





Steven Ludwick: That was common around the world.

Susan Moisio: That was common around the world.

Steven Ludwick: That was the practice.

Susan Moisio: That was the practice. Then in the 1950s, we developed wastewater treatment plants. They were built in Cincinnati, and interceptor sewers were put in place that intercepted the combined flow, and they took about six times dry weather flow and took it to the treatment plant and treated it.

Steven Ludwick: What's six times dry weather flow?

Susan Moisio: Dry weather flow would be when it's not raining so average flow-

Steven Ludwick: I guess I should have just figured that out. Good.

Susan Moisio: We have dry weather, and we have wet weather.

Steven Ludwick: Sure.

Susan Moisio: All right. Six times dry weather flow would be what could be conveyed to the treatment plant, but then when it rains, anything greater than that would overflow into the river, and that's what a combined sewer overflow is, is that overflow to the river. It's also a combined sewer overflow could be that location where it overflows. When you get into a regulatory discussion, often there's a fine on point about where it overflows and how much it overflows, and whether it maybe intercepts two or three places. They're very complex, especially urban



sophisticated approach to how we're dealing with sewage systems and storm sewers and how the combined sewers, I mean, it's really sophisticated. Isn't it?

Susan Moisio: It is very sophisticated. I'm going to add another level of sophistication to this. I talked about storm flow, and I've talked about storm sewers and combined sewers. We have sanitary sewers, so that's another element of this. All of this then ends up at a treatment works. When we're looking at a system, and we're trying to understand how they run, today we have to, in the past... Maybe let me look backwards a little bit. In the past, we've looked at our collection systems as stand-alone systems. We looked at it from the standpoint of here's what's happening in my combined sewer system or my sanitary sewer system from a collection system standpoint, but all of these are conveying flow to a treatment works. We really have to start thinking about this as a complete system.

When we look forward, we looking at it as one water. We're looking at it as what is the rainfall, what is coming into our conveyance and storage systems, but what's happening in our treatment works. When we look at that, then we start to understand a complete water cycle. That's really from where we need to be as an industry. We really need to think of this complete water cycle.

Steven Ludwick: That's a shift from when you started.

Susan Moisio: It's very much a shift from when... I've been doing this for 32 years, and when I started, we were more focused on the collection system, and quite frankly, there were a lot of problems with the collection systems.

Steven Ludwick: Well, it sounds like, because if we only had to start treating sewage in the 50s.

Susan Moisio: Yes.

Steven Ludwick: Then this is all relative. I mean, yes, it's been since the 50s, but there was a lot of figuring out to do in the first, probably a couple of decades.

Susan Moisio: There was a lot of figuring out, and many utilities were consolidating, and I'm going to use Cincinnati as an example. The combined sewer system is the city of Cincinnati, but the sewer district takes care of all of Hamilton County. All of those individuals' smaller sewer systems came together to a district. Now you have not only the complexity of combined sewers and sanitary sewers, but you have systems that have been built over time and with different regulations and two different standards.

Steven Ludwick: For those people that might not be in the United States, Cincinnati is in Ohio.

Susan Moisio: It's in Ohio. It's on the Ohio River.









Susan Moisio: A digital twin would be a representation of how the system is set up today so it's a twin digitally. It's more than, or maybe it's different than a hydraulic model, because a digital twin could be more about how you control the system. Jacobs has a process called Replica. It's a software that we've developed that allows us to build these digital twins. A very complex treatment works, pump stations, real time control facilities, interceptors and it gives us the ability to understand how the system is operating today and then we can understand what options are available for controlling that system. Where we're heading is to automate that so that the system is receiving predictive rainfall and then making those decisions on its own and using artificial intelligence and then controlling.

Steven Ludwick: Wow.

Susan Moisio: That's where we're heading.

Steven Ludwick: That's really amazing. This digital twin will begin to learn what happens and then-

Susan Moisio: Yes.

Steven Ludwick: ... make whatever the magic it makes and makes decisions that are-

Susan Moisio: We call that engineering rather than magic.

Steven Ludwick: Great, thank you. I meant well. Thank you. That's really interesting. Now you've talked about controlling these flows and what have you. What's the intersection between private property owners and the government or government sectors on sewage handling, as well as stormwater handling, and how do they have to work together to ensure that the whole system actually works properly? Because it seems like if a private property owner isn't playing well with the city, your planning can get all messed up.

Susan Moisio: It can. I think it helps to understand it in most cities, what the utility is responsible for. If you take a typical street, the utility is responsible. Let's assume that the sewer is in the street, and we'll talk about great outside the street later. In the street, they're responsible for the mains. The manholes, and often the laterals, and the laterals are that part of the sewer that goes from your house to the main. They're responsible for that portion of it. What happens on private property is often not the responsibility of the utility, but that impacts the flows that go into the sewer system. Whether it's a combined sewer system or a sanitary sewer system. We see this more, having an impact on sanitary sewers. We not talk that much about them, but our sanitary sewers are impacted by inflow and infiltration.

Little bit about sanitary sewers. They're designed to take sanitary flow. They're designed to take the from inside your house or your business.

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