



# Sewage utility company chooses innovative CSO treatment systems

**Case Study:** Combined Sewer Overflows (CSO)

## Overview

The Mon Valley region of southwestern Pennsylvania has been hit hard in recent years by the downturn of the steel industry. The community of just 5,500 households has struggled to recover. So, when members of the Mon Valley Sewage Authority pledged nearly \$50 million to update or eliminate its CSOs and improve water quality, the best interest of their residents weighed heavily on their minds. Their decision to proactively address CSO system upgrades, before regulators mandated action, put this community in control of its destiny and at the forefront of wet weather treatment.

## Solution

The CSO Long-Term Control Plan entails capturing an average of 85% of the flow that enters the combined system during precipitation events each year. A large portion of future overflows will route through the newly constructed treatment facility. In this facility, the Accu-Tab Chlorination and CleanSlate Dechlorination Systems play a leading role in simply and safely treating the water flow before its discharge directly in to the Monongahela River. The result is not only safer water for the community to enjoy but a successful model for other sewer authorities to follow.

## Accu-Tab® Chlorination and CleanSlate® Dechlorination systems provide Mon Valley communities with excessive rainfall insurance

The Mon Valley Sewage Authority in southwestern Pennsylvania decided to stay well ahead of state and federal mandates, investing in combined sewer solutions for the Monongahela River. The authority serves two small communities, Monessen and Donora, along the river about 30 miles south of Pittsburgh. Local steel mills were abandoned decades ago, and the local economy has struggled to recover.

From the late 1850s to the late 1950s, hundreds of municipalities constructed combined sewer systems to collect and convey sanitary sewage, commercial wastewater, and stormwater in single pipes. In dry weather, a local sewage plant treats this effluent and discharges it into a waterway. But heavy or prolonged rainfall events can overwhelm the capacities of a combined sewer system or treatment plant. When overloaded, these systems are permitted to release combined sewer overflows (CSOs) directly into rivers and streams. A CSO's raw sewage, debris, bacteria, and chemicals can harm water quality, aquatic life, and human health.

In 1994, the U.S. Environmental Protection Agency (EPA) issued the CSO Control Policy, requiring 828 sewer systems throughout the United States to reduce or eliminate overflows to meet the goals of the Clean Water Act. Combined sewer systems would be required to establish short-term plans and long-term CSO fixes.

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The Mon Valley Sewage Authority has spent nearly \$50 million since 2008 to update or eliminate its CSOs and improve water quality under guidance from the Pennsylvania Department of Environmental Protection (DEP).

“For a cash-strapped community that serves only 5,500 households, this has been a significant investment,” says Jason McBride, Senior Project Manager at Wade Trim, Inc., and consulting engineer for Mon Valley Sewage Authority.

Mon Valley chose to eliminate nine CSO outfalls, build 22,000 feet of new separated pipe, upgrade five pump stations, build equalization tanks, and improve conveyance systems, among other improvements.

The sewage authority piped its largest CSO to its new Satellite Treatment Plant, which became operational in October 2019. This resolved about 15 to 20 percent of the authority’s overflows.

Mon Valley initially considered two disinfection candidates for the CSO plant: UV treatment or chlorination using sodium hypochlorite. Each candidate is frequently used in municipal wastewater treatment. But each has limitations in cost, safety, or long-term effectiveness.

Instead, the sewage authority chose two innovative technologies for its CSO plant: the Accu-Tab Chlorination System and the CleanSlate Dechlorination Tablets system.

Manufactured by Westlake Water Treatment Products, the two complementary systems provide effective, low-cost wastewater treatment for satellite plants.

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## “Accu-Tab and CleanSlate’s safety and low cost made them stand out for us.”

**Thomas Salak**  
General Manager  
Mon Valley Sewage Authority



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Accu-Tab consistently delivers a safer, solid form of chlorine—calcium hypochlorite—as hard tablets within robust compact units.

“Accu-Tab and CleanSlate’s safety and low cost made them stand out for us,” says Thomas Salak, General Manager of the Mon Valley Sewage Authority.

McBride and his team of Wade Trim consultants also recommended the Accu-Tab and CleanSlate systems. “They have a positive combination of characteristics—lower upfront capital costs, higher safety potential, and are effective with intermittent treatment typical of CSOs,” says McBride.

The Accu-Tab calcium hypochlorite tablets are registered with the EPA. Accu-Tab had been successfully applied in other sewage and CSO treatment facilities before construction of Mon Valley’s satellite treatment plant. But Mon Valley’s CSO satellite plant is the largest of its kind in the nation to use the Accu-Tab and CleanSlate systems.

Wade Trim and Mon Valley learned valuable lessons and insights as they collaborated to gain state approval for Accu-Tab and applications in the satellite plant—and now they hope to pass on their knowledge to others.

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**Jason McBride, PE**  
Northeast Area Lead,  
Vice President



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“With our extensive experience, Wade Trim could effectively and efficiently navigate the approval process and assist other Pennsylvania sewer authorities as well as other wastewater entities around the country,” says McBride.

## Mon Valley’s choices

The EPA’s 1994 policy offers utilities three basic options to address CSOs. Systems can separate combined pipes, which is very expensive. Utilities can keep their combined pipes and build more capacity—storage tanks, for instance—to capture CSOs for later treatment by a main sewage plant. Or utilities can treat overflows onsite in a stand-alone facility.

Mon Valley developed its Combined Sewer Overflow Long Term Control Plan before regulators mandated controls. “We were one of the first systems in the state to enter a CSO agreement,” Salak says. “At the beginning of this process, our engineers stressed to the board that half-measures could satisfy DEP for now, but years down the road, DEP would come back and say, ‘You’ve got to do more.’ But our board chose to say, ‘Let’s do what needs to be done full-tilt, and then we’re done.’”

Most U.S. sewer systems with CSO problems have fewer than 10,000 residents. To finance costly CSO remedies, large municipalities have the advantage of substantial tax bases and many water users.

Mon Valley’s long-term CSO plan has been expensive to implement. But when completed, the CSO plan will capture, on annual average, 85% of the flow that enters the combined system during precipitation events, meeting EPA goals.

“DEP has been happy with what the authority has done and allowed some small CSOs to remain in operation,” says McBride.

## Best all-around technology

UV treatment was one of Mon Valley’s early candidates for disinfection at the new CSO plant, but the sewage authority elected to use the Accu-Tab system instead.

“UV is most effective when you’re dealing with a very clean effluent,” says McBride. “CSOs often contain heavy volumes of debris and grit materials, and UV bulbs can become blinded with material in the dirty effluent. UV bulbs are incredibly expensive as well and need replacement consistently over time. You would need a very robust cleaning program to make sure that your bulbs are clean, and you are getting the appropriate kill. In comparison to UV, Accu-Tab provides a significant capital cost reduction as well as long-term operational cost savings in electricity and maintenance.”





A bank of four Accu-Tab chlorination units at the Mon Valley Sewage Authority allow for a maximum of 400 lbs/hr chlorine delivery.



CleanSlate dechlorination units deliver environmentally safe water back into the water table.

Sodium hypochlorite was Mon Valley's second disinfection candidate. "Sodium hypochlorite is a cheap and effective disinfectant," says McBride. "But in storage, it loses potency." Sodium hypochlorite—liquid bleach—has a 12.5 to 15 percent potency level at delivery. Its potency can drop as low as 7 percent before the product is used, depending on storage conditions and timing.

"After sodium hypochlorite has been stored for months between storms, you might need much larger volumes to get the same disinfection equivalency," says Sean Gaskill, the sewage authority's chief operator. "With Accu-Tab you don't have that problem."

Storing and feeding sodium hypochlorite requires large, costly tanks and pumps. Utilities also need expensive safety systems to prevent potential leaks or ruptures.

Mon Valley did not consider chlorine gas as a treatment option. "Chlorine gas is a cheap product, the cheapest way you could go," says Salak. "But it's the most unsafe. Our first priority is safety. I want everybody to walk home through that gate at the end of the day."

By contrast, the Accu-Tab system consistently delivers safer calcium hypochlorite tablets. The Accu-Tab system operates in compact, chlorinators with smaller footprints than alternative systems.

McBride and his team also recommended the CleanSlate dechlorination system for Mon Valley's CSO plant. "The same company manufactures both systems, so CleanSlate would be

easier for operators to use if paired with Accu-Tab", he says. "CleanSlate is also a tablet system, which is safer and easier to handle than a liquid dechlorinator."

## Mon Valley's Accu-Tab and CleanSlate systems

When sewage is piped to Mon Valley's CSO plant, it is treated in a 250,000-gallon Storm King® tank. Manufactured by Hydro International, Storm King is an advanced hydrodynamic vortex separator and screen, removing or reducing total suspended solids, biological oxygen demand, gross solids, and floatables.

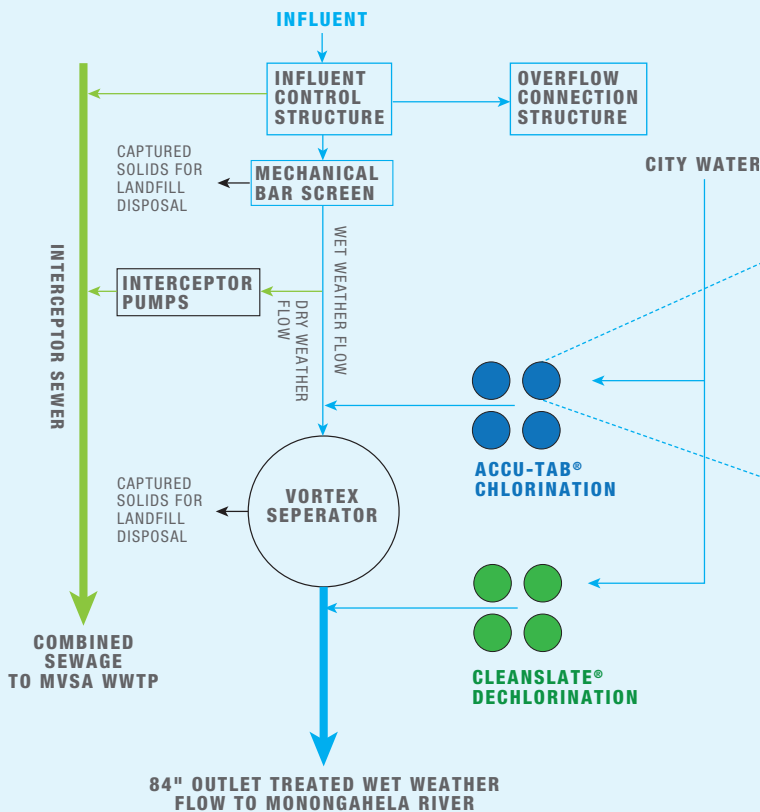
The Storm King tank receives a chlorinated solution piped from an Accu-Tab unit for disinfecting the screened influent. Within an Accu-Tab unit's durable chlorinator, three-inch calcium hypochlorite tablets are stacked on a horizontal sieve plate. The bottom of the chlorinator receives a clean water stream, which rises through the sieve plate's holes, eroding the first layer of tablets, which release chlorine. The chlorine solution is piped to the Storm King, and the second layer of tablets on the sieve plate is available for erosion and delivery of chlorine.

Accu-Tab technology ensures that the correct disinfectant volume is delivered for a contact time of at least eight minutes in the Storm King tank. For a full year after purchase, when stored properly, Accu-Tab tablets will provide 68% available chlorine.

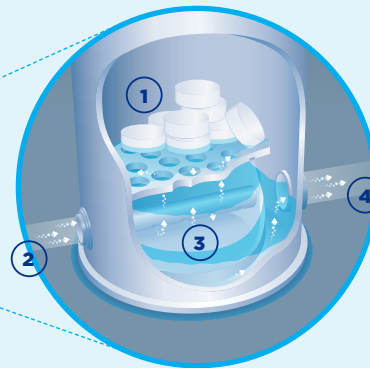
Up to four Accu-Tab units in the Mon Valley CSO facility can function together if needed. When dirty influent flows are relatively low, only one Accu-Tab unit becomes activated. When influent flows increase to the Storm King, the second, third, and fourth units in sequence automatically provide additional chlorinated solution. The four-unit system adjusts to rising influent flows, delivering disinfectant as needed.

After the chlorine contact time, the Storm King receives a piped-in solution from a CleanSlate Dechlorination Tablets system. When the volume of water stored in the Storm King rises, up to four CleanSlate units automatically operate in sequence to provide additional dechlorination to Storm King effluent.

## Mon Valley Sewage Authority Water Treatment



### How the Accu-Tab Chlorination and CleanSlate Dechlorination Systems Work



*This erosion chemical feed system can be combined with flow valves or pumped systems to tie in with the control systems.*

1. Proprietary tablets sit on top of a sieve plate prior to erosion.
2. Intake water is supplied to the erosion feeder and is adjusted to control the chemical delivery rate.
3. Untreated water rises through holes in the sieve plate contacting only the bottom tablets. The balance of the tablets remain dry.
4. Treated water is returned to the system.

"Once we chlorinate, we have to dechlorinate," says Salak. "We don't want any chlorinated water going into the river." The treated effluent is discharged via an 84-inch pipe into the waterway.

### Testing and future applications

Mon Valley's consulting engineers began the six-month testing of the CSO facility's performance in Fall 2019. Sampling will occur whenever a rainfall event causes the plant to accept, treat, and discharge sewage. "An inch of rain or even less is enough to trigger the treatment process," says Scott Duda, a consulting engineer with Wade Trim.

Samples will be collected from untreated overflows before they enter the plant as well as from the treated plant effluent. Each sample will be evaluated for total suspended solids and fecal coliform bacteria, confirming that the plant is removing suspended solid material and reducing bacteria concentrations in accordance with its design.

Facility operators likely need a learning curve to adjust disinfectant levels more accurately and precisely to the intermittent flows of a CSO. "Unlike a main treatment plant, a CSO facility has intermittent flows, and operators will need to become familiar with that," says McBride.

Now Mon Valley and Wade Trim want to pass on lessons learned from their performance testing and operator experiences. Their knowledge could aid other Pennsylvania sewer authorities, and national wastewater providers, to understand and choose Accu-Tab and CleanSlate technologies for their CSO plants.

**"We could be breaking the ice for everybody else behind us."** - Tom Salak



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