Testimony submitted by Gregory O'Mullan on 10/13/11:

Thank you for the invitation to speak at this public hearing. Sewage contamination of New York's waterways is an important issue, both to protect human health and for the economy of our state.

I am a faculty member in the School of Earth and Environmental Sciences at Queens College-CUNY. I study water resources, and the role of bacteria, both harmful and helpful, in aquatic environments. I hold a Ph.D. from Princeton University and I have been involved in environmental research for 15 years. Over the last five years I have been studying Hudson River water quality as part of a collaborative effort between Queens College, Columbia University, and Riverkeeper. We have collected more than 2000 water samples, from 75 locations spanning the entire tidal estuary[1], and analyzed these samples for the abundance of the sewage indicating microbe, *Enterococcus*. The *Enterococci* concentration in these samples has been compared to EPA guidelines for safe recreational water quality[2]. The results from these water quality surveys are made available to the public within days of collection via the Riverkeeper web site[3].

Our study represents the only major sampling effort for sewage indicators that spans the entire tidal portion of the Hudson River Estuary, from the convergence of the Mohawk and Hudson Rivers above the lock at Troy, to New York Harbor. For many sections of the Hudson, especially in the northern portions of the estuary, our study provides the only available data on sewage contamination. I would like to refer you to a recently published Riverkeeper report for a more complete overview of the data and conclusions from this project. The complete text of this report can be found online:

www.riverkeeper.org/wp-content/uploads/2011/08/RvK_How-Is-the-Water_2006-10.pdf

Today, I will highlight a few of the important findings from this study and I will recommend that the approaches used to monitor and managed water quality must continue to improve in New York State. An important component of this issue involves proper notification of the public when conditions are hazardous to public health.

There are two commonly used EPA guidelines for managing recreational water quality: geometric means (or averages) and single sample limits for microbial contamination as measured by sewage indicating microbes, such as *Enterococcus*[4, 5]. Prior epidemiological studies have demonstrated a linkage between swimmer illness and these commonly used microbial indicators of water quality[6]. These sewage indicators are intended to represent broad groups of pathogens that, when abundant, can cause human illness in exposed individuals. Many studies have describe the association of pathogens and human illness with sewage contaminated water [7, 8]. Studies recently conducted in my laboratory have found that local water samples with high levels of the sewage indicator *Enterococcus* also contain high levels antibiotic resistant bacteria[9]. Genetic analyses of these antibiotic resistant

cells indicate that they consist of diverse groups of bacteria, including genera that contain opportunistic pathogens. These data provide additional support that sewage contaminated water samples represent a threat to the health of individuals conducting contact recreation in these systems.

It is important to recognize that we are in the midst of an environmental success story on the Hudson. Investment in sewage infrastructure since the passage of the Clean Water Act has resulted in dramatic improvements in **average** summer water quality. As an example, this pattern in NY Harbor has been well documented in the NYC-DEP centennial water quality report[10]. We should be proud of these changes. However, it must also be noted that our progress has fallen well short of the goals outlined in the Clean Water Act: for all surface waters to become fishable and swimmable. Improvements in recent decades are threatened by an aging network of pipes connecting our homes and businesses to wastewater treatment plants[11, 12]**.** The improvements in water quality in recent decades have also coincided with increased recreational use of the Hudson and redevelopment of many waterfront communities. In order to protect public health and reap the economic dividends from our recent investments in infrastructure, the health of our waterways must continue to improve.

There is an important difference between mean (or average) conditions and the extreme values observed in our data. Averaging our sewage indicator data over time we find that most regions of the Hudson have acceptable water quality in relation to the EPA geometric mean guideline. **However, 21% of our individual samples from the river failed to meet the EPA single sample guideline for recreational waters.** This should be a large source of concern. Individuals get sick from microbial infections that occur from exposure on a single day, at a specific location. They do not get sick from exposure to "average" conditions over a month. The frequency of extreme values, representing extreme sewage contamination, is the most important aspect of the data that I would like to highlight today. Single sample values become especially important in systems, such as the Hudson, known to experience episodic pulses of pollution from Combined Sewer Overflows (CSOs). Although the average water quality data for major regions of the Hudson are acceptable according to EPA guidelines, we should not be satisfied with 1 in every 5 samples failing to meet single sample guidelines. The 21% of the data that failed to meet the single sample guideline were often 100 or more times the EPA guideline for primary contact, representing extreme levels of contamination.

Water quality in the Hudson varies at small spatial scales, for example neighboring communities often have quite different levels of sewage associated microbes. The highly contaminated samples in our study were not restricted to urban centers but were found spread all along the 155 miles of the estuary. It is often difficult to judge the quality of water visually. Some seemingly healthy waterways, such as the Sparkill Creek in Rockland County, are among the most frequently contaminated locations found in our study. This makes data collection and reporting of data

essential, because people's perception and assumptions about water quality based on visual cues are often unreliable.

Water quality also varies at individual locations over time as a result of pollution pulses. One very important source of pollution pulses comes from Combines Sewer Overflows (CSOs). This type of episodic contamination can be hidden by evaluation of average conditions (geometric means). Proper monitoring and notification is critical to protecting public health.

We can classify contamination at our sites as falling into three categories:

1) Chronically contaminated sites where average conditions are unacceptable;

2) Sites where average conditions are acceptable yet pulses of contamination frequently occur, for example from CSOs after rainfall;

3) Sites where conditions are generally acceptable, both in terms of average and single sample guidelines, but that experience rare events such as accidental spills or infrastructure failure (e.g. a ruptured sewage main).

Proper monitoring and public notification are important for all three of these categories. The patterns of contamination are complicated and therefore, management approaches, legislation, and public notification must not follow a one-size-fits-all approach. **One aspect that must be considered: we must not manage only for average conditions, we must also consider the extreme, episodic contamination that occurs within our waterways.**

Thank you for the opportunity to speak today.

Gregory O'Mullan, Ph.D.
Assistant Professor
School of Earth and Environmental Sciences
Queens College, CUNY
718-997-3452
gomullan@qc.cuny.edu

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