

Executive Summary

The Phase I Microbial Trackdown Study and Phase I Supplemental Study are landmark steps towards a comprehensive understanding of dry weather bacteria sources to Onondaga Creek and Harbor Brook in the City of Syracuse. As early as 2007, Onondaga Environmental Institute (OEI) confirmed that the presence of bacteria from sewage in city streams was more than simply the result of rainstorms – bacteria levels increase during wet weather and storm events due to the storm drains and combined sewer overflows (CSOs) that drain directly into the waterways. The current study demonstrated for the first time that discharged sewage is the primary cause of dry weather (<0.08 inches rain during previous 48-hour period) bacteria to Onondaga Creek. The findings illustrate the negative impact an old, decaying wastewater infrastructure has on the City of Syracuse’s urban creeks.

The United States Environmental Protection Agency (USEPA) Region 2 and New York State Department of Environmental Conservation (NYSDEC) Region 7, as well as other members of the Onondaga Lake Partnership (OLP), recognized the need to locate and identify sources of bacteria to both Onondaga Creek and Harbor Brook. Funding was procured to undertake a “Phase I Microbial Trackdown Study” in these two waterways.

The two major goals of the Phase I and Phase I Supplemental Microbial Trackdown Studies were to 1) monitor patterns of concentrated bacterial in Harbor Brook and Onondaga Creek and 2) identify sources of bacteria under dry weather conditions. Both of these goals have been accomplished to a high degree. Together OEI and Onondaga County Department of Water Environment Protection (OCDWEP) have improved the understanding of bacteria dynamics in each tributary.

The Phase I study assessed spatial variability of bacteria within each tributary. Seven sites were sampled in Harbor Brook spanning 5.0 stream miles, and 22 sites were sampled in Onondaga Creek spanning 24.4 stream miles. Samples were collected over ten rounds of sampling. Five field parameters (dissolved oxygen, temperature, specific conductivity, pH, and salinity) were collected at each site. Samples for fecal coliform, plus other indicators of bacteria, sewage, and water quality (for example, suspended solids) were collected for laboratory analysis. Additionally, temporal samples were collected hourly over a 24-hour period in Harbor Brook and two 12-hour periods in Onondaga Creek (both daytime and nighttime). These intensive sampling and analysis efforts recorded hourly fluctuations in bacteria levels while water quality parameters remained relatively constant.

The Phase I Supplemental study built upon the findings of Phase I. Emphasis was placed on further sampling of dry weather point sources, coupled with the concurrent collection of in creek samples. Resultant information enhanced the understanding of point source bacteria release. Finally, a set of maps was created to integrate CSO discharge points, Syracuse city storm drains, natural tributaries, and other dry weather point sources sampled as part of this Phase I Study within the Onondaga Creek and Harbor Brook basins. While preliminary, these maps are a major advance in understanding the relationship among these many diverse components of the urban sewer conveyance system and natural waterways.

Harbor Brook

Overall, sampling results generally indicate a concern does not exist for public contact recreation in Harbor Brook. Limited water quality sampling results suggest that Harbor Brook may be in compliance with the NYS ambient water quality standard for fecal coliform bacteria under normal dry weather conditions. This does not address wet weather conditions, however. Likewise, dry weather discharges from the identified point sources of concern do represent a potential public concern. Reconstruction of the Harbor Brook intercepting sewer (HBIS) may mitigate dry and some wet weather releases from the system. The extent to which reconstruction of the HBIS will address dry and wet weather discharges to Harbor Brook is unknown to the study authors. OCDWEP and their engineering consultants CH₂M-Hill and NYSDEC should possess this information.

Point source HB-PS101B (CSO 018) was found to be a major contributor to the bacteria levels in Harbor Brook. HB-PS101B had a sporadic flow but had the highest concentration of fecal coliform. According to OEI's summary minutes of the March 31, 2009 Bacteria Trackdown Study Planning Meeting with the Working Group, the discharge at CSO 018 and the high levels of fecal coliform observed from HB-PS101B in the spring of 2009 were the result of the sewer system being overwhelmed by ground water. The reconstruction of the HBIS should address this issue. Follow-up sampling to confirm the problem has been corrected is recommended after reconstruction occurs.

Onondaga Creek

Sampling data for Onondaga Creek were evaluated for compliance with the NYS ambient water quality standard according to three stream segments: upper (headwaters to Dorwin Avenue), middle (Dorwin Avenue to Temple Street), and lower (Temple Street to Onondaga Lake). Figure 1 shows minimum, maximum and average fecal coliform concentration values for all sample locations during dry weather events. Nineteen of the 22 average concentration values and 20 of the 22 maximum concentration values are above the NYS ambient water quality standard.

Limited sampling results suggest that upper Onondaga Creek is likely in compliance, and middle and lower Onondaga Creek are likely to exceed the NYS ambient water quality standard for coliform bacteria under normal dry weather conditions. Middle and lower Onondaga creek run through the densely populated and urbanized City of Syracuse. A series of storm drain, CSO and unknown outfalls into Onondaga Creek begins at Dorwin Avenue, the most upstream point of middle Onondaga Creek. These outfalls are likely to be the source of identified sources of bacteria in the streams. The following will describe the OEI's findings in regard to identified bacteria point sources from these outfalls during dry weather events.

Altogether 55 separate point sources were identified and sampled on Onondaga Creek. Of the 55 point sources, eight were identified solely as tributaries. 47 are direct pipes, most of these are storm drains; however, six were identified as CSOs and eleven in all were identified as potential

concerns. Three of the point sources are described below in greater detail, OC-PS25, OC-PS69, and OC-PS23. The remaining eight are summarized.

The impact of multiple point sources on bacteria levels in Onondaga Creek was difficult to ascertain due to overall high levels caused by an unknown upstream source. Consequently, focus of the supplemental Phase I work was shifted to find and identify the major sources of bacteria located upstream of Elmhurst Avenue. A single major sewage source was discovered and identified point source OC-PS25.

OC-PS25 was identified during the October 27, 2009 sampling event as the likely major source of fecal coliform bacteria. Findings indicate it to have a severe concentration but a sporadic discharge. The City of Syracuse then performed a series of digs to repair broken pipes during the winter of 2009 and 2010. A follow up investigation is recommended to confirm the repair corrected the problem.

Point source OC-PS69 (also CSO-067) sampling occurred during a known discharge event caused by a sewer collapse due to a water main break east of the discharge at West Corning Street on April 11-20, 2009. According to OCDWEP records, the Midland trunk sewer collapse caused the only dry weather sewage release from OC-PS69 in 2009. Consequently, this study's findings may not be indicative of normal dry weather conditions at OC-PS69.

Point source OC-PS23 (also CSO-080 [Erie Boulevard Storage System]) was sampled ten times with an average concentration of 4,177 cfu/100mL at a constant flow rate exceeding 100 gpm. It is likely a former tributary. The high flow rate and concentration mean that OS-PS23 could have serious impact on Onondaga Creek. OEI recommended follow-up work by OCDWEP and the City of Syracuse. The EBSS will be addressed under the Onondaga Lake Amended Consent Judgment's fourth stipulation.

As the previously listed point sources; OC-PS25, OC-PS69, and OC-PS23, are corrected and eliminated, impacts of the remaining eight point sources will be more discernable. Point sources: OC-PS11, OC-PS71, OC-PS70, OC-PS20, OC-PS61, OC-PS21, OC-PS76 and OC-PS22, experienced high concentrations at variable flow rates. For more detailed information, see section 4 of the final report. The sporadic nature of the bacteria is evidence that there is potential concern and a follow-up study is recommended to determine the source of the bacteria. Given the instances of aging sewer infrastructure failure seen with OC-PS25 and OC-PS69, it is assumed that these point sources could be examples of the same issue. All point sources are located north of Brighton Avenue in densely populated residential and commercial districts of the city, where the wastewater infrastructure tends to be older and would likely have a greater potential for failure.

In addition to the above point sources, freshwater enters Onondaga Creek via pipe or conduit at nine known locations within the City of Syracuse. In older cities, natural stream flow has been channelized and/or piped underground to outfall locations along primary surface waters. Such is the case with Onondaga Creek within the City of Syracuse. Much of the drainage throughout the watershed within the built environment has been diverted through sluices, culverts, under ground pipes, and conduits. Consequently, common knowledge of natural surface water runoff and

stream flow is not well understood by the public. The following point sources have been identified as tributaries outfalls to Onondaga Creek (discharge locations for natural surface water drainage): OC-PS26 (Dorwin Springs), OC-PS24 (Cold Brook Shunt), OC-PS00 (Kimber Brook), OC-PS01 (Cold Brook), OC-PS02 (Hopper Brook South), OC-PS04 (City Line Brook), OC-PS09 (Hopper Brook North), and OC-PS51 (Furnace Brook).

Of these eight tributary outfalls, three were identified as potential concerns. Limited data suggest OC-PS09 and OC-PS-04 are discharging significant concentration levels of fecal coliform. Their high volume flow rates make them a potential cause for concern. Data suggest a low level discharge may be occurring at OC-PS02. It had consistently lower concentration values than the OC-PS09 and OC-PS04; however, follow-up study is recommended for all three point sources.

In summary, the Phase I Microbial Trackdown Study has given a better understanding of dry weather discharges into Harbor Brook and Onondaga Creek. The findings of this report have aided in the decision making process used to rebuild older decaying infrastructure in the City of Syracuse; however, further investigation is recommended to monitor bacteria levels in the streams. A more rigorous scientific routine sampling design and data analysis strategy should be established in order to gain a greater understanding of spatial and temporal dynamics in Onondaga Creek. In addition to routine sampling all point sources of concern require further investigation and monitoring.