AECOM
500 West Jefferson Street
Louisville, KY 40202
aecom.com

Project name:
MSD Odor Control Master Plan

Project ref:
60644274

To:
Robin Burch
MSD Project Manager
4522 Algonquin Parkway
Louisville, KY 40211

From:
Brett Wagner
Jackson Allman

Reviewed By:
Alex Carciumaru
Amanda Foote
Janet Strickland
Maria DeLuca

Date:
December 13, 2022

FINAL

Memo

Subject: Technical Memorandum #7C – Morris Forman Service Area - Selected Pump Stations Current Odor Technologies Performance Evaluation

1. Introduction

1.1 Odor Control Master Plan Background

In response to receiving a Notice of Violation (NOV) in November 2019 for failure to control nuisance odors from the Morris Forman Water Quality Center (WQTC, Plant), pumping stations and its collection system, MSD entered an agreed order with the Louisville Metro Air Pollution Control District (APCD) to develop and implement a phased District-wide Odor Control Master Plan. MSD has contracted AECOM to provide MSD with professional engineering services for the development of Phase I of the Odor Control Master Plan (Odor Control Master Plan), which is focused on the Morris Forman Service Area. MSD also contracted with a public relations firm to increase public engagement and communications during development and implementation of the phased Odor Control Master Plan.

MSD owns and operates 139 wastewater pump stations within the Morris Forman Service Area. These pump stations are responsible for the conveyance of wastewater flow from the Morris Forman combined sewer collection system towards the Morris Forman WQTC. Several communities in the Morris Forman Service Area have experienced nuisance odors leading to a significant amount of complaints, specifically during the summer of 2019. Primary affected residents were in the Chickasaw, California, and Park DuValle neighborhoods. These complaints led to the development of a dedicated Odor Control Master Plan for the Morris Forman Service Area.

There were seven (7) pump stations selected from the Morris Forman Service Area for study, and three (3) of those pump stations have existing odor control systems installed as listed below:

1. Pump Station #5 - One (1) dual-bed carbon adsorber, one (1) supply fan, and connecting ductwork
2. Pump Station #2 - One (1) dual-bed carbon adsorber, one (1) exhaust fan, and connecting ductwork
3. Pump Station #3 - One (1) dual-bed carbon adsorber, one (1) exhaust fan, and connecting ductwork

1.2 Purpose

During previous phases of the Odor Control Master Plan, AECOM reviewed and compiled available data and documentation related to odor control and sampling within the Morris Forman Service Area. The purpose of this memorandum is to evaluate the performance of the odor control systems and technologies at the selected pump stations within the Morris Forman Service Area. The main objectives of this report are to:

1. Summarize the currently existing odor control systems and technologies within the selected pumps stations and evaluating their performance.
2. Determine if additional odor control systems and technologies are required within the selected pump stations.
3. Incorporate findings from this TM#7C, Pump Station Current Odor Control Technologies Performance Evaluation into TM#8, New Odor Control Technologies Performance Evaluation, and TM#9, Odor Control Conceptual Design.

Based on the findings of the current performance evaluation, recommended action items were developed to improve the odor removal efficiency of existing odor control systems at the selected pump stations in the Morris Forman Service Area.

1.3 Previous Documentation and Implementation Schedule

In accordance with the agreed order, MSD has submitted several documents to APCD to demonstrate ongoing odor control efforts. **Table 1** shows MSDs completed and ongoing efforts towards the APCD agreed order.

Table 1 – Master Plan Implementation Schedule

Title		Due Date	Status
TM#1	Morris Forman WQTC Background Document Review	Q1 2021	Completed
TM#2	Collection System Background Document Review	Q2 2021	Completed
TM#3	Pump Stations Background Document Review	Q2 2021	Completed
TM#4	WQTC, Pump Stations and Combined Sewer System Planned Process Modifications	Q1 2021	Completed
TM#5	Current WQTC, Pumping Stations and Combined Sewer System Odor Impact Evaluation	Q2 2021	Completed

TM#6A, TM#6B, TM#6C	Morris Forman WQTC (TM#6A), Pump Stations (TM #6C), and Collection System (TM #6B) Sampling Phase Results Analysis	Q4 2022	Completed
TM#7A, TM#7B, TM#7C	Morris Forman WQTC (TM#7A), Collection System (TM #7B), and Pump Stations (TM #7C) Current Odor Technologies Performance Evaluation	Q4 2022	Completed
TM#8	New Odor Control Technologies Recommendation	Q4 2022	Ongoing*
TM#9	Odor Control Conceptual Design	Q4 2022	Ongoing*
Odor Control Master Plan Phase I Final Report		Q4 2022	Ongoing**

**- TM#8 and TM#9 will be submitted following the completion of TM# 7A, 7B, 7C.*

***- The Final Odor Control Master Plan Phase I Final Report will be comprehensive document which includes information about the Morris Forman Collection System, WQTC, and selected pump stations.*

Please refer to **TM#2**, **TM#5**, and **TM#6B** for details relating to the data review, odor impact evaluation, and sampling results prior to the development of this report.

2. Design and Operational Performance Review

2.1 Odor Control System Review

Prior to the development of this report, a detailed review of existing documentation was performed in relation to odor control within the Morris Forman Pump Stations. Background documentation included previous studies, reports, and field sampling data to gain an understanding of MSD's odor control efforts to date and to investigate current odor conditions in specific areas of the pump stations. Key findings from the background documentation review process for the Morris Forman Pump Stations can be found in **TM#3**.

Of the seven (7) selected pump stations, only three (3) are currently equipped with odor control technologies for the treatment of foul air generated from process areas. These three (3) were Pump Station #5, Pump Station #2, and Pump Station #3. A summary of these pump stations existing odor control technologies is shown in **Table 2** including manufacturer and model, carbon media used, number of units, installation year and associated odor sources.

Table 2. Existing Odor Control Technologies Summary

Pump Station	Odor Control System	Manufacturer / Model	Carbon Media	# Of Units	Year Installed	Associated Odor Source(s)
Pump Station #5	Dual-Bed Carbon Adsorber	N/A	Virgin Activated Carbon	(1)	2013	Influent Chamber, Screen Channels, Screen Room, Pipe Gallery, and Wet Wells
Pump Station #2	Dual-Bed Carbon Adsorber	ECS RO10 Carbon Adsorber	High-Capacity Activated Carbon Virgin Coconut Shell Activated Carbon	(1)	2017	Wet Well, Screen Channels, Screen Room, Dumpster Area
Pump Station #3	Dual-Bed Carbon Adsorber	ECS VX-7,600	Enhanced Virgin Coconut Shell Activated Carbon	(1)	2018	Wet Well, Inlet Channel, Screen Room, and Dumpster Area

Existing equipment specifications and reports were reviewed to identify key design parameters for each of the existing odor technologies and summarized in **Table 3**. The project team also compiled previous performance testing results and design performance parameters to assess the current operational performance.

Table 3. Existing Odor Control System Design Summary

	Inlet Conditions			
Odor Control System	Total Peak Capacity (cfm)	Average / Peak H_2S (ppmv)	Average / Peak Odor Conc. (ou)	**Expected Performance**
Dual-Bed Carbon Adsorber (PS #5)	10,000	1 - 10	N/A	1-10 ppm H_2S – 99% Removal Efficiency > 10ppm H_2S - 99% Removal Efficiency
Dual-Bed Carbon Adsorber (PS #2)	10,000	1 - 10	N/A	< 0.2 ppm H_2S in Outlet Air or 99% Removal Efficiency
Dual-Bed Carbon Adsorber (PS #3)	7,600	10	N/A	99.5% removal or less than 0.5 ppm in outlet air

2.1.1 Pump Station #5 Dual-Bed Carbon Adsorber Performance Evaluation

The existing system, installed in 2013, provides odor control to the influent chamber, screen channels, screen room, pipe gallery, and wet wells of the pump station. The system treats foul air from the wet well via two 12” intakes. The Dumpster Room and Splitter Structure #1 are not tied to the existing odor control system. **Table 4** summarizes the air sampling results pertaining to H_2S and odor pump station dumpster room and Splitter Structure #1.

Table 4. Pump Station #5 Odor Control System Performance Summary, 2021

Location	**H_2S Concentration (ppm)**	**Odor Concentration (D/T)**
	Room	Room
Dumpster Room	Low	High
Splitter Structure #1	High	High

H_2S and odor concentration removal efficiencies are not able to be determined based on current information. This is due to air samples being taken within the process area and not from the inlet/outlet of the existing odor control system. It is noted however that Pump Station #5 is currently in the design phase of a new odor control system that is designated to treatment of the Splitter Structure #1.

Based on the findings of current performance data evaluations, the following conclusions were made regarding the existing odor control system:

- H_2S percent (%) reduction was not able to be determined for the dual-bed carbon adsorber system due to the locations that were sampled not being tied to the current odor control system.

- Odor concentrations have been noticed to be high in the splitter structure #1 area sampled. If splitter structure #1 is entered by personnel, air should be ventilated, treated, and monitored for safety purposes, limit environmental emissions, and corrosion of equipment. However, this area is not typically entered by maintenance personnel, so the risk of exposure is limited.

2.1.2 Pump Station #2 Dual-Bed Carbon Adsorber Performance Evaluation

An air sampling program was conducted during Summer 2022 of the existing Pump Station #2 Odor Control Room, which was originally installed in 2017. The odor control system consists of one (1) 10,000 cubic feet per minute (cfm) carbon adsorber in roll-off bin area. Odor emissions are conveyed through a 30-inch duct and pass through a grease filter before entering the carbon adsorber for treatment. The treated air is conveyed through a 24-inch fiberglass reinforced pipe (FRP) stack before being released into the atmosphere.

Table 5 summarizes the results of the 2022 air sampling period for the Pump Station #2 odor control systems, including H_2S and odor concentrations and associated percentage (%) reduction.

Table 5. Pump Station #2 Odor Control System Performance Summary, 2022

Location	H_2S Concentration (ppm)	Odor Concentration (D/T)
	% Reduction	% Reduction
Carbon Inlet/Outlet	45.7%	50%

Available sampling data shows that the existing carbon adsorber is meeting performance standards for the H_2S removal.

The percent (%) reduction of the odor control system was 45.7%. This reduction percentage does not influence the current performance rating of the odor control system due to the inlet low concentration of H_2S at the time of sampling, but should be monitored further to confirm performance and impact to the surrounding environment.

The odor control system was also analyzed for outlet odor concentration (D/T) in Summer 2022. The sampling results showed the carbon outlet demonstrated a 50% odor concentration removal efficiency.

Based on the current performance data evaluations, the following conclusions were made regarding the existing odor control system:

- The H_2S reduction target in the outlet air was met during the Summer 2022 sampling tests and is indicative of the carbon adsorber system meeting performance expectations.
- The odor reduction was 50% only and this may result in odor complaints from the receptors in the proximity of the PS.

2.1.3 Pump Station #3 Dual-Bed Carbon Adsorber Performance Evaluation

An air sampling program was conducted during Summer 2022 at the existing Pump Station #3 odor control system, installed in 2013 and updated in 2018.

Table 6 summarizes the results 2022 sampling period of the pump station odor control systems, including H_2S and odor concentrations and associated percent reduction.

Table 6. Pump Station #3 Odor Control System Performance Summary, 2022

Location	H_2S Concentration (ppm)	Odor Concentration (D/T)
	% Reduction	% Reduction
System 1	95.6%	25.6%
System 2	97.8%	70.2%

Available sampling data shows that the existing carbon adsorber is meeting performance standards for H_2S removal. Based on these results, the odor control system is meeting the H_2S reduction performance levels during the Summer 2022 sampling period.

The percent (%) reduction of the odor control system for System 1 and System 2 were 95.6% and 97.8%, respectively. This reduction percentage does not influence the current performance rating of the odor control system due to the low concentration of H_2S (> 0.5 ppm) at the time of sampling but is indicative of moderate performance and should be monitored for confirmation.

The odor control system was also analyzed for outlet odor concentration (D/T) and demonstrated a 25.6% and 70.2% odor concentration removal efficiency for System 1 and System 2, respectively.

Based on the findings of current performance data evaluations, the following conclusions were made regarding the existing odor control system:

- The H_2S reduction target in the outlet air was met during the Summer 2022 sampling tests and is indicative of the carbon adsorber system meeting performance expectations.
- The odor reduction was 25.6% for System 1 and 70.2% for System 2 and this may result in odor complaints from the receptors in the proximity of the PS.

3. Conclusions

Available performance data was compiled and evaluated for each selected pump station with an existing odor control system.

Table 7 summarizes the performance data including average H_2S and odor removal efficiency for each existing odor control system. A performance rating was included to indicate whether each performance efficiency target was met.

Table 7. Current Odor Control Technologies Performance Evaluation Summary

Locations	Odor Control System	Average Odor Conc. % Reduction	Average H_2S Conc. % Reduction	Performance Rating(s)
Pump Station #5	Dual-Bed Carbon Adsorber	N/A	N/A	• Odor Removal: N/A, but high conc. within sampled area • H_2S Removal: N/A, but high conc. within sampled area
Pump Station #2	Dual-Bed Carbon Adsorber	Carbon Outlet: 50%	Carbon Outlet: 45.7%	• Odor Removal: Moderate

				• H_2S Removal: Moderate
Pump Station #3	Dual-Bed Carbon Adsorber	System 1: 25.6% System 2: 70.2%	System 1: 95.6% System 2: 97.8%	• Odor Removal: Moderate • H_2S Removal: Good

Available performance data showed that Pump Station #2 and Pump Station #3 odor control systems are meeting performance targets in terms of H_2S removal and had adequate removal of outlet odor concentrations. Pump Station #2, based on H_2S percent reduction, should continue to be monitored for performance evaluation. Pump Station #5 odor control system was unable to be evaluated as sampling locations were not tied to the existing control system.

Additionally, Pump Station #5 is set to have a new odor control system installed specifically for treating Splitter Structure #1. Since the odor control station is already planned to be replaced, no new conclusions will be made based on data collected with the existing odor control system. The new odor control system should undergo a performance test once installed to confirm performance meets the intended design parameters.

4. Recommendations

The following action items are proposed to improve the odor removal efficiency of the existing pump station odor control systems units:

- In future TMs #8 & #9, odor control technologies will be selected and evaluated for upgrade and/or enhancement based on the highest odor concentrations sampled at the studied facilities.
- TM#8 & TM#9 will be focused on pumps stations with and without odor control systems that had high odor sampling results as listed in TM #6C.