

**APPENDIX 10
DILUTION FACTOR AND EFFLUENT LIMITATION CALCULATIONS
FOR VERMONT**

Prior to completing the Notice of Intent (NOI) requirements for the AQUAGP, the applicant must contact the State to confirm the critical low flow (7Q10) of the receiving water, dilution factor (DF), other appropriate hydrologic conditions, and to confirm site-specific limiting factors, including additional water quality-based effluent limitations (WQBELs). See Part I.C.2 of Appendix 4 (Suggested NOI Format and Instructions) for contact information.

I. Dilution Factor

A DF for sites that discharge to receiving waters in Vermont is calculated using the equation below. Alternate calculation methods for DFs may be acceptable if approved by the State.

A. Determine 7Q10:

1. Using SWToolbox: SWToolbox is a desktop application that builds upon past tools, such as SWSTAT and DFLOW, which have historically been used to estimate low flow statistics from stream gage data. SWToolbox allows users to compute n-day frequency analyses (i.e., 1Q10 or 7Q10) and biologically based flows. It also facilitates the use of USGS National Water Information System (NWIS) streamflow data, as well as user-provided data files. The SWToolbox desktop application can be downloaded at: <https://water.usgs.gov/osw/swtoolbox/>.

2. Using StreamStats: StreamStats is a web application that provides access to an assortment of geographic information system (GIS) analytical tools that are useful for water resources planning and management, as well as engineering and design purposes. StreamStats can be used for mapping and exploring the drainage area and stream gages near a discharge location of interest. StreamStats is available at: <https://www.usgs.gov/mission-areas/water-resources/science/streamstats-streamflow-statistics-and-spatial-analysis-tools>.

B. Calculate Dilution Factor:

1. The equation used to calculate the dilution factor is:

$$Dilution\ Factor = \frac{Q_S + Q_D}{Q_D}$$

Where:

Q_S = 7Q10 in million gallons per day (MGD)

Q_D = Discharge flow in MGD

II. Effluent Limitation Calculations

Applicants applying to discharge to receiving waters in Vermont shall utilize the calculation instructions provided below to calculate effluent limitations for formaldehyde and hydrogen peroxide, as specified in Part 3.1 of the AQUAGP. A suggested electronic format for the calculations required in this appendix can be downloaded from EPA's website available at: <https://www.epa.gov/draft-aquaculture-general-permit>.

A. Calculate WQBEL:

If no dilution applies, skip this step. In this case, the WQBELs specified in Part 3.1 of the AQUAGP shall be applied directly, without credit for dilution, for formaldehyde and hydrogen peroxide.

Note that if a WQBEL is calculated to be lower than the criterion, then the WQBEL is set at the criterion. Calculate the WQBEL as follows:

1. Calculate the WQBEL for a parameter detected in the receiving water as:

$$C_d = \frac{Q_r C_r - Q_s C_s}{Q_d}$$

Where:

C_d = Discharge concentration (i.e., WQBEL) in $\mu\text{g/L}$

Q_r = Downstream receiving water flow in MGD¹

C_r = Downstream concentration (i.e., water quality criterion) in $\mu\text{g/L}$ ²

Q_s = Upstream flow (i.e., 7Q10) in MGD

C_s = Upstream concentration in $\mu\text{g/L}$ ³

Q_d = Discharge flow in MGD⁴

2. Calculate the WQBEL for a parameter either not detected in the receiving water, or for which receiving water sampling is not required as:

$$C_d = \left(\frac{Q_r}{Q_d}\right) \times C_r$$

¹ Equal to the sum of the upstream 7Q10 and the discharge flow. If available, a downstream 7Q10 may be used.

² Use the water quality criterion listed in Part 3.1 of the AQUAGP for formaldehyde and hydrogen peroxide.

³ If the sample size is greater than 1, the median value may be used.

⁴ Equal to the effluent flow limitation.