

**Methodologies for Calculating Pollutant Load Reductions
Achieved for Structural Stormwater Controls and Enhanced Non-Structural BMPs
and
Methodologies for Calculating Runoff Volume Reduction and Peak Flow Attenuation
Factors for the Impervious Cover Standard**

A. Pollutant Load Reductions and Yearly Pollutant Removal Percentages Calculation

For non-bacteria TMDLs with a pollutant load reduction percentage that applies to Warwick, the pollutant load reduction Warwick is required to meet in accordance with Attachment N of the Consent Agreement and paragraph 2 of Attachment M of the Consent Agreement for a given Impaired Water Body Segment is the required pollutant load reduction percentage multiplied by the pollutant loading rate (as mass per acre per year) multiplied by the area of the MS4 impervious cover in the Impaired Sub-Watershed that discharges directly or indirectly to the Impaired Water Body Segment. To determine the extent of the contribution of an individual structural control or enhanced non-structural BMP to meeting this requirement, it is necessary to calculate the pollutant load reduction achieved by the control. Pollutant loading rates and/or average annual ("yearly") pollutant removal rates (expressed as a percentage) for individual controls are required to be determined for input to these calculations.

Yearly pollutant removal rates (expressed as a percentage) for individual controls are also required to be determined as one of the inputs to calculations under Attachment O of the Consent Agreement related to meeting the requirements of Paragraph C(4)(a)(xix)3 of the Consent Agreement.

1. Pollutant Loading Rates

For those calculations which require yearly phosphorus pollutant loading rates from the MS4 areas as inputs, Warwick shall use either (a) the roadway impervious cover and developed land pervious cover phosphorus yearly load export rates in a document entitled "Methods to Calculate Phosphorus Load Reductions for Structural Stormwater Best Management Practices in the Watershed", which is attached hereto and incorporated herein as Attachment Q of the Consent Agreement or (b) other yearly phosphorus loading rates proposed by Warwick, subject to review and approval by the EPA, based on credible stormwater runoff phosphorus quality information that is representative of road/ highway impervious cover, and, if applicable, associated pervious cover, for New England, e.g., United States Geological Survey ("USGS") studies in Rhode Island.

For those calculations which require yearly zinc, other metals, nitrogen, or total suspended solids ("TSS") loading rates as inputs, Warwick shall use either (a) yearly loading rates for the specific pollutant provided by the EPA, where available, or (b) other yearly loading rates for the specific pollutant proposed by Warwick, subject to review and approval by the EPA, based on credible stormwater runoff quality information that is representative of road/highway impervious cover and, if applicable, associated pervious cover, for New England, e.g., USGS studies in Rhode Island.

2. Yearly Pollutant Removal Percentages for Individual Controls

a. Structural Controls

Warwick shall use the calculation methods and BMP Performance Curves and BMP Performance Tables in Attachment Q of the Consent Agreement to determine yearly phosphorus removal percentages for calculating the pollutant load reduction achieved by individual structural controls for the types of structural controls specifically addressed by these performance curves and tables and for other types of structural controls that are analogous, where phosphorus is the pollutant of concern.

These methods and tables shall also be used to determine the yearly phosphorus removal percentages for individual controls when calculating the Pollutant Removal Factor described in Attachment O of the Consent Agreement.

Warwick shall also use methods in Attachment Q of the Consent Agreement and BMP Performance Curves and BMP Performance Tables similar to those in Attachment Q of the Consent Agreement that have been developed by the EPA, where available, to determine yearly zinc, TSS, or nitrogen pollutant removal percentages to be used in calculating zinc, TSS, or nitrogen load reduction achieved by individual structural controls for the types of structural controls specifically addressed by these performance curves and tables and for other types of structural controls that are analogous, where zinc, TSS, or nitrogen, respectively, is the pollutant of concern. The percentages in the BMP Performance Curves and BMP Performance Tables developed for zinc shall also be used for other metal(s), where those metal(s) are the pollutant(s) of concern.

Warwick may develop similar types of curves and tables, subject to review and approval by the RIDEM, for particular types of controls that are not analogous to the types of controls for which BMP Performance Curves and BMP Performance Tables have been developed by the EPA.

b. Enhanced Non-Structural BMPs

Warwick shall use the methods in a document entitled "Phosphorus Reduction Credits for Selected Enhanced Non-Structural BMPs in the Watershed", which is attached hereto and incorporated herein as Attachment R of the Consent Agreement to calculate phosphorus load reduction credits for individual enhanced non-structural BMPs implemented by Warwick that fall within the categories described in Attachment R of the Consent Agreement. Warwick shall also use the Phosphorus Reduction Factors in these methods for individual controls when calculating the Pollutant Removal Factor described in Attachment O of the Consent Agreement.

Where pertinent and appropriate, Warwick shall use methods similar to those in Attachment R of the Consent Agreement developed by the EPA, where available, to calculate nitrogen or TSS load reduction credits for individual enhanced non-structural control practices implemented by Warwick that fall within the categories described in Attachment R of the Consent Agreement.

Where pertinent and appropriate, Warwick may develop methods to calculate credits for enhanced non-structural control practices for other pollutants of concern or for types of enhanced non-structural controls not addressed in Attachment R of the Consent Agreement for its use in assessing pollutant loading reduction credits, subject to review and approval by the RIDEM.

B. Runoff Volume Reduction Calculation

For calculation of the Runoff Volume Reduction Factor described in Attachment O of the Consent Agreement for an individual control related to meeting the requirements of Paragraph C(4)(a)(xix)3 of the Consent Agreement a determination of the yearly stormwater runoff volume reduction (expressed as a percentage) for the individual control (for those controls that provide infiltration) is required as an input.

Warwick shall use the methods and BMP Performance Curves and BMP Performance Tables in Attachment Q of the Consent Agreement to determine the yearly stormwater runoff volume reduction percentages for individual controls that provide infiltration when calculating the Runoff Volume Reduction Factor described in Attachment O of the Consent Agreement for the types of structural controls that provide infiltration specifically addressed by these performance curves and tables and for other types of structural controls that are analogous.

Warwick may develop similar types of curves and tables, subject to review and approval by the RIDEM, for particular types of controls that provide infiltration that are not analogous to the types of controls for which BMP Performance Curves and BMP Performance Tables have been developed by the EPA.

C. Peak Flow Attenuation Calculation

For calculation of the Peak Flow Attenuation Factor described in Attachment O of the Consent Agreement for an individual control related to meeting the requirements of Paragraph C(4)(a)(xix)3 of the Consent Agreement, a determination of the attenuation in peak flow provided by the individual control is required (for the types of controls that reduce peak flow rate) as an input.

Warwick shall develop, for the RIDEM review and approval, curves and tables that indicate peak flow (as the maximum twelve-hour flow in an average year) for a model one-acre impervious watershed after treatment by different types and depths of structural controls. Warwick shall also provide peak flows for the model one-acre watershed at 100% and 0% impervious cover without any treatment. Warwick shall use SWMM or similar modeling, or an alternative as approved by the RIDEM, to develop these curves and tables, for use in calculating the attenuation in peak flow provided by the individual control.