of George Washington Boulevard and Rockland Street were determined to be directly contributing to Weir River (Figure 2). On the west side of George Washington Boulevard, stormwater is conveyed through a closed drainage system to outfalls that drain immediately to Weir River. Stormwater on the east side is either collected in a closed drainage system or flows a short distance into swales and cross culverts that discharge into Weir River. On Rockland Street, stormwater travels a short distance before discharging via a paved waterway to Weir River near Kilby Street. To the east of Bonnie Brier Circle, stormwater enters Weir River through leakoffs or outfalls from a closed drainage system.

Environmental resources within the subwatershed include Outstanding Resource Waters and Areas of Critical Environmental Concern (Figure 2).

Existing BMPs

MassDOT did not identify any existing BMPs in place to treat roadway runoff from the directly discharging area before reaching the impaired water segment.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the waterbody for the impairments covered by the TMDL under the BMP 7R methodology.[6] MassDOT separately assesses the waterbody for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[7] MassDOT assessed Weir River (MA74-11) using the BMP 7U methodology described below.

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[4] MassDEP, 2010. Weymouth and Weir River Basin 2004 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/74wqar04.pdf

[5] EPA, 2012. ATTAINS parent cause category summaries, adapted from doc. no. EPA841-R-12-104, October 2012. Available at: http://www.epa.gov/waters/ir/34PARENTATTAINSDESCRIPTIONS.pdf

[6] 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

[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

MassDOT has identified a water body impairment in the Weir River watershed which is not related to stormwater runoff. The specific impairment unrelated to stormwater for the Weir River is PCB in fish tissue. 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 impairment is not specifically addressed as part of the Impaired Waters Program.[8]

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[10] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of Weir 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 Storm Water Management Plan (SWMP)[11] which applies to impairments that have been assigned to a water body not covered by a final TMDL. Weir River (MA74-11) is covered by the *Draft Pathogen TMDL for the Boston Harbor Watershed*.[12] 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 TMDL Report[12] states likely bacteria sources include failing septic systems, combined sewer overflows, sanitary sewer overflows, sewer pipes connected to storm drains, certain recreational activities, wildlife including birds along with domestic pets and animals and direct overland stormwater runoff.

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.[13]

BMP 7U for Impervious Cover Related Impairments

A Final TMDL is not in place to address Weir River's (MA74-11) following impairments: other. Therefore, MassDOT assessed the stormwater-related impairments not addressed by a TMDL using the approach outlined in the Description of MassDOT's Application of Impervious Cover

[8] 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

[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

[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] 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 BMP 7U for Pathogen Related Impairments.

Method in BMP 7U[14] which was developed using the EPA Region I's Impervious Cover (IC) Method, described in EPA's Stormwater TMDL Implementation Support Manual.[15] Consistent with the findings of EPA and others, MassDOT concluded that when a watershed had less than 9% IC, stormwater was not the likely cause of the impairment.

MassDOT calculated the following values for the total contributing watershed and the subwatershed of the impaired water (Weir River) to determine the IC area and set a reduction target. Watersheds are based on the USGS Dataset 451 and modified as necessary using topography.[16] MassGIS's impervious surfaces data layer was used to determine the IC of the watersheds.[17] The total watershed and the subwatershed are shown in Figures 1A and 1B.

Table 1 Impaired Segment Watershed

	Total Watershed	Subwatershed
Watershed Area	12,332 acres	3,426 acres
Impervious Cover (IC) Area	1,795 acres	503 acres
Percent Impervious	15%	15%
IC Area at 9% Effective IC Target	1,110 acres	308 acres
Target Effective IC Reduction	40%	40%

The total and subwatersheds percent impervious are greater than 9% indicating that stormwater is a likely contributor to the impairment. To meet the 9% effective IC target, the effective IC within the subwatershed will need to be reduced by the percentage calculated in . MassDOT then uses the same target percent reduction for their directly contributing watershed as shown in Table 2.

Table 2 MassDOT Directly Contributing Watershed

Directly Contributing Area	20.7 acres
Directly Contributing IC Area	15.2 acres
Percent Impervious	73%
Directly Contributing Area Effective IC Reduction Target (40% Target Effective IC Reduction of MassDOT Directly Contributing IC Area)	6.1 acres
Target Effective IC	44%
Target Effective IC	9.1 acres

[14] 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

[15] ENSR 2006. Stormwater TMDL Implementation Support Manual for US EPA Region 1. ENSR International & EPA Region 1, Boston, MA. Available at http://www.epa.gov/region1/eco/tmdl/regionalpgrfs.html

[16] USGS Data Series 451 Local and Cumulative Impervious Cover of Massachusetts Stream Basins Available at: http://pubs.usgs.gov/ds/451/

[17] MassGIS Impervious Surfaces datalayer taken from 2005 orthoimagery. Available at: http://www.mass.gov/mgis/impervious_surface.htm

Under existing conditions, MassDOT's estimated effective IC exceeds the target as described above. To mitigate the effects of IC, MassDOT will implement stormwater BMPs to the maximum extent practical given site constraints.

This assessment was not able to identify practical locations for stormwater management improvements within the current MassDOT right-of-way. The Proposed Mitigation Plan section discusses the site constraints and mitigation plan.

Proposed Mitigation Plan

During this assessment phase of the Impaired Waters Program, MassDOT has focused on directly contributing areas and identified BMPs that can be constructed entirely on MassDOT property without resulting in substantial wetland impacts or resulting in an adverse impact on historical or archeological resources. Projects that meet these requirements can be implemented under the Impaired Waters Program Retrofit initiative.

Site limitations in the Weir River watershed include: steep slopes, limited right-of-way, high groundwater, and environmental constraints including wetlands, Outstanding Resource Waters, and Areas of Critical Environmental Concern.

Based on the review of MassDOT's directly contributing drainage area, no BMPs have been identified that can be implemented on MassDOT property to address the impairments of the Weir River given the site constraints.

With respect to the fecal coliform impairment, 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,[18] MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements in regard to pathogens.

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 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 Weir 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

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

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 Weir River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education. Further work by MassDOT on programmed projects, which often include broader scale road layout changes, may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to address impairments. MassDOT will include an update in NPDES permit annual reports to EPA regarding proposed BMP design either through retrofit or programmed projects, plans for construction of BMPs, reduction achieved by finalized BMP designs and progress made towards meeting target effective IC reductions.

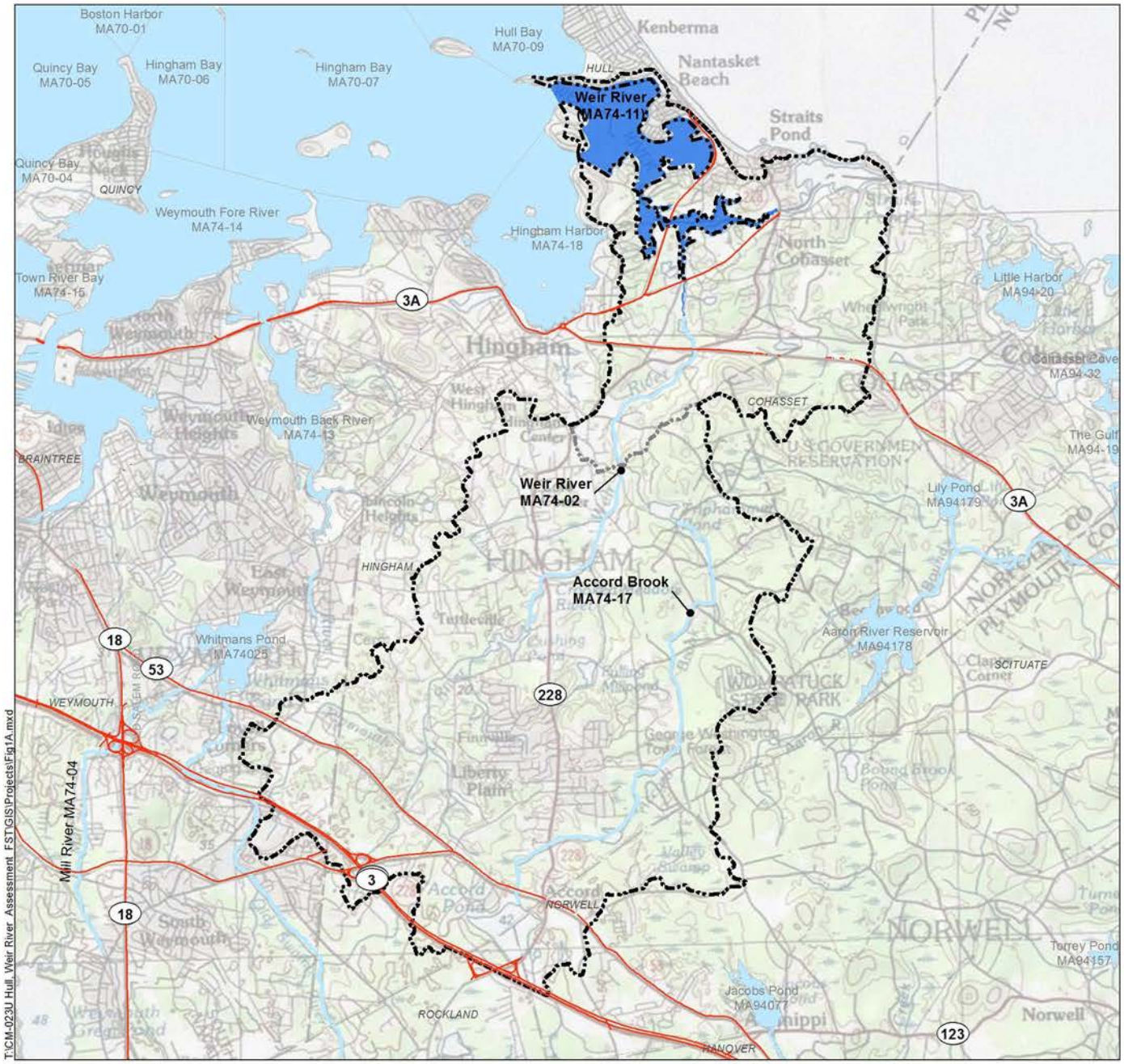
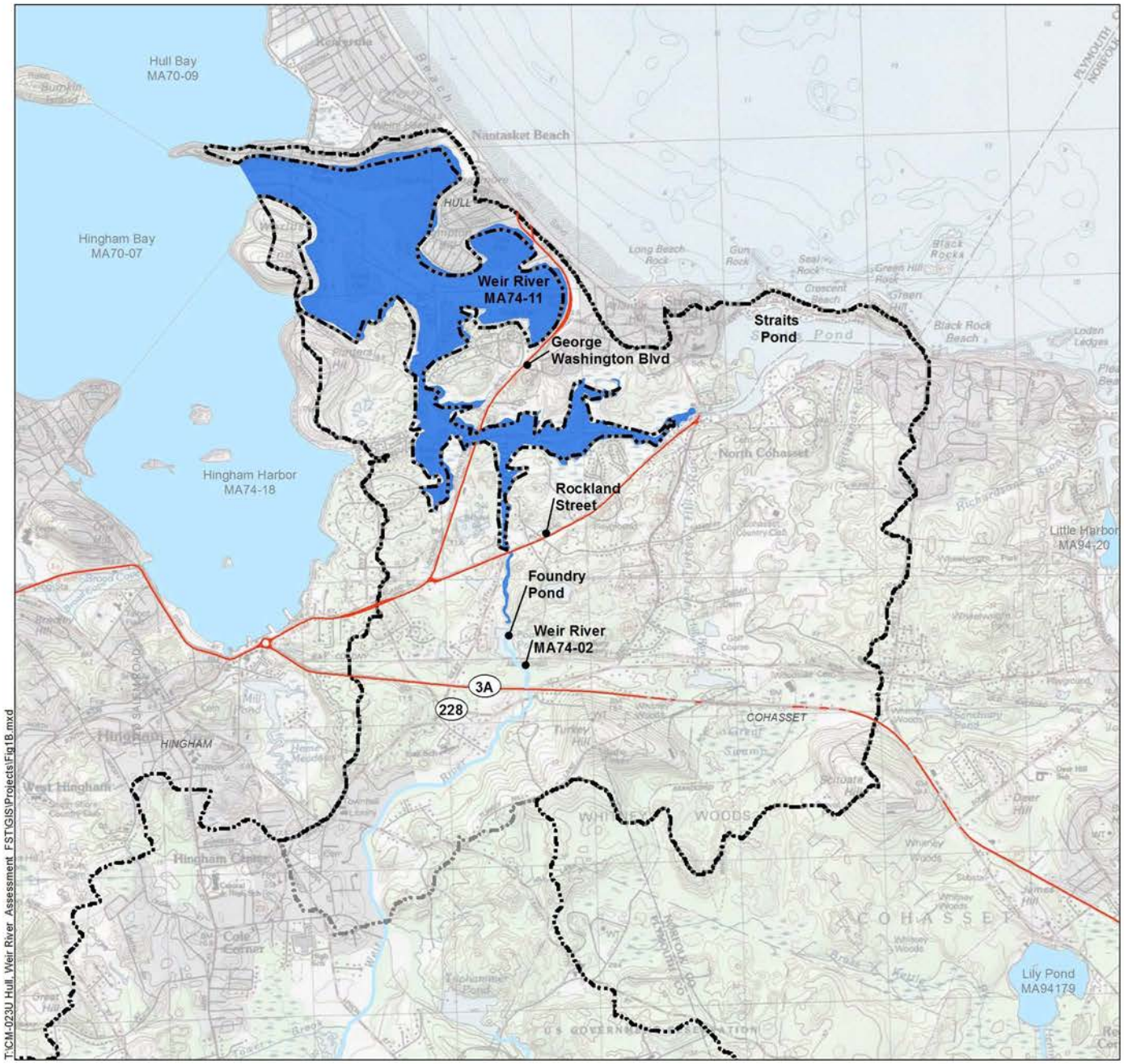


Figure 1A

Weir River (MA74-11) Watersheds

December 2014



MassDOT Roadways in Urban Area

Total Watershed

Subwatershed

Assessed Segment

Impaired Lakes

Impaired Streams

N

0 1,500 3,000 Feet

Figure 1B

Weir River (MA74-11) Subwatershed

December 2014

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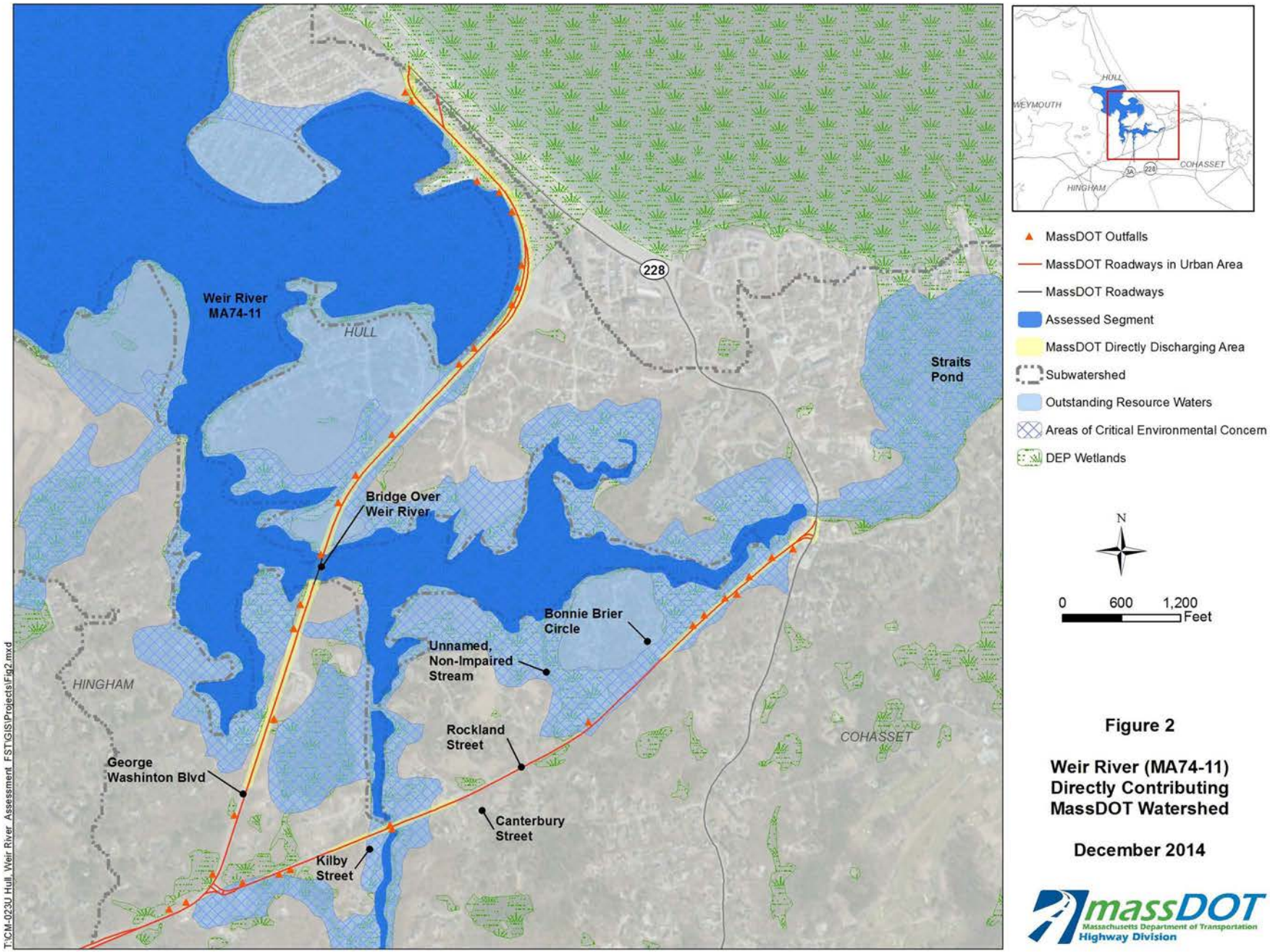

Figure 2

Weir River (MA74-11)
Directly Contributing
MassDOT Watershed

December 2014

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12/08/2014

Impaired Waters Assessment for Weymouth Back River (MA74-13)

Summary

Impaired Water[1]	Impairments:	Stormwater:	***Fecal Coliform, Other***
		Non-Stormwater[2]:	***PCB in Fish Tissue***
	Category:		***5 (Waters requiring a TMDL)***
	Final TMDLs:		***None***
	WQ Assessment:		***Weymouth and Weir River Basin 2004 Water Quality Assessment Report***[3]
Location	Towns:		***Hingham, Weymouth***
	MassDOT Roads:		***Route 3A, Route 18, Route 53***
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒	
BMPs	Existing:		***None***
MassDOT Area and Targets			Impervious Cover (IC)
	Directly Contributing Area:		***15.7 acres***
	Contributing Area Reduction Target:		***9.7 acres***
	Existing BMPs Reduction:		***0.0 acres***
	Remaining Reduction to Meet Target:		***9.7 acres***

[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.massdot.state.ma.us/Portals/8/docs/environmental/impairedWaters/Year3/Year3_ImpairedWatersAssessment_1.pdf#page=308

[3] MassDEP, 2010. Weymouth and Weir River Basin 2004 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/74wqar04.pdf

Site Description

From the outfall at Whitmans Pond (MA74025), the upper reach of the Weymouth Back River (MA74-05) flows north approximately 0.4 miles before entering the lower reach of the Weymouth Back River (MA74-13) in Weymouth, Massachusetts (Figure 1). The Weymouth Back River has a tidal connection to Hingham Bay (MA70-07) to the north. MassDEP's Water Quality Assessment Report[4] for this receiving water identified the other impairment as being related to contaminants in fish and shellfish with the source unknown. According to the EPA Assessment TMDL Tracking and Implementation System (ATTAINS) description,[5] other cause is a miscellaneous reporting category used for dissolved gases, floating debris and foam, leachate, stormwater pollutants, and many other uncommon causes lumped together. Additionally, MassDEP's Water Quality Assessment Report[4] noted low smelt egg production for Aquatic Life may be due to stormwater impacts and the Shellfish status as "impaired" is related to fecal coliform.

Route 3A runs east/west through the northern portion of the subwatershed from the Weymouth/Hingham town line to the Weymouth Back River (Figure 1). Route 3A is a four lane, curbed roadway with sidewalks on both sides. Land use directly abutting MassDOT's right-of-way is primarily commercial and is highly urbanized.

Based on record plans and a site visit on October 9, 2014, three outfall locations were identified that directly contribute to the Weymouth Back River from Route 3A; outfalls adjacent to USS Amesbury Drive, Beal Street, and Neck Street (Figure 2). All stormwater within the directly contributing watershed is collected and conveyed through closed drainage systems before reaching these outfall locations. Steep slopes, wetlands, and limited right-of-way exist at these outfalls. Additionally, limited right-of-way exists along the entire Route 3A corridor.

Environmental resources within the subwatershed include Outstanding Resource Waters, Areas of Critical Environmental Concern, and Certified Vernal Pools to the south of Route 3A (Figure 2).

Existing BMPs

MassDOT did not identify any existing BMPs in place to treat roadway runoff from the directly discharging area before reaching the impaired water segment.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the waterbody for the impairments covered by the TMDL under the BMP 7R methodology.[6] MassDOT separately assesses the waterbody for any stormwater-related impairments that are not covered by the TMDL

[4] MassDEP, 2010. Weymouth and Weir River Basin 2004 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/74wqar04.pdf

[5] EPA, 2012. ATTAINS parent cause category summaries, adapted from doc. no. EPA841-R-12-104, October 2012. Available at: http://www.epa.gov/waters/ir/34PARENTATTAINSDESCRIPTIONS.pdf

[6] 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

under the BMP 7U methodology.[7] MassDOT assessed Weymouth Back River (MA74-13) using the methodologies described below.

MassDOT has identified a water body impairment in the Weymouth Back River watershed which is not related to stormwater runoff. The specific impairment unrelated to stormwater for the Weymouth Back River is PCB in fish tissue. 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 impairment is not specifically addressed as part of the Impaired Waters Program.[8]

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[10] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of Weymouth Back 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 Storm Water Management Plan (SWMP)[7] which applies to impairments that have been assigned to a water body not covered by a final TMDL. Weymouth Back River (MA74-13) is covered by the *Draft Pathogen TMDL for the Boston Harbor Watershed*.[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 TMDL Report[11] states likely bacteria sources include failing septic systems, combined sewer overflows, sanitary sewer overflows, sewer pipes connected to storm drains, certain recreational activities, wildlife including birds along with domestic pets and animals and direct overland stormwater runoff.

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]

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[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 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

[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

[11] 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

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

BMP 7U for Impervious Cover Related Impairments

A Final TMDL is not in place to address Weymouth Back River's (MA74-13) following impairments: other. Therefore, MassDOT assessed the stormwater-related impairments not addressed by a TMDL using the approach outlined in the Description of MassDOT's Application of Impervious Cover Method in BMP 7U[13] which was developed using the EPA Region I's Impervious Cover (IC) Method, described in EPA's Stormwater TMDL Implementation Support Manual.[14] Consistent with the findings of EPA and others, MassDOT concluded that when a watershed had less than 9% IC, stormwater was not the likely cause of the impairment.

MassDOT calculated the following values for the total contributing watershed and the subwatershed of the impaired water (Weymouth Back River) to determine the IC area and set a reduction target. Watersheds are based on the USGS Dataset 451 and modified as necessary using topography.[15] MassGIS's impervious surfaces data layer was used to determine the IC of the watersheds.[16] The total watershed and the subwatershed are shown in Figure 1.

Table 1 Impaired Segment Watershed

	Total Watershed	Subwatershed
Watershed Area	11,543 acres	4,258 acres
Impervious Cover (IC) Area	2,512 acres	1,009 acres
Percent Impervious	22%	24%
IC Area at 9% Effective IC Target	1,039 acres	383 acres
Target Effective IC Reduction	59%	62%

The total and subwatersheds percent impervious are greater than 9% indicating that stormwater is a likely contributor to the impairment. To meet the 9% effective IC target, the effective IC within the subwatershed will need to be reduced by the percentage calculated in Table 1. MassDOT then uses the same target percent reduction for their directly contributing watershed as shown in Table 2.

Table 2 MassDOT Directly Contributing Watershed

Directly Contributing Area	21.9 acres
Directly Contributing IC Area	15.7 acres
Percent Impervious	72%
Directly Contributing Area Effective IC Reduction Target (62% Target Effective IC Reduction of MassDOT Directly Contributing IC Area)	9.7 acres

[13] 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

[14] ENSR 2006. Stormwater TMDL Implementation Support Manual for US EPA Region 1. ENSR International & EPA Region 1, Boston, MA. Available at http://www.epa.gov/region1/eco/tmdl/regionalpgrfs.html

[15] USGS Data Series 451 Local and Cumulative Impervious Cover of Massachusetts Stream Basins Available at: http://pubs.usgs.gov/ds/451/

[16] MassGIS Impervious Surfaces datalayer taken from 2005 orthoimagery. Available at: http://www.mass.gov/mgis/impervious_surface.htm

Directly Contributing Area	21.9 acres
Target Effective IC	27%
Target Effective IC	5.9 acres

Under existing conditions, MassDOT's estimated effective IC exceeds the target as described above. To mitigate the effects of IC, MassDOT will implement stormwater BMPs to the maximum extent practical given site constraints.

This assessment was not able to identify practical locations for stormwater management improvements within the current MassDOT right-of-way. The Proposed Mitigation Plan section discusses the site constraints and mitigation plan.

Proposed Mitigation Plan

During this assessment phase of the Impaired Waters Program, MassDOT has focused on directly contributing areas and identified BMPs that can be constructed entirely on MassDOT property without resulting in substantial wetland impacts or resulting in an adverse impact on historical or archeological resources. Projects that meet these requirements can be implemented under the Impaired Waters Program Retrofit initiative.

Site limitations in the Weymouth Back River watershed include: steep slopes, limited right-of-way, high groundwater, and environmental constraints including wetlands, Outstanding Resource Waters, and Areas of Critical Environmental Concern.

Based on the review of MassDOT's directly contributing drainage area, no BMPs have been identified that can be implemented on MassDOT property to address the impairments of the Weymouth Back River given the site constraints.

With respect to the fecal coliform impairment, 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,[17] MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements in regard to pathogens.

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 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.

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

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for the Weymouth Back 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 Weymouth Back River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education. Further work by MassDOT on programmed projects, which often include broader scale road layout changes, may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to address impairments. MassDOT will include an update in NPDES permit annual reports to EPA regarding proposed BMP design either through retrofit or programmed projects, plans for construction of BMPs, reduction achieved by finalized BMP designs and progress made towards meeting target effective IC reductions.

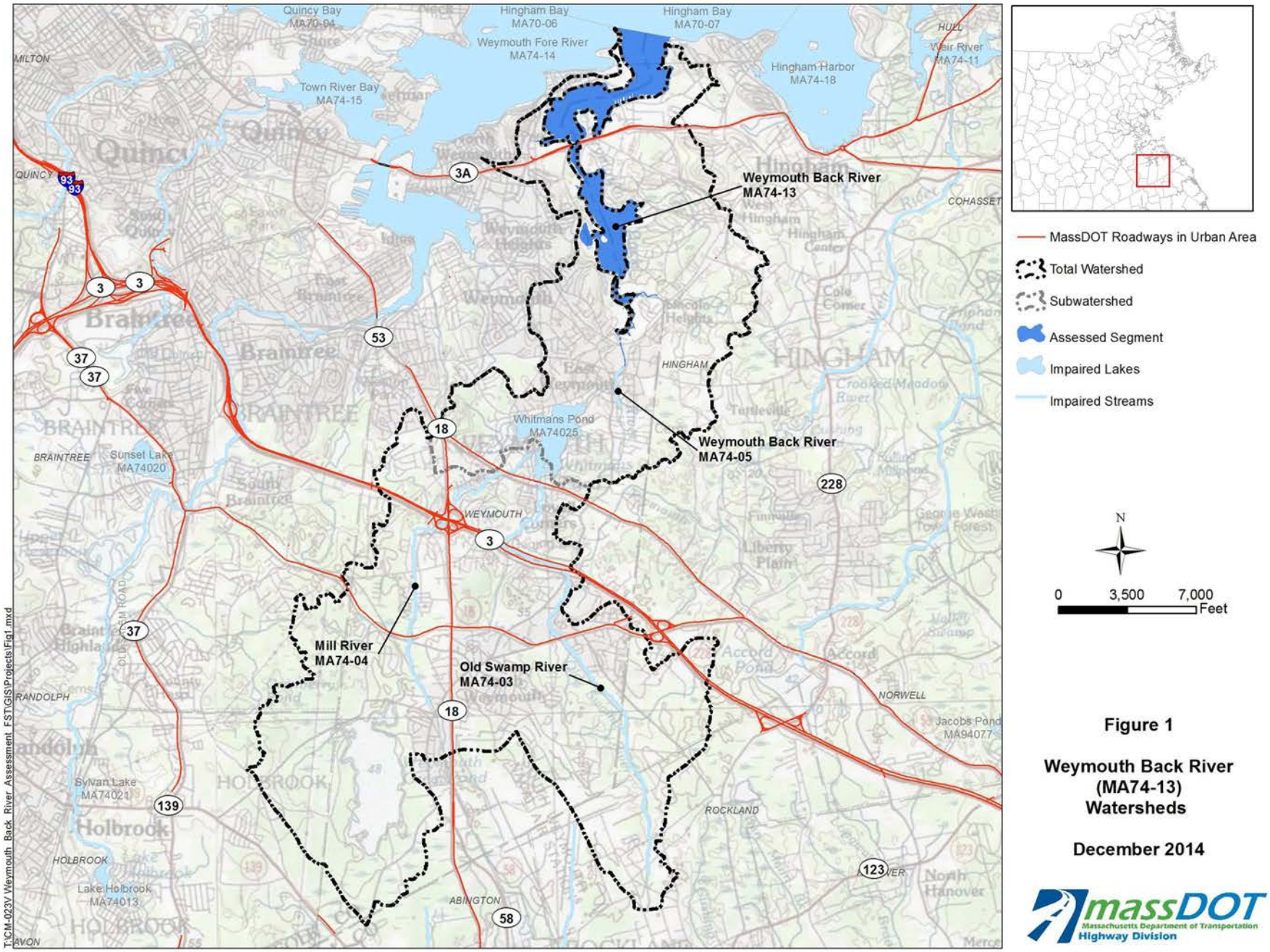

Figure 1

Weymouth Back River (MA74-13) Watersheds

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

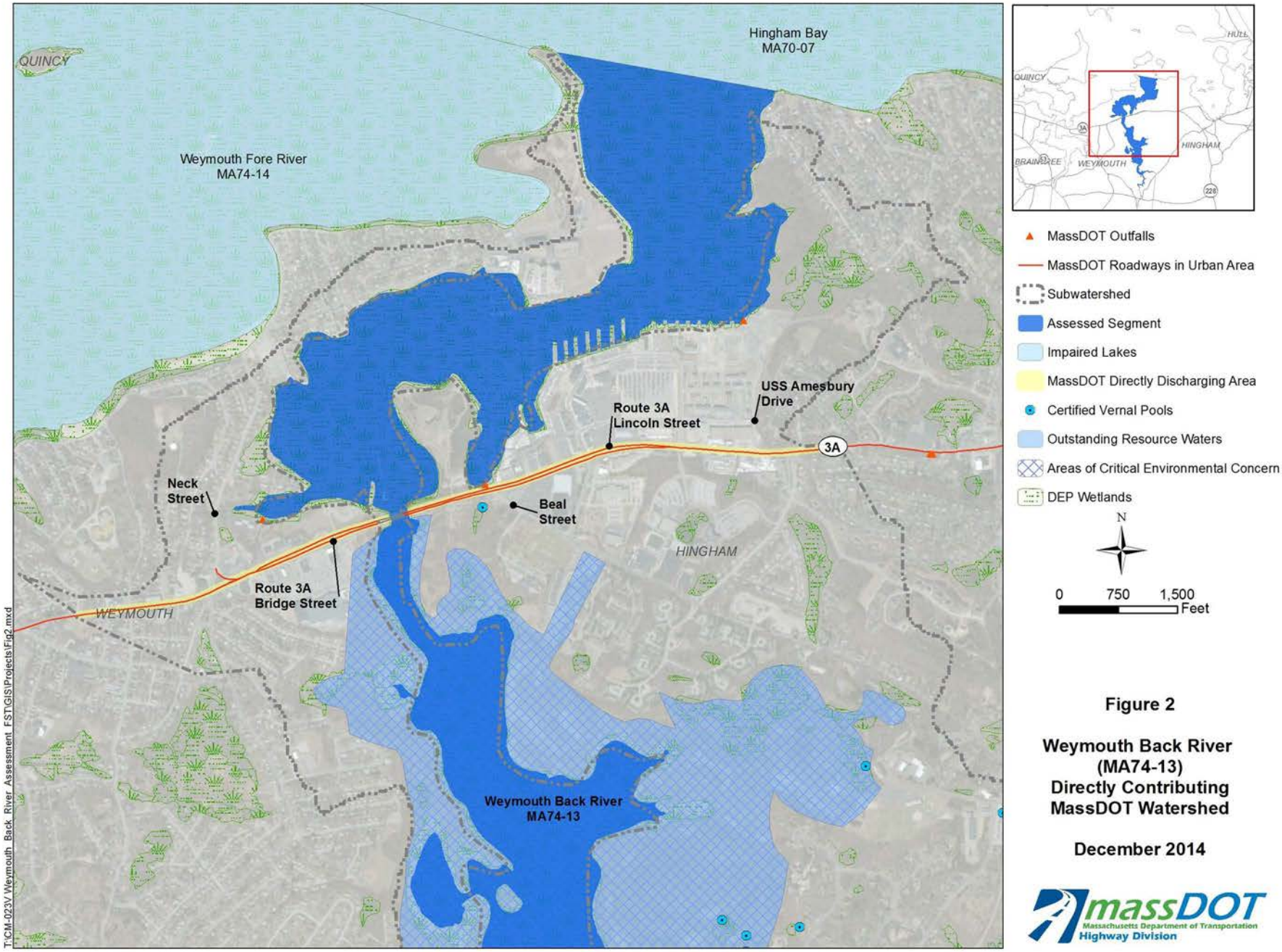

Figure 2

Weymouth Back River (MA74-13) Directly Contributing MassDOT Watershed

December 2014

12/08/2014

Impaired Waters Assessment for Weymouth Fore River (MA74-14)

Summary

Impaired Water[1]	Impairments:	Stormwater:	***Fecal Coliform, Other***
		Non-Stormwater[2]:	***PCB in Fish Tissue***
	Category:		***5 (Waters requiring a TMDL)***
	Final TMDLs:		***None***
	WQ Assessment:		***Weymouth and Weir River Basin 2004 Water Quality Assessment Report***[3]
Location	Towns:		***Braintree, Quincy, Weymouth***
	MassDOT Roads:		***Route 3, Route 3A, Route 37, Route 53, Commercial Street***
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒	
BMPs	Existing:		***None***
MassDOT Area and Targets			Impervious Cover (IC)
	Directly Contributing Area:		***19.3 acres***
	Contributing Area Reduction Target:		***14.1 acres***
	Existing BMPs Reduction:		***0.0 acres***
	Remaining Reduction to Meet Target:		***14.1 acres***

[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.massdot.state.ma.us/Portals/8/docs/environmental/impairedWaters/Year3/Year3_ImpairedWatersAssessment_1.pdf#page=308

[3] MassDEP, 2010. Weymouth and Weir River Basin 2004 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/74wqar04.pdf

Site Description

The Weymouth Fore River (MA74-14) begins west of Route 53 in Braintree, with tidal connections to Town River Bay (MA74-15) to the west and Hingham Bay (MA70-06, MA70-07) to the north (Figure 1). The assessed segment is located in Braintree, Quincy, and Weymouth, Massachusetts. MassDEP's Water Quality Assessment Report[4] for this receiving water identified the other impairment as being related to contaminants in fish and shellfish. According to the EPA Assessment TMDL Tracking and Implementation System (ATTAINS) description,[5] other cause is a miscellaneous reporting category used for dissolved gases, floating debris and foam, leachate, stormwater pollutants, and many other uncommon causes lumped together.

MassDOT-owned roadways within the subwatershed include Route 3, Route 3A, Route 37, Route 53, and a bridge at Commercial Street. Both Route 3A and Route 53 are four lane, curbed roadways with sidewalks on both sides. Land use directly abutting MassDOT's right-of-way is primarily commercial and is highly urbanized.

During a site visit on October 14, 2014, five outfall locations directly contributing to the Weymouth Fore River (MA74-14) were identified (Figure 2). All stormwater within the directly contributing watershed is collected and conveyed through closed drainage systems before reaching outfalls that immediately discharge to the assessed segment. Stormwater from Route 3A discharges to outfalls located adjacent to Brewster Road and Monatiquot Street in Weymouth. A section of Route 53 (Washington Street) in Weymouth connects to a municipal drainage system that travels via a culvert to the Weymouth Fore River north of the Weymouth Landing/East Braintree Commuter Rail Station. In Braintree, stormwater from Route 53 (Quincy Avenue) discharges to two outfall locations – the Route 53 bridge over the Weymouth Fore River and to a culvert adjacent to Hill Avenue. Additionally, stormwater from the MassDOT-owned bridge at Commercial Street directly contributes to the assessed segment. Steep slopes, wetlands, and limited right-of-way exist at all outfall locations.

Existing BMPs

MassDOT did not identify any existing BMPs in place to treat roadway runoff from the directly discharging area before reaching the impaired water segment.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the waterbody for the impairments covered by the TMDL under the BMP 7R methodology.[6] MassDOT separately assesses the waterbody for any stormwater-related impairments that are not covered by the TMDL

[4] MassDEP, 2010. Weymouth and Weir River Basin 2004 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/74wqar04.pdf

[5] EPA, 2012. ATTAINS parent cause category summaries, adapted from doc. no. EPA841-R-12-104, October 2012. Available at: http://www.epa.gov/waters/ir/34PARENTATTAINSDESCRIPTIONS.pdf

[6] 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

under the BMP 7U methodology.[7] MassDOT assessed Weymouth Fore River (MA74-14) using the methodologies described below.

MassDOT has identified a water body impairment in the Weymouth Fore River watershed which is not related to stormwater runoff. The specific impairment unrelated to stormwater for the Weymouth Fore River is PCB in fish tissue. 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 impairment is not specifically addressed as part of the Impaired Waters Program.[8]

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[10] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of Weymouth Fore 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 Storm Water Management Plan (SWMP)[7] which applies to impairments that have been assigned to a water body not covered by a final TMDL. Weymouth Fore River (MA74-14) is covered by the *Draft Pathogen TMDL for the Boston Harbor Watershed*.[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 TMDL Report[11] states likely bacteria sources include failing septic systems, combined sewer overflows, sanitary sewer overflows, sewer pipes connected to storm drains, certain recreational activities, wildlife including birds along with domestic pets and animals and direct overland stormwater runoff.

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]

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[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 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

[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

[11] 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

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

BMP 7U for Impervious Cover Related Impairments

A Final TMDL is not in place to address Weymouth Fore River's (MA74-14) following impairments: other. Therefore, MassDOT assessed the stormwater-related impairments not addressed by a TMDL using the approach outlined in the Description of MassDOT's Application of Impervious Cover Method in BMP 7U[13] which was developed using the EPA Region I's Impervious Cover (IC) Method, described in EPA's Stormwater TMDL Implementation Support Manual.[14] Consistent with the findings of EPA and others, MassDOT concluded that when a watershed had less than 9% IC, stormwater was not the likely cause of the impairment.

MassDOT calculated the following values for the total contributing watershed and the subwatershed of the impaired water (Weymouth Fore River) to determine the IC area and set a reduction target. Watersheds are based on the USGS Dataset 451 and modified as necessary using topography.[15] MassGIS's impervious surfaces data layer was used to determine the IC of the watersheds.[16] The total watershed and the subwatershed are shown in Figure 1.

Table 1 Impaired Segment Watershed

	Total Watershed	Subwatershed
Watershed Area	27,363 acres	9,147 acres
Impervious Cover (IC) Area	7,334 acres	3,069 acres
Percent Impervious	27%	34%
IC Area at 9% Effective IC Target	2,463 acres	823 acres
Target Effective IC Reduction	66%	73%

The total and subwatersheds percent impervious are greater than 9% indicating that stormwater is a likely contributor to the impairment. To meet the 9% effective IC target, the effective IC within the subwatershed will need to be reduced by the percentage calculated in Table 1. MassDOT then uses the same target percent reduction for their directly contributing watershed as shown in Table 2.

Table 2 MassDOT Directly Contributing Watershed

Directly Contributing Area	22.1 acres
Directly Contributing IC Area	19.3 acres
Percent Impervious	87%
Directly Contributing Area Effective IC Reduction Target (73% Target Effective IC Reduction of MassDOT Directly Contributing IC Area)	14.1 acres

[13] 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

[14] ENSR 2006. Stormwater TMDL Implementation Support Manual for US EPA Region 1. ENSR International & EPA Region 1, Boston, MA. Available at http://www.epa.gov/region1/eco/tmdl/regionalpgrfs.html

[15] USGS Data Series 451 Local and Cumulative Impervious Cover of Massachusetts Stream Basins Available at: http://pubs.usgs.gov/ds/451/

[16] MassGIS Impervious Surfaces datalayer taken from 2005 orthoimagery. Available at: http://www.mass.gov/mgis/impervious_surface.htm

Directly Contributing Area	22.1 acres
Target Effective IC	24%
Target Effective IC	5.2 acres

Under existing conditions, MassDOT's estimated effective IC exceeds the target as described above. To mitigate the effects of IC, MassDOT will implement stormwater BMPs to the maximum extent practical given site constraints.

This assessment was not able to identify practical locations for stormwater management improvements within the current MassDOT right-of-way. The Proposed Mitigation Plan section discusses the site constraints and mitigation plan.

Proposed Mitigation Plan

During this assessment phase of the Impaired Waters Program, MassDOT has focused on directly contributing areas and identified BMPs that can be constructed entirely on MassDOT property without resulting in substantial wetland impacts or resulting in an adverse impact on historical or archeological resources. Projects that meet these requirements can be implemented under the Impaired Waters Program Retrofit initiative.

Site limitations in the Weymouth Fore River watershed include: steep slopes, wetlands, and limited right-of-way. MassDOT roadways directly contributing to the Weymouth Fore River are located in a highly urbanized and developed area with limited right-of-way for proposed BMPs.

Based on the review of MassDOT's directly contributing drainage area, no BMPs have been identified that can be implemented on MassDOT property to address the impairments of the Weymouth Fore River given the site constraints.

With respect to the fecal coliform impairment, 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,[17] MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements in regard to pathogens.

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 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.

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

MassDOT has concluded that the BMPs outlined in the SWMP are consistent with its existing permit requirements for the Weymouth Fore 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 Weymouth Fore River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education. Further work by MassDOT on programmed projects, which often include broader scale road layout changes, may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to address impairments. MassDOT will include an update in NPDES permit annual reports to EPA regarding proposed BMP design either through retrofit or programmed projects, plans for construction of BMPs, reduction achieved by finalized BMP designs and progress made towards meeting target effective IC reductions.

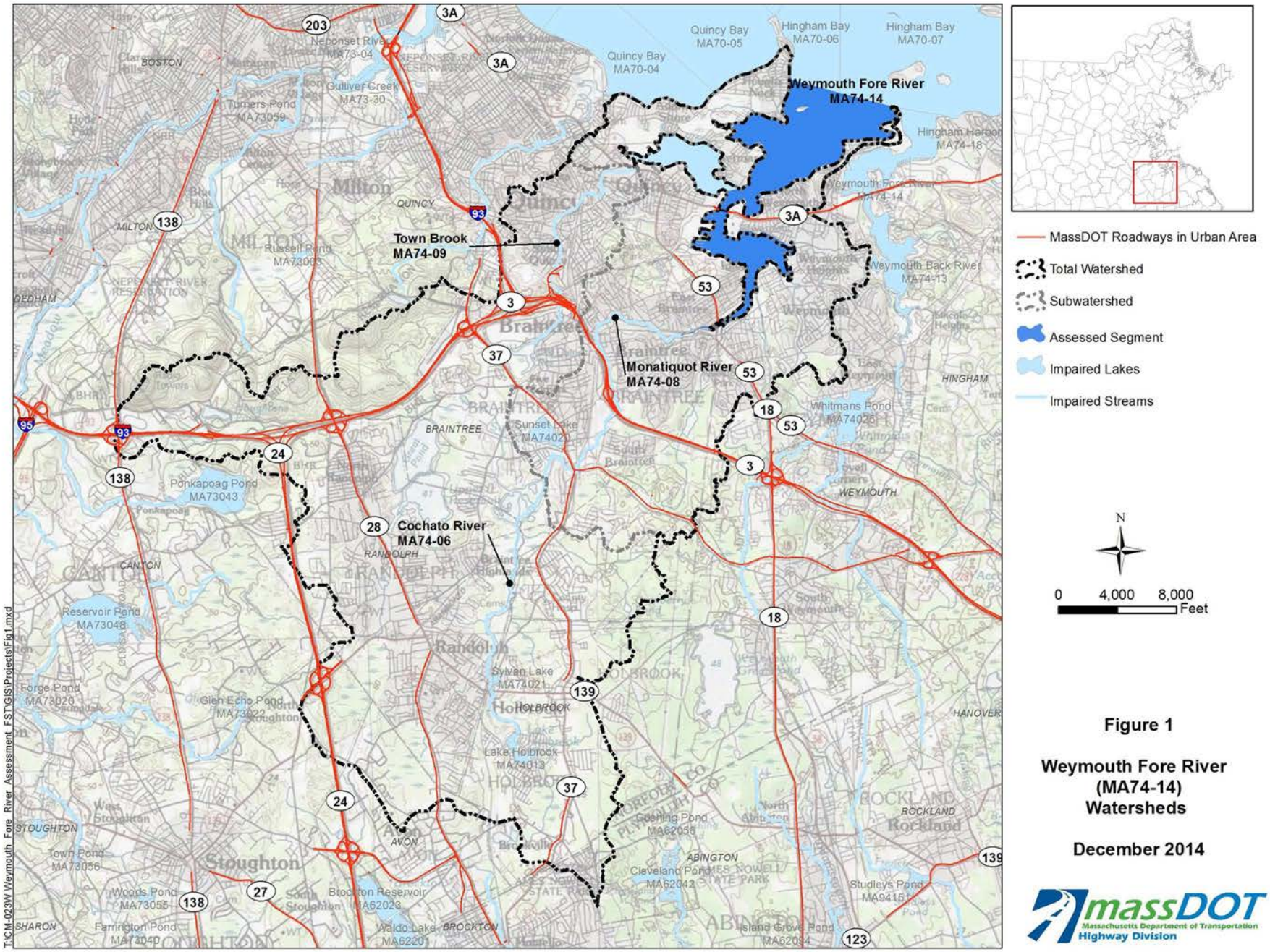

Figure 1

Weymouth Fore River (MA74-14) Watersheds

December 2014

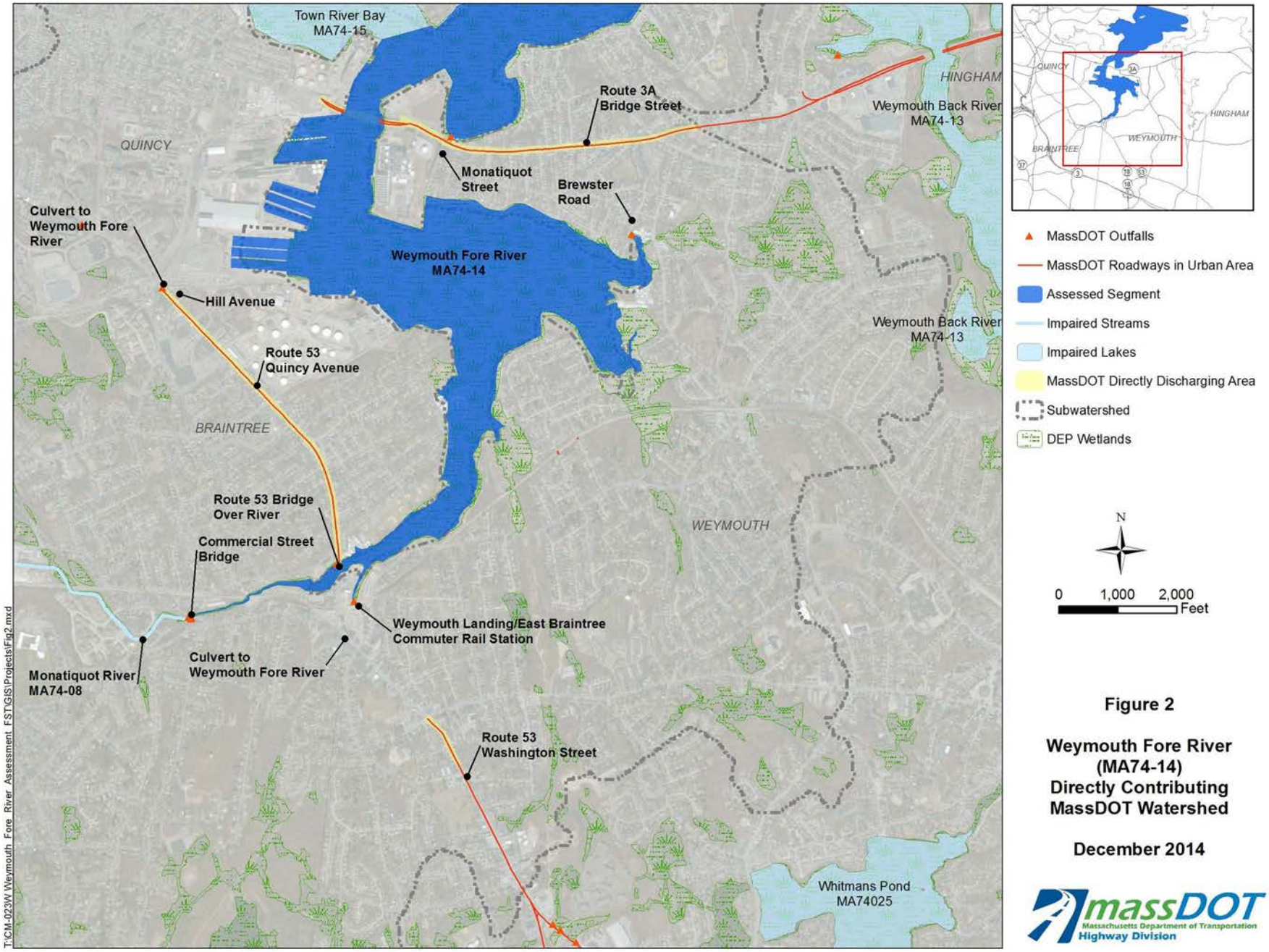

Figure 2

Weymouth Fore River (MA74-14) Directly Contributing MassDOT Watershed

December 2014

Impaired Waters Assessment for North Nashua River (MA81-04)

Summary

Impaired Water[1]	Stormwater Impairments:	*Escherichia coli, Taste and odor*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Nashua River Watershed 2003 Water Quality Assessment Report* [2]
Location	Towns:	*Lancaster and Leominster*
	MassDOT Roads:	*Interstate 190, Route 2, Route 12, Leominster Connector and Nashua Street*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒
BMPs	Existing:	*Six Infiltration Basins*

MassDOT Area and Targets	Impervious Cover (IC)
Directly Contributing Area:	*48.0 acres*
Contributing Area Reduction Target:	*8.6 acres*
Existing BMPs Reduction:	*32.1 acres*
Remaining Reduction to Meet Target:	*0.0 acres*

[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

Site Description

North Nashua River (MA81-04) originates at the Leominster Wastewater Treatment Plant (WWTP) and flows southeast for approximately 10.4 miles to its confluence with Nashua River (MA81-05) in Lancaster Massachusetts. MassDEP's Water Quality Assessment Report[3] for this receiving water identified the Primary and Secondary Contact Recreation Uses as well as the Aesthetics Use with an "impaired" status due to Escherichia coli and taste/odor with wet weather discharges being the likely source. The Aquatic Life Use is identified with a "supported status while the Fish Consumption Use was "not assessed".

The total and subwatersheds of North Nashua River are shown on Figure 1A, which includes the cities and towns of Ashburnham, Ashby, Gardner, Westminster, Fitchburg, Lunenburg, Leominster, Hubbardston, Princeton, Sterling, Lancaster, Clinton, Bolton, Rutland, Holden, West Boylston, Boylston, Paxton and Worcester. Figure 1B shows the MassDOT-owned roadways in the North Nashua River subwatershed, which includes portions of Interstate 190 (I-190), Route 2, Route 12, Leominster Connector and Nashua Street. The subwatershed to North Nashua River is comprised of commercial, industrial, waste disposal and recreational land with the majority of the subwatershed consisting of forested and agricultural land.

Figures 2A and 2B show the MassDOT directly discharging area, the limits of which were determined by the existing drainage infrastructure and roadways high points. The I-190 and Route 2 limited access right-of-ways are variable, consisting of four lanes and shoulders divided by a vegetated median with variable width vegetated shoulders. Stormwater runoff is primarily collected by catch basins along the edge of the road and discharged to various MassDOT stormwater outfalls. The majority of the stormwater flows from these outfalls are discharged directly to existing stormwater BMPs for treatment prior to discharge into the North Nashua River. The remaining MassDOT stormwater flows are either conveyed via manmade ditches or discharge directly into the North Nashua River and as such are considered directly discharging.

North Nashua River is located within the Central Nashua River Valley Area of Critical Environmental Concern (ACEC) as shown on Figures 2A and 2B.

Existing BMPs

MassDOT identified six existing BMPs, which were confirmed during a site visit, in place to treat roadway runoff from the directly discharging area before reaching the impaired water segment all of which are infiltration basins. Existing BMPs 1, 2 and 3 which were constructed as part of the I-190 and Route 2 Interchanges projects in the 1970s are located within the I-190 and Route 2 interchange as shown on Figure 3A. Stormwater from I-190, Route 2, Leominster Connector and Nashua Street is collected by catch basins along the edge of the road and flows reach the existing BMPs via piped discharges and drainage ditches. Natural Resources and Conservation Service (NRCS) soil data indicates soils in the area are Udorthents surrounded by Hydrologic Soil Groups (HSG) A and C. HSG C soils will be assumed for determining infiltration rates for the purposes of calculating the infiltration basin effective IC reduction credit.

Figure 3B shows existing BMPs 4, 5(A), 5(B), 5(C) and 6 which are all located within the median or shoulder of I-190. Existing BMPs 4 and 5C were constructed as part of the I-190 project in the 1970s. Existing BMPs 5(A), 5(B) and 6 were constructed in 2010 and are located within the Central Nashua River Valley Area ACEC. Both BMP 5(A) and 5(B) were constructed upstream of BMP 5(C) and provide an enhanced treatment train prior to discharge into the North Nashua River. BMP

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

6 was constructed as an enhancement to the previous stormwater BMP. Stormwater from I-190 is collected by catch basins along the edge of the road and flows reach the existing BMPs via piped discharges and drainage ditches. NRCS soil data indicates soils in the area are Merrimac fine sandy loam, Windsor loamy sand and Hinckley sandy loam all with an assigned HSG of A.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the waterbody for the impairments covered by the TMDL under the BMP 7R methodology.[4] MassDOT separately assesses the waterbody for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[5] MassDOT assessed North Nashua River (MA81-04) 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.[6] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List[7] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of North Nashua 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 Storm Water Management Plan (SWMP)[8] which applies to impairments that have been assigned to a water body not covered by a final TMDL. North Nashua River (MA81-04) is covered by the draft *Pathogen TMDL for the Nashua River Watershed*.[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.

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]

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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] 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] MassDEP. Draft Pathogen TMDL for the Nashua River Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/nashua1.pdf

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

According to the draft TMDL, sources of indicator bacteria in the Nashua River watershed were found to be many and varied. Most of the bacteria sources are believed to be stormwater related. A general compilation of likely bacteria sources in the Nashua River watershed includes failing septic systems, combined sewer overflows (CSO), sanitary sewer overflows (SSO), sewer pipes connected to storm drains, certain recreational activities, wildlife including birds along with domestic pets and animals and direct overland stormwater runoff.

The draft TMDL report states the following on Page 25:

> "It is difficult to provide accurate quantitative estimates of indicator bacteria contributions from the various sources in the Nashua River watershed because many of the sources are diffuse and intermittent, and extremely difficult to monitor or accurately model. Therefore, a general level of quantification according to source category is provided. This approach is suitable for the TMDL analysis because it indicates the magnitude of the sources and illustrates the need for controlling them. Additionally, many of the sources (failing septic systems, leaking sewer pipes, sanitary sewer overflows, and illicit sanitary sewer connections) are prohibited, because they could result in a potential health risk and, therefore, must be eliminated. However, estimating the magnitude of overall indicator bacteria loading is achieved for wet and dry conditions using the extensive ambient data available that define baseline conditions."

Stormwater runoff including municipal point source and urban runoff/storm sewers are identified as the potential sources of bacteria for North Nashua River (MA81-04).

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:

- Identify and abatement of bacteria sources from illicit sewer connection, leaking sewer pipes, sanitary sewer overflows, or failing septic systems
- Application of non-structural BMPs

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.

The following BMPs are specifically identified as being ongoing and/or planned for the Nashua River Watershed bacteria TMDL:

- Agricultural BMPs
- Elimination of illicit sewer connections, repairing failing infrastructure and controlling impacts associated with CSOs
- Develop and implement Storm Water Management Plans
- Septic system controls
- Wastewater treatment plant controls
- Recreational waters use management
- Watershed resident education

BMP 7U for Impervious Cover Related Impairments

A Final TMDL is not in place to address North Nashua River's (MA81-04) following impairments: taste and odor. Therefore, MassDOT assessed the stormwater-related impairments not addressed by a TMDL using the approach outlined in the Description of MassDOT's Application of Impervious Cover Method in BMP 7U[11] which was developed using the EPA Region I's Impervious Cover (IC) Method, described in EPA's Stormwater TMDL Implementation Support Manual.[12] Consistent with the findings of EPA and others, MassDOT concluded that when a watershed had less than 9% IC, stormwater was not the likely cause of the impairment.

MassDOT calculated the following values for the total contributing watershed and the subwatershed of the impaired water (North Nashua River) to determine the IC area and set a reduction target. Watersheds are based on the USGS Dataset 451 and modified as necessary using topography.[13] MassGIS's impervious surfaces data layer was used to determine the IC of the watersheds.[14] The total watershed and the subwatershed are shown in Figures 1A and 1B.

Table 1 Impaired Segment Watershed

	Total Watershed	Subwatershed
Watershed Area	169,780 acres	9,826 acres
Impervious Cover (IC) Area	14,582 acres	1,075 acres
Percent Impervious	8.6%	11%
IC Area at 9% Effective IC Target	15,280 acres	884 acres
Target Effective IC Reduction	0.0%	18%

The subwatershed percent impervious is greater than 9% indicating that stormwater is a likely contributor to the impairment. To meet the 9% effective IC target, the effective IC within the subwatershed will need to be reduced by the percentage calculated in Table 1. MassDOT then uses the same target percent reduction for their directly contributing watershed as shown in Table 2.

Table 2 MassDOT Directly Contributing Watershed

Directly Contributing Area	170.0 acres
Directly Contributing IC Area	48.0 acres
Percent Impervious	28%
Directly Contributing Area Effective IC Reduction Target (18% Target Effective IC Reduction of MassDOT Directly Contributing IC Area)	8.6 acres

[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] ENSR 2006. Stormwater TMDL Implementation Support Manual for US EPA Region 1. ENSR International & EPA Region 1, Boston, MA. Available at http://www.epa.gov/region1/eco/tmdl/regionalpgrfs.html

[13] USGS Data Series 451 Local and Cumulative Impervious Cover of Massachusetts Stream Basins Available at: http://pubs.usgs.gov/ds/451/

[14] MassGIS Impervious Surfaces datalayer taken from 2005 orthoimagery. Available at: http://www.mass.gov/mgis/impervious_surface.htm

Directly Contributing Area	170.0 acres
Target Effective IC	23%
Target Effective IC	39.4 acres

Next, MassDOT estimated the effective IC of the MassDOT directly contributing drainage areas accounting for treatment provided by existing BMPs. This effective IC reduction was calculated by applying effective IC reduction rates to existing BMPs based on their size, function and contributing watershed. BMP performances were derived from EPA Region 1's BMP performance analysis report[15] and engineering judgment. The table below shows the existing BMPs, their MassDOT drainage areas and effective IC reductions.

Table 3 Existing Conditions

BMP Name	BMP Type	Contributing Effective IC (acres)	Estimated Percent Reduction	Estimated Effective IC Reduction (acres)
EX BMP 1	Infiltration Basin	4.9	78%	3.8
EX BMP 2	Infiltration Basin	3.9	78%	3.0
EX BMP 3	Infiltration Basin	17.6	52%	9.2
EX BMP 4	Infiltration Basin	4.8	96%	4.6
EX BMP 5 (A, B and C)	Infiltration Basin	7.7	96%	7.4
EX BMP 6	Infiltration Basin	4.4	94%	4.1
Total Directly Discharging Area		**43.3**	**74%**	**32.1**
Target Effective IC				8.6
Remaining Reduction to Meet Target				**0.0**

Under existing conditions, MassDOT's estimated effective IC does not exceed the target as described above, therefore no additional stormwater BMPs are required as part of the Impaired Waters Program.

Proposed Mitigation Plan

During the assessment phase of the Impaired Water Program, MassDOT has focused on directly contributing areas. MassDOT identified existing stormwater BMPs that provide the required effective IC reduction to meet the target as described above, therefore no additional stormwater BMPs are required as part of the Impaired Water Program.

With respect to the Escherichia coli impairment, 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

[15] Environmental Protection Agency (EPA), 2010, Stormwater Best Management Practices (BMP) Performance Analysis. Available at: http://www.epa.gov/region1/npdes/stormwater/assets/pdfs/BMP-Performance-Analysis-Report.pdf

in MassDOT's BMP 7U Pathogen Methodology[16], MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and draft TMDL recommendations in regard to pathogens.

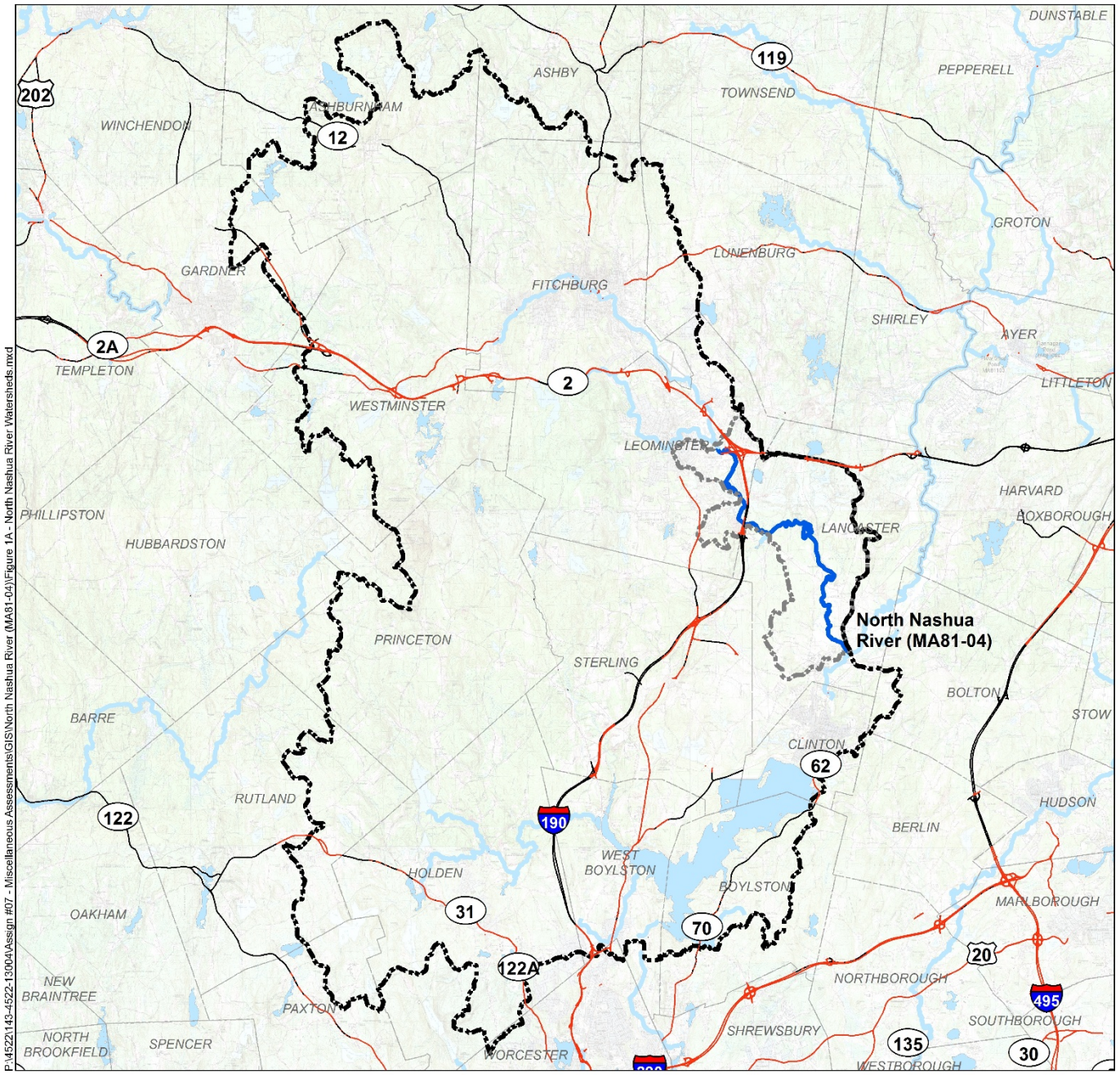
In addition, as part of its pet waste management program, MassDOT has determined that a MassDOT targeted rest stops is located within the subwatershed of this water body. The rest stop is located south of Route 2 eastbound between Harvard Street and Route 70. MassDOT will be installing signs at rest 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.

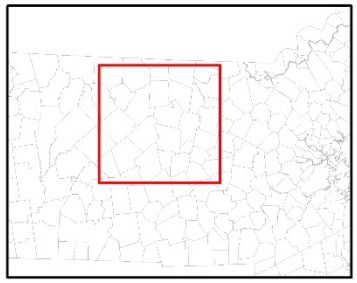
Furthermore, MassDOT has an ongoing inspection and monitoring program aimed at identifying and addressing illicit discharges to MassDOT's stormwater management system. MassDOT investigates any suspicious flows noted, and will work with owners of confirmed illicit discharges to remove these flows, and 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 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. 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. Further work by MassDOT on programmed projects, which often include broader scale road layout changes, may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to address impairments. MassDOT will include an update in NPDES permit annual reports to EPA regarding proposed BMP design either through retrofit or programmed projects, plans for construction of BMPs, reduction achieved by finalized BMP designs and progress made towards meeting target effective IC reductions.

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





MassDOT Roadways in Urban Area

MassDOT Roads

Total Watershed

Subwatershed

Assesed Segment

Impaired Lakes

Impaired Streams

N

0 2 4 Miles

Figure 1A

North Nashua River (MA81-04) Watersheds

December 2014

massDOT Massachusetts Department of Transportation Highway Division

P:\4522\143-4522-13004\Assign #07 - Miscellaneous Assessments\GIS\North Nashua River (MA81-04)\Figure 1A - North Nashua River Watersheds.mxd

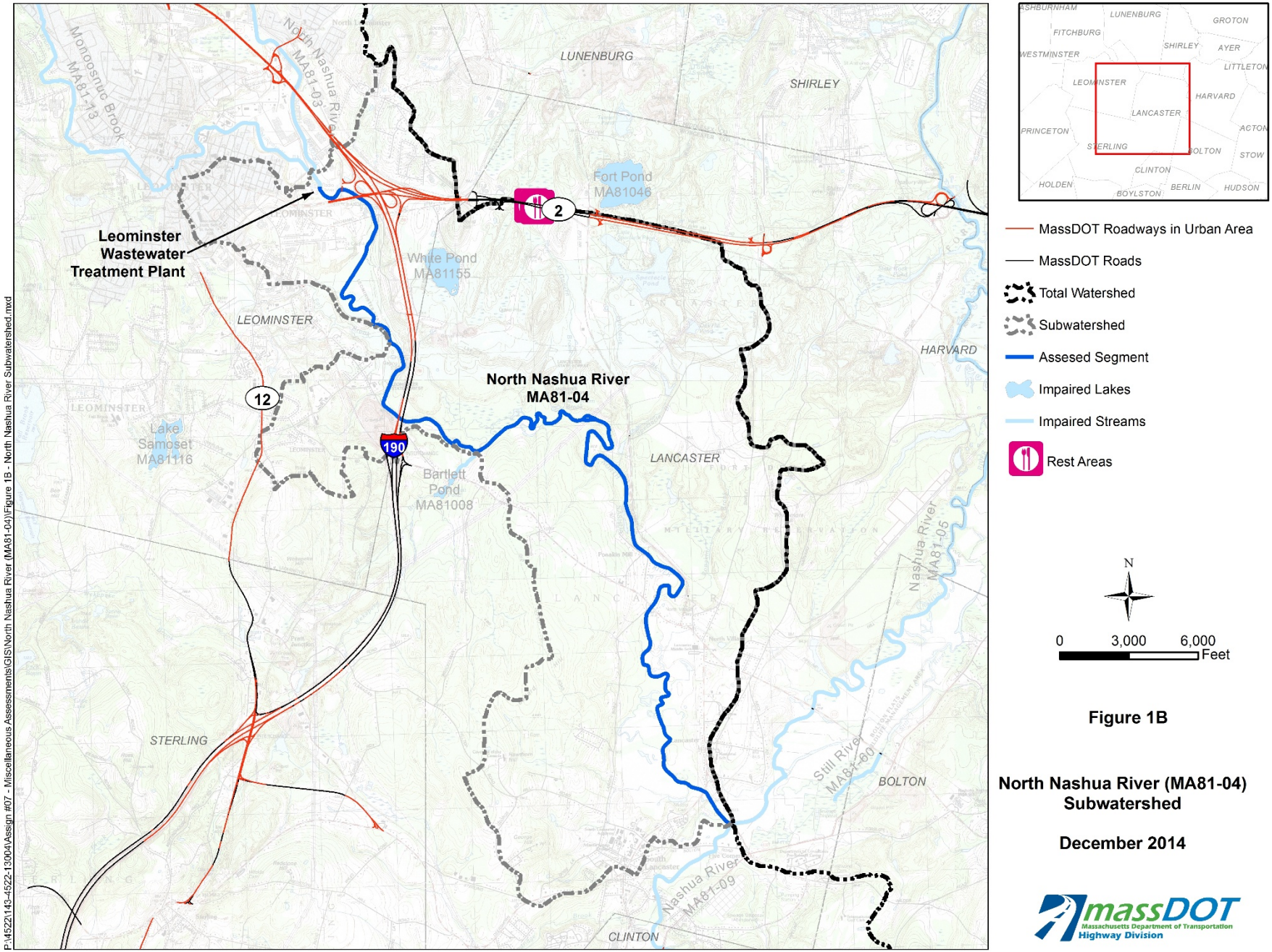
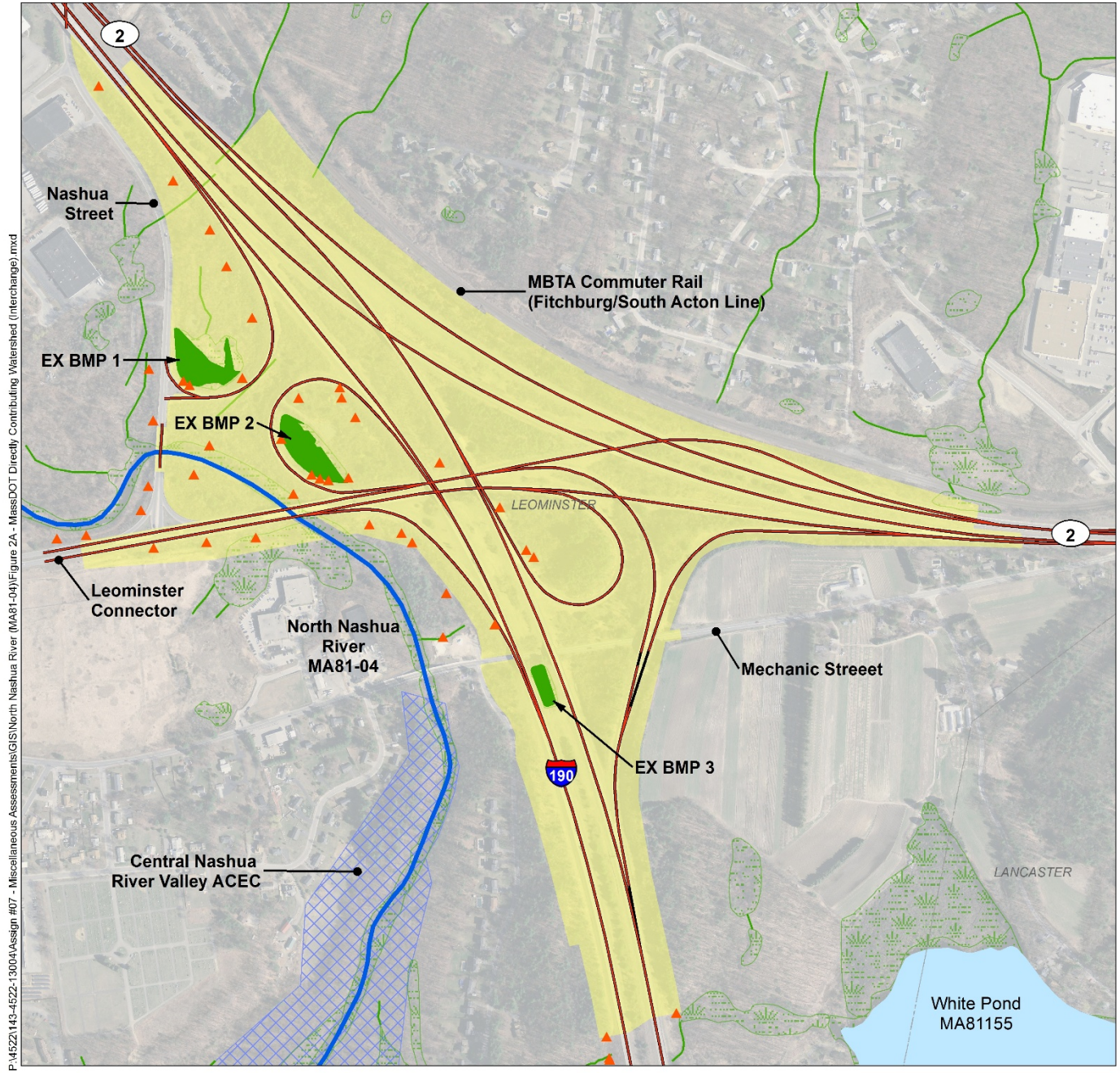
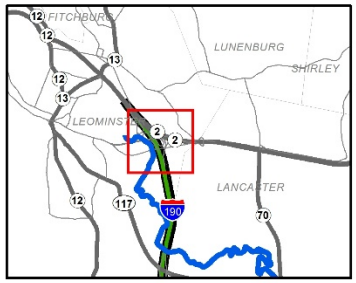


Figure 1B

North Nashua River (MA81-04) Subwatershed

December 2014





- MassDOT Outfalls
- MassDOT Roadways in Urban Area
- MassDOT Roads
- Assesed Segment
- Impaired Streams
- Impaired Lakes
- MassDOT Directly Discharging Area
- Existing BMP
- DEP Wetlands
- Hydrologic Connection
- Areas of Critical Environmental Concern (ACEC)

N

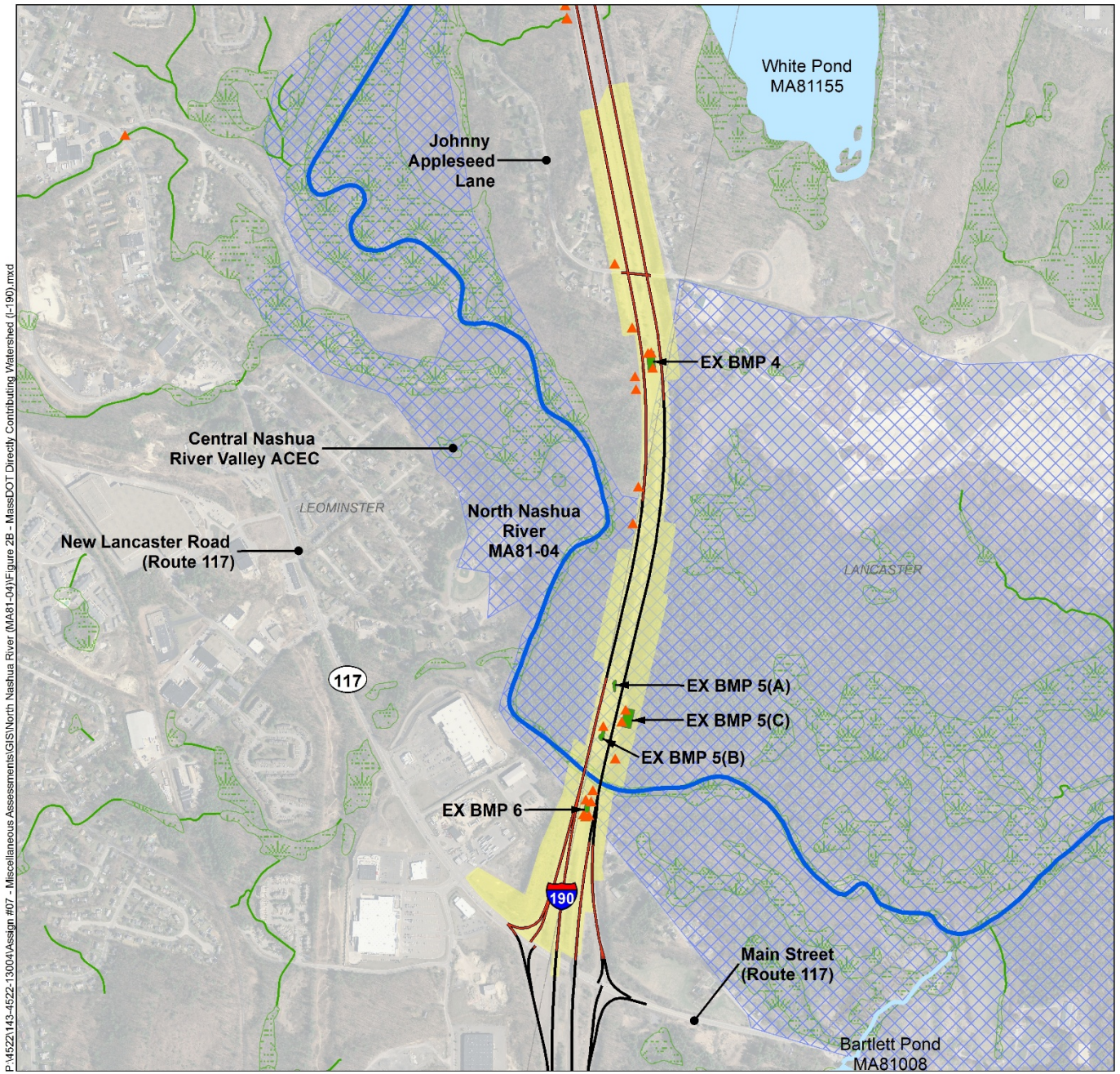
0 400 800 Feet

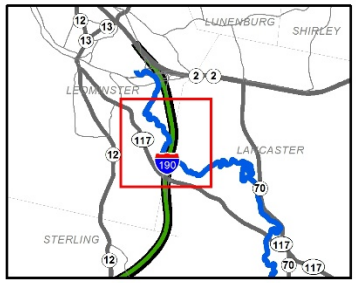
Figure 2A
North Nashua River (MA81-04) Directly Contributing MassDOT Watershed (Rt 2/I-190 Interchange Area)

December 2014

massDOT Massachusetts Department of Transportation Highway Division

P:\4522\143-4522-13004\Assign #07 - Miscellaneous Assessments\GIS\North Nashua River (MA81-04)\Figure 2A - MassDOT Directly Contributing Watershed (Interchange).mxd





- MassDOT Outfalls
- MassDOT Roadways in Urban Area
- MassDOT Roads
- Assesed Segment
- Impaired Streams
- Impaired Lakes
- MassDOT Directly Discharging Area
- Existing BMP
- DEP Wetlands
- Hydrologic Connection
- Areas of Critical Environmental Concern (ACEC)

N

0 700 1,400 Feet

Figure 2B
North Nashua River (MA81-04) Directly Contributing MassDOT Watershed (I-190)

December 2014

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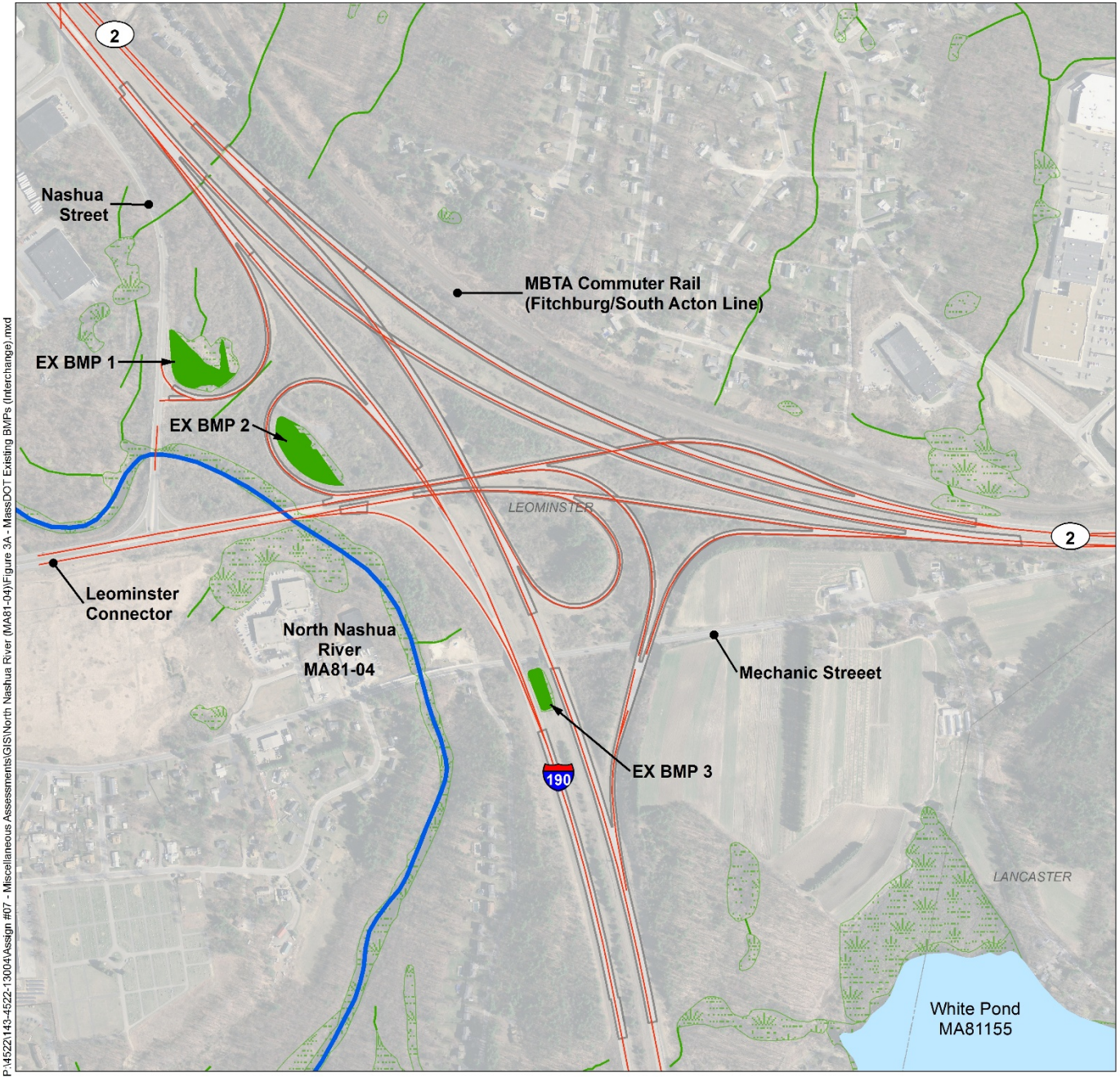
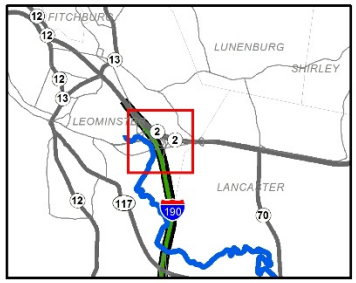
Massachusetts Department of Transportation
Highway Division

P:\4522\1143-4522-13004\Assign #07 - Miscellaneous Assessments\GIS\North Nashua River (MA81-04)\Figure 2B - MassDOT Directly Contributing Watershed (I-190).mxd





MassDOT Roadways in Urban Area
Existing BMP
Existing BMP Impervious Watershed
Assesed Segment
Impaired Streams
Impaired Lakes
DEP Wetlands
Hydrologic Connection

N

0 400 800 Feet

Figure 3A

North Nashua River (MA81-04)
Existing BMPs
(Rt 2/I-190 Interchange Area)

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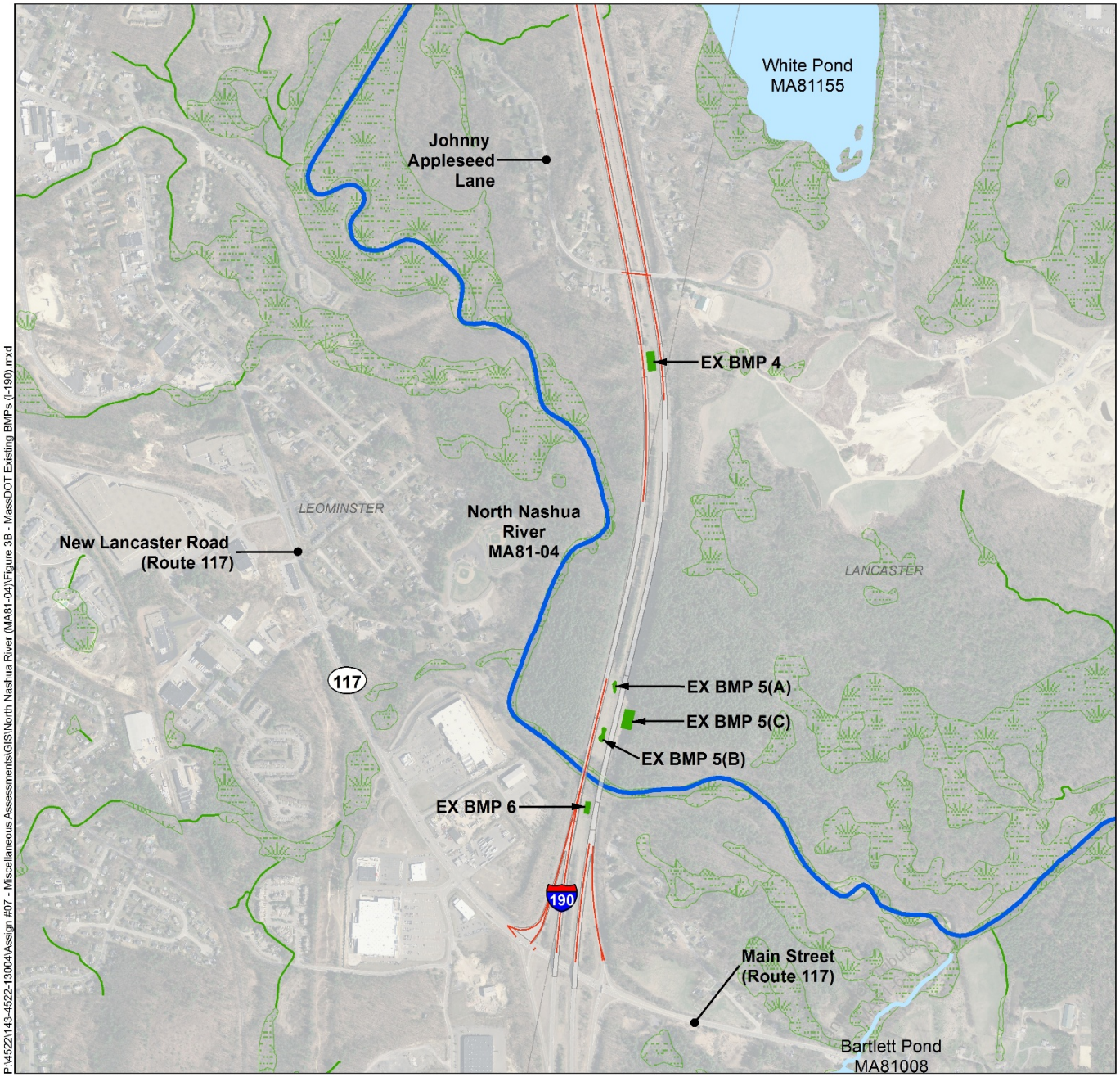
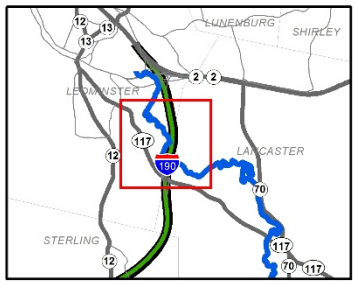
P:\4522\143-4522-13004\Assign #07 - Miscellaneous Assessments\GIS\North Nashua River (MA81-04)\Figure 3A - MassDOT Existing BMPs (Interchange).mxd





MassDOT Roadways in Urban Area

Existing BMP

Existing BMP Impervious Watershed

Assesed Segment

Impaired Streams

Impaired Lakes

DEP Wetlands

Hydrologic Connection

N

0 700 1,400 Feet

Figure 3B

North Nashua River (MA81-04)
Existing BMPs
(I-190)

December 2014

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Massachusetts Department of Transportation
Highway Division

P:\4522\143-4522-13004\Assign #07 - Miscellaneous Assessments\GIS\North Nashua River (MA81-04)\Figure 3B - MassDOT Existing BMPs (I-190).mxd

Impaired Waters Assessment for French Stream (MA94-03)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform, Fishes Bioassessments, Dissolved Oxygen, Phosphorus (Total), Whole Effluent Toxicity*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*South Shore Coastal Watersheds 2001 Water Quality Assessment Report*[2]
Location	Towns:	*Rockland, Abington, Hanover*
	MassDOT Roads:	*Route 18, Route 123, Route 139*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒
BMPs	Existing:	*1 Infiltration Basin and 1 Infiltration Swale (In Series)*
MassDOT Area and Targets		Impervious Cover (IC)
	Directly Contributing Area:	*4.3 acres*
	Contributing Area Reduction Target:	*2.3 acres*
	Existing BMPs Reduction:	*0.6 acres*
	Remaining Reduction to Meet Target:	*1.8 acres*

Site Description

French Stream (MA94-03) is located in the towns of Rockland, Abington, and Hanover, Massachusetts. The segment is approximately 6.1 miles long and flows southeast from its

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

headwaters along the southeast side of the South Weymouth Naval Air Station in Rockland through Studleys Pond (MA94151) to its confluence with Drinkwater River (MA94-21) in Hanover. Due to its location in the upper portion of the South Coastal Watershed, the total watershed and subwatershed to French Stream are the same. Land uses within the total watershed/subwatershed consist primarily of forested, residential, and open land areas. Refer to Figure 1, attached, for a map showing the total watershed/subwatershed to French Stream.

MassDEP's Water Quality Assessment Report[3] for this receiving water indicates that one site located within the total watershed/subwatershed to French Stream is awaiting a National Priorities List (NPL) decision. This site, the former South Weymouth Naval Air Station, is located near the headwaters of French Stream and has a history of contamination. Most recently, a developer has put together a twelve-year smart growth re-use plan for redeveloping the former South Weymouth Naval Air Station. The report also indicates that the Town of Rockland is authorized to discharge a treated sanitary and industrial wastewater flow of 2.5 MGD from its Wastewater Treatment Plant (WWTP) to French Stream via Outfall #001 (MA0101923 issued in August 1999).

The report identified the water body as a Class B, warm water fishery, but the Aquatic Life Use is listed as "impaired" based on several factors, including poor in-stream habitat quality in the upper portion of the river, low abundance and diversity of fish and benthic communities, elevated levels of total phosphorus downstream of the Rockland WWTP, and the presence of acute and chronic toxicity in the Rockland WWTP discharge. Suspected sources of impairment listed in the report other than the Rockland WWTP point source discharge include discharges from municipal separate storm sewer systems, loss of riparian habitat, post-development erosion and sedimentation, and stormwater from urbanized areas. According to the report, French Stream is not assessed for the Fish Consumption Use.

The report also identified the Primary Contact Recreation Use for this receiving water as "impaired" due to elevated fecal coliform bacteria counts in samples taken from the North Avenue crossing, the Summer Street crossing, and 300 feet downstream of the Rockland WWTP discharge canal confluence. The report identified the Secondary Contact Recreation and Aesthetic Uses as "support" with an "alert" status because of occasional chlorine/septic odors in the river downstream of the Rockland WWTP discharge.

Within the subwatershed to French Stream, MassDOT-owned roads include Route 18 and portions of Route 123 and Route 139. Refer to Figure 1 for the location of these roadways within the total watershed/subwatershed. Route 18 is a two-lane urban collector roadway that runs through mostly commercial and some residential areas along the northwestern edge of the total watershed/subwatershed to French Stream. MassDOT's right-of-way along this roadway is 60 feet wide. There are sidewalks on both sides of the road along a short stretch in the vicinity of the intersection with Route 58. The majority of the roadway is curbed, with catch basins collecting runoff and outfalls discharging stormwater to wooded deciduous swamps within the total watershed/subwatershed. A small portion of the roadway is not curbed, with runoff sheet flowing to both shoulders, where it then enters wooded deciduous swamps. Route 18 crosses the total watershed/subwatershed more than a mile from French Stream. As such, stormwater discharges from this roadway are considered indirect. Refer to Figure 1 for the location of these water bodies within the subwatershed to Drinkwater River.

Route 123 and Route 139 are also two-lane urban collector roadways that run through commercial and residential areas within the total watershed/subwatershed to French Stream. The routes join

[3] MassDEP, March 2006. South Shore Coastal Watersheds 2001 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/94wqar1.pdf

together for a length of approximately 0.64 miles. The right-of-way along these two roadways varies from 40 feet wide to 55 feet wide. Route 123 crosses over French Stream at the outlet of Studleys Pond (MA94151), with flow out of the pond spilling over a weir into a stone masonry box culvert beneath the roadway. Steep slopes and vegetation prevented the field team from taking measurements of the culvert, but it appeared to have a rise of approximately five feet and a span of approximately six feet. The majority of both Route 123 and Route 139 within the total watershed/subwatershed to French Stream is curbed, with catch basins collecting runoff and outfalls discharging stormwater directly to French Stream, Studleys Pond, two unnamed tributaries (unimpaired) and bordering wooded deciduous swamps.

MassDOT's directly contributing watershed to French Stream is 4.3 acres, all of which is impervious cover. Stormwater from the directly contributing watershed enters French Stream via a 24-inch outfall to Studleys Pond and a 36-inch outfall to the stream just downstream of the culvert beneath Route 123. The field team could not measure the size of either outfall as the 24-inch outfall to Studleys Pond is located on private property and the 36-inch outfall was inaccessible at the time of the field visit due to steep slopes and heavy vegetation. Refer to Figure 2 for the location of MassDOT's directly contributing watershed and the contributing outfalls.

Another portion of MassDOT's impervious cover along Route 123 appears to be routed to a series of water quality BMPs prior to discharging to French Stream. These BMPs consist of oil/grit separators, an infiltration basin, and an infiltration swale routed in series. Refer to Figure 3 for the location of the BMPs and the section titled "Existing BMPs" below for additional information.

Existing BMPs

A segment of MassDOT's impervious cover along Route 123 appears to be routed to a series of water quality BMPs prior to discharging to French Stream. These BMPs consist of oil/grit separators, an infiltration basin, and an infiltration swale routed in series. The BMPs are located adjacent to John A Dunn Memorial Drive just south of Rockland Plaza, which is a shopping plaza that houses Luke's Liquors and Calvary Chapel in Rockland. The BMPs appear to treat stormwater runoff from both MassDOT's Route 123 and from the shopping plaza's parking lots. Refer to Figure 3 for the location of the BMPs and the contributing watershed.

Stormwater from MassDOT's Route 123 is collected by catch basins on both sides of the roadway and piped into a trunk line, which also receives stormwater from the Rockland Plaza parking lots. The trunk line first enters the oil/grit separators in the paved parking lot behind Luke's Liquors. It then flows into the infiltration basin, which was enclosed by a fence and heavily vegetated during the time of the field visit. The infiltration basin is estimated to have a surface area of approximately 5,900 square feet and a depth of approximately three feet. Stormwater then flows out of a reinforced concrete pipe, beneath a paved walking path, to an infiltration swale. The infiltration swale is estimated to have a six-foot bottom width, an 18-foot top width, and side slopes of two horizontal to one vertical. Stormwater then flows through another reinforced concrete pipe from the infiltration swale, beneath John A. Dunn Memorial Drive, and discharges to French Stream.

At the time of the field visit, the BMPs appeared to be functioning well. There was no visible scour or erosion and no visible sediment accumulation. However, as mentioned previously, a fence and heavy vegetation prevented the field team from conducting a thorough inspection of the infiltration basin and infiltration swale.

A desktop analysis of the soils at the BMP locations using USGS SSURGO-certified soils data obtained from MassGIS indicates that the BMPs are located on urban land, with a wet substratum and 0 to 3 percent slopes. The dataset does not indicate a hydrologic soil group for this particular soil type, and therefore the infiltration rate of the soil is difficult to estimate without conducting an on-

site geotechnical investigation. The BMP is located less than 100 feet from French Stream, however, so it can be assumed that groundwater is relatively high and the infiltration rate of the soils at the BMP locations is relatively low.

Because the BMPs are surrounded by urban areas, including a roadway and shopping plaza, there is not much room for improvement or expansion of the BMPs unless the parking lot area is repurposed for such a use.

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 French Stream (MA94-03) 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.[6] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List[7] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of French Stream 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 Storm Water Management Plan (SWMP)[8] which applies to impairments that have been assigned to a water body not covered by a final TMDL. French Stream (MA94-03) is covered by the draft *Pathogen TMDL for the South Coastal Watershed*.[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.

This draft TMDL does not include specific recommendations for mitigation of point-source and non-point source stormwater runoff for French Stream; however, it does include six minimum control measures that municipalities and other agencies that operate municipal separate storm sewer systems must implement and set measurable goals for. These six control measures are:

- public education and outreach particularly on the proper disposal of pet waste,

[4] 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] 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] 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

- public participation/involvement,
- illicit discharge detection and elimination,
- construction site runoff control,
- post construction runoff control, and
- pollution prevention/good housekeeping.

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]

BMP 7U for Impervious Cover Related Impairments

A Final TMDL is not in place to address French Stream's (MA94-03) following impairments: fishes bioassessments, dissolved oxygen, phosphorus (total), and whole effluent toxicity. Therefore, MassDOT assessed the stormwater-related impairments not addressed by a TMDL using the approach outlined in the Description of MassDOT's Application of Impervious Cover Method in BMP 7U[11] which was developed using the EPA Region I's Impervious Cover (IC) Method, described in EPA's Stormwater TMDL Implementation Support Manual.[12] Consistent with the findings of EPA and others, MassDOT concluded that when a watershed had less than 9% IC, stormwater was not the likely cause of the impairment.

MassDOT calculated the following values for the total contributing watershed and the subwatershed of the impaired water (French Stream) to determine the IC area and set a reduction target. Watersheds are based on the USGS Dataset 451 and modified as necessary using topography.[13] MassGIS's impervious surfaces data layer was used to determine the IC of the watersheds.[14] The total watershed and the subwatershed are the same and are shown in Figure 1.

Table 1 Impaired Segment Watershed

	Total Watershed/Subwatershed
Watershed Area	5,721 acres
Impervious Cover (IC) Area	1,092 acres
Percent Impervious	19.1%
IC Area at 9% Effective IC Target	514.9 acres
Target Effective IC Reduction	52.8%

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

[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] ENSR 2006. Stormwater TMDL Implementation Support Manual for US EPA Region 1. ENSR International & EPA Region 1, Boston, MA. Available at http://www.epa.gov/region1/eco/tmdl/regionalpgrfs.html

[13] USGS Data Series 451 Local and Cumulative Impervious Cover of Massachusetts Stream Basins Available at: http://pubs.usgs.gov/ds/451/

[14] MassGIS Impervious Surfaces datalayer taken from 2005 orthoimagery. Available at: http://www.mass.gov/mgis/impervious_surface.htm

The total and subwatersheds percent impervious are greater than 9% indicating that stormwater is a likely contributor to the impairment. To meet the 9% effective IC target, the effective IC within the subwatershed will need to be reduced by the percentage calculated in Table 1. MassDOT then uses the same target percent reduction for their directly contributing watershed as shown in Table 2.

Table 2 MassDOT Directly Contributing Watershed*

Directly Contributing Area	4.3 acres
Directly Contributing IC Area	4.3 acres
Percent Impervious	100%
Directly Contributing Area Effective IC Reduction Target (52.8% Target Effective IC Reduction of MassDOT Directly Contributing IC Area)	2.3 acres
Target Effective IC	47.2%
Target Effective IC	2.0 acres

*Rounding accounts for differences in calculations.

Next, MassDOT estimated the effective IC of the MassDOT directly contributing drainage areas accounting for treatment provided by existing BMPs. This effective IC reduction was calculated by applying effective IC reduction rates to existing BMPs based on their size, function and contributing watershed. BMP performances were derived from EPA Region 1's BMP performance analysis report[15] and engineering judgment. The table below shows the existing BMPs, their MassDOT drainage areas and effective IC reductions. Note the oil/grit separators are not included in the analysis, as these do not receive any effective IC reduction credit based on the current methodology.

Table 3 Existing Conditions*

BMP Name	BMP Type	Contributing Effective IC (acres)	Estimated Percent Reduction	Estimated Effective IC Reduction (acres)
BMP 1A	Infiltration Basin	1.26	37%	0.47
BMP 1B	Infiltration Swale	0.80	10%	0.08
Total Directly Discharging Area			**43.3%**	**0.55**
Target Effective IC				2.0
Remaining Reduction to Meet Target				**1.75**

*Rounding accounts for differences in calculations.

Under existing conditions, MassDOT's estimated effective IC exceeds the target as described above. To mitigate the effects of IC, MassDOT will implement stormwater BMPs to the maximum extent practical given site constraints.

[15] Environmental Protection Agency (EPA), 2010, Stormwater Best Management Practices (BMP) Performance Analysis. Available at: http://www.epa.gov/region1/npdes/stormwater/assets/pdfs/BMP-Performance-Analysis-Report.pdf

This assessment was not able to identify practical locations for stormwater management improvements within the current MassDOT right-of-way. The Proposed Mitigation Plan section discusses the site constraints and mitigation plan.

Proposed Mitigation Plan

During this assessment phase of the Impaired Waters Program, MassDOT has focused on directly contributing areas and identified BMPs that can be constructed entirely on MassDOT property without resulting in substantial wetland impacts or resulting in an adverse impact on historical or archeological resources. Projects that meet these requirements can be implemented under the Impaired Waters Program Retrofit initiative.

Site limitations in the French Stream watershed include a lack of space available within the State Highway Layout and MassDOT's existing right-of-way along Route 123 and Route 139 for the construction of stormwater BMPs. Based on the review of MassDOT's directly contributing drainage area, no BMPs have been identified that can be implemented on MassDOT property to address the impairments of the French Stream given the site constraints.

With respect to the fecal coliform impairment, 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,[16] MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements and TMDL recommendations in regard to pathogens.

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 French Stream. 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 French Stream, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education. Further work by MassDOT on programmed projects, which often include broader scale road layout changes, may provide

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

additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to address impairments. MassDOT will include an update in NPDES permit annual reports to EPA regarding proposed BMP design either through retrofit or programmed projects, plans for construction of BMPs, reduction achieved by finalized BMP designs and progress made towards meeting target effective IC reductions.

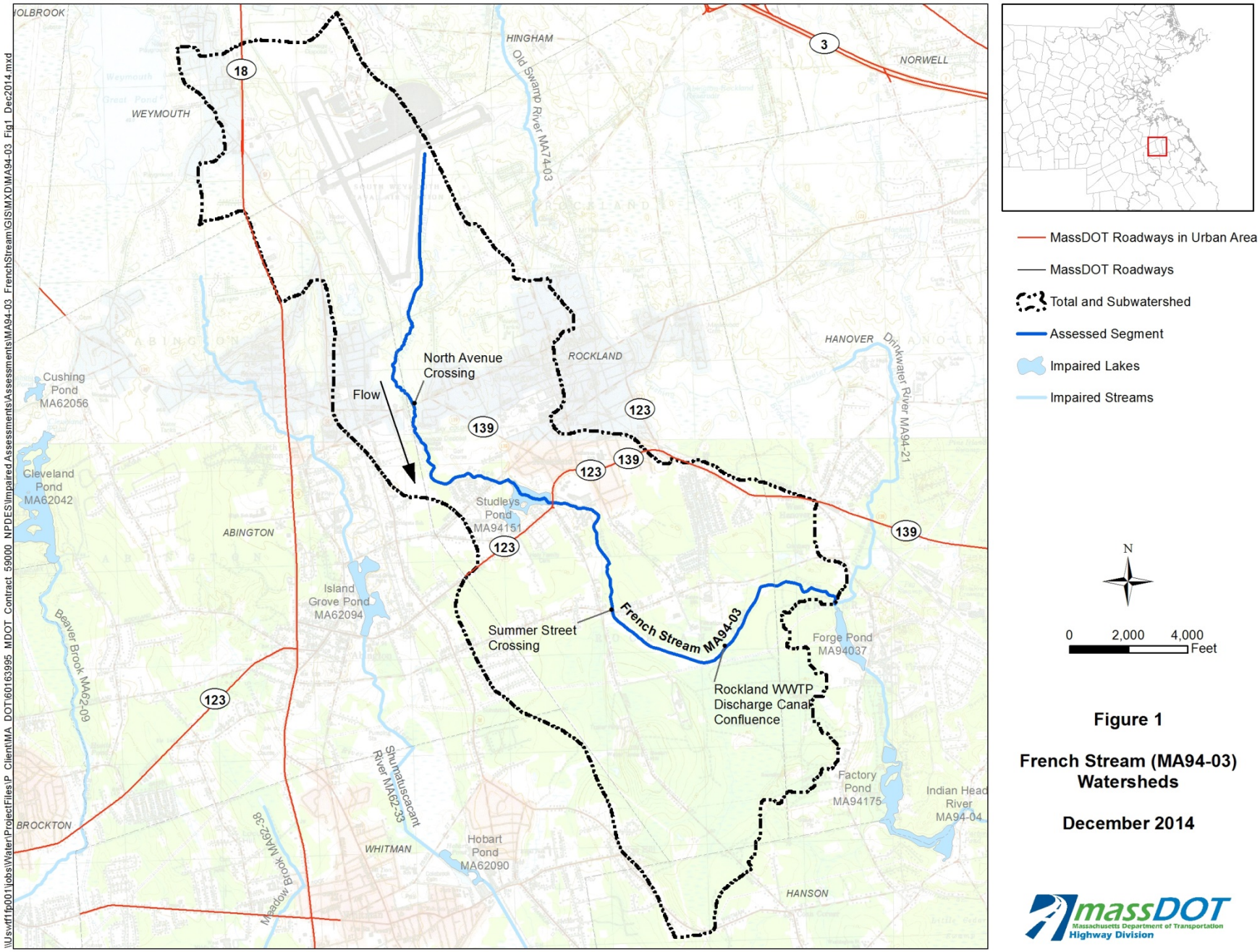
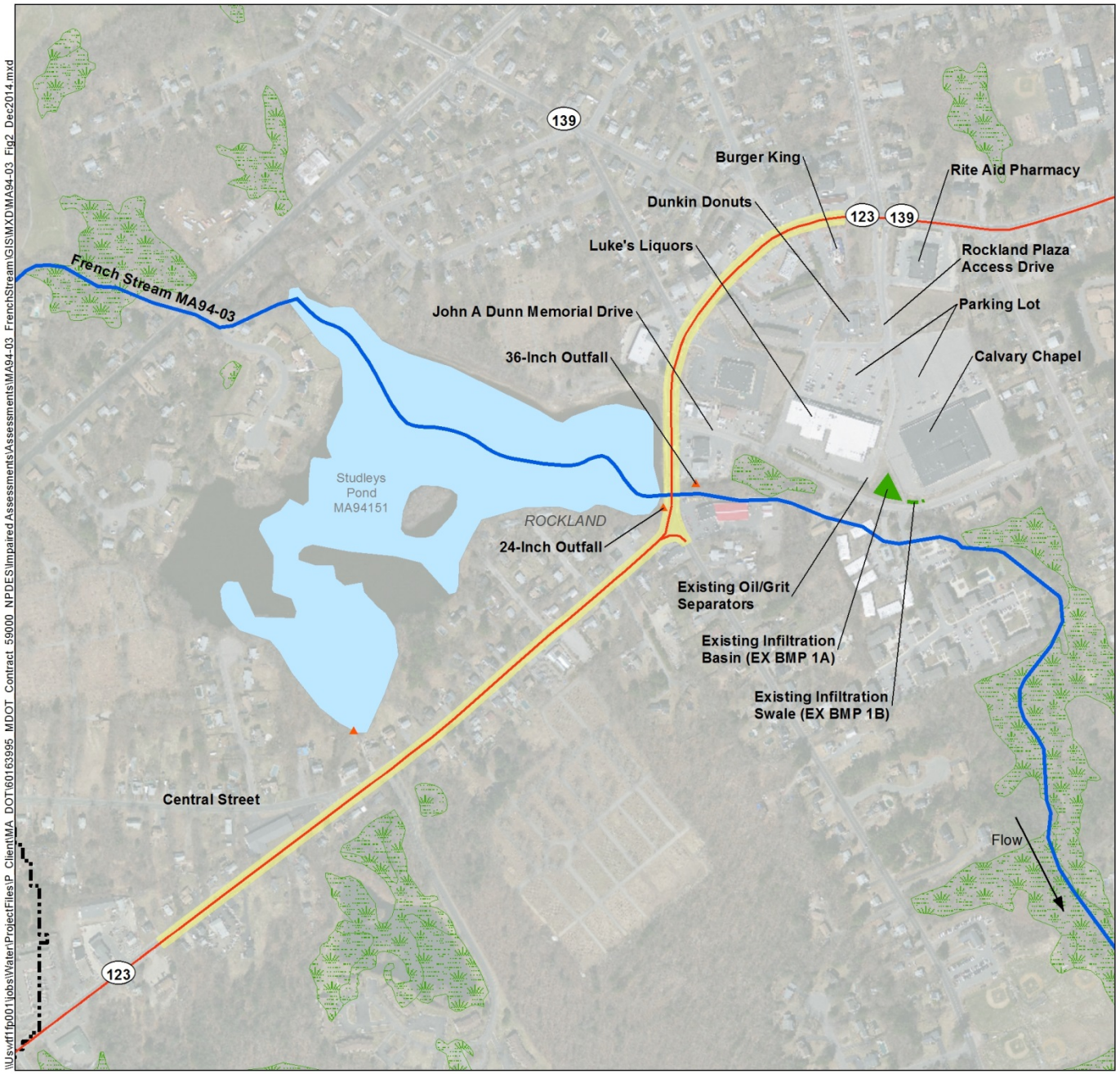
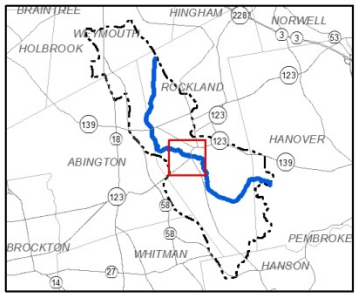


Figure 1

French Stream (MA94-03) Watersheds

December 2014





- MassDOT Outfalls
- MassDOT Roadways in Urban Area
- Assessed Segment
- Impaired Lakes
- Impaired Streams
- Total and Subwatershed
- Existing BMPs
- Existing Swales
- MassDOT Directly Discharging Area
- DEP Wetlands

N

0 300 600 Feet

Figure 2

French Stream (MA94-03) Directly Contributing MassDOT Watershed

December 2014

massDOT Massachusetts Department of Transportation Highway Division

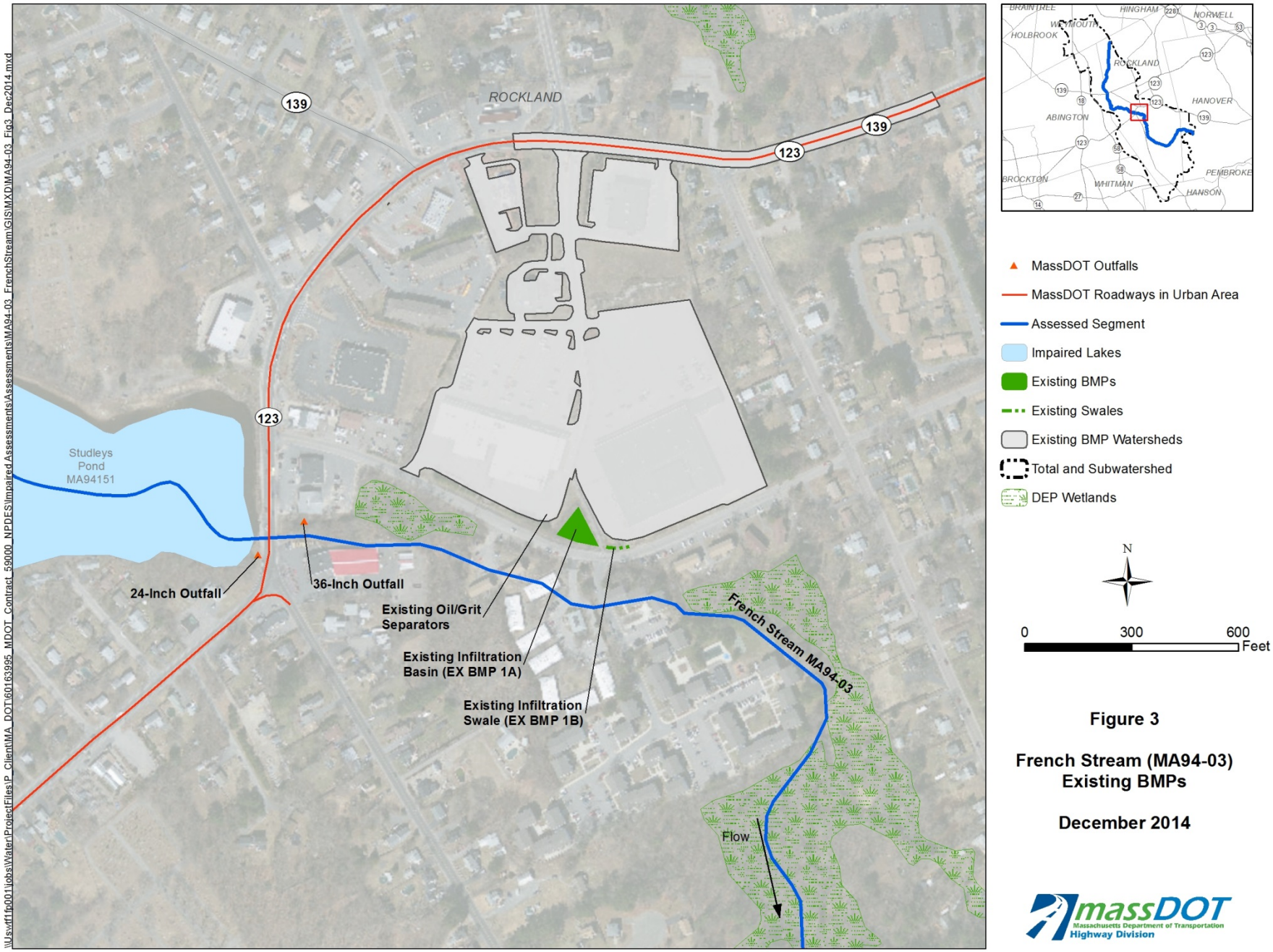


Figure 3

French Stream (MA94-03)
Existing BMPs

December 2014

Impaired Waters Assessment for Drinkwater River (MA94-21)

Summary

Impaired Water[1]	Impairments:	Stormwater:	*Excess Algal Growth* *Fecal Coliform* *Dissolved Oxygen* *Phosphorus (Total)* *Secchi Disk Transparency*
		Non-Stormwater:[2]	*Mercury in Fish Tissue*
	Category:	*5 (Waters requiring a TMDL)*	
	Final TMDLs:	*None*	
	WQ Assessment:	*South Shore Coastal Watersheds 2001 Water Quality Assessment Report*[3]	
Location	Towns:	*Hanover*	
	MassDOT Roads:	*Route 3, Route 53, Route 139*	
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒	
BMPs	Existing:	*None*	
MassDOT Area and Targets			Impervious Cover (IC)
	Directly Contributing Area:		*1.6 acres*
	Contributing Area Reduction Target:		*0.8 acres*
	Existing BMPs Reduction:		*0 acres*
	Remaining Reduction to Meet Target:		*0.8 acres*

[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.massdot.state.ma.us/Portals/8/docs/environmental/impairedWaters/Year3//Year3_ImpairedWatersAssessment_1.pdf#page=308

[3] MassDEP, March 2006. South Shore Coastal Watersheds 2001 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/94wqar3.pdf

Site Description

Drinkwater River (MA94-21) is located in Hanover, Massachusetts. This segment is approximately 3.5 miles long and flows south from Whiting Street through Forge Pond (MA94037) and into Factory Pond (MA94175). Land uses within the subwatershed consist primarily of forested and residential areas. Refer to Figure 1A, attached, for a map showing the total watershed and subwatershed to Drinkwater River (MA94-21).

MassDEP's Water Quality Assessment Report[4] for this receiving water identified the Aquatic Life Use with an "alert" status based on fish community data and elevated levels of total phosphorus. Based on the report, the upper 2.4 miles (upstream of the confluence with French Stream, MA94-03) is assessed as "support." However, the lower 1.1 mile stretch (downstream of the confluence with French Stream, MA94-03) is assessed as "impaired" due to supersaturation of dissolved oxygen and elevated total phosphorus concentrations. Suspected sources of impairment listed in the report include the Rockland Wastewater Treatment Plant point source discharge, stormwater runoff, and agricultural runoff.

The report identified the Fish Consumption Use as "impaired" for the lower 0.5 miles of the segment due to elevated levels of mercury. The source of the contamination listed in the report is the former National Fireworks, Inc. site located adjacent to Factory Pond (MA94175). The upper 3.0 mile portion of this segment is not assessed for the Fish Consumption Use.

The report identified the Primary Contact Recreation Use for this receiving water as "impaired" due to elevated fecal coliform bacteria counts in samples taken from the Circuit Street Bridge. The report identified the Secondary Contact Recreation and Aesthetic Uses as "support" for the upper 2.4 miles (upstream of the confluence with French Stream, MA94-03) but "impaired" for the lower 1.1 mile stretch (downstream of the confluence with French Stream, MA94-03) due to objectionable conditions including excess algal growth and low Secchi disk transparency. Suspected sources of impairment listed in the report for all three uses include the Rockland Wastewater Treatment Plant point source discharge, stormwater runoff, and agricultural runoff.

Within the subwatershed to Drinkwater River, MassDOT-owned roads include Route 3, Route 53, and Route 139. Refer to Figure 1B for the location of these roadways within the subwatershed. Route 3 is a multi-lane divided highway with two travel lanes in both directions, paved shoulders along the outside lanes, and a vegetated median strip approximately 80-100 feet in width. The highway runs through a mostly wooded area. In total, MassDOT's right-of-way is 400 feet in width. The majority of the roadway is not curbed, and runoff primarily sheet flows to the median and shoulders. There are small, localized drainage systems in a few spots that consist of several catch basins and outfalls that discharge stormwater to the shoulders of the roadway. Receiving waterbodies for this stretch of Route 3 include Longwater Brook (unimpaired), two unnamed streams (unimpaired), and several deciduous wooded swamps. Refer to Figure 1B for the location of these water bodies within the subwatershed to Drinkwater River.

Route 53 is a two-lane urban collector roadway that runs through commercial and residential areas along the northern edge of the subwatershed to Drinkwater River. MassDOT's right-of-way along this roadway is much smaller than Route 3, having a width of only 41 feet. The majority of the roadway is curbed, with catch basins collecting runoff and outfalls discharging stormwater to the shoulders of the roadway. Receiving waterbodies for this stretch of Route 53 include several

[4] MassDEP, March 2006. South Shore Coastal Watersheds 2001 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/94wqar1.pdf

deciduous wooded swamps. Refer to Figure 1B for the location of these water bodies within the subwatershed to Drinkwater River.

Both Route 3 and Route 53 cross the northern part of the subwatershed more than one and a half miles from the headwaters of Drinkwater River. As such, stormwater discharges from these two roadways are considered indirect.

Route 139 is also a two-lane urban collector roadway that runs through commercial and residential areas. MassDOT's right-of-way along this roadway is 55 feet wide. Route 139 crosses over Drinkwater River, with the stream flow being conveyed under the roadway via a concrete box culvert. At the time of field inspection, a significant amount of poison ivy prevented the field team from taking measurements of the existing culvert. The majority of Route 139 within the subwatershed to Drinkwater River is curbed, with catch basins collecting runoff and outfalls discharging stormwater directly to the river and several deciduous wooded swamps that have formed adjacent to two unnamed tributaries to the river (unimpaired), one of which extends from Cushing Brook. Refer to Figure 1B for the location of these water bodies within the subwatershed to Drinkwater River.

MassDOT's directly contributing watershed to Drinkwater River is 2.1 acres, with 1.6 acres of impervious cover. In the directly contributing watershed, stormwater from high points along the roadway is collected by catch basins and discharged directly to the receiving water. According to drainage plans for Route 139 (Contract 98039, dated 2/10/98) stormwater discharges to Drinkwater River through two 12-inch reinforced concrete pipe outfalls along the downstream headwall of the box culvert. As mentioned previously, a significant amount of poison ivy during the time of the field visit prevented the field team from visually confirming the location of these two outfalls.

Existing BMPs

MassDOT did not identify any existing BMPs in place to treat roadway runoff from the directly discharging area before reaching the impaired water segment.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the waterbody for the impairments covered by the TMDL under the BMP 7R methodology.[5] MassDOT separately assesses the waterbody for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[6] MassDOT assessed Drinkwater River (MA94-21) using the methodologies described below.

MassDOT has identified a water body impairment in the Drinkwater River watershed which is not related to stormwater runoff. The specific impairment unrelated to stormwater for the Drinkwater River is mercury in fish tissue. 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.[7]

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

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

[7] 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

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[9] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of Drinkwater 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 Storm Water Management Plan (SWMP)[10] which applies to impairments that have been assigned to a water body not covered by a final TMDL. Drinkwater River (MA94-21) is not covered by a draft or 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.[11]

BMP 7U for Impervious Cover Related Impairments

A Final TMDL is not in place to address Drinkwater River's (MA94-21) following impairments: excess algal growth, dissolved oxygen, phosphorus (total), and secchi disk transparency. Therefore, MassDOT assessed the stormwater-related impairments not addressed by a TMDL using the approach outlined in the Description of MassDOT's Application of Impervious Cover Method in BMP 7U[12] which was developed using the EPA Region I's Impervious Cover (IC) Method, described in EPA's Stormwater TMDL Implementation Support Manual.[13] Consistent with the findings of EPA and others, MassDOT concluded that when a watershed had less than 9% IC, stormwater was not the likely cause of the impairment.

MassDOT calculated the following values for the total contributing watershed and the subwatershed of the impaired water (Drinkwater River) to determine the IC area and set a reduction target. Watersheds are based on the USGS Dataset 451 and modified as necessary using topography.[14]

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[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

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

[12] 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

[13] ENSR 2006. Stormwater TMDL Implementation Support Manual for US EPA Region 1. ENSR International & EPA Region 1, Boston, MA. Available at http://www.epa.gov/region1/eco/tmdl/regionalpgrfs.html

[14] USGS Data Series 451 Local and Cumulative Impervious Cover of Massachusetts Stream Basins Available at: http://pubs.usgs.gov/ds/451/

MassGIS's impervious surfaces data layer was used to determine the IC of the watersheds.[15] The total watershed and the subwatershed are shown in Figures 1A and 1B.

Table 1 Impaired Segment Watershed

	Total Watershed	Subwatershed
Watershed Area	13,249 acres	4,917 acres
Impervious Cover (IC) Area	2,440 acres	830 acres
Percent Impervious	18.4%	16.9%
IC Area at 9% Effective IC Target	1,192 acres	443 acres
Target Effective IC Reduction	51.1%	46.6%

The total and subwatersheds percent impervious cover are greater than 9%, indicating that stormwater is a likely contributor to the impairment. To meet the 9% effective IC target, the effective IC within the subwatershed will need to be reduced by the percentage calculated in Table 1. MassDOT then uses the same target percent reduction for their directly contributing watershed as shown in Table 2.

Table 2 MassDOT Directly Contributing Watershed

Directly Contributing Area	2.1 acres
Directly Contributing IC Area	1.64 acres
Percent Impervious	78%
Directly Contributing Area Effective IC Reduction Target (46.6% Target Effective IC Reduction of MassDOT Directly Contributing IC Area)	0.76 acres
Target Effective IC	53.4%
Target Effective IC	0.85 acres

Under existing conditions, MassDOT's estimated effective IC exceeds the target as described above. To mitigate the effects of IC, MassDOT will implement stormwater BMPs to the maximum extent practical given site constraints.

This assessment was not able to identify practical locations for stormwater management improvements within the current MassDOT right-of-way. The Proposed Mitigation Plan section discusses the site constraints and mitigation plan.

Proposed Mitigation Plan

During this assessment phase of the Impaired Waters Program, MassDOT has focused on directly contributing areas and identified BMPs that can be constructed entirely on MassDOT property without resulting in substantial wetland impacts or resulting in an adverse impact on historical or archeological resources. Projects that meet these requirements can be implemented under the Impaired Waters Program Retrofit initiative.

[15] MassGIS Impervious Surfaces datalayer taken from 2005 orthoimagery. Available at: http://www.mass.gov/mgis/impervious_surface.htm

Site limitations in the Drinkwater River watershed include:

- Limited space available within MassDOT's right-of-way
- Presence of wetlands adjacent to the roadway at the Drinkwater River crossing

In the area of MassDOT's directly contributing watershed to Drinkwater River, the roadway is approximately 40 feet wide, while the right-of-way is 55 feet wide. This leaves only 7.5 feet along either side of the roadway, which is insufficient for the implementation of a stormwater BMP. In addition, wetlands are located adjacent to the roadway in the vicinity of the Drinkwater River crossing. Although there is an open lot adjacent to the crossing of the river beneath Route 139; MassDOT does not own this property.

Based on the review of MassDOT's directly contributing drainage area, no BMPs have been identified that can be implemented on MassDOT property to address the impairments of the Drinkwater River given the site constraints.

With respect to the fecal coliform impairment, 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,[16] MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements in regard to pathogens.

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 Drinkwater 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 Drinkwater River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education. Further work by MassDOT on programmed projects, which often include broader scale road layout changes, may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to address impairments. MassDOT will include an update in NPDES permit annual reports to EPA regarding proposed BMP design either through retrofit or

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

programmed projects, plans for construction of BMPs, reduction achieved by finalized BMP designs and progress made towards meeting target effective IC reductions.

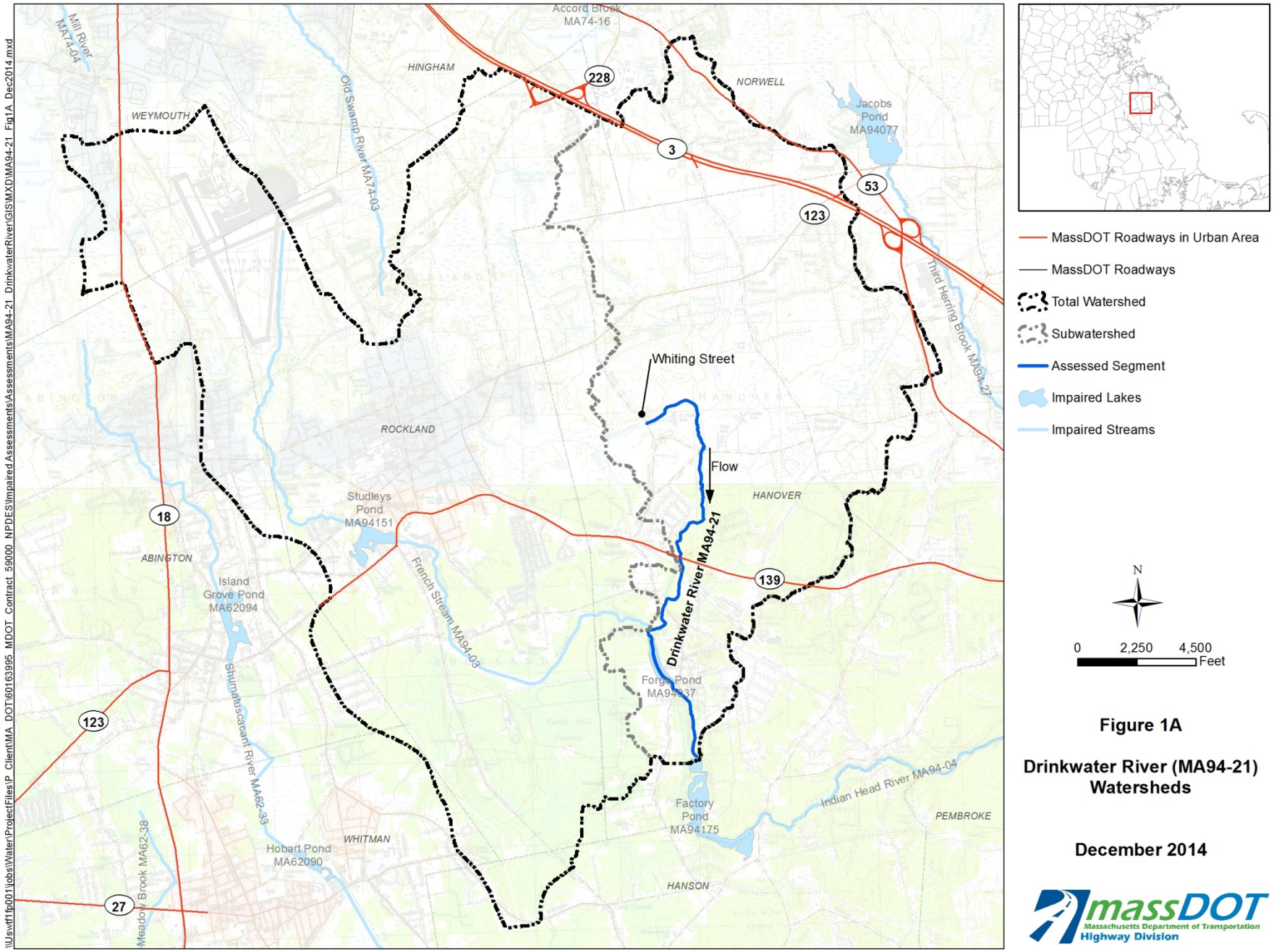


Figure 1A

Drinkwater River (MA94-21) Watersheds

December 2014

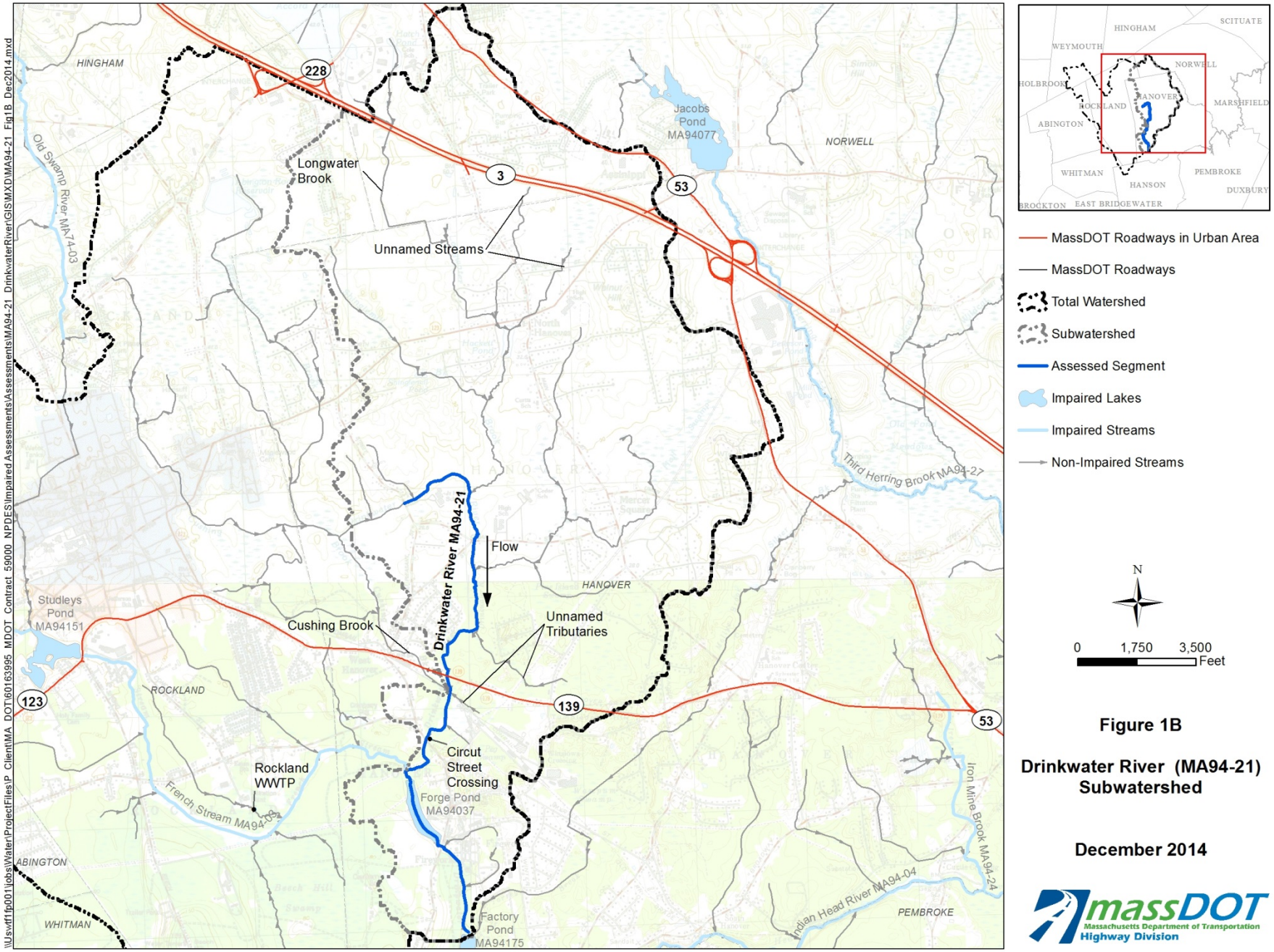
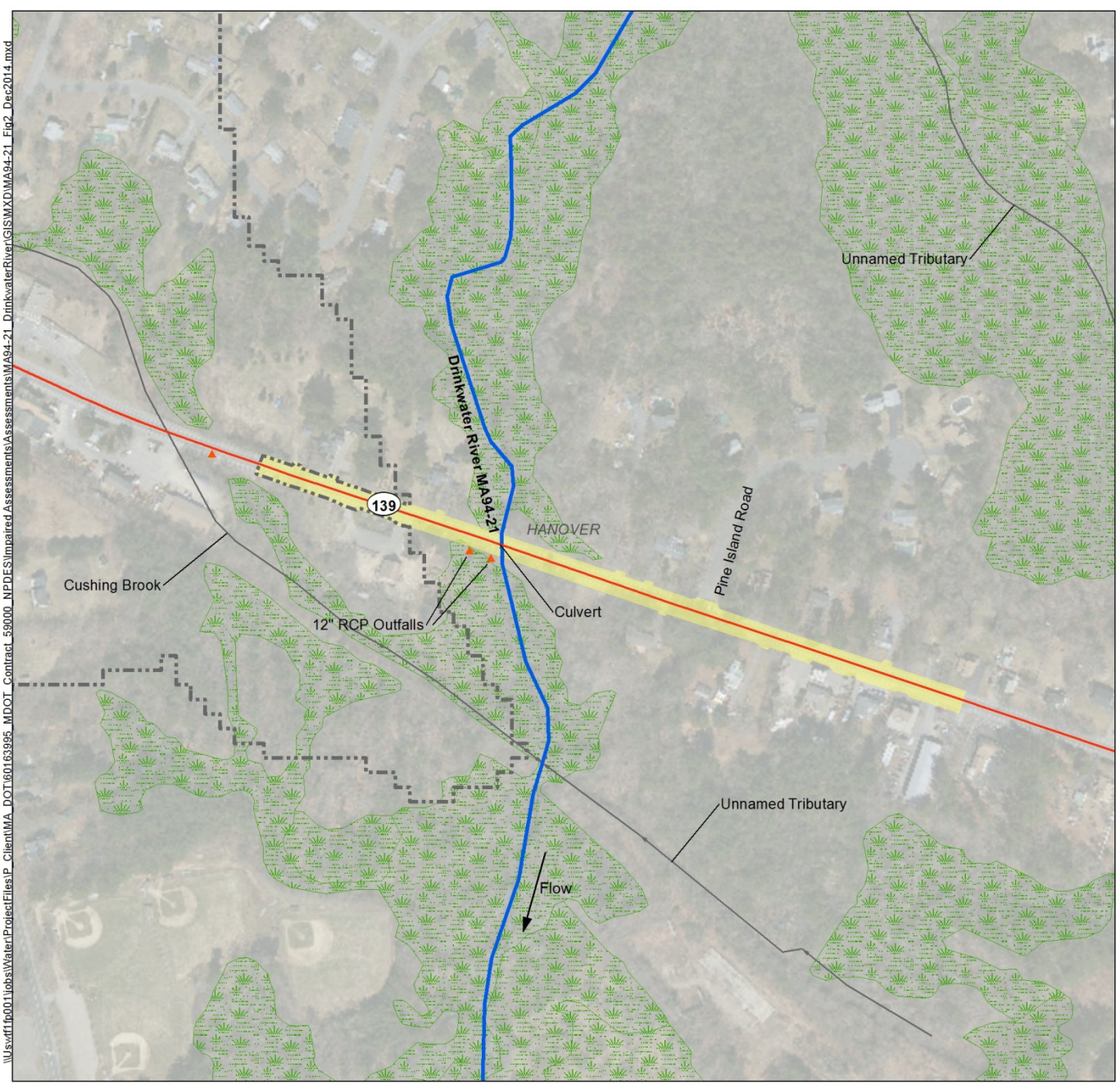
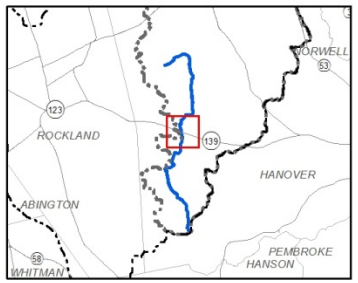


Figure 1B

Drinkwater River (MA94-21) Subwatershed

December 2014





- MassDOT Outfalls
- MassDOT Roadways in Urban Area
- Assessed Segment
- Subwatershed
- MassDOT Directly Discharging Area
- Non-Impaired Streams
- DEP Wetlands

N

0 200 400 Feet

Figure 2

Drinkwater River (MA94-21)
Directly Contributing
MassDOT Watershed

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division

Impaired Waters Assessment for Hammett Cove (MA95-56)

Summary

Impaired Water[1]	Stormwater Impairments:	*Estuarine bioassessments, Fecal coliform, Nitrogen (total)*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*Final Pathogen TMDL for the Buzzards Bay Watershed March 2009*[2]
	WQ Assessment:	*Buzzards Bay Watershed 2000 Water Quality Assessment Report*[3,4]
Location	Towns:	*Marion*
	MassDOT Roads:	*Interstate 195, Route 105 and Route 6*
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method) ☒
BMPs	Existing:	*None*

MassDOT Area and Targets	Impervious Cover (IC)
Directly Contributing Area:	*7.4 acres*
Contributing Area Reduction Target:	*1.3 acres*
Existing BMPs Reduction:	*0.0 acres*
Remaining Reduction to Meet Target:	*1.3 acres*

[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 Buzzards Bay Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/buzzbay1.pdf

[3] MassDEP, 2003. Buzzards Bay Watershed 2000 Water Quality Assessment Report, Section I. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/95wqar1.pdf

[4] MassDEP, 2003. Buzzards Bay Watershed 2000 Water Quality Assessment Report, Section III. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/95wqar3.pdf

Site Description

Hammett Cove (MA95-56) is located south of Route 6 and west of Point Road in Marion Massachusetts. Hammett Cove has a surface area of approximately 0.07 square miles which receives flows from upstream wetlands and water bodies. The downstream end of Hammett Cove borders Sippican Harbor (MA95-70) along a line from the southwestern most point of Little Neck to the end of the seawall on the opposite side. MassDEP's Water Quality Assessment Report[5] for this receiving water identified the Aquatic Life Use with an "impaired" status because of a decline in eelgrass bed habitat. A 0.02 square mile portion of the receiving water also is identified with an "impaired" status for the Shellfish Harvesting Use based upon a Division of Marine Fisheries prohibition due to fecal coliform. A 0.05 square mile portion of the receiving water is "supported" for the Shellfish Harvesting Use as well as the Primary and Secondary Contact Recreation Uses. All other uses and remaining 0.02 square miles of the Primary and Secondary Contact Recreation Uses were "not assessed".

Figure 1 shows the total and subwatersheds of Hammett Cove, which are the same and are located in the town of Marion. The MassDOT-owned roadways in the Hammett Cove watershed, which includes portions of Interstate 195, Route 105 and Route 6, are also shown on Figure 1. The watershed to Hammett Cove is comprised of commercial, medium density and multifamily residential land with the majority of the watershed consisting of forested land, recreational uses and open space.

Figure 2 shows the MassDOT directly discharging area, the limits of which were determined by the existing drainage infrastructure and roadway high points. The Route 6 right-of-way is sixty-feet wide, consists of four undivided lanes, two shoulders and sidewalks, is curbed and is generally bounded by commercial and medium density residential uses as well as water bodies and wetlands. Stormwater runoff is primarily collected by catch basins along the edge of the road and discharged to various MassDOT stormwater outfalls along the northern and southern shoulders of Route 6.

The MassDOT directly discharging area shown on Figure 2 can be broken up into western and eastern segments. The western portion which starts at the high point just east of Hermitage Road and continues to a high point east of Creek Road discharges stormwater flows directly into Hammett Cove. The eastern portion which concludes at the high point east of Hill Street discharges stormwater flows to an unnamed tributary where flows have a relatively short residence time prior to discharging via a culvert under Creek Road into Hammett Cove. Due to the short residence time these flows are considered to be directly contributing to Hammett Cove.

Existing BMPs

MassDOT did not identify any existing BMPs in place to treat roadway runoff from the directly discharging area before reaching the impaired water segment.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the waterbody for the impairments covered by the TMDL under the BMP 7R methodology.[6] MassDOT separately

[5] MassDEP, 2003. Buzzards Bay Watershed 2000 Water Quality Assessment Report, Section III. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/95wqar3.pdf

[6] 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

assesses the waterbody for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[7] MassDOT assessed Hammett Cove (MA95-56) 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[9] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of Hammett Cove is not proposed to change.

BMP 7R for Pathogen TMDL (CN 251.1)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R of MassDOT's Storm Water Management Plan (SWMP)[10] which applies to impairments that have been assigned to a water body covered by a TMDL. Hammett Cove (MA95-56) is covered by the *Final Pathogen TMDL for the Buzzards Bay 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 Buzzards Bay Watershed, sources of indicator bacteria in the Buzzards Bay watershed were found to be many and varied. Most of the bacteria sources in the Buzzards Bay watershed are believed to be failing septic systems, combined sewer overflows (CSO), sanitary sewer overflows (SSO), sewer pipes connected to storm drains, certain recreational activities, wildlife including birds along with domestic pets and animals and direct overland stormwater runoff.

The TMDL report states the following on Page 54:

> "It is difficult to provide accurate quantitative estimates of indicator bacteria contributions from the various sources in the Buzzards Bay watershed because many of the sources are diffuse and intermittent, and extremely difficult to monitor or accurately model. Many of the sources (failing septic systems, leaking sewer pipes, sanitary sewer overflows, and illicit sanitary sewer connections) are prohibited, because they could result in a potential health risk and, therefore,

[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, 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

[11] MassDEP, 2009. Final Pathogen TMDL for the Buzzards Bay Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/buzzbay1.pdf

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

must be eliminated. Estimating the magnitude of overall indicator bacteria loading can perhaps be achieved for wet and dry conditions using ambient data available that define baseline conditions."

Stormwater runoff including municipal separate storm sewer systems (MS4) is identified as a potential source of bacteria for Hammett Cove (MA95-56).

In addition to the generic recommendations provided in the draft NPDES MS4 permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the Buzzards Bay TMDL report (Section 8.0, page 100) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed:

- Tracking and remediation of bacteria sources from illicit sewer connection, leaking sewer pipes, sanitary sewer overflows, or failing septic systems
- Implementation of non-structural practices such as street sweeping and/or managerial strategies using local regulatory controls

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 Buzzards Bay Watershed:

- Agricultural BMPs
- Identification and elimination of illicit sewer connections, repairing failing infrastructure, and mitigating CSO impacts
- Develop and implement Storm Water Management Plans
- Septic system controls
- Wastewater treatment plant controls
- Recreational waters use management
- Watershed resident education
- Marion – Washburn Park Wetland Restoration and Creation Project

BMP 7U for Impervious Cover Related Impairments

A Final TMDL is not in place to address Hammett Cove's (MA95-56) following impairments: estuarine bioassessments and nitrogen (total). Therefore, MassDOT assessed the stormwater-related impairments not addressed by a TMDL using the approach outlined in the Description of MassDOT's Application of Impervious Cover Method in BMP 7U[13] which was developed using the EPA Region I's Impervious Cover (IC) Method, described in EPA's Stormwater TMDL Implementation Support Manual.[14] Consistent with the findings of EPA and others, MassDOT concluded that when a watershed had less than 9% IC, stormwater was not the likely cause of the impairment.

[13] 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

[14] ENSR 2006. Stormwater TMDL Implementation Support Manual for US EPA Region 1. ENSR International & EPA Region 1, Boston, MA. Available at http://www.epa.gov/region1/eco/tmdl/regionalpgrfs.html

MassDOT calculated the following values for the total contributing watershed of the impaired water (Hammett Cove) to determine the IC area and set a reduction target. Watersheds are based on the USGS Dataset 451 and modified as necessary using topography.[15] MassGIS's impervious surfaces data layer was used to determine the IC of the watersheds.[16] The total watershed is shown on Figure 1.

Table 1 Impaired Segment Watershed

	Total Watershed
Watershed Area	917 acres
Impervious Cover (IC) Area	99 acres
Percent Impervious	11%
IC Area at 9% Effective IC Target	83 acres
Target Effective IC Reduction	18%

The total watershed percent impervious is greater than 9% indicating that stormwater is a likely contributor to the impairment. To meet the 9% effective IC target, the effective IC within the watershed will need to be reduced by the percentage calculated in Table 1. MassDOT then uses the same target percent reduction for their directly contributing watershed as shown in Table 2.

Table 2 MassDOT Directly Contributing Watershed

Directly Contributing Area	8.2 acres
Directly Contributing IC Area	7.4 acres
Percent Impervious	90%
Directly Contributing Area Effective IC Reduction Target (18% Target Effective IC Reduction of MassDOT Directly Contributing IC Area)	1.3 acres
Target Effective IC	74%
Target Effective IC	6.1 acres

Under existing conditions, MassDOT's estimated effective IC exceeds the target as described above. To mitigate the effects of IC, MassDOT will implement stormwater BMPs to the maximum extent practical given site constraints.

This assessment was not able to identify practical locations for stormwater management improvements within the current MassDOT right-of-way. The Proposed Mitigation Plan section discusses the site constraints and mitigation plan.

Proposed Mitigation Plan

During this assessment phase of the Impaired Waters Program, MassDOT has focused on directly contributing areas and identified BMPs that can be constructed entirely on MassDOT property

[15] USGS Data Series 451 Local and Cumulative Impervious Cover of Massachusetts Stream Basins Available at: http://pubs.usgs.gov/ds/451/

[16] MassGIS Impervious Surfaces datalayer taken from 2005 orthoimagery. Available at: http://www.mass.gov/mgis/impervious_surface.htm

without resulting in substantial wetland impacts or resulting in an adverse impact on historical or archeological resources. Projects that meet these requirements can be implemented under the Impaired Waters Program Retrofit initiative.

Site limitations in the Hammett Cove watershed include limited MassDOT property, consisting of a sixty-foot wide right-of-way made up of four undivided lanes, two shoulders and sidewalks which are generally bounded by commercial and medium density residential uses as well as water bodies and wetlands.

Based on the review of MassDOT's directly contributing drainage area, no BMPs have been identified that can be implemented on MassDOT property to address the impairments of the Hammett Cove given the site constraints.

With respect to the fecal coliform impairment, 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[17], 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 Buzzards Bay Watershed bacteria TMDL report, MassDOT implements a SWMP. 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.

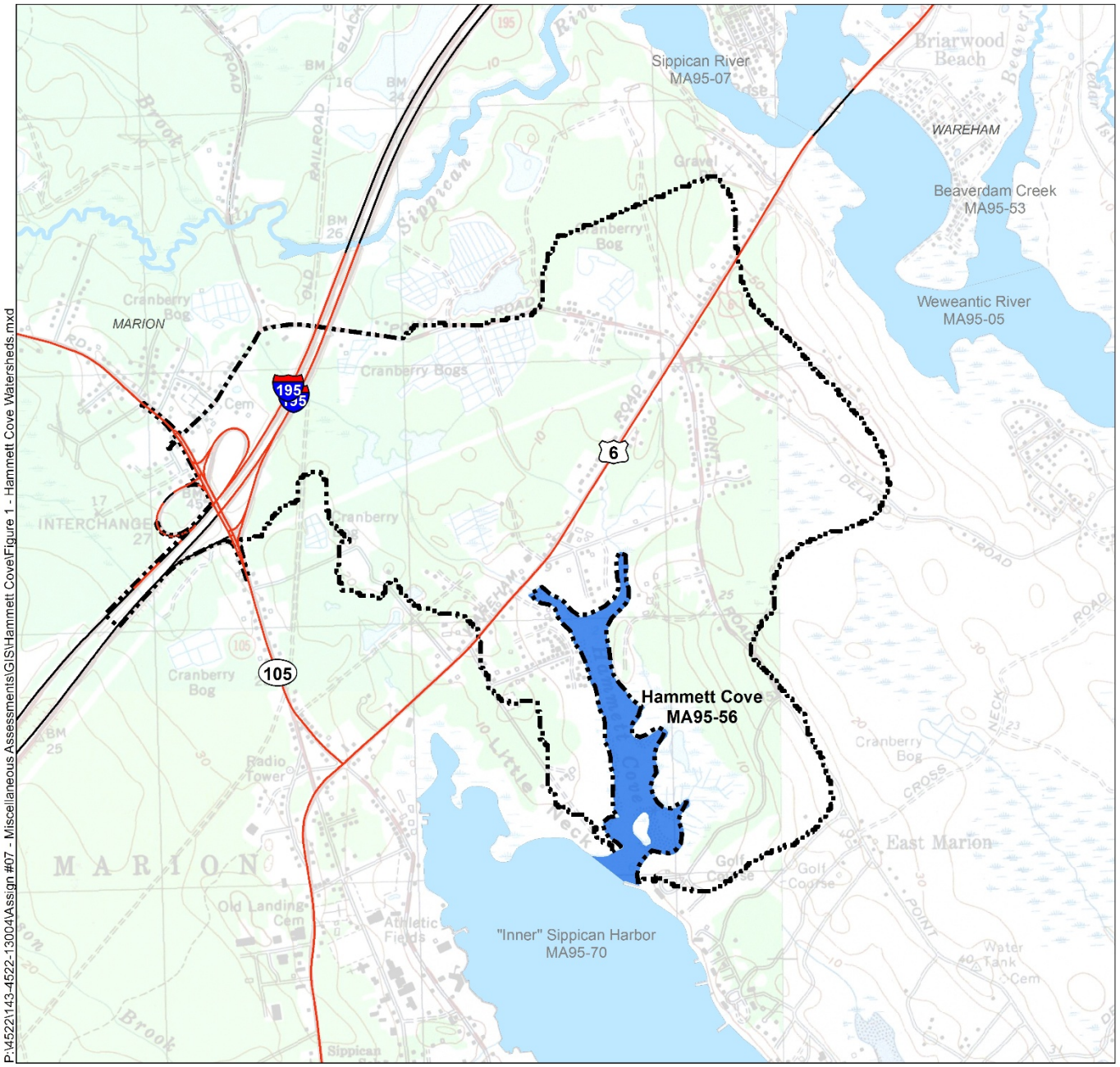
Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability 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 Hammett Cove. 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.

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

MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Hammett Cove, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education. Further work by MassDOT on programmed projects, which often include broader scale road layout changes, may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to address impairments. MassDOT will include an update in NPDES permit annual reports to EPA regarding proposed BMP design either through retrofit or programmed projects, plans for construction of BMPs, reduction achieved by finalized BMP designs and progress made towards meeting target effective IC reductions.



MassDOT Roadways in Urban Area

MassDOT Roadways

Watershed

Assessed Segment

Impaired Lakes

Impaired Streams

N

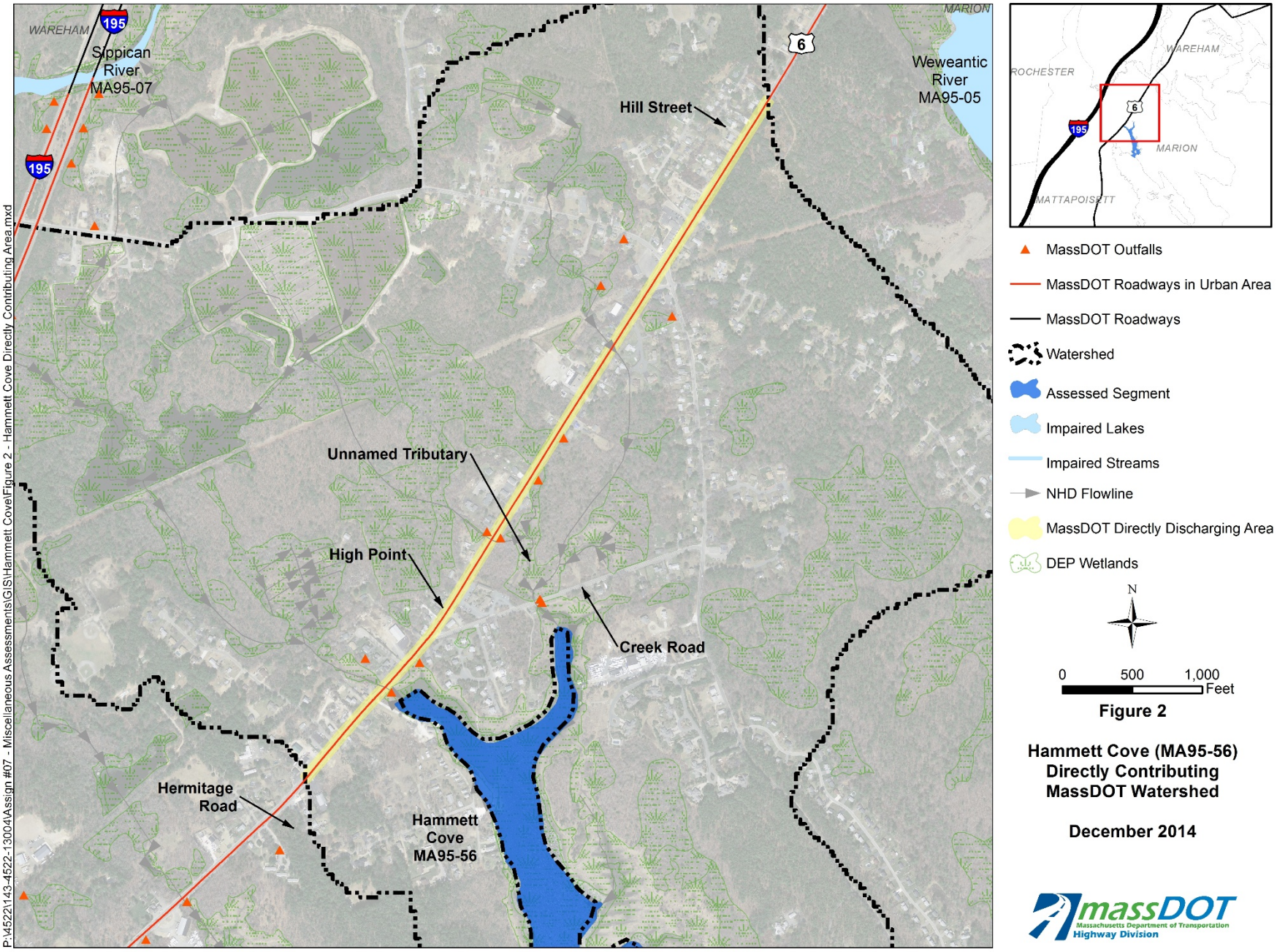
0 1,000 2,000 Feet

Figure 1

Hammett Cove (MA95-56) Watersheds

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division



P:\14522\143-4522-13004\Assign #07 - Miscellaneous Assessments\GIS\Hammett Cove\Figure 2 - Hammett Cove Directly Contributing Area.mxd

Figure 2

Hammett Cove (MA95-56)
Directly Contributing
MassDOT Watershed

December 2014

Impaired Waters Assessment for Eel Pond (MA95-61)

Summary

Impaired Water[1]	Stormwater Impairments:	*Nutrient/Eutrophication Biological Indicators, Fecal Coliform*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*Final Pathogen TMDL for the Buzzards Bay Watershed (EPA TMDL #36172)*[2]
	WQ Assessment:	*Buzzards Bay Watershed 2000 Water Quality Assessment Report*[3]
Location	Towns:	*Mattapoisett*
	MassDOT Roads:	*Route 6, Interstate 195*
Assessment Method(s)	7R (TMDL Method) ☒	7U (non-TMDL Method) ☒
BMPs	Existing:	*None*
MassDOT Area and Targets		Impervious Cover (IC)
	Directly Contributing Area:	*2.8 acres*
	Contributing Area Reduction Target:	*1.4 acres*
	Existing BMPs Reduction:	*0.0 acres*
	Remaining Reduction to Meet Target:	*1.4 acres*

Site Description

Figure 1 illustrates the total and subwatershed for Eel Pond (MA95-61). The Eel Pond watershed is located in Mattapoisett, Massachusetts and includes residential areas, woods, wetlands, ponds, and MassDOT-owned roadways Route 6 and Interstate 195. Eel Pond is a salt pond located near the center of Mattapoisett and near the mouth of Mattapoisett Harbor.

[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 Buzzards Bay Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/buzzbay1.pdf

[3] MassDEP, 2003. Buzzards Bay Watershed 2000 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/95wqar1.pdf

Figure 2 illustrates the MassDOT-owned road that is directly contributing to the water body. Contributing MassDOT property to Eel Pond includes the impervious area along Route 6 and along the paved shoulders. This portion of Route 6 is a two lane road with paved shoulders and a sidewalk located on the westbound side. The immediately surrounding area is densely developed with commercial businesses, residential homes and utilities along the roadway. Wetlands and woodlands occupy the open spaces between developed areas. The stormwater system along Route 6 drains to Eel Pond between Reservation Golf Club and Main Street. A local high point exists at the intersection with Main Street where drainage changes direction away from Eel Pond and is piped down residential side streets.

The outfall that connects the MassDOT drainage system to Eel Pond also receives flow from an unnamed, non-impaired stream that flows from the north originating near the cloverleaf at I-195 in Mattapoisett (Figure 1). Run off received from I-195 to the unnamed stream is not considered to be directly contributing to Eel Pond due to a series of wetlands that dissipate the runoff before it is able to terminate within the Pond. In addition, the unnamed stream is not impaired and therefore it is unlikely that it is contributing to the impairments within Eel Pond.

Existing BMPs

MassDOT did not identify any existing BMPs in place to treat roadway runoff from the directly discharging area before reaching the impaired water segment.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the waterbody for the impairments covered by the TMDL under the BMP 7R methodology.[4] MassDOT separately assesses the waterbody for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[5] MassDOT assessed Eel Pond (MA95-61) 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[7] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of Eel Pond (MA95-61) is not proposed to change.

BMP 7R for Pathogen TMDL (CN 251.1)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R of MassDOT's Storm Water Management Plan (SWMP)[8] which applies to impairments

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

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

[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] 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

that are covered by a final TMDL. Eel Pond (MA95-61) is covered by the TMDL for the Buzzards Bay Watershed.[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 7R Pathogen Methodology.[10]

The Buzzards Bay watershed has no documented point sources of bacteria pollution. Suspected dry-weather sources of bacteria reported in the TMDL report include illicit sewer connections, failing septic systems, and direct wildlife, while suspected and known wet-weather sources reported include sanitary sewer overflows, combined sewer overflows, failing septic systems, and stormwater runoff including MS4s. On-site treatment, or septic, systems and MS-4 discharges are specifically mentioned as potential sources of bacterial pollution to Eel Pond (MA95-61).[9]

In an effort to eliminate bacteria sources, segments of the Buzzards Bay Watershed were prioritized based on a number of considerations, including value as a shellfish resource, existing fecal coliform concentration in receiving water, and proximity to swimming beaches. Segment MA95-61 of Eel Pond is listed as a medium priority due to its value as a resource for shellfishing. It is suspected that elevated dry-weather bacteria concentrations indicate illicit sewer connections or failing septic systems, and these sources should be eliminated.[9]

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 Buzzards Bay Watershed*[9] (Section 8.0-8.9) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed:

- Correction of failing septic systems
- Non-structural practices (street sweeping and/or managerial strategies)
- Controls for agricultural runoff, such as improved grazing management

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 *Final Pathogen TMDL for the Buzzards Bay Watershed*:[9]

- Agricultural BMPs
- Septic tank controls
- Documentation of storm drain outfall locations
- Recreational Waters use management

[9] MassDEP.2009. Final Pathogen TMDL for the Buzzards Bay Watershed. Available at: http://www.epa.gov/waters/tmdldocs/Buzz%20%20Bay%20Revised%20final%205-11-09.pdf

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

- Watershed resident education
- Additional monitoring
- Stormwater guidance tools

BMP 7U for Impervious Cover Related Impairments

A Final TMDL is not in place to address Eel Pond's (MA95-61) following impairments: nutrient/eutrophication biological indicators. Therefore, MassDOT assessed the stormwater-related impairments not addressed by a TMDL using the approach outlined in the Description of MassDOT's Application of Impervious Cover Method in BMP 7U[11] which was developed using the EPA Region I's Impervious Cover (IC) Method, described in EPA's Stormwater TMDL Implementation Support Manual.[12] Consistent with the findings of EPA and others, MassDOT concluded that when a watershed had less than 9% IC, stormwater was not the likely cause of the impairment.

MassDOT calculated the following values for the total contributing watershed and the subwatershed of the impaired water Eel Pond to determine the IC area and set a reduction target. Watersheds are based on the USGS Dataset 451 and modified as necessary using topography.[13] MassGIS's impervious surfaces data layer was used to determine the IC of the watershed.[14] The total watershed and subwatershed are the same and are shown in Figure 1.

Table 1 Impaired Segment Watershed

	Total and Subwatershed
Watershed Area	959 acres
Impervious Cover (IC) Area	178 acres
Percent Impervious	18.6%
IC Area at 9% Effective IC Target	86 acres
Target Effective IC Reduction	51.7%

The total and subwatershed percent impervious is greater than 9% indicating that stormwater is a likely contributor to the impairment. To meet the 9% effective IC target, the effective IC within the watershed will need to be reduced by the percentage calculated in Table 1. MassDOT then uses the same target percent reduction for their directly contributing watershed as shown in Table 2.

[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] ENSR 2006. Stormwater TMDL Implementation Support Manual for US EPA Region 1. ENSR International & EPA Region 1, Boston, MA. Available at http://www.epa.gov/region1/eco/tmdl/regionalpgrfs.html

[13] USGS Data Series 451 Local and Cumulative Impervious Cover of Massachusetts Stream Basins Available at: http://pubs.usgs.gov/ds/451/

[14] MassGIS Impervious Surfaces datalayer taken from 2005 orthoimagery. Available at: http://www.mass.gov/mgis/impervious_surface.htm

Table 2 MassDOT Directly Contributing Watershed

Directly Contributing Area	2.8 acres
Directly Contributing IC Area	2.8 acres
Percent Impervious	100%
Directly Contributing Area Effective IC Reduction Target (51.7% Target Effective IC Reduction of MassDOT Directly Contributing IC Area)	1.4 acres
Target Effective IC	50%
Target Effective IC	1.4 acres

Under existing conditions, MassDOT's estimated effective IC exceeds the target as described above. To mitigate the effects of IC, MassDOT will implement stormwater BMPs to the maximum extent practical given site constraints.

This assessment was not able to identify practical locations for stormwater management improvements within the current MassDOT right-of-way. The Proposed Mitigation Plan section discusses the site constraints and mitigation plan.

Proposed Mitigation Plan

During this assessment phase of the Impaired Waters Program, MassDOT has focused on directly contributing areas and identified BMPs that can be constructed entirely on MassDOT property without resulting in substantial wetland impacts or resulting in an adverse impact on historical or archeological resources. Projects that meet these requirements can be implemented under the Impaired Waters Program Retrofit initiative.

Route 6 in Mattapoisett is the main street that traverses the densely developed area of town and is lined with commercial businesses as well as residential homes and utilities. Wooded areas and wetlands are located along Route 6 between developed areas leaving little space for the potential placement of a BMP.

Based on the review of MassDOT's directly contributing drainage area, no BMPs have been identified that can be implemented on MassDOT property to address the impairments of Eel Pond given the site constraints.

With respect to the fecal coliform impairment, 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,[15] 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 Buzzards Bay 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

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

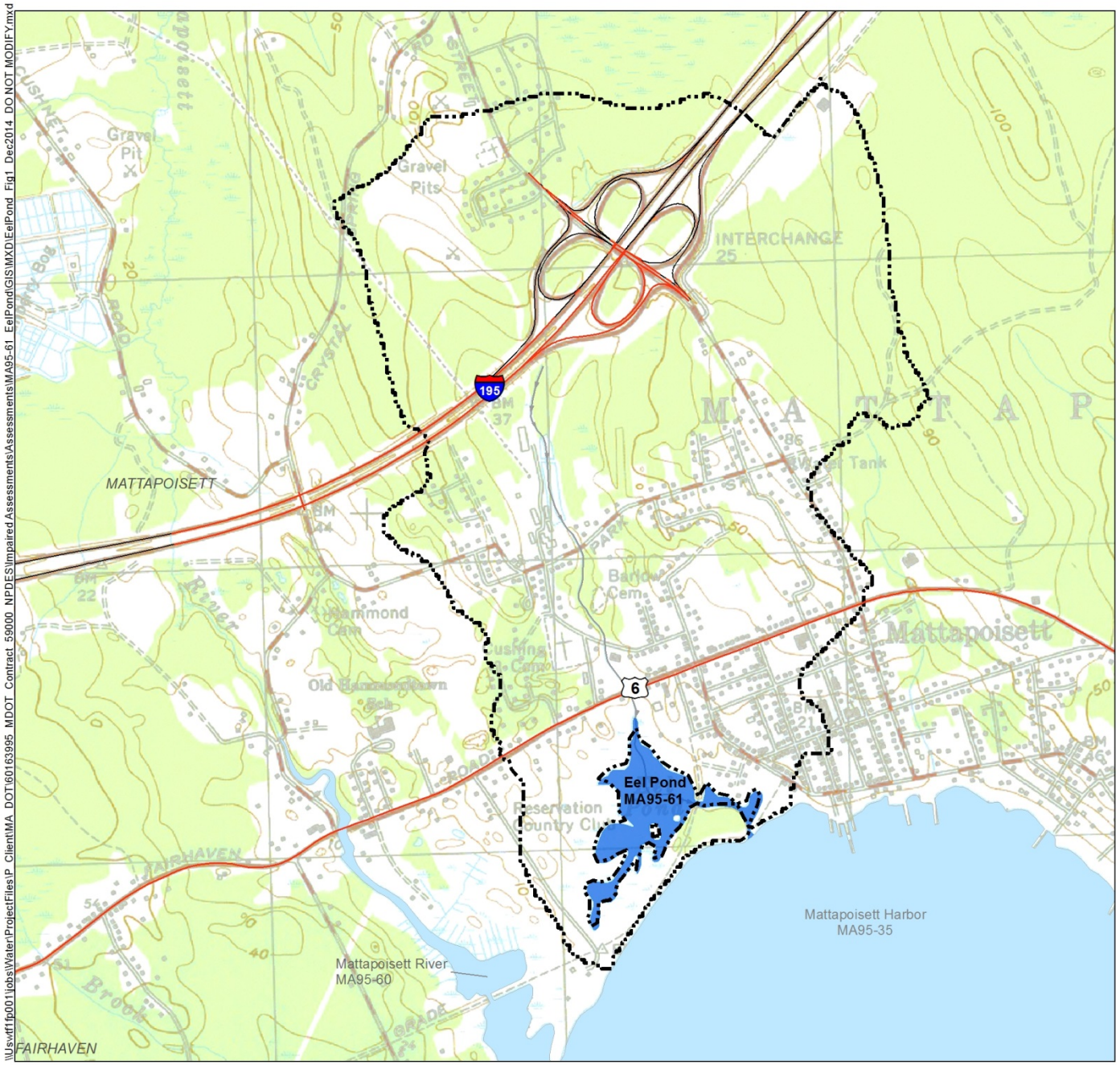
subwatershed of this water body. MassDOT will be installing signs at rest stops within the subwatershed of impaired waterbodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans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

Although the TMDL report also identifies the benefits of riparian restoration and 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 Eel 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 Eel Pond, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education. Further work by MassDOT on programmed projects, which often include broader scale road layout changes, may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to address impairments. MassDOT will include an update in NPDES permit annual reports to EPA regarding proposed BMP design either through retrofit or programmed projects, plans for construction of BMPs, reduction achieved by finalized BMP designs and progress made towards meeting target effective IC reductions.



MassDOT Roadways in Urban Area

MassDOT Roadways

Total and Subwatershed

Assessed Segment

Impaired Lakes

Impaired Streams

Non-Impaired Stream

N

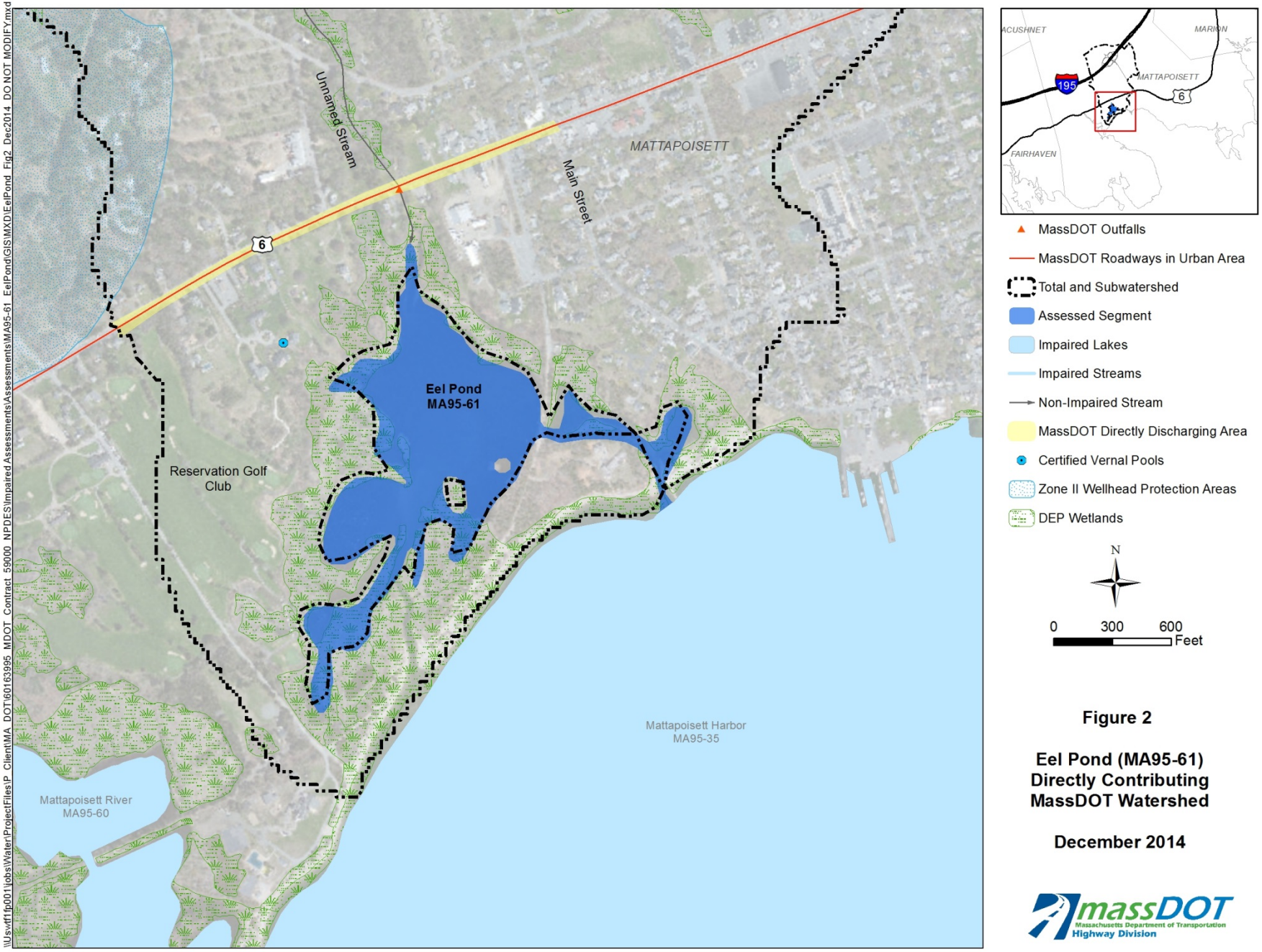
0 1,000 2,000 Feet

Figure 1

Eel Pond (MA95-61) Watersheds

December 2014

massDOT
Massachusetts Department of Transportation
Highway Division



- MassDOT Outfalls
- MassDOT Roadways in Urban Area
- Total and Subwatershed
- Assessed Segment
- Impaired Lakes
- Impaired Streams
- Non-Impaired Stream
- MassDOT Directly Discharging Area
- Certified Vernal Pools
- Zone II Wellhead Protection Areas
- DEP Wetlands

N

0 300 600 Feet

Figure 2

Eel Pond (MA95-61)
Directly Contributing
MassDOT Watershed

December 2014

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Highway Division

Impaired Waters Assessment for Outer New Bedford Harbor (MA95-63)

Summary

Impaired Water[1]	Impairments:	Stormwater:	*Estuarine bioassessments, Fecal coliform, Nitrogen (total), Other, Dissolved oxygen*
		Non-Stormwater:[2]	*PCB in fish tissue*
	Category:	*5 (Waters requiring a TMDL)*	
	Final TMDLs:	*Final Pathogen TMDL for the Buzzards Bay Watershed March 2009*[3]	
	WQ Assessment:	*Buzzards Bay Watershed 2000 Water Quality Assessment Report*[4,5]	
Location	Towns:	*Fairhaven and New Bedford*	
	MassDOT Roads:	*Interstate 195, Route 6, Route 18, Route 140, Adams Street, Main Street and South Main Street*	
Assessment Method(s)	7R (TMDL Method) ☒	7U (Non-TMDL Method**)** ☒	
BMPs	Existing:	*None*	

MassDOT Area and Targets	Impervious Cover (IC)
Directly Contributing Area:	*3.1 acres*
Contributing Area Reduction Target:	*2.5 acres*
Existing BMPs Reduction:	*0.0 acres*
Remaining Reduction to Meet Target:	*2.5 acres*

[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.massdot.state.ma.us/Portals/8/docs/environmental/impairedWaters/Year3/Year3_ImpairedWatersAssessment_1.pdf#page=308

[3] MassDEP, 2009. Final Pathogen TMDL for the Buzzards Bay Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/buzzbay1.pdf

[4] MassDEP, 2003. Buzzards Bay Watershed 2000 Water Quality Assessment Report, Section I. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/95wqar1.pdf

[5] MassDEP, 2003. Buzzards Bay Watershed 2000 Water Quality Assessment Report, Section III. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/95wqar2.pdf

Site Description

Outer New Bedford Harbor (MA95-63) has a surface area of approximately 5.8 square miles, originates on the south side of the hurricane barrier dividing New Bedford Inner Harbor (MA95-42) and Outer New Bedford Harbor (MA95-63) in Fairhaven/New Bedford Massachusetts and is bounded to the south by a line drawn from Wilbur Point in Fairhaven to Clarks Point at Buzzards Bay (MA95-62) in New Bedford. Prior to June 4, 2003 this segment was reported as MA95-27. MassDEP's Water Quality Assessment Report[6,7] for this receiving water identified the Aquatic Life Use with an "impaired" status due to eelgrass bed habitat loss. The receiving water also is identified with an "impaired" status for the Fish Consumption Use do to PCB contamination and Shellfish Harvesting Use due to fecal coliform bacteria. MassDEP's Water Quality Assessment Report indicated the Atlas Tack Corporation which formerly manufactured cut and wire tacks, steel nails, and similar items on a 24-acre site in Fairhaven located in the Outer New Bedford Harbor subwatershed and the 18,000-acre New Bedford Harbor Superfund site as major contributors to the PCB impairment. Primary and Secondary Contact Recreation Uses and Aesthetics were "not assessed".

The total and subwatersheds of Outer New Bedford Harbor are shown of Figure 1A, which includes the cities and towns of Lakeville, Freetown, Rochester, Acushnet, Fairhaven and New Bedford. Figure 1B shows the MassDOT-owned roadways in the Outer New Bedford Harbor subwatershed, which includes portions of Interstate 195, Route 6, Route 18, Route 140, Adams Street, Main Street and South Main Street. The subwatershed to Outer New Bedford Harbor is comprised of commercial, industrial, and recreational land with the majority of the subwatershed consisting of forested land and high and medium density residential.

Figure 2 shows the MassDOT directly discharging area, the limits of which were determined by the existing drainage infrastructure and roadway high points. The only MassDOT-owned road within the subwatershed that directly discharges to Outer New Bedford Harbor (MA95-63) is Route 6. Stormwater runoff is primarily collected by catch basins along the edge of Route 6 and is conveyed to a Town of Fairhaven stormwater outfall at the intersection of Alden Road and David Drown Boulevard. These flows have a relatively short residence time in the wetlands prior to discharging into Outer New Bedford Harbor due to the channelization of stormwater and therefore these flows are considered to be directly contributing to Outer New Bedford Harbor. The Route 6 right-of-way width is variable but is not less than sixty-feet wide, consists of four divided and undivided lanes, two shoulder and sidewalks and is generally bounded by commercial uses and existing wetlands.

Stormwater runoff from Interstate 195, Route 18, Route 140, Adams Street, Main Street, South Main Street and portions of Route 6 discharges into either the Acushnet River (MA95-33) or New Bedford Inner Harbor (MA95-42) both of which are assessed separately.

Existing BMPs

MassDOT did not identify any existing BMPs in place to treat roadway runoff from the directly discharging area before reaching the impaired water segment.

[6] MassDEP, 2003. Buzzards Bay Watershed 2000 Water Quality Assessment Report, Section I. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/95wqar1.pdf

[7] MassDEP, 2003. Buzzards Bay Watershed 2000 Water Quality Assessment Report, Section III. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/95wqar2.pdf

Assessment

In cases where a TMDL has been approved, MassDOT assesses the waterbody for the impairments covered by the TMDL under the BMP 7R methodology.[8] MassDOT separately assesses the waterbody for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[9] MassDOT assessed Outer New Bedford Harbor (MA95-63) using the methodologies described below.

MassDOT has identified a water body impairment in the Outer New Bedford Harbor watershed which is not related to stormwater runoff. The specific impairment unrelated to stormwater for the Outer New Bedford Harbor is PCB in fish tissue. 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.[10]

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.[11] MassDEP has released a Proposed Massachusetts Year 2014 Integrated List[12] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of Outer New Bedford Harbor is not proposed to change.

BMP 7R for Pathogen TMDL (CN 251.1)

MassDOT assessed the indicator bacteria (fecal coliform) impairment using the approach described in BMP 7R of MassDOT's Storm Water Management Plan (SWMP)[13] which applies to impairments that have been assigned to a water body covered by a TMDL. Outer New Bedford Harbor (MA95-63) is covered by the *Final Pathogen TMDL for the Buzzards Bay Watershed*.[14]

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

[8] 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

[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 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

[11] 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

[12] 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

[13] 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

[14] MassDEP, 2009. Final Pathogen TMDL for the Buzzards Bay Watershed. Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/buzzbay1.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.[15]

According to the Final Pathogen TMDL for the Buzzards Bay Watershed, sources of indicator bacteria in the Buzzards Bay watershed were found to be many and varied. Most of the bacteria sources in the Buzzards Bay watershed are believed to be failing septic systems, combined sewer overflows (CSO), sanitary sewer overflows (SSO), sewer pipes connected to storm drains, certain recreational activities, wildlife including birds along with domestic pets and animals and direct overland stormwater runoff.

The TMDL report states the following on Page 54:

> "It is difficult to provide accurate quantitative estimates of indicator bacteria contributions from the various sources in the Buzzards Bay watershed because many of the sources are diffuse and intermittent, and extremely difficult to monitor or accurately model. Many of the sources (failing septic systems, leaking sewer pipes, sanitary sewer overflows, and illicit sanitary sewer connections) are prohibited, because they could result in a potential health risk and, therefore, mush be eliminated. Estimating the magnitude of overall indicator bacteria loading can perhaps be achieved for wet and dry conditions using ambient data available that define baseline conditions."

Stormwater runoff including municipal separate storm sewer systems (MS4) is identified as a potential source of bacteria for Outer New Bedford Harbor (MA95-63).

In addition to the generic recommendations provided in the draft NPDES MS4 permits for Massachusetts and discussed in the MassDOT Pathogen Methodology, the Buzzards Bay TMDL report (Section 8.0, page 100) recommends the following specific BMPs to address elevated fecal coliform levels in the watershed:

- Tracking and remediation of bacteria sources from illicit sewer connection, leaking sewer pipes, sanitary sewer overflows, or failing septic systems
- Implementation of non-structural practices such as street sweeping and/or managerial strategies using local regulatory controls

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 Buzzards Bay Watershed:

- Agricultural BMPs
- Identification and elimination of illicit sewer connections, repairing failing infrastructure, and mitigating CSO impacts
- Develop and implement Storm Water Management Plans
- Septic system controls
- Wastewater treatment plant controls
- Recreational waters use management

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

- Watershed resident education
- New Bedford – CSO Assessment and Mitigation; Stormwater Drainage Network Mapping

BMP 7U for Impervious Cover Related Impairments

A Final TMDL is not in place to address Outer New Bedford Harbor's (MA95-63) following impairments: estuarine bioassessments, nitrogen (total), other and dissolved oxygen. Therefore, MassDOT assessed the stormwater-related impairments not addressed by a TMDL using the approach outlined in the Description of MassDOT's Application of Impervious Cover Method in BMP 7U[16] which was developed using the EPA Region I's Impervious Cover (IC) Method, described in EPA's Stormwater TMDL Implementation Support Manual.[17] Consistent with the findings of EPA and others, MassDOT concluded that when a watershed had less than 9% IC, stormwater was not the likely cause of the impairment.

MassDOT calculated the following values for the total contributing watershed and the subwatershed of the impaired water (Outer New Bedford Harbor) to determine the IC area and set a reduction target. Watersheds are based on the USGS Dataset 451 and modified as necessary using topography.[18] MassGIS's impervious surfaces data layer was used to determine the IC of the watersheds.[19] The total watershed and the subwatershed are shown in Figures 1A and 1B.

Table 1 Impaired Segment Watershed

	Total Watershed	Subwatershed
Watershed Area	18,592 acres	6,514 acres
Impervious Cover (IC) Area	4,313 acres	2,903 acres
Percent Impervious	23%	45%
IC Area at 9% Effective IC Target	1,673 acres	586 acres
Target Effective IC Reduction	61%	80%

The total and subwatersheds percent impervious are greater than 9% indicating that stormwater is a likely contributor to the impairment. To meet the 9% effective IC target, the effective IC within the subwatershed will need to be reduced by the percentage calculated in Table 1. MassDOT then uses the same target percent reduction for their directly contributing watershed as shown in Table 2.

[16] 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

[17] ENSR 2006. Stormwater TMDL Implementation Support Manual for US EPA Region 1. ENSR International & EPA Region 1, Boston, MA. Available at http://www.epa.gov/region1/eco/tmdl/regionalpgrfs.html

[18] USGS Data Series 451 Local and Cumulative Impervious Cover of Massachusetts Stream Basins Available at: http://pubs.usgs.gov/ds/451/

[19] MassGIS Impervious Surfaces datalayer taken from 2005 orthoimagery. Available at: http://www.mass.gov/mgis/impervious_surface.htm

Table 2 MassDOT Directly Contributing Watershed

Directly Contributing Area	3.7 acres
Directly Contributing IC Area	3.1 acres
Percent Impervious	84%
Directly Contributing Area Effective IC Reduction Target (80% Target Effective IC Reduction of MassDOT Directly Contributing IC Area)	2.5 acres
Target Effective IC	16%
Target Effective IC	0.6 acres

Under existing conditions, MassDOT's estimated effective IC exceeds the target as described above. To mitigate the effects of IC, MassDOT will implement stormwater BMPs to the maximum extent practical given site constraints.

This assessment was not able to identify practical locations for stormwater management improvements within the current MassDOT right-of-way. The Proposed Mitigation Plan section discusses the site constraints and mitigation plan.

Proposed Mitigation Plan

During this assessment phase of the Impaired Waters Program, MassDOT has focused on directly contributing areas and identified BMPs that can be constructed entirely on MassDOT property without resulting in substantial wetland impacts or resulting in an adverse impact on historical or archeological resources. Projects that meet these requirements can be implemented under the Impaired Waters Program Retrofit initiative.

Site limitations in the Outer New Bedford Harbor watershed include limited MassDOT property, consisting of a variable width Route 6 right-of-way that is not less than sixty-feet wide, consists of four divided and undivided lanes, two shoulder and sidewalks and is generally bounded by commercial uses and existing wetlands.

Based on the review of MassDOT's directly contributing drainage area, no BMPs have been identified that can be implemented on MassDOT property to address the impairments of the Outer New Bedford Harbor given the site constraints.

With respect to the fecal coliform impairment, 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[20], 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 Buzzards Bay Watershed bacteria TMDL report, MassDOT implimnents a SWMP. 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

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

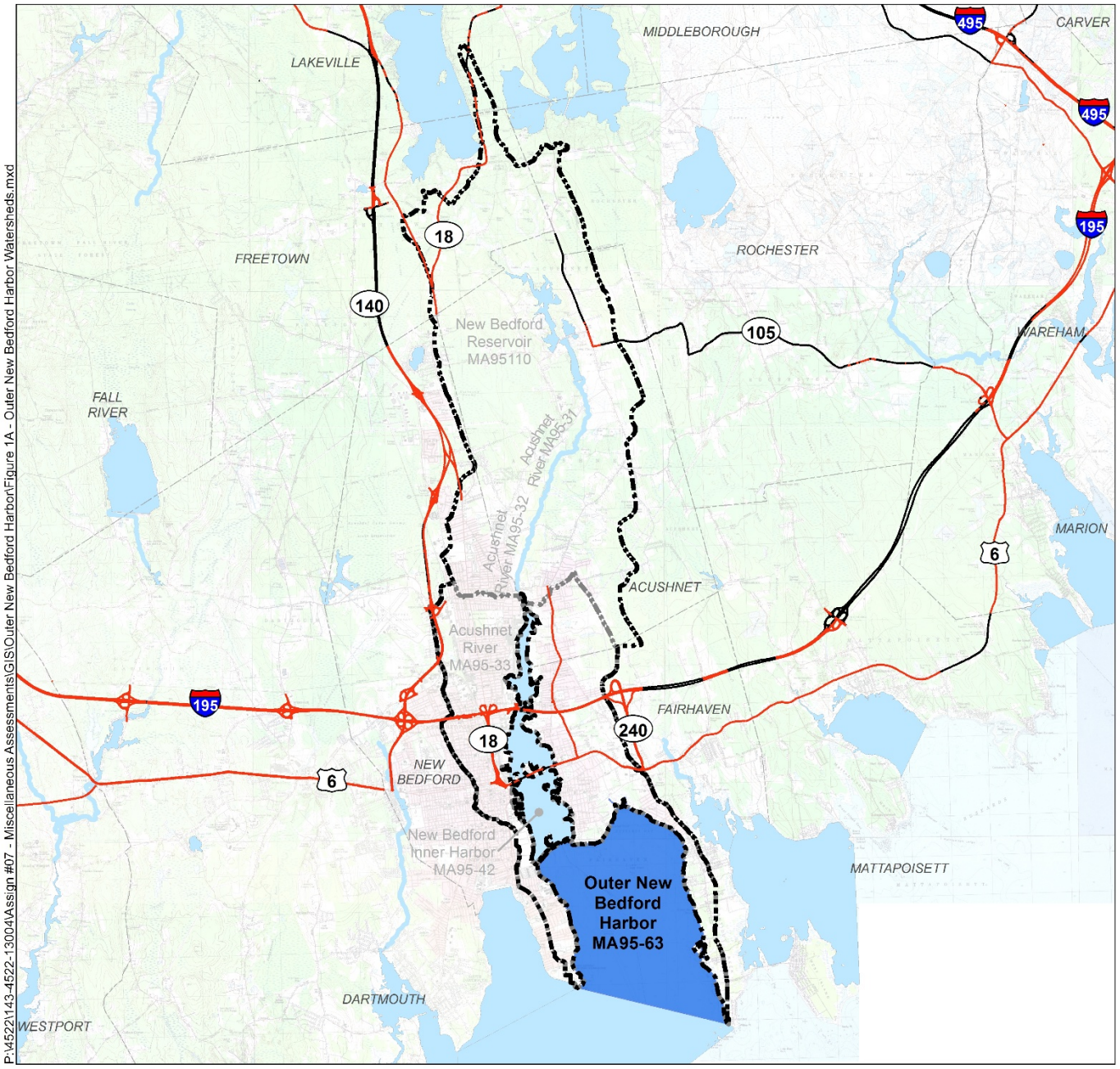
will be installing signs at rest stops within the subwatershed of impaired water bodies. The signs will inform the public of the need to remove pet waste, which can minimize contributions of pathogens to stormwater runoff. Pet waste removal bags and disposal cans will be provided.

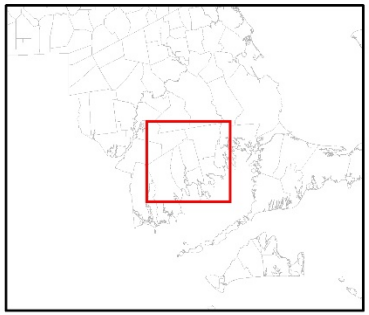
Although the TMDL report also identifies the benefits of structural BMPs to address runoff from impervious areas in some instances, MassDOT feels that it is not a beneficial approach to implement these BMPs in advance of other ongoing BMP efforts identified in the watershed, given the documented variability 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 Outer New Bedford 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 Outer New Bedford Harbor, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education. Further work by MassDOT on programmed projects, which often include broader scale road layout changes, may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to address impairments. MassDOT will include an update in NPDES permit annual reports to EPA regarding proposed BMP design either through retrofit or programmed projects, plans for construction of BMPs, reduction achieved by finalized BMP designs and progress made towards meeting target effective IC reductions.





MassDOT Roadways in Urban Area

MassDOT Roadways

Total Watershed

Subwatershed

Assessed Segment

Impaired Lakes

Impaired Streams

N

0 6,500 13,000 Feet

Figure 1A

Outer New Bedford Harbor (MA95-63) Watersheds

December 2014

massDOT Massachusetts Department of Transportation Highway Division

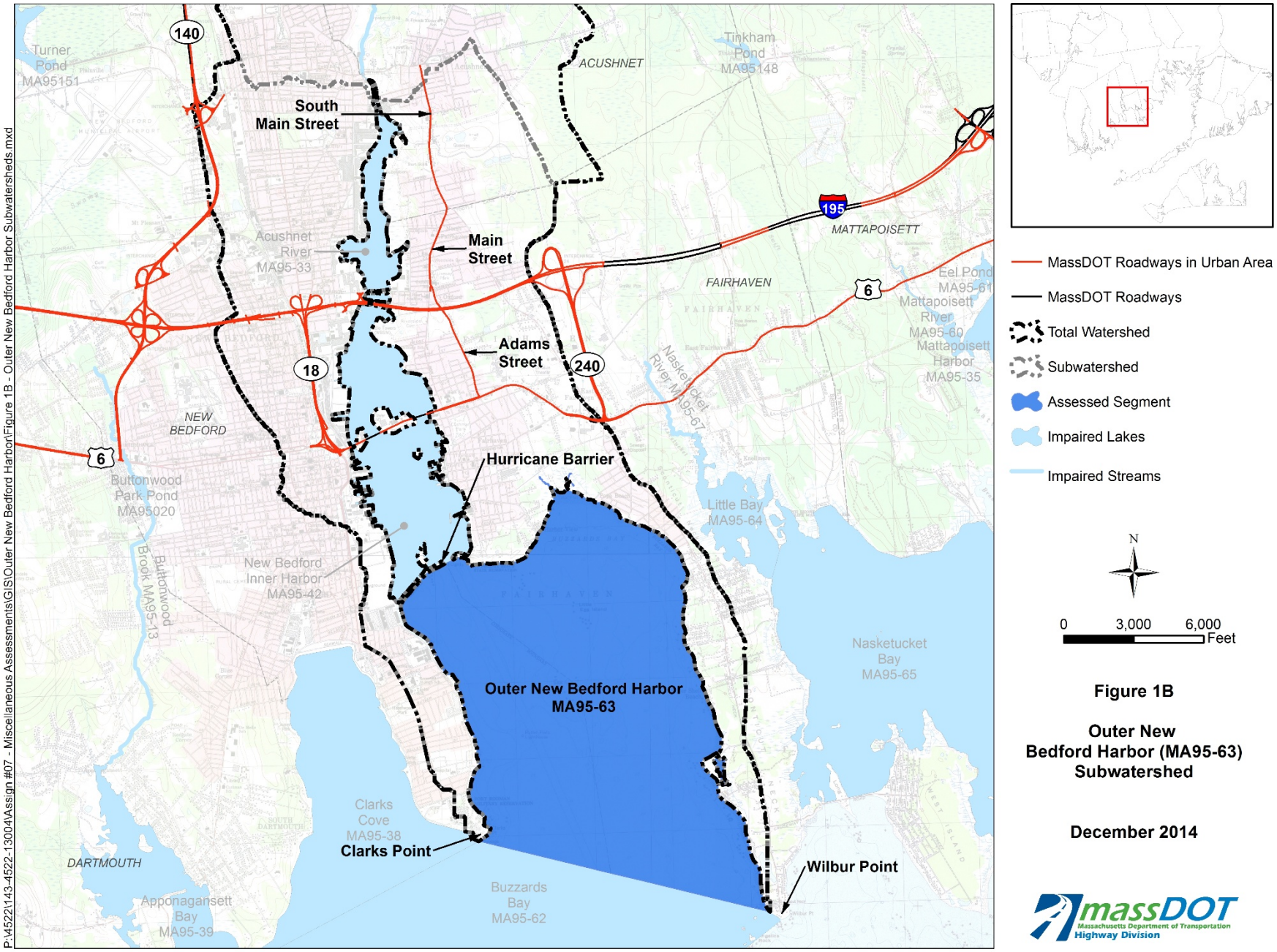


Figure 1B

Outer New Bedford Harbor (MA95-63) Subwatershed

December 2014

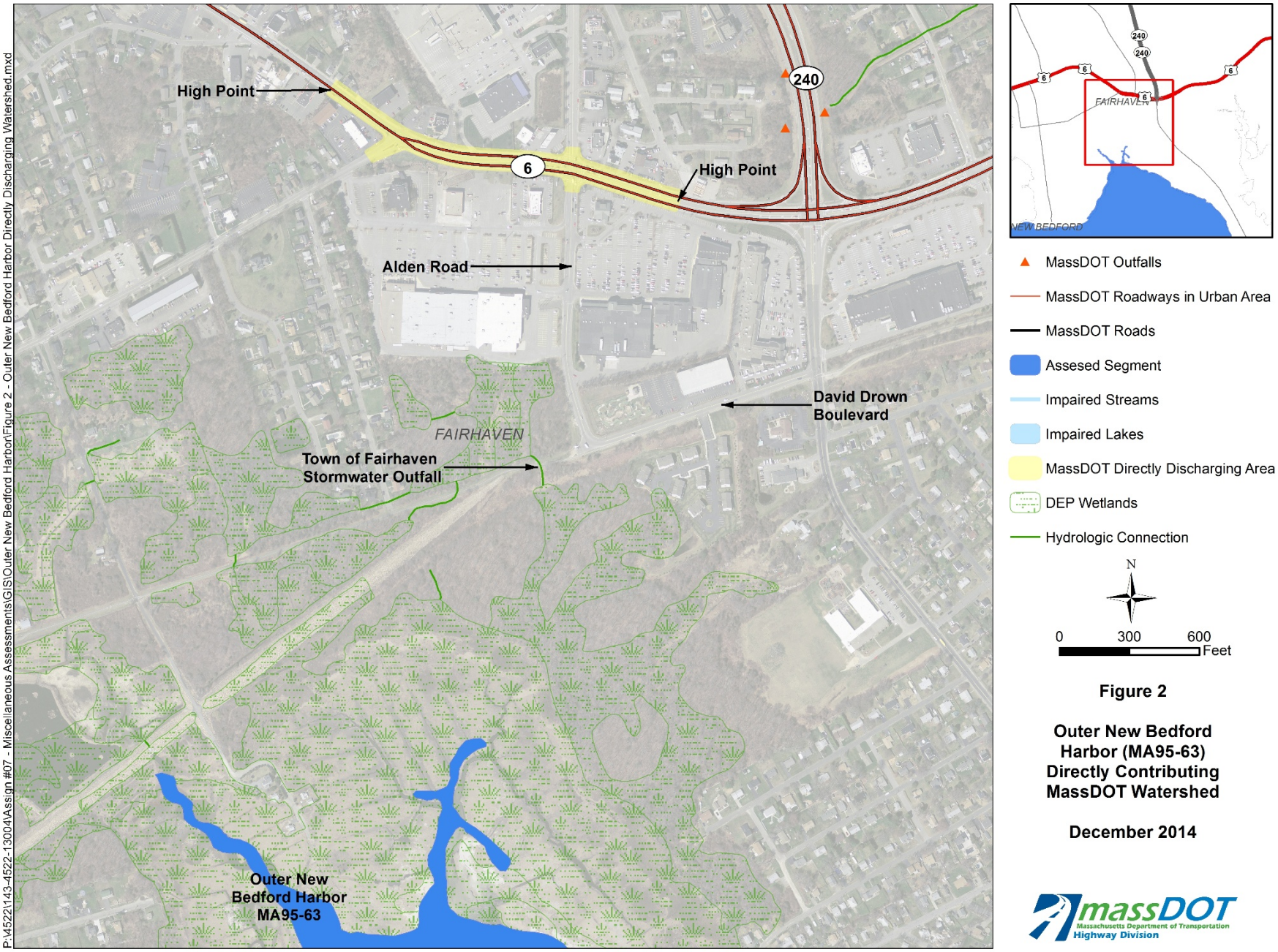


Figure 2

Outer New Bedford Harbor (MA95-63) Directly Contributing MassDOT Watershed

December 2014

Impaired Waters Assessment for Nasketucket River (MA95-67)

Summary

Impaired Water[1]	Stormwater Impairments:	*Nitrogen (total)*	
	Category:	*5 (Waters requiring a TMDL)*	
	Final TMDLs:	*None*	
	WQ Assessment:	*None*	
Location	Towns:	*Fairhaven*	
	MassDOT Roads:	*Route 6, Route 240 and Interstate 195*	
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL Method) ☒	
BMPs	Existing:	*None*	
MassDOT Area and Targets			Impervious Cover (IC)
	Directly Contributing Area:		*20.1 acres*
	Contributing Area Reduction Target:		*7.8 acres*
	Existing BMPs Reduction:		*0.0 acres*
	Remaining Reduction to Meet Target:		*7.8 acres*

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

Site Description

Nasketucket River (MA95-67) originates at the outlet of an unnamed pond north of Meadow Lane and flows southeast for approximately 0.89 miles to its confluence with Little Bay (MA95-64) in Fairhaven Massachusetts. Figure 1 shows the total and subwatersheds of Nasketucket River, which are the same and are located in the town of Fairhaven. The MassDOT-owned roadways in the Nasketucket River watershed, which includes portions of Route 6, Route 240 and Interstate 195, are also shown on Figure 1. The watershed to Nasketucket River is comprised of commercial, recreational, high and medium density residential land with the majority of the watershed consisting of forested and agricultural land.

Figure 2 shows the MassDOT directly discharging area, the limits of which were determined by the existing drainage infrastructure and roadway high points. The Route 6 right-of-way width is variable but is not less than sixty feet wide, consists of four divided and undivided lanes, two shoulder and sidewalks and is generally bounded by commercial and residential uses. Stormwater runoff is primarily collected by catch basins along the edge of the road and discharged to various MassDOT stormwater outfalls at three culverts under Route 6. The westernmost culvert is for a manmade paved drainage channel that conveys flows directly into the Nasketucket River. The middle culvert is for a manmade ditch that conveys flows to the manmade paved drainage channel prior to directly discharging into the Nasketucket River. The easternmost culvert is for the Nasketucket River where two MassDOT stormwater outfalls are directly discharging to the river.

The Route 240 limited access right-of-way width is also variable and is generally 250 feet wide, consists of four lanes and shoulders divided by a grassed median and has variable width grassed shoulders. Stormwater runoff is primarily collected by catch basins along the edge of the road and discharged to various MassDOT stormwater outfalls along the western shoulder. Stormwater flows from these outfalls are conveyed via a manmade ditch and paved drainage channel prior to directly discharging into the Nasketucket River.

A portion of the Interstate 195 eastbound off ramp is collected by catch basins along the edge of the road and discharges to various MassDOT stormwater outfalls along the southern shoulder. Stormwater flow from these outfalls are conveyed via a manmade ditch and paved drainage channel prior to directly discharging into the Nasketucket River. The remainder of Interstate 195 does not discharge to the assessed segment.

Nasketucket River is a drinking water source, and the Town of Fairhaven manages the inactive tubular wellfield. The Interim Wellhead Protection Area (IWPA) is shown on Figure 2.

Existing BMPs

MassDOT did not identify any existing BMPs in place to treat roadway runoff from the directly discharging area before reaching the impaired water segment. The drainage ditch within the western shoulder of Route 240 is not considered a BMP because it is only meant to convey runoff away from the roadway.

Assessment

In cases where a TMDL has been approved, MassDOT assesses the waterbody for the impairments covered by the TMDL under the BMP 7R methodology.[2] MassDOT separately

[2] 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

assesses the waterbody for any stormwater-related impairments that are not covered by the TMDL under the BMP 7U methodology.[3] MassDOT assessed Nasketucket River (MA95-67) 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[4]. 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 Nasketucket River is not proposed to change.

BMP 7U for Impervious Cover Related Impairments

A Final TMDL is not in place to address Nasketucket River's (MA95-67) following impairments: nitrogen (total). Therefore, MassDOT assessed the stormwater-related impairments not addressed by a TMDL using the approach outlined in the Description of MassDOT's Application of Impervious Cover Method in BMP 7U[6] which was developed using the EPA Region I's Impervious Cover (IC) Method, described in EPA's Stormwater TMDL Implementation Support Manual.[7] Consistent with the findings of EPA and others, MassDOT concluded that when a watershed had less than 9% IC, stormwater was not the likely cause of the impairment.

MassDOT calculated the following values for the total contributing watershed of the impaired water (Nasketucket River) to determine the IC area and set a reduction target. Watersheds are based on the USGS Dataset 451 and modified as necessary using topography.[8] MassGIS's impervious surfaces data layer was used to determine the IC of the watersheds.[9] The total watershed is shown in Figure 1.

Table 1 Impaired Segment Watershed

	Total Watershed
Watershed Area	1,897 acres
Impervious Cover (IC) Area	280 acres
Percent Impervious	15%
IC Area at 9% Effective IC Target	171 acres
Target Effective IC Reduction	39%

[3] 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

[4] 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

[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, 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

[7] ENSR 2006. Stormwater TMDL Implementation Support Manual for US EPA Region 1. ENSR International & EPA Region 1, Boston, MA. Available at http://www.epa.gov/region1/eco/tmdl/regionalpgrfs.html

[8] USGS Data Series 451 Local and Cumulative Impervious Cover of Massachusetts Stream Basins Available at: http://pubs.usgs.gov/ds/451/

[9] MassGIS Impervious Surfaces datalayer taken from 2005 orthoimagery. Available at: http://www.mass.gov/mgis/impervious_surface.htm

The total watershed percent impervious is greater than 9% indicating that stormwater is a likely contributor to the impairment. To meet the 9% effective IC target, the effective IC within the watershed will need to be reduced by the percentage calculated in Table 1. MassDOT then uses the same target percent reduction for their directly contributing watershed as shown in Table 2.

Table 2 MassDOT Directly Contributing Watershed

Directly Contributing Area	36.0 acres
Directly Contributing IC Area	20.1 acres
Percent Impervious	56%
Directly Contributing Area Effective IC Reduction Target (39% Target Effective IC Reduction of MassDOT Directly Contributing IC Area)	7.8 acres
Target Effective IC	34%
Target Effective IC	12.3 acres

Under existing conditions, MassDOT's estimated effective IC exceeds the target as described above. To mitigate the effects of IC, MassDOT will implement stormwater BMPs to the maximum extent practical given site constraints.

This assessment has identified locations for potential stormwater BMPs. The Proposed Mitigation Plan section describes the next steps for the potential BMPs to reduce the effective IC.

Proposed Mitigation Plan

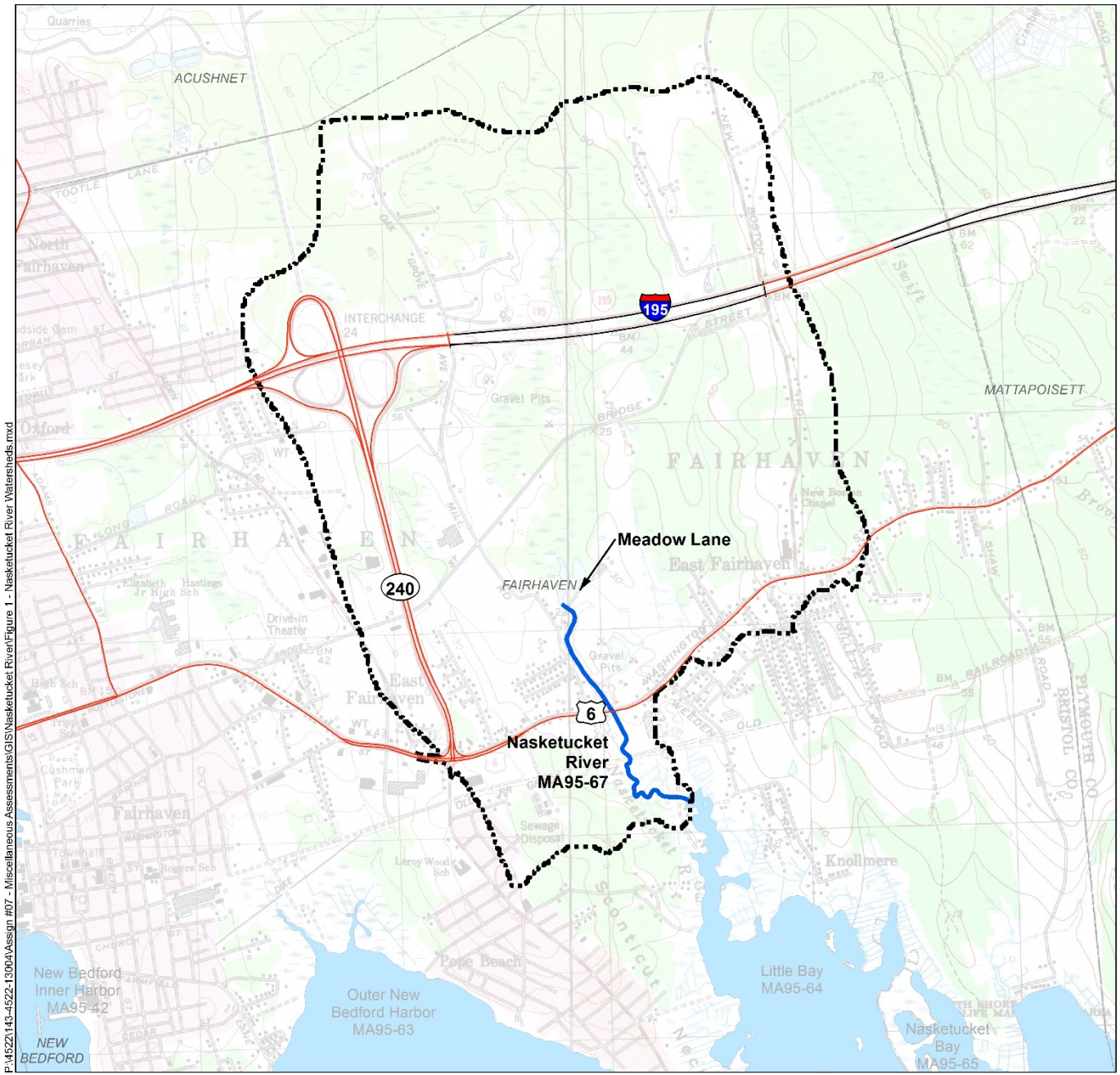
During this assessment phase of the Impaired Waters Program, MassDOT has focused on directly contributing areas and identified BMPs that can be constructed entirely on MassDOT property without resulting in substantial wetland impacts or resulting in an adverse impact on historical or archeological resources. Projects that meet these requirements can be implemented under the Impaired Waters Program Retrofit initiative.

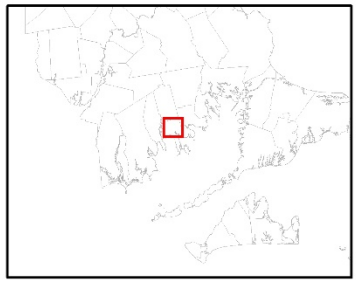
MassDOT has identified that additional control measures are needed to reduce its effective IC within the directly contributing watershed to achieve the targeted reduction and that appropriate locations are potentially available for control measures. MassDOT will now work with its design consultants to identify locations suitable for construction of additional BMPs to treat stormwater runoff from directly contributing IC as part of MassDOT's Impaired Waters Retrofit Initiative. The project designer will gather additional information in this phase, such as soil data, wetland delineations, and site survey, to further refine the proposed BMPs. The design consultants will develop construction plans for BMPs that will aim to provide the target IC reduction to the maximum extent practical.

Once the design of the proposed BMPs is finalized, MassDOT will provide an update in the NPDES permit annual report with BMP information and summarize the final effective IC reduction.

MassDOT will continue to ensure proper non-structural BMPs are being implemented within the watershed of Nasketucket River, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education. Further work by MassDOT on programmed projects, which often include broader scale road layout changes, may provide

additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to address impairments. MassDOT will include an update in NPDES permit annual reports to EPA regarding proposed BMP design either through retrofit or programmed projects, plans for construction of BMPs, reduction achieved by finalized BMP designs and progress made towards meeting target effective IC reductions.





MassDOT Roadways in Urban Area

MassDOT Roads

Watershed

Assesed Segment

Impaired Lakes

Impaired Streams

N

0 1,250 2,500 Feet

Figure 1

Nasketucket River (MA95-67) Watersheds

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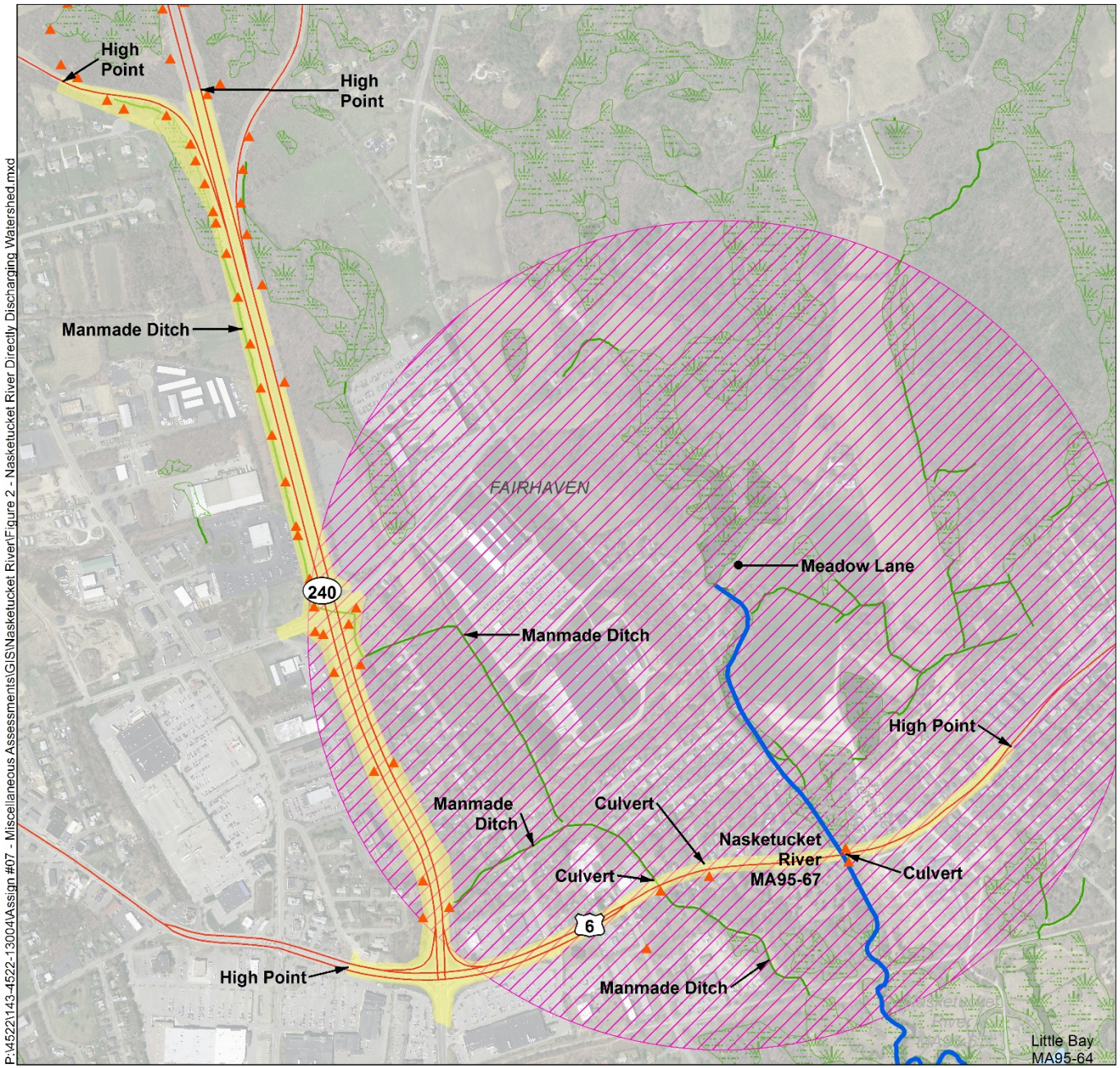

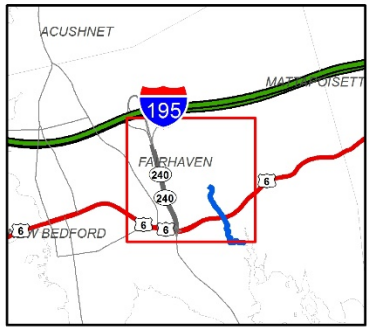

- MassDOT Outfalls
- MassDOT Roadways in Urban Area
- Assesed Segment
- Impaired Streams
- Impaired Lakes
- MassDOT Directly Discharging Area
- Interim Wellhead Protection Area (IWPA)
- DEP Wetlands
- Hydrologic Connection

N

0 500 1,000 Feet

Figure 2

Nasketucket River (MA95-67)
Directly Contributing
MassDOT Watershed

December 2014

MassDOT Massachusetts Department of Transportation Highway Division

Impaired Waters Assessment for "Inner" Sippican Harbor (MA95-70)

Summary

Impaired Water[1]	Stormwater Impairments:	*Fecal Coliform, Nitrogen (Total), Nutrient/ Eutrophication Biological Indicators*
	Category:	*5 (Waters requiring a TMDL)*
	Final TMDLs:	*None*
	WQ Assessment:	*Buzzards Bay Watershed 2000 Water Quality Assessment Report*[2] [included as a portion of Sippican Harbor (MA95-08)]
Location	Towns:	*Marion*
	MassDOT Roads:	*I-195, Route 6, Route 105 (Front Street)*
Assessment Method(s)	7R (TMDL Method) ☐	7U (Non-TMDL) ☒
BMPs	Existing:	*None*

MassDOT Area and Targets	Impervious Cover (IC)
Directly Contributing Area:	*6.8 acres*
Contributing Area Reduction Target:	*2.8 acres*
Existing BMPs Reduction:	*0 acres*
Remaining Reduction to Meet Target:	*2.8 acres*

Site Description

"Inner" Sippican Harbor (MA95-70) is an approximately 0.57 square mile water body, and is located in the Buzzards Bay Watershed, southeast of Route 6 in Marion, Massachusetts. The water body extends from its source at a non-impaired stream and flows south to Sippican Harbor (MA95-69), excluding Hammett Cove (MA95-56) located to the northeast, as shown in Figure 1. The boundary

[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, November 2003. Buzzards Bay Watershed 2000 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/95wqar1.pdf

between "Inner" Sippican Harbor (MA95-70) and Sippican Harbor (MA95-69) extends from Allens Point around the southeastern tip of Ram Island, then westerly to the point of land south of Nyes Wharf (Figure 1). These two water bodies, Sippican Harbor and Inner Sippican Harbor, were formerly combined and reported as MA95-08. The total and subwatershed to "Inner" Sippican Harbor are the same area and are shown on Figure 1. The watershed is approximately 1,990 acres; land use within the area is primarily residential and forest, with dense commercial development along Route 6 and salt water wetlands and recreation in the vicinity of "Inner" Sippican Harbor (MA95-70).

Sippican Harbor (MA95-08) is discussed in the *Buzzards Bay Watershed 2000 Water Quality Assessment Report.*[3] Since this report, the Sippican Harbor (MA95-08) water body area has been divided into "Inner" Sippican Harbor (MA95-70) and Sippican Harbor (MA95-69). "Inner" Sippican Harbor was formerly reported as a portion of Sippican Harbor (MA95-08) but was not included separately in the Water Quality Assessment Report. The *Buzzards Bay Watershed 2000 Water Quality Assessment Report* for Sippican Harbor (MA95-08) identified the Primary and Secondary Contact Recreational Uses as "support." Aquatic Life and Fish Consumption Uses were not assessed.

As shown on Figures 1 and 2, the closest MassDOT-owned urban roadway (Route 6) is approximately 480 feet away from "Inner" Sippican Harbor. Portions of Route 105 (Front Street), and Interstate 195 (including the entrance ramp at Exit 20) are also contributing to the watershed. Route 105 narrows from four lanes to two lanes south of the Exit 20 interchange off of I-195. A portion of Route 105 is not directly discharging.

As shown on Figure 2, MassDOT directly discharging roadways include portions of Route 6 and Front Street. Runoff from these roadways is collected by a storm drain trunk line along Route 6 and is discharged to a non-impaired stream approximately 480 feet northwest and upstream of "Inner" Sippican Harbor. The portion of Route 6 that directly discharges to the western side of the non-impaired stream begins at a high point south of Luce Avenue and continues north, then curves to the northeast to a low point at the non-impaired stream. Runoff on the eastern side of the non-impaired stream drains from a highpoint northeast of Hermitage Road and flows approximately 1,200 feet southwest to the non-impaired stream. Route 6 within the watershed consists of four lanes, and curbing is located along both sides of the road. The right-of-way includes sidewalk and the road shoulder in this area. Land use along Route 6 is densely developed with commercial, residential, and institutional uses; wetlands are located in the vicinity of the non-impaired stream.

Runoff from a portion of Front Street, from the entrance to the Pilgrim Bank shopping plaza to the intersection with Route 6 (approximately 200 feet), is collected by the storm drain trunk line within Route 6 (Figure 2). Front Street in this area is two lanes (double line) with curbing on the southbound side until the intersection with Route 6 (curbing is located on both sides of Front Street at the intersection). The right-of-way includes sidewalk and the road shoulder in this area. Land use along this portion of Front Street is commercial.

Existing BMPs

MassDOT did not identify any existing BMPs in place to treat roadway runoff from the directly discharging area before reaching the impaired water segment.

[3] MassDEP, November 2003. Buzzards Bay Watershed 2000 Water Quality Assessment Report. Available at: http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/95wqar1.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.[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 "Inner" Sippican Harbor (MA95-70) 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[7] which has been reviewed for any proposed changes to the condition of the water bodies. The condition of "Inner" Sippican 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 Storm Water Management Plan (SWMP)[8] 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.[9]

BMP 7U for Impervious Cover Related Impairments

A Final TMDL is not in place to address "Inner" Sippican Harbor's (MA95-70) following impairments: nitrogen (total) and nutrient/ eutrophication biological indicators. Therefore, MassDOT assessed the stormwater-related impairments not addressed by a TMDL using the approach outlined in the Description of MassDOT's Application of Impervious Cover Method in BMP 7U[8] which was developed using the EPA Region I's Impervious Cover (IC) Method, described in EPA's Stormwater TMDL Implementation Support Manual.[10] Consistent with the findings of EPA and others,

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

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

[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

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

[10] ENSR 2006. Stormwater TMDL Implementation Support Manual for US EPA Region 1. ENSR International & EPA Region 1, Boston, MA. Available at http://www.epa.gov/region1/eco/tmdl/regionalpgrfs.html

MassDOT concluded that when a watershed had less than 9% IC, stormwater was not the likely cause of the impairment.

MassDOT calculated the following values for the total contributing watershed and the subwatershed of the impaired water ("Inner" Sippican Harbor) to determine the IC area and set a reduction target. Watersheds are based on the USGS Dataset 451 and modified as necessary using topography.[11] MassGIS's impervious surfaces data layer was used to determine the IC of the watersheds.[12] The total watershed and subwatershed are the same and are shown in Figure 1.

Table 1 Impaired Segment Total and Subwatershed

	Total Watershed
Watershed Area	1,492 acres
Impervious Cover (IC) Area	229 acres
Percent Impervious	15.3%
IC Area at 9% Effective IC Target	134 acres
Target Effective IC Reduction	41.5%

The total and subwatershed percent impervious are greater than 9% indicating that stormwater is a likely contributor to the impairment. To meet the 9% effective IC target, the effective IC within the subwatershed will need to be reduced by the percentage calculated in Table 1. MassDOT then uses the same target percent reduction for their directly contributing watershed as shown in Table

Table 2 MassDOT Directly Contributing Watershed

Directly Contributing Area	6.8 acres
Directly Contributing IC Area	6.8 acres
Percent Impervious	100%
Directly Contributing Area Effective IC Reduction Target (41.5% Target Effective IC Reduction of MassDOT Directly Contributing IC Area)	2.8 acres
Target Effective IC	58.5%
Target Effective IC	4.0 acres

Under existing conditions, MassDOT's estimated effective IC exceeds the target as described above. To mitigate the effects of IC, MassDOT will implement stormwater BMPs to the maximum extent practical given site constraints.

This assessment was not able to identify practical locations for stormwater management improvements within the current MassDOT right-of-way. The Proposed Mitigation Plan section discusses the site constraints and mitigation plan.

[11] USGS Data Series 451 Local and Cumulative Impervious Cover of Massachusetts Stream Basins Available at: http://pubs.usgs.gov/ds/451/

[12] MassGIS Impervious Surfaces datalayer taken from 2005 orthoimagery. Available at: http://www.mass.gov/mgis/impervious_surface.htm

Proposed Mitigation Plan

During this assessment phase of the Impaired Waters Program, MassDOT has focused on directly contributing areas and identified BMPs that can be constructed entirely on MassDOT property without resulting in substantial wetland impacts or resulting in an adverse impact on historical or archeological resources. Projects that meet these requirements can be implemented under the Impaired Waters Program Retrofit initiative.

Site limitations in the "Inner" Sippican Harbor watershed include a lack of available space due to residential and commercial development along Route 6. Wetlands are located within close proximity (approximately 20 feet) of the area where the Route 6 storm drain trunk line discharges to the non-impaired stream, precluding the installation of BMPs in this area (Figure 2).

Based on the review of MassDOT's directly contributing drainage area, no BMPs have been identified that can be implemented on MassDOT property to address the impairments of the "Inner" Sippican Harbor given the site constraints.

With respect to the fecal coliform impairment, 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, MassDOT believes that existing efforts are consistent with the current and draft MS4 permit requirements in regard to pathogens.

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 "Inner" Sippican 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 "Inner" Sippican Harbor, including regular roadway and drainage system maintenance, erosion and sedimentation control, and outreach and education. Further work by MassDOT on programmed projects, which often include broader scale road layout changes, may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to address impairments. MassDOT will include an update in NPDES permit annual reports to EPA regarding proposed BMP design either through retrofit or programmed projects, plans for construction of BMPs, reduction achieved by finalized BMP designs and progress made towards meeting target effective IC reductions.

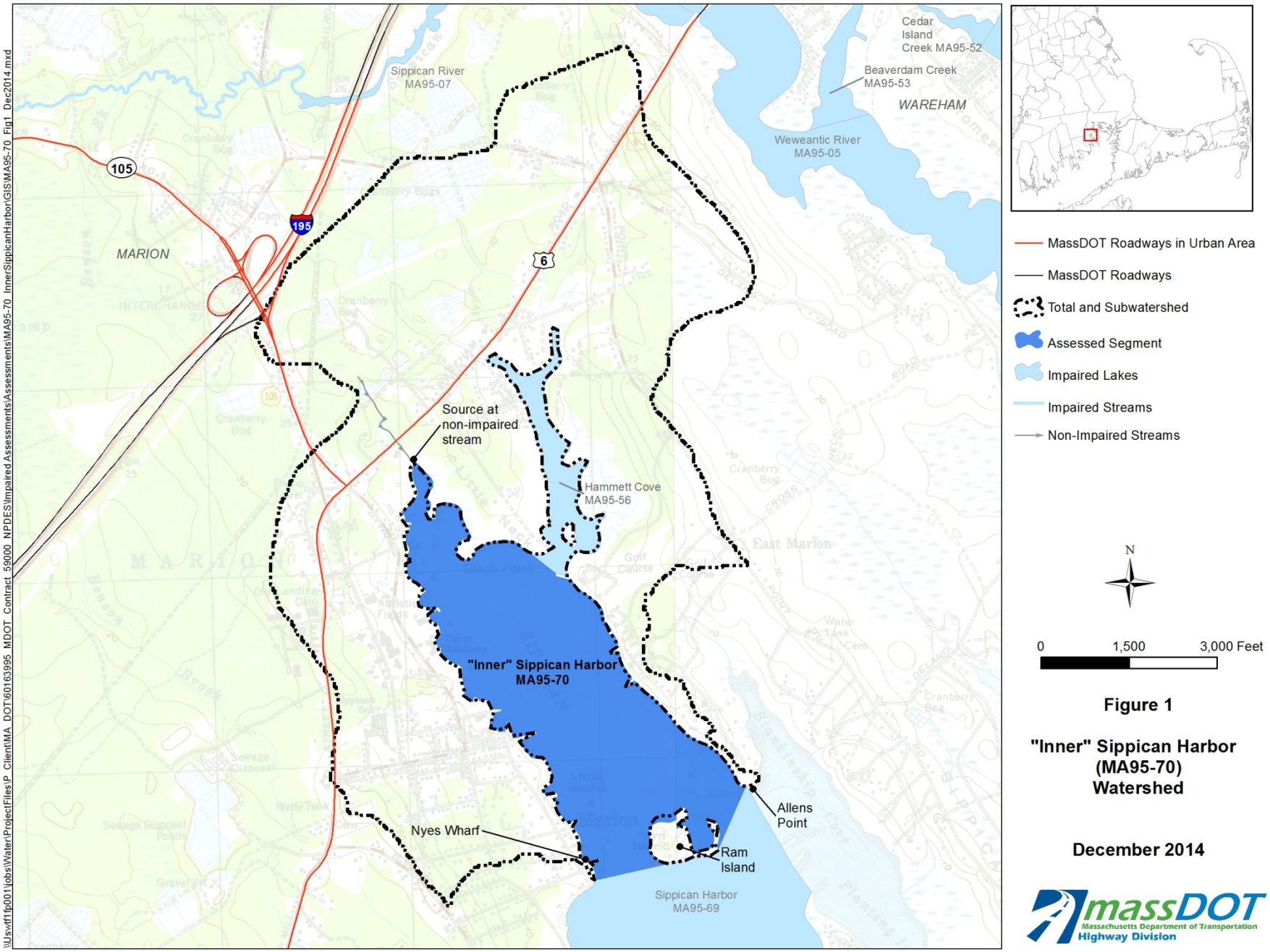

Figure 1

"Inner" Sippican Harbor (MA95-70) Watershed

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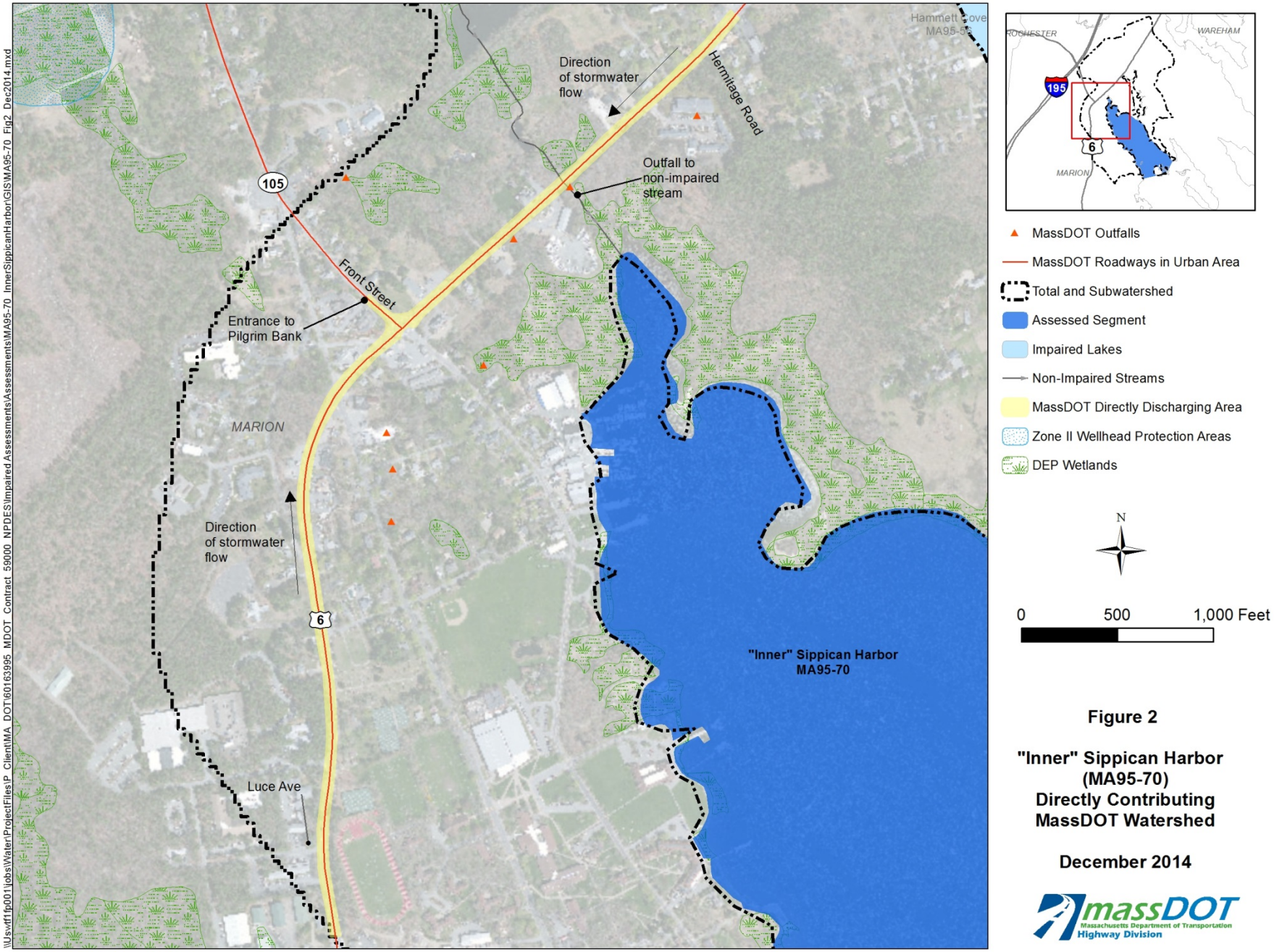

Figure 2

"Inner" Sippican Harbor (MA95-70) Directly Contributing MassDOT Watershed

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