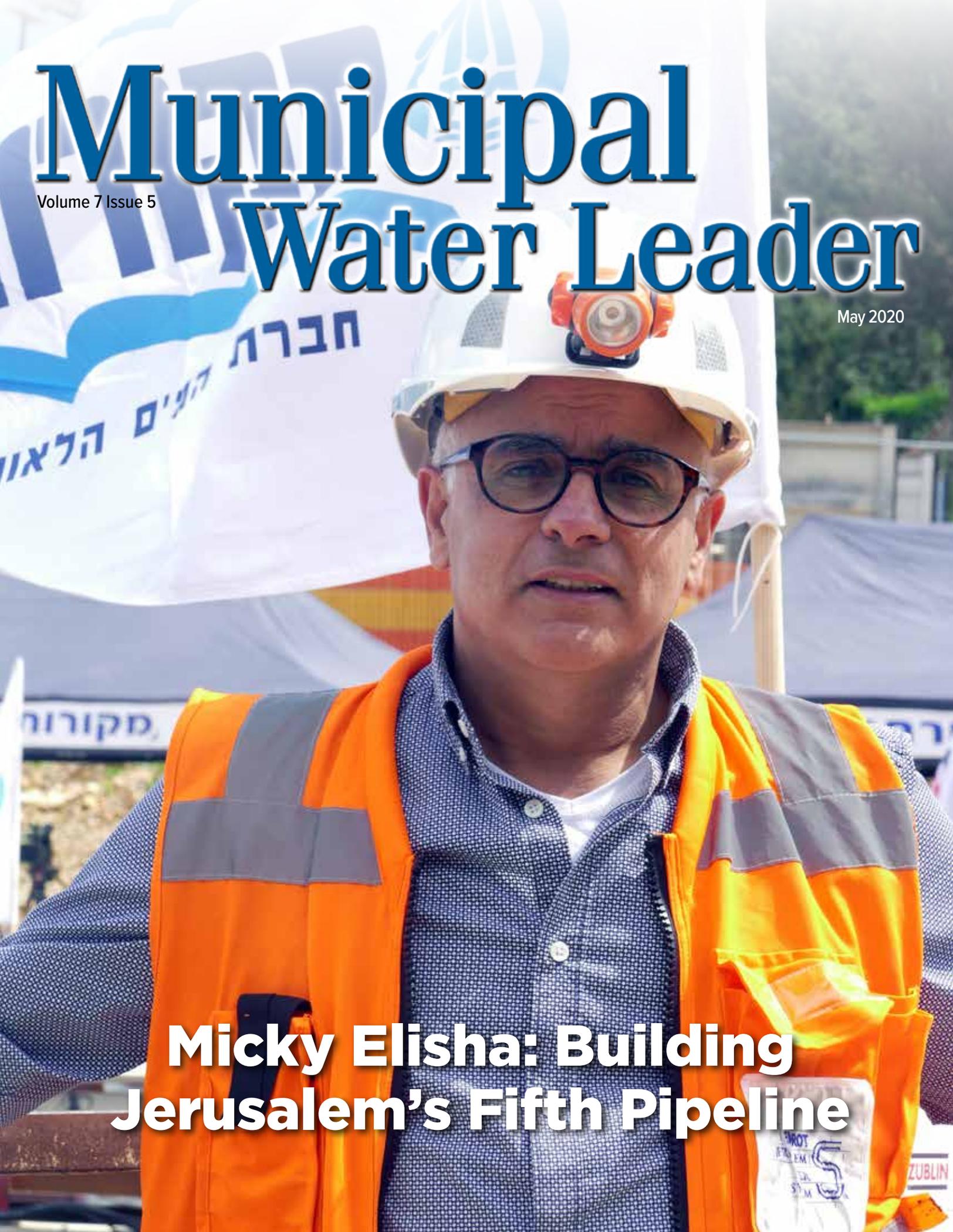


Municipal Water Leader

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A photograph of Micky Elisha, a man with glasses, wearing a white hard hat with a headlamp and an orange safety vest over a blue patterned shirt. He is standing at a construction site with banners in the background. One banner has Hebrew text: 'חברת הערים הלאומית' (National Cities Company) and 'מקורות' (Mekorot). Another banner has 'ZUBLIN'.

**Micky Elisha: Building
Jerusalem's Fifth Pipeline**

How TAYA Empowers Small Communities to Recycle Their Wastewater



The TAYA pilot installation in Bennett, Colorado.

Wastewater reuse is an increasingly popular source of water for agricultural and domestic use throughout larger municipalities. Yet few small communities can afford to implement and operate the complex treatment technology required for reuse.

An Israeli company, Triple-T, is seeking to change this paradigm with its TAYA technology, a simple, sustainable, and affordable alternative to conventional wastewater reuse that is nearing regulatory approval in Colorado. Smart technologies like TAYA are an integral part of resiliency planning in small communities, reducing dependency on centralized utilities and promoting sustainable growth.

In this interview, Smart Water Group President Ben Perlman tells Municipal Water Leader about how TAYA works and the advantages it holds for developers and small municipalities.

Municipal Water Leader: Please tell us about your background and how you came to be in your current position.

Ben Perlman: My journey into the water business began in 2010, when I relocated from Boston to Tel Aviv to support our family office investment in the Israeli water space. Over the next 3½ years, I worked hand-in-hand with the chief executive officer, building our business, Water From Innovation, also known as WFI Group. In 2014, I returned to the United States and started Smart Water Group, an affiliated entity that helps our group in Israel commercialize its water technologies in the United States.

Municipal Water Leader: Please tell us about Triple-T.

Ben Perlman: Triple-T, one of the four business units that make up WFI Group, specializes in sustainable wastewater reuse. The company was founded in 2007 with the mission of bringing affordable wastewater treatment to small communities and businesses with limited resources. We empower municipalities, decentralized communities, and agricultural customers to transform water treatment from a burden into an asset by minimizing operational expenses; maximizing tangible resources; reducing their ecofootprints; and providing affordable clean water autonomy and, ultimately, peace of mind.

Municipal Water Leader: Where around the world is Triple-T active?

Ben Perlman: We've been active in Israel for over a decade, supplying municipal, industrial, and agricultural customers with sustainable wastewater solutions. We've engaged in a number of smaller projects abroad, including in Chile, Italy, South Africa, and the United States. We're also seeing an increased demand for our technology in China.

Municipal Water Leader: Please tell us about your TAYA technology.

Ben Perlman: TAYA is a hybrid biological wastewater treatment technology that combines the intensive treatment capabilities

of the leading technologies on the market (activated sludge, moving bed reactor, etc.) with the operational simplicity of more extensive approaches like constructed wetlands. The result is a state-of-the-art treatment plant that requires a fraction of the labor, maintenance, and electricity of conventional wastewater treatment and empowers small communities to take ownership of their water resources. TAYA systems are noiseless, odorless, and sustainably powered by solar power, making them an ideal fit for any green community. We are now showcasing this technology for the first time in Colorado.

Municipal Water Leader: How does TAYA technology work and what would a TAYA installation look like?

Ben Perlman: A TAYA system is an earth-dug, fixed-film aerobic anoxic reactor, comprising two basins filled with a crushed-gravel aggregate that is seeded with biofilm. A specialized pumping arrangement moves water from one basin to the other in a fill-and-drain motion, supplying food to the bacteria living on the aggregate. During each drain cycle, atmospheric oxygen is pulled deep into the media, supplying the bacteria with an unlimited supply of the oxygen needed to break down organic matter in the wastewater. This fill-and-drain motion is continuous, supplying both food and oxygen to the bacteria with every reciprocating cycle.

Every TAYA has three treatment zones: an aerobic environment, an anoxic environment, and an anaerobic environment. This enables full nitrification and denitrification in the same basin, in addition to 99 percent complete removal of biological oxygen demand (BOD), chemical oxygen demand (COD), and total suspended solids (TSS). TAYA is a full secondary treatment system that replaces both aerobic treatment and secondary clarification, greatly simplifying the process. A typical TAYA plant would consist of basic headworks for solids and grit removal, anaerobic settling, and the TAYA system itself. This simplification of the process delivers 80 percent savings in energy and 60 percent in labor in maintenance—huge numbers for small communities with limited resources.

Municipal Water Leader: What is the treatment capacity of the system?

Ben Perlman: We've installed TAYA systems on applications ranging from 50,000 gallons a day to 1.5 million gallons a day. While this system scales like any other treatment technology, the land requirements of the system make it most suitable for rural communities. A TAYA capable of treating 300,000 gallons a day would require 1 acre of land—perhaps 2–3 times the land required by conventional treatment, but 10 times less than that required by a constructed wetland.

TAYA is ideal for small towns on the periphery of larger metro areas, where land is cheaper and more available but experienced labor is in limited supply. This is the ideal

application for our technology and the primary focus of our marketing efforts.

Municipal Water Leader: After the treatment process is over, are there biosolids or waste products that need to be disposed of?

Ben Perlman: Amazingly, no. We have a primary anaerobic treatment before the TAYA system, which is typical of almost all treatment plans. However, the TAYA itself is operated in starvation mode, meaning we feed the bacteria just enough for them to survive but not enough to produce any secondary sludge. We have systems that have operated for over a decade without producing any secondary sludge, a huge advantage over all other treatment technologies.

Municipal Water Leader: How does TAYA save money?

Ben Perlman: The major cost drivers of most wastewater treatment plants are electricity, replacement parts, and labor, all of which are a function of electromechanical complexity. TAYA is designed based on the principles of electromechanical simplicity and process redundancy, making it one of the simplest system in the world to operate.

TAYA has two pumps and one control system. The pumps are high-efficiency turbines with a lifespan of more than 10 years, consuming 80 percent less energy than conventional wastewater treatment—about 0.4 kilowatts per thousand gallons treated. The rest of the infrastructure is made up of earthworks, piping, gravel, and a bit of concrete—all of which have no moving parts and a lifespan of more than 30 years. TAYA is engineered with every robust process tolerance you could imagine. It utilizes a complete mix feed system and operates with longer retention than most systems—typically 2–3 days for municipal wastewater—enabling the system to handle variable influent conditions with ease. TAYA works with hardy bacteria capable of withstanding large temperature swings and intermittent interruptions in food or oxygen.

We also save labor. None of our systems in Israel require a full-time laborer because they don't require daily maintenance or operational oversight. Our part-time operators show up to take a sample in accordance with the requirements of the Israeli Ministry of Health and Environment, and that's it. The system is designed to run itself, and nothing breaks.

Municipal Water Leader: Please tell us about your installation in Bennett, Colorado.

Ben Perlman: We've partnered with the Town of Bennett and a local developer to showcase TAYA to the Colorado market and receive regulatory approval. Bennett lies on a high desert plain, 30 miles east of Denver, where the demand for housing is high but water is scarce. The town's leadership is intelligent and proactive. They have recently upgraded their central

wastewater treatment plant, but they also recognize the benefits of a more flexible, resilient, and distributed approach.

With a recent surge in developer demand, the town's new wastewater plant will need to be expanded in short order and modified to handle flows from miles away. In response, the town is thinking outside the box and looking at a distributed system. That means building treatment capacity on site, 2–3 miles away from core infrastructure, and reusing the water locally. There is no reason to build a long pipeline and a lift station to move water to a centralized facility.

Bennett is on Colorado's Front Range, where water rights are the most expensive in the country, between \$30,000 and \$45,000 an acre-foot. Due to severe water shortages, developers need to prove that they have a 100-year renewable water source. The Colorado Department of Public Health and Environment (CDPHE) has been proactive in advancing regulation and cutting red tape to allow communities to recycle water more. It has recently expanded what it calls Regulation 84 Category 3, which is its standard for the highest quality of reuse water.

Municipal Water Leader: Was it difficult to get permits for the Bennett installation?

Ben Perlman: No, it wasn't. We had been working closely with CDPHE before we engaged Bennett to make sure we were operating within the state's regulatory framework. CDPHE concluded early on that TAYA required alternative testing and acceptance, meaning that we needed to invest in a local pilot and collect a year's worth of data to prove the system's efficacy. That's the path we've been on since August 2019, when we commissioned the system.

Municipal Water Leader: What results have you seen?

Ben Perlman: Since the beginning of the pilot, the TAYA has delivered exceptional results. Treating the same wastewater as Bennett's primary wastewater treatment plant, our system has achieved an average removal rate of 97 percent BOD, 96 percent TSS, and 98 percent ammonium, far exceeding CDPHE's secondary treatment requirements. Some technologies struggle in cold weather, but earth-dug systems like TAYA maintain their temperature much better than above-ground systems, providing ideal conditions for bacteria to flourish in. We'll continue operating the pilot into the spring to make sure the technology performs well during spring snow melt, but we expect approval in the next few months.

Municipal Water Leader: How does TAYA fit into the broader landscape of water policy in Israel?

Ben Perlman: Israel has a history of water reuse and conservation that predates the founding of the State of Israel. Israelis have grown up in a society where water is a

tremendously valuable and constrained resource. They would never consider discharging treated wastewater, as is commonly done in the United States. That's the philosophy our company was built with—given the opportunity to treat or to reuse, we always choose to reuse. It may come as no surprise that today, Israel leads the world in water reuse, recycling almost 90 percent of its wastewater for agricultural purposes.

Any treatment technology developed in the Israeli water ecosystem must be capable of achieving consistent, ultra-high-quality water for reuse. That's the standard we applied to TAYA, and we're seeing the results in Bennett. For this reason, it's easy to integrate TAYA into a tertiary treatment system, because by the time the water leaves the TAYA, it's almost standard-filter quality, which is an integral component of a tertiary filtration process. With a simple sand filter and some ultraviolet disinfection, you have perfect-quality wastewater that will hit any turbidity target imposed by a regulator in the United States. That's the type of water you need for toilet flushing, public irrigation, public gardening, etc.

Municipal Water Leader: Do you have other U.S. clients who are interested in implementing the technology?

Ben Perlman: We're engaging a number of residential developers and small communities that are looking for smart reuse solutions, and the interest is growing. While there are many reuse technologies out there, TAYA is uniquely positioned to empower developers and small communities, not only because the system saves money but because it enhances the overall appeal of the community.

Traditionally, wastewater treatment plants are located on the periphery of a community—you don't want to see or smell them. TAYA is the opposite. The system produces no noise or odor and is built entirely underground, enabling the development of the land above. You can build a soccer field on top of it, integrate it into a public park, or construct a solar array in the middle of the system. Imagine a wastewater treatment plant that is actually a net producer of energy—this is 100 percent achievable with TAYA.

We're weeks away from regulatory approval, and we're optimistic that developers and small communities will continue to embrace this solution. The merits of this technology are evident for anyone brave enough to explore a new approach to an age-old problem, so we're confident that TAYA will find its niche in the United States. TAYA is part of a larger paradigm shift toward sustainable reuse, and we're excited to offer a solution to the communities that need it the most. **M**



Ben Perlman is the president of Smart Water Group. He can be contacted at ben@wfi-group.net.