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Attention: Daniel Tinkham Senior Consultant / Hydrogeologist Emery & Garrett Groundwater Investigations, a Division of GZA 56 Main Street PO Box 1578 Meredith, NH 03253 Daniel.Tinkham@gza.com

## Reference: Evergreen Spring 2022 Biological Monitoring Results and Recommendations

Dear Dan,

Thank you for your time explaining a question before the Fryeburg Selectboard (Board). Blue Triton Brands (d/b/a Poland Spring Bottling Company; hereafter, Poland Spring) understands that the Board has questions regarding the stream classification results obtained from biological monitoring of the benthic macroinvertebrate communities in Wards Brook in 2022. The results of the biological monitoring have been provided to the Board in the *Evergreen Spring: 2022 Biological Monitoring Report* (March 14, 2023) as prepared by Stantec Consulting Services Inc (Stantec). This letter further summarizes the key findings of the 2022 biological monitoring and provides modified recommendations for future biological monitoring.

In 2009, Poland Spring initiated a voluntary biological monitoring program to monitor the water quality of Wards Brook through sampling of the benthic macroinvertebrate communities at a location downstream of their Evergreen Spring site on Route 5 in Fryeburg. Stantec has been supporting Poland Spring with this monitoring since 2009. The purpose of the monitoring is to record changes to the water quality of the stream. The benthic macroinvertebrate community is widely used as an indicator community of the general aquatic life in flowing waters<sup>1,2</sup> and most taxa have literature-designated tolerance values assigned on a scale of 0 to 10 to indicate a species tolerance to pollution (tolerance values increase as water quality decreases).<sup>3</sup> The Maine Department of Environmental Protection (MDEP) has assigned statutory water quality standards and classifications for Maine waters under Maine Revised Statutes (MRS) Title 38, Chapter 3, §464–470. Under MRS Title 38, Chapter 3, §465, four categories of water classification have been established, which describe the standards of aquatic life (e.g., macroinvertebrates) to be attained within Maine streams.

<sup>&</sup>lt;sup>1</sup> Davies, S., and L. Tsomides. 2002. *Methods for Biological Sampling and Analysis of Maine's Rivers and Streams*. Maine Department of Environmental Protection. Bureau of Land and Water Quality. Augusta, ME.

<sup>&</sup>lt;sup>2</sup> Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

<sup>&</sup>lt;sup>3</sup> Mandaville, S.M. 2002. Benthic Macroinvertebrates in Freshwaters – Taxa Tolerance Values, Metrics, and Protocols. Soil and Water Conservation Society of Metro Halifax.

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The aquatic life standards are as follows:

Class	Biological Standard
AA	Aquatic life as naturally occurs
A	Aquatic life as naturally occurs
В	Water quality sufficient to support all indigenous aquatic species. Only non-
	detrimental changes to the resident biological community are allowed.
С	Water quality sufficient to support all indigenous fish species. Changes to aquatic
	life may occur but structure and function of the resident biological community must
	be maintained.

The state statutory designation of Wards Brook is Class C.4

Biological monitoring of Wards Brook through the deployment of macroinvertebrate rock bag samplers was conducted on an every-other-year basis between 2009 and 2019 and was then modified to an every-three-year schedule following 2019. The water quality of Wards Brook, as determined through this biological monitoring, has consistently exceeded its Class C statutory classification with Class B results being attained in 2009 and 2022, and Class A results being attained from 2011, 2013, 2015, 2017, and 2019. The water quality classification determination was made independently by Lotic, Inc. (Lotic) using their "Water Quality Estimation Model". This model has been used consistently by Lotic to determine stream classification at this site since 2009. It is important to note that Lotic's model is separate from that used by the MDEP for determining official stream classifications of Maine waters, although it evaluates similar metrics such as species richness and relative abundance. As such, the results from the Lotic model are an estimated stream classification rather than a regulatory determination.

In 2022, the biological monitoring resulted in a Class B determination of Wards Brook. Although this classification is higher than the Class C statutory classification and consistent with the 2009 Class B determination, it is lower than the Class A determinations in 2011–2019. As summarized in Stantec's *Evergreen Spring: 2022 Biological Monitoring Report*, most metrics in 2022 are comparable to and within the range of values from previous monitoring years. However, the 2022 data contained a lower relative abundance of mayfly (Ephemeroptera) taxa compared with previous monitoring. The 2022 data also contained a higher relative abundance of caddisfly (Trichoptera) taxa compared with previous monitoring years. Lotic noted that the lower than usual mayfly relative abundance and lack of Class A indicator species were the primary reasons for the Class B determination.<sup>5</sup> It is also important to note that at the time of retrieval of the rock bag samplers in 2022, stream flows were elevated as a result of a significant precipitation event with over 2 inches of rain being recorded in Fryeburg on September 5, 2022<sup>6</sup>, the day before retrieval of the rock bags. This high flow event may have contributed to shifts in macroinvertebrate diversity and abundance in the rock bag samplers through flushing and subsequent accumulation of

<sup>&</sup>lt;sup>4</sup> Wards Brook is classified as Class C surface water. Title 38, Section 467-12(B)(2).

<sup>&</sup>lt;sup>5</sup> Lotic, Inc. 2023. Report on the Benthic Macroinvertebrate Community Collected from Ward Brook in Fryeburg, Maine 2023. March 8. Provided as Appendix A in Stantec's *Evergreen Spring: 2022 Biological Monitoring Report* (March 14, 2023).

<sup>&</sup>lt;sup>6</sup> Fryeburg Eastern Slopes Regional Airport, NOAA Station USW00054772

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additional detritus and organic material from downstream drift which in turn may have affected water quality classification analyses.

The 2022 data compared to previous data shows minor shifts in species diversity and abundance, but dominant macroinvertebrate species have been relatively consistent since the initiation of Stantec's biomonitoring efforts. Dominant and common taxa continue to include black flies (*Simulium* sp.), bloodworm midges (Chironomidae), and several species of mayflies and caddisflies. There was an evident increase in abundance of a net-spinning caddisfly species (i.e., *Diplectrona modesta*) in 2022 compared with previous years. This is a common species that is frequently found in a variety of cold, spring-fed streams with moderate current.<sup>7</sup> It is a filtering collector organism that obtains its food by filtering fine particulate matter (e.g., detritus or algae) from the water column. It has a tolerance value of 5 (out of 10). An increase in abundance may correspond to an increase of available food sources, which are expected to vary annually and seasonally due to runoff and high-velocity flow events, inputs of detritus, or water temperature. A similar temporal increase of net-spinning caddisflies (e.g., *Hydropsyche sparna*) has been observed during past biomonitoring of Wards Brook (e.g., 2019). The mean abundance of mayflies in 2022 was within the range of historical values compared with past monitoring but their relative abundance was diluted due largely to the increase in caddisfly abundance.

The lack of Class A indicator species also contributed to the Class B determination in 2022. Class A indicator species are provided in Davies and Tsomides (2022) and include seven taxa of mayflies and stoneflies (Plecoptera) that have low tolerance values (e.g., 0 to 2 on a scale of 10) and are susceptible to changes in water quality conditions. The diversity of Class A indicator species has fluctuated throughout the monitoring period and have been relatively low in overall abundance. The lack of Class A indicator species is not unusual as Wards Brook is a Class C stream in a suburban environment that is subject to fluctuating water quality as a result of runoff from roadways, driveways, and residential areas and Class A taxa are not expected to be prevalent in such streams under normal conditions.

The continued abundance of mayfly, caddisfly, and stonefly taxa, as well as species with low to moderate tolerance values (i.e., 0 to 5) in Wards Brook in 2022, is characteristic of streams in wooded suburban environments. The shift from Class A to Class B conditions in 2022 is not indicative of an adverse effect to stream water quality as a result of spring water withdrawals but rather the result of seasonal and temporal habitat fluctuations in the stream as a result of a variety of factors in the suburban watershed including localized precipitation patterns as well as temperature fluctuations and nutrient loading as a result of runoff from residential areas and roadways.

To continue to monitor the water quality of Wards Brook, Poland Spring will return to conducting biological monitoring of the benthic macroinvertebrate communities on an every-other-year basis with the next monitoring event to be conducted in 2024.

<sup>&</sup>lt;sup>7</sup> Schmude, K. L., and W. L. Hilsenhoff. 1986. Biology, ecology, larval taxonomy, and distribution of Hydropsychidae (Trichoptera) in Wisconsin. The Great Lakes Entomologist. Vol 19: No. 3, 123–145

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Regards,

**Stantec Consulting Services Inc.** 

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c. Mark Dubois (Poland Spring) Brian Rayback (Pierce Atwood)