

# Tiny Alloway Township Saves Big with Vacuum Sewers



By Edwin Masker, Mayor, Alloway Township and Carl Gaskill, P.E., Fralinger Engineering

**N**o one will ever mistake Alloway for New York or Philadelphia. Alloway is a tiny town (population 2,500) located in the Southwest part of the state just a few miles from the Delaware River. Yet, Alloway has something that even major cities can only dream of—a state-of-the-art sewer system that’s low maintenance and environmentally sound.

Alloway’s new wastewater collection system, which was completed in September, 2009, is perhaps the most advanced sewer in the Mid-Atlantic region. Alloway is using vacuum sewer technology to convey the community’s sewage to nearby Salem where the effluent is treated and discharged. The system replaces hundreds of septic tanks that were creating an environmental problem for local residents and New Jersey’s Department of Environmental Protection.

INSTALLING AIRVAC SEWERS RATHER THAN GRAVITY SEWERS SAVED ALLOWAY TAXPAYERS APPROXIMATELY \$1 MILLION, OR ABOUT \$180 ANNUALLY FOR EACH USER OVER 40 YEARS.

Alloway had been looking to replace its septic tanks for decades. A new sewer was first proposed back in the early 1970s, but cost and inconvenience delayed the project until 2007. When engineers first looked at designing a conventional gravity sewer, they realized that Alloway presented numerous and significant installation obstacles.



Vacuum sewer installation causes minimal disruption to neighborhoods. Trenches are shallower, less excavation is required and streets can remain open to traffic.

## How AIRVAC Works:



**1** Traditional gravity lines carry wastewater from the customer to an AIRVAC valve pit package.



**2** When 10 gallons of wastewater collects in the sump, the AIRVAC valve opens and differential pressure propels the contents into the vacuum main.



**3** Wastewater travels at 15 to 18 fps in the vacuum main, which is laid in a sawtooth fashion to insure adequate vacuum levels at the end of each line.



**4** At the vacuum station, vacuum pumps cycle on and off as needed to maintain a constant level of vacuum on the entire collection system. Wastewater enters the collection tank. When the tank fills to a predetermined level, sewage pumps transfer the contents to the treatment plant via a force main.

Sewer collection lines must be laid at an incline to achieve the grade require for gravity flow. They also needed three pumping stations to keep the flow moving to the treatment facility. The engineers estimated that to achieve the necessary grade in the line, the pipes would need to be buried 22-24 feet deep. Because the area around Alloway has a high groundwater table, this would mean extensive excavation and dewatering, both of which add significantly to the cost of any project. Furthermore, the excavation would destroy most of the local roads and disrupt traffic and neighborhoods for many months. These were just a few of the challenges that would be created by installing a gravity sewer.

The cost effective solution was to install vacuum sewers.

**Vacuum Sewers** Homeowners typically don't notice the difference between a vacuum sewer and any other collection system. Gravity lines transport sewage from the home just like they do in a gravity system, but at the street or property line, the sewage empties into a buried valve pit. Inside the valve pit is a patented AIRVAC pneumatic valve. It requires no electricity, so there are no electrical lines to worry about and the valve will function even during a power outage. When 10 gallons of wastewater accumulate in the pit, the valve opens automatically and differential air pressure propels the contents into the vacuum main.

Because vacuum lines do not rely on gravity to transport sewage, there is no need for deep-trench excavation. Vacuum lines are typically buried 4-6 feet deep, so no dewatering was necessary. Shallow trenching means less heavy equipment and less disruption of neighborhoods and traffic. The design also called for only one vacuum station, rather than three pumping stations for a gravity system. This was another significant cost savings.

The sewage within the collection line travels at speeds of up to 18 feet per second, scouring the line along the way. Negative pressure in the pipeline is creat-

ed by vacuum pumps located at the vacuum station. The vacuum station looks much like the surrounding architecture. It covers a relatively small footprint and can be placed almost anywhere, even in a residential neighborhood.

Vacuum sewers are contained systems, so the municipality doesn't have to pay to treat infiltration or storm water. At a cost of approximately \$6 for every 1,000 gallons of treated water, the savings in treatment cost is significant. Vacuum sewers do not leak, there is little to no odor and workmen almost never come in contact with raw sewage. In fact, there are no confined



Gravity lines transport sewage from the home just like they do in a gravity system, but at the street or property line, the sewage empties into a buried valve pit.

entry requirements for workmen. Very little maintenance is needed and the system requires less electricity than a

comparable gravity system since we only have one vacuum station rather than three pumping stations.

**Saving Money and the Environment**  
Installing AIRVAC sewers rather than gravity sewers saved Alloway taxpayers approximately \$1 million, or about \$180 annually for each user over 40 years. Saving money was an extremely important consideration, but there were other significant benefits, as well.

No other sewer conveyance system is more environmentally sound than vacuum sewers. With vacuum sewers you eliminate the problem of exfiltration of raw sewage into the environment. Any time a leak develops in an AIRVAC sewer line, the vacuum pressure within the line prevents sewage from escaping into the environment, thus protecting the groundwater. You also know about leaks immediately because the system is monitored electronically at all times. Repairing a vacuum line takes only a few hours, compared to days or even weeks to fix a deep-trench gravity pipe, and often gravity sewer leaks go undetected.

When AIRVAC vacuum sewers were proposed in Alloway, approval of the

design from the New Jersey Department of Environmental Protection was required. Virtually every person involved with wastewater collection and treatment in the department attended the meeting to hear about vacuum sewers. After the presentation, the general consensus was that vacuum sewers are the system of the future.

The Village of Alloway will also benefit from operational costs for years to come. The system itself requires very little maintenance and very little energy is required to operate it.

Because it was the first system of its kind in this area, there were no contractors nearby with vacuum sewer experience. This turned out to be a non-factor, as installation proved to be relatively easy. For more information on how vacuum sewers work visit [airvac.com](http://airvac.com).

We're confident that the vacuum system we now have will serve Alloway's residents for many years to come. The track record for the durability of vacuum technology is good; the oldest vacuum systems in the United States are now more than 30 years old and still going strong. ▲