

# ACHIEVING DRAMATIC IMPROVEMENTS IN FLOW RATES

## Upper Montgomery Joint Authority(UMJA) Credits Successful I&I Reduction Program

By: Jennifer Leister, Upper Montgomery Joint Authority

*In 2010, the Upper Montgomery Joint Authority (UMJA) faced a major challenge: the Department of Environmental Protection (PADEP)'s determination that the wastewater treatment plant was hydraulically overloaded due to excessive Inflow and Infiltration (I&I).*

*Fast forward to today: thanks to many successful I&I reduction projects as well as considerable efforts by UMJA, dramatic improvements in flow rates during wet weather events have been achieved.*

### BACKGROUND

The Upper Montgomery Joint Authority is a regional sewer authority in Montgomery County, Pennsylvania, serving a population of approximately 8,300 in the boroughs of Red Hill, Pennsburg, East Greenville, and parts of Upper Hanover Township. The authority owns and operates a sanitary sewer collection system and a wastewater treatment plant (WWTP), which is permitted for an average daily flow of 2.0 million gallons per day (MGD). The plant's actual hydraulic design capacity is 2.77 MGD, but it often experiences peak flows exceeding 15 MGD during heavy wet weather events.

Since being established as hydraulically overloaded, UMJA has made significant strides in infrastructure improvements at both the treatment plant and throughout the collection system. This includes substantial upgrades to the wastewater treatment plant, culminating in a \$28 million upgrade in 2022, costing over \$10/gallon to construct. Throughout these efforts, the UMJA Board has been very supportive and proactive in ensuring the necessary improvements are realized.

### FLOW METERING AND COLLECTION INSPECTIONS (2013)

In 2013, UMJA launched a comprehensive flow metering program and conducted inspections of manholes, mains, and laterals. Based on these inspections, it was determined that a more aggressive program would be necessary to prevent overflows, free up capacity, and accommodate new development.

### REHABILITATION MATERIALS, METHODS AND ACHIEVEMENTS

Of top priority was the use of proper rehabilitation materials and methods, ensuring long-term success and value add to the system. Utilizing cured-in-place pipeliners (CIPP) manufactured by LMK, as well as applying polyurea coating manufactured by OBIC, UMJA was able to rehabilitate mains and laterals within the collection system.

<FIG 1.png> (use left hand side of composite) Figure 1. OBIC Composite Polyurea Lining System

The Mr. Manhole system was also utilized, allowing crews to quickly and easily cut out and replace manhole frames.

**“THE NUMBER OF SSOS OCCURRING WAS REDUCED SIGNIFICANTLY.”**



Figure 1. OBIC Composite Polyurea Lining System



Figure 2. Mr. Manhole Installation System

## PROGRESS AND ACHIEVEMENTS

To date, UMJA has successfully continued the rehabilitation, tackling necessary infrastructure improvements. Some achievements include:

- More than 85,000 linear feet (LF) of main line and laterals have been televised
- At least 82,000 LF of CIPP lining has been installed in 8-inch and 10-inch diameter sewer mains. (12,200 LF in 2023 alone)
- 714 laterals have been CIPP lined
- 123 manholes have been lined
- Nearly 40 manholes have been raised to grade in low-lying areas
- At least 500 properties have been inspected for illegal connections

The majority of these improvements were completed by Performance Pipelining, Inc. (PPI), with PPI completing about 90 percent of the actual rehabilitation work.

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Figure 3. Main sewer CIPP lining



Figure 4. Steam curing CIPP



Figure 5. CIPP Liner Installation



Figure 6. CIPP Lining System

## IMPACT OF THE I&I IMPROVEMENTS

The primary goal of the UMJA I&I abatement program was to reduce, if not eliminate, bypass events at the wastewater treatment plant. As well as, eliminate sanitary sewer overflows (SSOs) occurring in the collection system.

Since 2018, UMJA has invested over \$8.41 Million on the collection system in order to resolve wet weather I&I and to make its treatment plant more efficient and operationally effective. During 2018, there were 15 SSOs that occurred in the collection system. However, following the extensive I&I reduction program, the

number of SSOs occurring was reduced significantly – with only one event in 2023.

Additionally, as a direct result of the substantial I&I abatement efforts since 2018, the average daily hydraulic loading to the treatment plant has decreased significantly from 1.93 MGD in 2018, to 1.08 MGD in 2023.

When interpreting the data, it is relevant to note that 2018 was a very wet year, and the elevated flows (1.93 MGD) were somewhat unique. Nonetheless, in 2019, the average daily flow decreased to 1.66 MGD, and then further decreased to 1.27 MGD in 2020 – all of these can be attributed to the I&I reduction efforts.

Year	Average Daily Flow to WWTP	Percent Reduction From Previous Year	Percent Reduction From 2018
2018	1.93 MGD		
2019	1.66 MGD	14.0%	14.0%
2020	1.27 MGD	23.5%	34.2%
2021	1.16 MGD	8.7%	39.9%
2022	1.19 MGD	-2.6%	38.3%
2023	1.08 MGD	9.2%	44.0%

The I&I reduction efforts are also evidenced by the reduction of average daily flow from 850,000 GPD (between 2018-2023) and nearly 580,000 GPD (between 2019-2023). Overall, this is a 44 percent reduction in average daily flows over the past five years.

Additionally, the three-month maximum flow in 2023 was 1.44 MGD, in comparison to 2.108 MGD in 2019, a 32 percent decrease. Furthermore, the maximum monthly flow decreased significantly – from 2.80 MGD (2018) to 1.97 MGD (2023). Totalling, an almost 30 percent reduction in maximum monthly flow in the past five years – thanks to I&I abatement efforts by UMJA.

## ADDITIONAL MEASURES: SMOKE TESTING (2020)

In order to identify illicit connections within the collection system that may be contributing to the increased flows, UMJA began smoke testing within the collection system in 2020. Initial focus was on areas of the collection system that experienced sanitary sewer back-ups or SSO's – primarily areas of the Boroughs of East Greenville and Pennsburg.

Throughout September and October 2020, UMJA conducted smoke testing in approximately 22,600 LF of sewer main line, identifying 37 potential issues and/or illicit connections on private property.

Continuing the efforts, in 2022, approximately 24,752 LF (or 4.70 miles) of smoke testing was conducted throughout the area.

Smoke testing has thus far resulted in identifying cracked and/or leaking laterals, cracked or missing caps, possible connections of gutters/downspouts, storm drains, and floor drains to the sanitary system, and the possible presence of previously abandoned laterals.

Following smoke testing work, UMJA conducted additional, more thorough, investigations including lateral inspections and dye-testing for storm drains implicated. As issues have been identified, UMJA has notified property owners and has coordinated requirements to resolve the noted issues.

UMJA plans to continue smoke testing as needed, or as timing and funds allow.



Figure 7. Smoke testing in progress

## CONTINUED MANAGEMENT OF REHABILITATION EFFORTS AND IMPROVEMENTS

UMJA previously worked with a consultant to develop a comprehensive Geographic Information System (GIS) database of its collection system, allowing for accurate monitoring of the rehabilitation work.

In April 2022, UMJA installed flow meters throughout the collection system. Since then, the authority has closely

monitored flows throughout the years to determine baseline infiltration and identify problem areas experiencing significant inflow during wet weather events.

When improvement projects are completed, these flow meters are deployed to their previous locations in order to determine if the I&I efforts produced a successful result in terms of flow reduction.

Recently, UMJA worked with Spotts, Stevens and McCoy (SSM) to evaluate

the quantities of I&I in each of the sewer sheds by calculating I&I in gallons per day per parcel. The data was normalized to remove the parcels with the highest water usage based on commercial, industrial and institutional usages. The I&I was calculated for each of the basins based on extensive flow metering data and the parcel counts for each sewer shed in order to give each basin a rating in terms of its I&I contributions.

These tools are continued resources that assist UMJA with identifying areas of high concern, and scheduling upcoming work based on priority.

## OVERALL SUCCESS

Due to the extensive I&I reduction efforts by UMJA, the treatment plant was able to eliminate its wet weather bypassing operations, and treat all wastewater influent to the wastewater treatment plant.

The result of this program is that overflows within the collection system – both from an intensity and volume standpoint – have been greatly reduced. The I&I reduction efforts may have saved UMJA



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**“BASED ON THE INSPECTIONS, IT WAS DETERMINED THAT A MORE AGGRESSIVE PROGRAM WOULD BE NECESSARY.”**

millions in additional construction costs, as well as the treatment costs associated

with treating the additional 850,000 GPD of wastewater. The rehabilitation work has



Figure 9. The author with the team at UMJA – proud of their accomplishments!

essentially paid for itself and will continue to do so, by reducing pumping, treatment, chemical, and energy costs in addition to allowing for future development for many years to come. †

**ABOUT THE AUTHOR:**



**Jennifer Leister** is Executive Director of the Upper Montgomery Joint Authority (UMJA). Jennifer joined UMJA in 2012, initially in the role of Laboratory Technician,

and then stepping into the role of Assistant Superintendent. In 2018, Jennifer became the Executive Director as the Authority was beginning construction of a \$28 million treatment plant upgrade. She jumped into leadership, navigating the large construction project as well as management of 10 operators and administrative staff. As Executive Director, Jennifer has prioritized providing high quality wastewater treatment, while empowering her staff and engaging positively with the community.

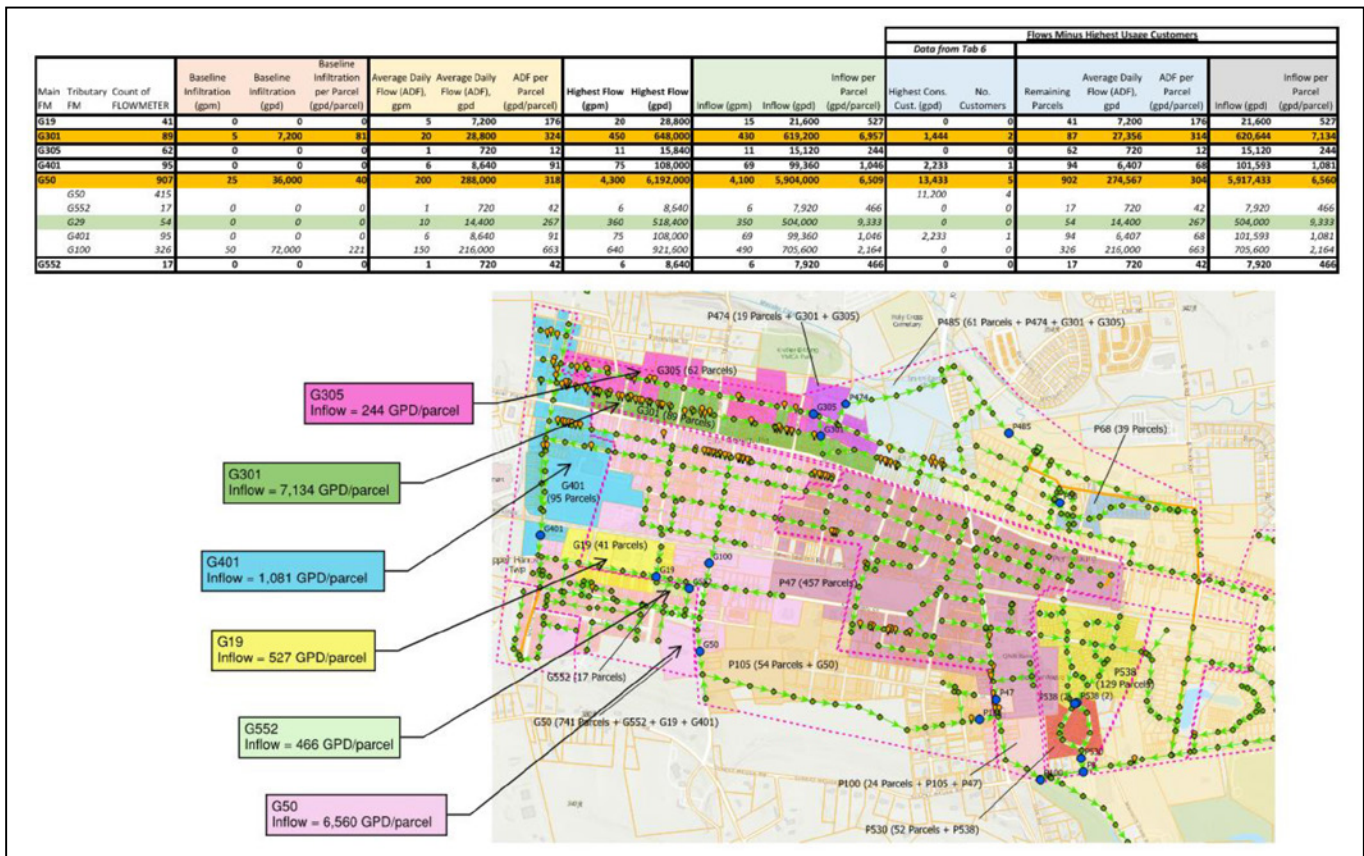


Figure 8: Flow Data per Parcel for East Greenville Borough, including Tributary Flows