

Site-Specific Methylmercury Water Quality Criterion Stream Study Report:

Unnamed Tributary to Rambo Run and Unnamed Tributary to Ebaughs Creek
York County, Pennsylvania

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Executive Summary

The York County Solid Waste and Refuse Authority (YCSWRA) owns and operates the York County Sanitary Landfill (Landfill) located in Hopewell Township, York County, Pennsylvania. This landfill was in operation from 1974 to 1997 receiving municipal and industrial waste. In 1983, volatile organic compounds thought to be associated with unlined cells were detected in groundwater; in 1985 a pump and treat system (treatment system) was established with multiple wells and two air stripping towers. The treatment system discharges treated groundwater effluent from two outfalls under National Pollutant Discharge Elimination System (NPDES) Permit Number PA0081744 to unnamed tributaries (UNT) of Rambo Run and Ebaughs Creek. Both outfalls are at the head waters to these tributaries. Historically the outfalls have had total mercury (THg) concentrations above the Pennsylvania surface water quality, human health criterion of 0.05 micrograms/liter ($\mu\text{g/L}$), yet are consistently below the Pennsylvania Fish and Aquatic Life Continuous (0.77 $\mu\text{g/L}$) and Maximum (1.4 $\mu\text{g/L}$) water quality criteria as outlined in 25 Pa. Admin. Code Chapter 93.8c (PADEP, 2009), as well as below the Maximum Contaminant Level (i.e., drinking water standard; MCL) of 2.0 $\mu\text{g/L}$. As part of the routine NPDES permit renewal process, the Pennsylvania Department of Environmental Protection (PADEP; the Department) has required that the YCSWRA either:

1. Meet the Human Health Criteria for Hg of 0.05 $\mu\text{g/L}$ as listed in Table 5 of Title 25 Chapter 93 of the Pennsylvania Code, or
2. Conduct a study to develop a site-specific methylmercury criterion and translation factor for the unnamed tributaries to Rambo Run and Ebaughs Creek that would be used to establish NPDES THg permit limits.

The YCSWRA chose to conduct a Site-Specific study (Stream Study), and entered into a Consent Order and Agreement (COA) on August 20, 2015 with the Department to conduct the Stream Study. The Stream Study as outlined in the COA is generally consistent with the United States Environmental Protection Agency (EPA) guidance (2010) for establishing a scientifically defensible water-column translation of the EPA tissue-based Ambient Water Quality Criterion for Methylmercury ($\text{AWQC}_{\text{MeHg}}$). As stated in Section 7.4 of the above referenced EPA (2010) guidance document, the water column translation of the fish tissue criterion is to be used in determining reasonable potential and for deriving numeric water-quality based effluent limits (WQBELs). In October, 2016, the YCSWRA commenced surface water and fish tissue sampling for the Stream Study in accordance with the COA and the later approved work plan.

Part of the process to develop a site-specific methylmercury criterion is determining a site-specific bioaccumulation factor (BAF) which relates the concentration of dissolved methylmercury (MeHg) in the water column to the concentration of THg in fish tissue present in the surface waterbody. The BAF is used to determine the quantity of dissolved MeHg in the water-column (e.g., the $\text{AWQC}_{\text{MeHg}}$) which can be present without fish tissue THg concentrations exceeding thresholds that are protective of human health. Surface water and fish tissue data used in the calculation of site-specific BAF and $\text{AWQC}_{\text{MeHg}}$ were collected at stations located approximately two miles downstream of the subject outfalls (Stream Stations); these locations were the closest stations to the Outfalls where suitable populations of legal sized gamefish were documented in a fish population survey (AECOM, 2016b) conducted prior to commencement of the Stream Study. Concentrations of dissolved MeHg in surface water collected during the Stream Study at these locations were below method detection limits (MDLs) and the respective site-specific $\text{AWQC}_{\text{MeHg}}$ for each stream. Fish tissue THg concentrations in samples collected during the Stream Study were consistently below the EPA recommended tissue-based AWQC (0.3 mg/kg), and also the Department's unrestricted consumption threshold of 0.12 mg/kg. These results indicate that methylation of outfall THg is not contributing to unsafe MeHg levels in surface water or fish.

Data collected during the Stream Study demonstrates that the UNT-Rambo Run and UNT-Ebaughs Creek achieve all designated uses. They are fishable, swimmable, and meet the Department's existing 25 Pa. Admin. Code Chapter 93 aquatic life (acute/chronic) water quality standards and MCL (i.e., drinking water standard) for THg. These data sets also demonstrate that there is no unacceptable risk

to human health associated with exposure to site-related sources of mercury through ingestion of surface water and fish tissue from the UNT-Rambo Run and Ebaughs Creek. It is reasonable to conclude that the YCSWRA Outfalls 001 and 002 do not have reasonable potential to cause or contribute to an exceedance of the applicable water-column translation of the site-specific fish tissue water quality criterion (i.e., the $AWQC_{THg}$) at the point where a complete exposure pathway exists. It is important to note that these discharges have been ongoing since the mid-1980's and that fish tissue and surface water data are reflective of long-term exposure conditions.

In accordance with the COA, a site-specific translation factor was developed during the Stream Study to facilitate conversion of the $AWQC_{MeHg}$ to an $AWQC_{THg}$. This requirement was set forth in the COA as NPDES permit limits typically rely on the total recoverable concentration of THg to determine compliance, which is analytically simpler to measure, but less biologically relevant than the filtered MeHg concentration in surface water. The location where surface water samples are collected for use in the calculation of the translation factor is of critical importance when it is to be used to establish a scientifically defensible translation of a site-specific $AWQC_{MeHg}$, as fish accumulation of mercury is dependent on the form and concentration of mercury at the location where habitat is capable of supporting edible sized fish. Surface water data for the calculation of the translation factor were collected approximately 25 feet downstream of each subject Outfall as required by the Department. However, edible sized fish were collected approximately two miles from the outfalls. Mercury concentrations in surface water were substantially lower at locations where fish samples were collected than at the outfall locations.

Based upon the multiple lines of evidence presented in this report, it is reasonable to conclude that the YCSWRA Outfalls 001 and 002 do not have reasonable potential to cause or contribute to an exceedance of the applicable water-column translation of the site-specific fish tissue water quality criterion (i.e., the $AWQC_{THg}$) at the point where a complete exposure pathway exists. Consistent with Section 7 of the EPA (2010) Guidance for Implementing the January 2001 Methylmercury Water Quality Criterion, it is recommended that the YCSWRA develop and implement a voluntary mercury minimization plan and conduct effluent monitoring to ensure that the discharges will continue to have no reasonable potential to cause or contribute to an exceedance of the applicable site-specific water quality standards with a re-opener clause if future monitoring data demonstrate that the discharges have reasonable potential. It is important to note that these discharges have been ongoing since the mid-1980's and that fish tissue and surface water data are reflective of long-term exposure conditions; therefore, establishing a THg permit limit that is more restrictive than existing effluent quality would be unduly restrictive based upon the results of the Stream Study.

Acronym List

Acronym	Explanation
µg/L	Micrograms per Liter
AWQC	Ambient water quality criteria
AWQC _{MeHg}	Ambient Water Quality Criteria for filtered Methylmercury
AWQC _{THg}	Ambient Water Quality Criteria for Total Mercury
BAF	Bioaccumulation factor
C _t	Mercury concentration in tissue
C _w	Mercury concentration in a waterbody
cfs	Cubic feet per second
COA	Consent Order and Agreement
COC	Chain-of-Custody
Department	Pennsylvania Department of Environmental Protection
EPA	United States Environmental Protection Agency
f _d	Water column translation factor
fMeHg	Filtered Methylmercury
ft.	Feet
Landfill	York County Sanitary Landfill
L/kg	Liters per Kilogram
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MeHg	Methylmercury
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MGD	Million gallons per day
mm	Millimeters
ng/L	Nanograms per liter
NPDES	National Pollutant Discharge Elimination System
PADEP	Pennsylvania Department of Environmental Protection
QA/QC	Quality assurance/Quality control
QAPP	Quality Assurance Project Plan
THg	Total Mercury
TL	Trophic level
TMDL	Total maximum daily load
TRC	Tissue residue concentration
µg/L	Microgram/Liter
UNT	Unnamed Tributary
WQBEL	Water quality based effluent limits
YCSWRA	York County Solid Waste and Refuse Authority