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Dear Phillip,

In response to your January 10, 2014 letter regarding your concerns about the Department of Environmental Protection's (DEP) Newtown Creek aeration project, please see below for a summary of the issues and responses that we discussed during our phone call on January 13 and subsequent meeting on February 7, 2014. DEP's mission is to protect public health and the environment by supplying clean drinking water, collecting and treating wastewater, and reducing air, noise, and hazardous substances pollution. In line with this mission, the Newtown Creek aeration project is a near-term effort to improve the dissolved oxygen (DO) level of the Creek in order to attain water quality standards and improve the baseline conditions in the Creek for future remediation efforts. The aeration project is mandated by the New York State Department of Environmental Conservation under the Newtown Creek Waterbody/Watershed Facility Plan. The Newtown Creek Long Term Control Plan to manage combined sewer overflows (CSO) is due in 2017, and will propose measures to reduce CSOs and improve water quality. DEP acknowledges your concern that aeration would increase the public's exposure to airborne bacteria and could pose a public health threat. However, DEP has reviewed your concerns and consulted with the Department of Health and Mental Hygiene, and as described below, we do not interpret results of sampling aerosols or surface water during aeration to suggest a health risk to the public.

Aeration system operation

The aeration system is designed to operate continuously from late May through early September (generally from Memorial Day through Labor Day), with periodic operation throughout the offseason to exercise the system. We heard from you that Riverkeeper, as a policy matter, is not interested in having DEP remove the aeration system, but is interested in the possibility to adjust aeration parameters based on the assumption that larger bubbles eject more bacteria than smaller bubbles because they release more energy when they burst. This is not an unreasonable assumption, but the opposite is actually the case. Smaller bubbles have a higher surface area-to-volume ratio, which leads to a larger air transfer surface area per volume of supplied air. Coarse bubble systems have a lower ratio of surface area-to-volume, which leads to a lower aerosolization potential.¹ We believe it is also worth noting that the volume of air injected into the system would remain fixed regardless of the bubbler; the aeration system runs along the bottom of the Creek and is more than a mile long; and the depth of the Creek varies, which causes the interaction between bubbles to vary as they make their way to the surface. The ultimate effect of these variables is that it would be infeasible to add active control to the existing system.

Bacterial fallout rate and composition

¹ See attached *Response to Inquiry by the United States Army Corps of Engineers Regarding Health Issues Potentially Associated with Aeration*, page 4 ("Dose").

1. While the aeration system is in operation, the amount of coarse aerosols released into the air increases. The bacterial fallout rate is slightly higher when the aerator is operating, but the difference is not statistically significant.

The study by Dueker et al. (2012)² demonstrates proof of concept that bacteria present in the water may aerosolize and enter the air. However, the study did not demonstrate an increased risk of illness due to exposure, nor did it assess infectivity of the bacteria. An increase in bacteria aerosols from aeration does not inherently worsen the air quality and/or increase the bacterial exposure to the nearby community.

Furthermore, the Dueker et al. study does not provide data to support the conclusion that the aeration would significantly increase the public's bacterial exposure in general because the study did not show an increase in bacterial fallout with aeration on; it did not differentiate land sources (e.g., bacteria from animal feces, such as dogs, pigeons, squirrels, etc.) from Newtown Creek; and did not account for seasonal differences in the timing of sample collection in the locally collected data or in comparisons with other studies. Other studies, including some of those cited in the Dueker et al. study, have shown that bacteria are common in urban and rural aerosols from various sources, including soils, and that the abundance and composition have strong daily and seasonal variation. Finally, samples from Louis Valentino Pier (LVP), the other New York City location, were collected at 2.5 to 5 meters above the water, as opposed to 2.5 meters above the water at Newtown Creek. Coarse particle concentrations would be expected to decay significantly with distance from source; therefore it is not clear whether bacteria aerosols would have been measured in higher concentrations at LVP if the sampling methods were consistent.

2. The bacterial taxonomy of the surface water was different with and without aerator operation, but there are no monitored data to determine if levels of human pathogens would increase.

The statistical methods used to compare the types of bacteria present in Newtown Creek aerosols with other urban and coastal areas appear to be inappropriate since the percentage of any individual phyla is a function of others present in the sample.³ Based on the Newtown Creek data, the concentration of surface water bacteria was significantly lower while the aerator was in operation. Given that aeration would improve the water quality, it would be logical to assume the level of human exposure to pathogens would also be reduced with aeration; or would at least remain consistent.

3. Transfer of viable bacteria.

The types of human pathogens that were detected in water are not detected in air based on limited sampling. Some human pathogens that were found in the surface water were not detected in the aerosols, which seems to indicate that aeration does not transfer certain human pathogens into the air. Aeration may also put dead bacterial cells into the air; however, the health impacts associated with this parameter are unknown.

Health risks and future considerations

Based on DEP's review of publically available data and our experience with in-stream aeration at our 14 wastewater treatment plants (WWTPs), there is no evidence that the bacteria aerosols cause illness. The WWTPs treat water that has significantly higher pathogen concentrations than Newtown Creek, and the aeration systems at the plants use much more air per unit volume than the aeration system in the Creek. Based on the records maintained by DEP in accordance with State Department of Labor Public Employee Safety and Health (PESH)

² M. Elias Dueker, Gregory D. O'Mullan, Andrew R. Juhl, Kathleen C. Weathers and Maria Uriarte, *Local Environmental Pollution Strongly Influences Culturable Bacterial Aerosols at an Urban Aquatic Superfund Site*, Environmental Science and Technology, September 6, 2012, appended as Attachment A in the January 14, 2014 letter.

³ See Figure 1 in Dueker et al. (2012).