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**Technical Memorandum**

Subject: pH Excursion Policy for City of Memphis Industrial Users  
Date: November 17, 2022  
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## Section 1: Background

The City of Memphis (City) has long supported industry in providing wastewater collection and treatment services at a cost that is one of the lowest in the nation. The City has made a concerted effort to balance the cost of services with maintaining its wastewater systems and protecting worker safety and health, while meeting regulatory compliance. While the City has established a program to manage wastewater system assets, there have been challenges in managing the condition of some collection system assets. There are also challenges with meeting National Pollutant Discharge Elimination System (NPDES) permit requirements for effluent discharge (an example is shown in Figure 1).

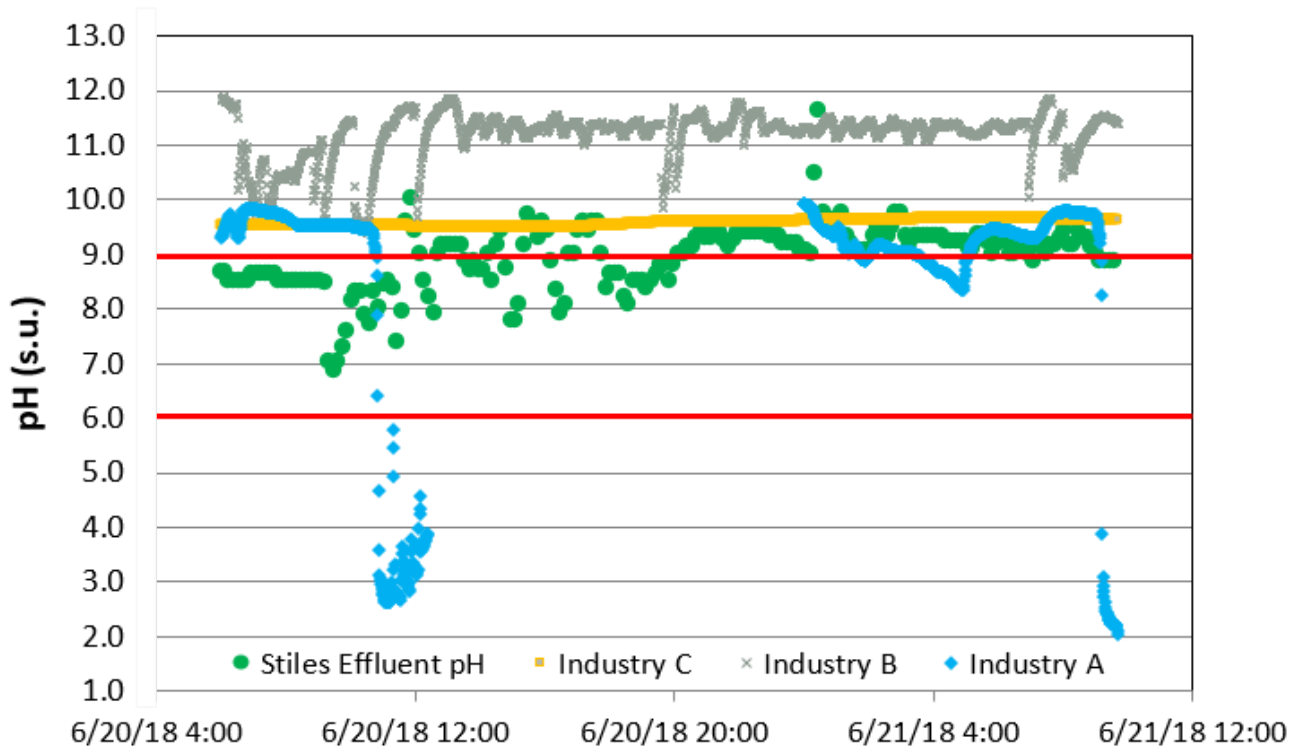


Figure 1. Examples of industrial user high pH discharge impacts on M.C. Stiles WWTP discharge resulting in noncompliance with effluent limits of  $6 > \text{pH} > 9$

## Section 2: Wastewater Collection and Treatment Systems

The City provides sanitary sewer collection and treatment services to most areas within the city limits. The City also receives wastewater generated from municipal satellite systems, including the Horn Lake Creek Basin Interceptor Sewer District (Mississippi), the City of Germantown, portions of the cities of Bartlett, Collierville, Lakeland, and Millington, and from unincorporated areas of Shelby County. Collierville, Lakeland, and Millington will no longer be included by contract in the future, but the low levels of industrial discharge from these sources are not expected to alter this policy significantly.

## 2.1 Collection System

The City has a separate sanitary sewer system that serves a total area of 442 square miles, with 314 square miles within the City limits and 128 square miles within suburban areas. The collection system is divided into six major sewer basins: Loosahatchie River, Wolf River, Front Street, President's Island, Nonconnah Creek, and Horn Lake Creek. The sewer system in the service area is predominately gravity flow and consists of approximately 2,800 miles of sanitary sewers, including gravity sewers and force mains, nearly 100 lift stations, and 64,000 manholes. This excludes privately owned laterals or private collection systems, such as within gated communities and apartment complexes; these sewers are neither owned or maintained by the City and are not covered by Management, Operations and Maintenance programs.

## 2.2 Wastewater Treatment Plants

The City operates two major wastewater treatment plants (WWTPs), M.C. Stiles and T.E. Maxson, that collectively treat an average of over 150 million gallons per day (MGD) of wastewater. The M.C. Stiles WWTP, located near the confluence of the Mississippi and Wolf Rivers, serves the northern portion of the service area, including the Wolf River, Front Street, and Loosahatchie River sewer basins. The T.E. Maxson WWTP, located near the confluence of McKellar Lake and the Mississippi River south of President's Island, serves the southern portion of the service area, including the Nonconnah Creek, Horn Lake Creek, and President's Island sewer basins.

The liquid treatment process at the M.C. Stiles WWTP is a contact-stabilization process with coarse and fine bar screens, grit tanks, activated sludge and secondary clarification. The facility recently added peracetic acid (PAA) to meet bacteria limits, which are not yet effective. The current liquid treatment process at the T.E. Maxson WWTP consists of coarse bar screens, grit removal, fine bar screens, primary clarification, high rate biotowers, activated sludge and secondary clarification. Like M.C. Stiles, PAA is used to meet forthcoming bacteria limits at the T.E. Maxson WWTP.

With respect to pH, both the M.C. Stiles and T.E. Maxson WWTPs have NPDES permit limits of 6.0 – 9.0. As noted, high pH discharges from industrial users have periodically resulted in challenges meeting compliance related to pH (Figure 1).

## Section 3: Sewer Use Ordinance for pH in IU Discharges

Section 33-243 (b) (3), (4) and (5) of the City's Sewer Use Ordinance (SUO) establishes pH limits for Industrial Users (IUs), as follows:

*“Section 33-243 (b) Specific Prohibitions*

*No Person shall Discharge, or cause to be Discharged, any of the following to the City's POTW (including the City's sewers):*

...

*(3) Pollutants in violation of a pH Minimum Limit, i.e., having a pH lower than 5.5 standard units.*

*(4) Pollutants with corrosive properties capable of causing damage or hazard to the structures, equipment, conveyances, and personnel of the sewerage works or interfering with the operation of the treatment facility.*

*(5) Wastewaters in violation of a pH Maximum Limit, i.e., having a pH higher than 10.0 standard units unless prior approval of a higher limit is approved by the City of Memphis, Division of Public Works, and set forth in a Discharge Permit. In order to Discharge a pH above 10.0 standard units, the City may require the User to submit a study identifying, among other things, the flow and pH*

concentrations requested, an estimate of the duration the Discharge will exceed 10.0 standard units, the potential impacts of the high pH on the sewer system, lift stations, WWTP or any other part of the POTW, and such other information as the City may request. In no event shall a User discharge a pH equal to or over 11.5 s.u.”

## Section 4: Industrial User pH Enforcement Discretion Excursion Policy

This policy sets forth the City discretion in exercising its enforcement authority pertaining to excursions of the upper pH limit, to a certain extent. The policy may be applied to users with the intent to separate what causes harm to the system and at the WWTPs and what may not necessarily merit an enforcement response. Notably, typical activated sludge processes can experience decline in treatment performance at pH > 9 (Figure 2). Due to the potential for inhibition of biomass in the short hydraulic and solids retention time treatment processes at the M.C. Stiles and T.E. Maxson WWTPs that could result in effluent discharge noncompliance, the approach to the policy assumes that an influent pH of 9 s.u. cannot be exceeded.

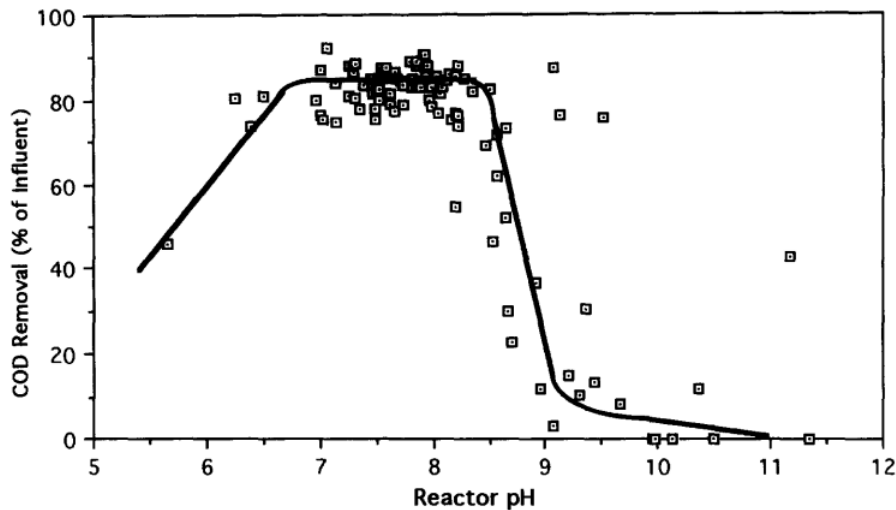


Figure 2. High pH discharge impacts on activated sludge performance, Chong et al. (1997).

Based on a technical approach evaluating IU discharges in context of the flow, pH and timing of discharges, the City may apply a discretionary pH excursion policy in exercising its enforcement authority for pH excursions > 10 s.u. and < 11.5 s.u., based on the potential to impact WWTP performance (i.e., plant influent pH > 9 s.u.).

Continuous online self-monitoring and minute-by-minute reporting of pH and flow must be employed by IUs seeking consideration under this enforcement discretion excursion policy; pH monitoring should be conducted according to EPA Method 150.2 (40 CFR 136). Documentation of proper pH meter calibration and maintenance is required for discretion under this policy and calibration and maintenance logs must be submitted with each monthly self-monitoring report.

The pH and flow data provided as part of the monthly reporting is required for consideration of discretion under this policy. This policy may be applied to all IUs with exception of batch dischargers and the City will address compliance on a discharger-by-discharger basis, as follows:

- Excursions are not allowed for batch dischargers.
- No excursions  $< 5.5$  or  $\geq 11.5$  are allowed, whether subject to continuous monitoring or otherwise; if a  $\text{pH} < 5.5$  s.u. or  $\geq 11.5$  occurs, it is a violation.
- Any  $\text{pH} > 10$  s.u. and  $< 11.5$  s.u. discharged to the M.C. Stiles and/or T.E. Maxson WWTP is potentially eligible under this policy only if the IU provides minute by minute flow and pH data to the City.
- While discharges  $> 10$  pH are a violation, the City may use enforcement discretion regarding upper limit excursions  $> 10$   $\text{pH} < 11.5$  s.u. This includes a safety factor to protect the system from discharges of hazardous wastes; any excursions with a  $\text{pH} \geq 11.5$  s.u. will not be subject to the enforcement discretion provided by this policy.<sup>1</sup>
- For all IU permittees seeking enforcement discretion under this policy, minute-by minute pH and flow monitoring and reporting is required to be submitted with self-monitoring reports. The City is working toward electronic reporting and will notify IU permittees when this reporting format is available, at which time, minute-by-minute flow and pH data must be submitted in Excel, or another electronic file format approved by the City. Calibration logs must also be provided with each monthly report.
- For dischargers that continuously monitor pH and flow, excursions  $> \text{pH } 10$  s.u. are limited to 30 minutes during any monthly compliance period, with a maximum of 10 minutes at  $10.5 > \text{pH} < 11.5$ . It is expected that 30 minutes would be the exception, the City would not exercise its enforcement discretion if violations  $> \text{pH } 10$  occur for more than 30 minutes or if they occur on a periodic or frequent basis.
- Dischargers subject to an enforcement action may be subject to a penalty based on state and federal law for each violation, including fees for administrative actions. This amount is \$10,000 per day for each day during which the act or omissions continues or occurs at the time of policy development and may be subject to higher federal penalties.
- If WWTP effluent is  $> 9$ , and any IU discharge  $\text{pH} > 10$ , the City may consider time of travel of the discharge to determine whether it is concurrent with the elevated effluent pH. If the IU discharge is determined to be concurrent, the excursion policy may not be applied.
- Excursions are not subject to this policy when the IU discharge is in noncompliance with an applicable pH limit in a categorical guideline or is otherwise deemed problematic. For example, if an industry contributed or is believed to have potentially contributed to corrosion in wastewater infrastructure, industry excursions cause City NPDES violations, or industry excursions inhibit treatment at the WWTPs, this policy would not apply.

## References

Chong, N-M., Pai, S-L., Chen, C-H. (1997). Bioaugmentation of an Activated Sludge Receiving pH Shock Loadings. *Bioresources Technology*, 59: 235–240.

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<sup>1</sup> This does not mean that every pH violation  $\geq 11.5$ , or otherwise not covered by this policy, will be subject to an enforcement response. Nothing herein shall be deemed to create rights associated with the City's exercise of its enforcement discretion.