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Watch Where You Step

One of my volunteer activities involves monitoring a riparian buffer that replaced a row of flood-prone homes a few years ago after the borough bought out the repetitively damaged buildings. My job is to check on the stability of the stream banks, monitor the growth of the trees planted in the buffer, and report on any conditions that might threaten the environmental health of the recently created open space. The process is intended to reveal changes in conditions that could threaten the status of the project site or stream bank stability. Usually this means reporting on an influx of purple loosestrife or Japanese knotweed. But over the last two years another situation has replaced alien invasive threats as my top concern. This is a human-induced condition, and it has steadily worsened with each repeated flood event.



This sewer manhole has ruptured; its unvented lid dislodged during recent rains.

pipe system, several things occur. One is the propulsion of the pipe contents up through the holes in the sewer lids, creating miniature fountains of effluent. The holes in the lids serve a purpose, for without them, the water pressure could

ply ruptures the pipes. Meanwhile, surface runoff can scour the soil so that there is no ground over the cracked piping. The result is what you see in the photos.

Once upon a time in the development of our country, sewers were basically ditches or creek beds that served as open trenches into which all kinds of nasty stuff (whether refuse or dead animals) was either directly deposited or directed by pipe. In humid areas with watercourses affected by tides, such as southeastern Pennsylvania where my riparian buffer problem exists, the result was downright unhealthy, and disease sometimes raged in epidemic proportions as a result. As mortality rates rose, the engineering solution was to put the creeks into pipes, thereby allowing construction to occur in otherwise wet and fetid areas while reducing the stench and other unpleasantness associated with the former open sewer system. Of course, this meant that the contents of these pipes were merely transferred downstream to the next watercourse.

Under the Clean Water Act, sanitary sewer overflows (SSOs) are illegal and combined sewer overflows (CSOs) are closely monitored.

The site, which is inundated several times every year, used to be the back yards of 13 houses that were razed to create the riparian buffer. It is also where the borough's street sewers connect into the main collector pipe that runs along the bank of the creek. These are combined sewers, meaning they carry both sewage and stormwater.

When the fluidic volume is greater than can be carried or stored by the

pop the covers off the manholes. Still, it is not a good situation when even this diluted sewage bubbles up out of the system and runs over the ground.

The second result of too much water in the pipes is that the pipes themselves cannot handle the flow. When the main collector is full, water and sewage back up through the feeder lines, creating pressure that in some instances causes the pipe joints to dislodge, and in others cases sim-

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In urbanized areas, underground sewer systems first shunted refuse from homes and businesses to open water dump sites, and later to treatment plants. Eventually two parallel systems took the place of the single combined sewers, in recognition that the separation of stormwater and sanitary sewage would mean, first, that the pipes would not have to be so large, and second, that separation offered a better opportunity to preserve stream, river, and even ocean water quality.

But older sections of some of these separated systems still carry everything to the treatment plant through dual-purpose pipes, except when stormwater influx is so great that the pipes must overflow and drain into our natural water bodies. Combined sewer systems entail half as much pipe and trenching, and therefore are less expensive than separate system, so they were still com-

monly installed just three decades ago. The one in the riparian buffer I inspect is one of these more recent versions.

Obviously this is an engineering problem, so why am I writing about it in a surveying magazine? Think about us as the eyes of our clients out in the field. Even if no manhole is immediately evident (it may be buried), seeing a whitish gray effluent stain like the one in the photos can clue us in on the existence of some underground facility. It is time to research utilities in the area or employ the One Call system. It's time to alert the client of a possible environmental hazard as well. Under the Clean Water Act, sanitary sewer overflows (SSOs) are illegal and combined sewer overflows (CSOs) are closely monitored. The original concept of diluted sewage as better than straight sewage no longer is credited with providing adequate public health protection; EPA and the states enforce penalties against operators of overflowing and polluting systems.

Effluent deposits (after the water has gone) are a sign of undersized sewer pipes or inadequate storage. Clients wishing to utilize those pipes must be advised of the impossibility of their dreams without considerable investment in the local infrastructure. They could also have difficulty getting permits to build homes with pathogens washing over the lawn every time it rains.

Even if the area is to be utilized as open space, health problems continue after the efflorescence has faded. Dried bacteria and wet bacteria both can cause illness. Don't let the dog eat any grass or roll around on the ground to scratch his back. Don't let the kids run barefoot. Don't wade in the creek. Don't eat any wild berries, even after washing them at home in filtered tap water. Definitely don't eat any fish, if there are any to catch. And don't forget to clean off your work boots. 



Here the pipes between manholes have ruptured, and the soils above them sank and eroded to form above-ground effluent pools. Overbank flooding from the nearby stream has "cleaned up" most of the initial stains.