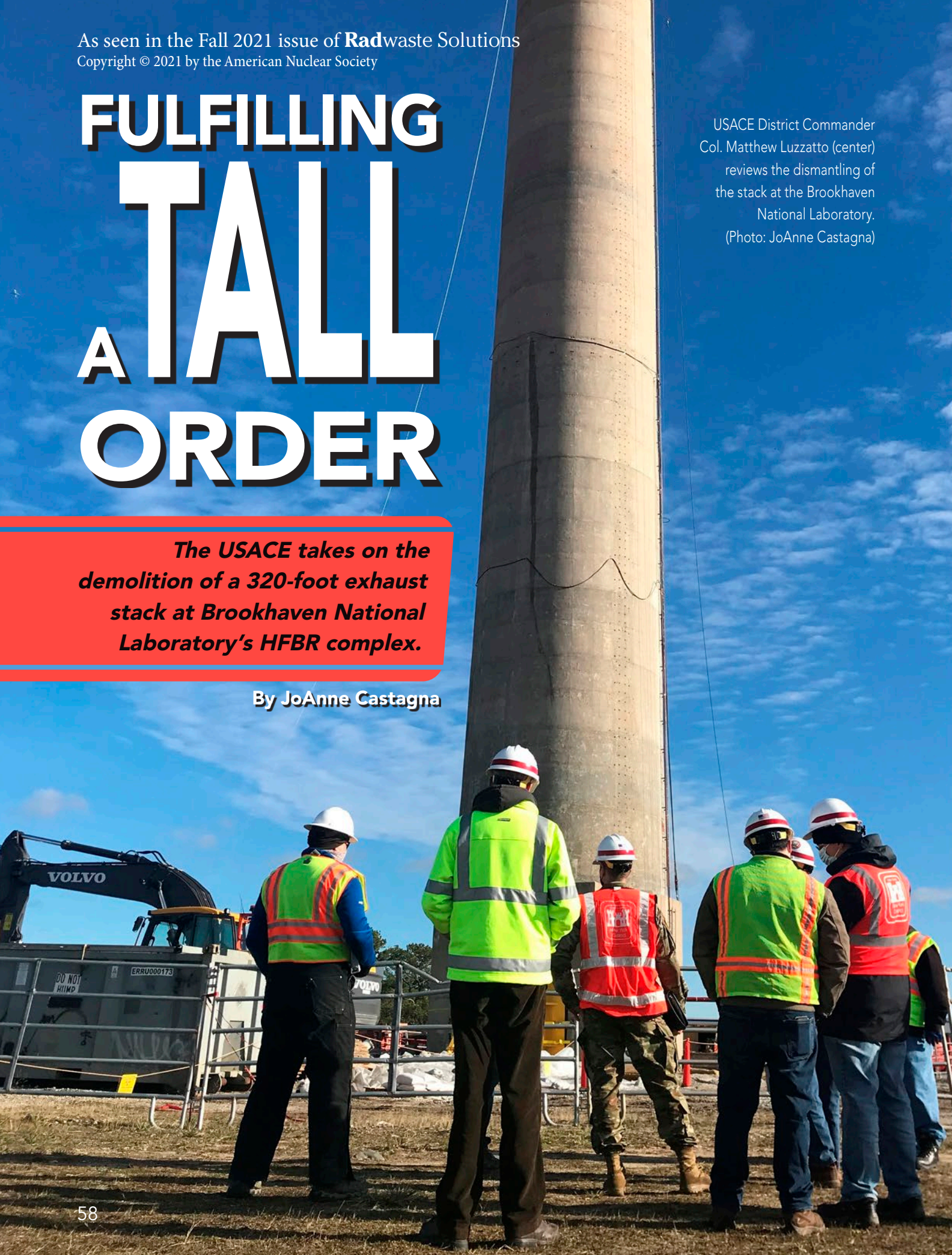
As seen in the Fall 2021 issue of **Rad**waste Solutions

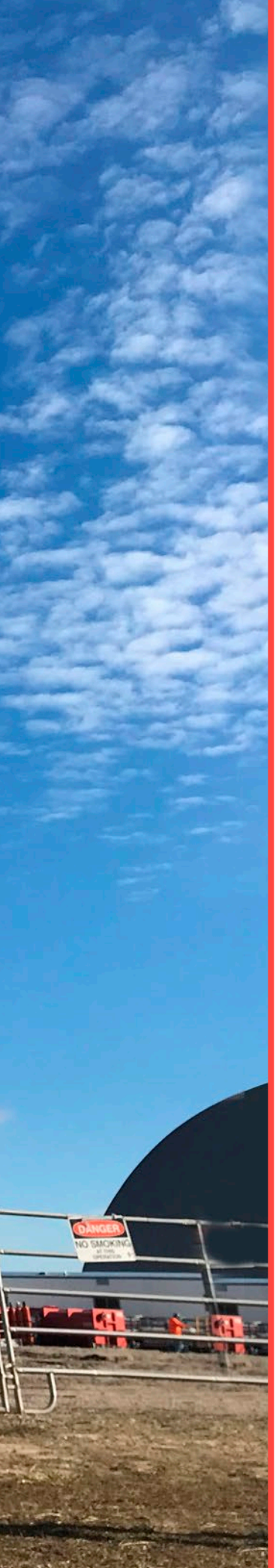
FULFILLING A TALL ORDER



USACE District Commander Col. Matthew Luzzatto (center) reviews the dismantling of the stack at the Brookhaven National Laboratory. (Photo: JoAnne Castagna)

The USACE takes on the demolition of a 320-foot exhaust stack at Brookhaven National Laboratory's HFBR complex.

By JoAnne Castagna



The Brookhaven Graphite Research Reactor with the iconic exhaust stack it shared with the lab's High Flux Beam Reactor in the background before the stack was demolished. (Photo: BNL)

In providing tangible, real-world solutions for some of the nation's toughest challenges, the U.S. Army Corps of Engineers, New York District, continues to demonstrate its unique engineering and construction capabilities. The latest example involves the Brookhaven National Laboratory on Long Island, N.Y.

Over the years, the lab has been on a mission to remove old buildings on its property that contain legacy radioactive material that was a result of past work. Many have been removed or decommissioned so far, but one high-profile structure has remained—a towering smokestack. Using the latest in demolition technologies, the New York District has now safely removed that exhaust stack.

"This project is another example of the exceptional work New York District does on a daily basis," said District Commander Col. Matthew Luzzatto. "I couldn't be prouder of our team, because they are addressing unique challenges, working closely and transparently with contractors and our partners at the Department of Energy, and ensuring safe and effective execution of the work."

To perform this work, the Army Corps of Engineers has partnered with contractor Olgoonik Development, its subcontractor ICC Commonwealth, and the Department of Energy's Office of Environmental Management, which is responsible for the environmental remediation of the High Flux Beam Reactor stack at Brookhaven.

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The national laboratory is in the town of Brookhaven, about 60 miles east of New York City. Since 1947, this multipurpose research institution—known for its seven Nobel Prize-winning discoveries—has performed pioneering research in physical, biological, and environmental sciences, as well as in energy technologies, computation, and national security.

The lab's 5,300 acres of property sits on the former site of the U.S. Army's Camp Upton. Near the center of the site—standing like a beacon—is a tall, red-and-white concrete stack. The stack marks where the 13-acre High Flux Beam Reactor (HFBR) complex sits. The 60-MW reactor operated from 1965 through 1996 and was permanently shut down by the DOE in 1999.

The complex includes two research reactors—the HFBR and the Brookhaven Graphite Research Reactor (BGRR). The BGRR was decommissioned and dismantled over a decade ago; the HFBR has been similarly dismantled except for the reactor vessel, which will be removed in the future.

These reactors performed outstanding work in their day. The HFBR is known for many accomplishments, including being a dependable source of neutrons that have been crucial to a wide array of scientific research programs. It is also known for discovering new uses for radioactive isotopes for treating cancer, cardiovascular disease, arthritis, and other medical conditions.

The BGRR had its share of achievements, including being the world's first reactor built solely to perform scientific research on peaceful uses of the atom after World War II.

Ventilation lines and ducts transported exhaust air from these two reactors through filters to the stack. The distinctive stack stands 320 feet tall and has a tapered cone shape; its interior base diameter is almost 27 ft and the interior top diameter is almost 19 ft.

The stack was used to discharge cooling air from the BGRR and later to ventilate equipment and rooms in the HFBR and other support buildings on the complex. This exhaust included radioactive material.

This hazardous material contaminated the interior of the stack, up to three-fourths of an inch in depth. In addition, the red-and-white paint on the stack's exterior contained asbestos and lead. Removal of the stack was one of the last remaining actions related to the cleanup plan for the complex. USACE offered Brookhaven and the DOE a safe and efficient alternative solution to removing the stack using the latest demolition technology.

Over the past 20 years, the stack has been radiologically analyzed by the DOE and the lab through the gathering of concrete core samples, surface contamination or swipes, stack drain water, sediment, soil, and air samples. Samples were analyzed for gross alpha, gross beta, and gamma spectroscopy, as well as the entire thorium, uranium, and plutonium series.

The primary radionuclides found included cesium-137, tritium, and strontium-90, with the total estimated Curie content present in the stack concrete of 29.7 millicuries (2005).

To demolish the stack, the contractors first removed the contaminated paint. A hydro-blasting technique was applied that used high-pressure water to remove the paint from the concrete. The paint was then vacuumed up at the point of removal from the stack's surface and contained in a closed system. This procedure minimized the release of any hazardous material and eliminated the need for workers to directly handle the contaminated waste.

Next, the contractors began dismantling the stack using what is called the MANTIS demolition system. This is a remotely operated hydraulic machine that has proven effective in dismantling concrete chimneys ranging in height from 200 ft to 835 ft. The machine sits on a movable scaffolding system that encompasses the entire diameter of the chimney, allowing the operator and crew 360 degrees of access while maintaining a safe distance from demolition operations.

"With this system, the equipment actually sits on top of the stack and walks its way down as it chips away," said Matthew Creamer, USACE project manager. "Each piece of concrete is broken out, the rebar supports are cut, and it all falls inside the stack for removal. By the stack collecting its own waste, it keeps workers and the surrounding area protected from hazardous material. The system also produces limited vibration, which protects nearby lab equipment from being damaged."

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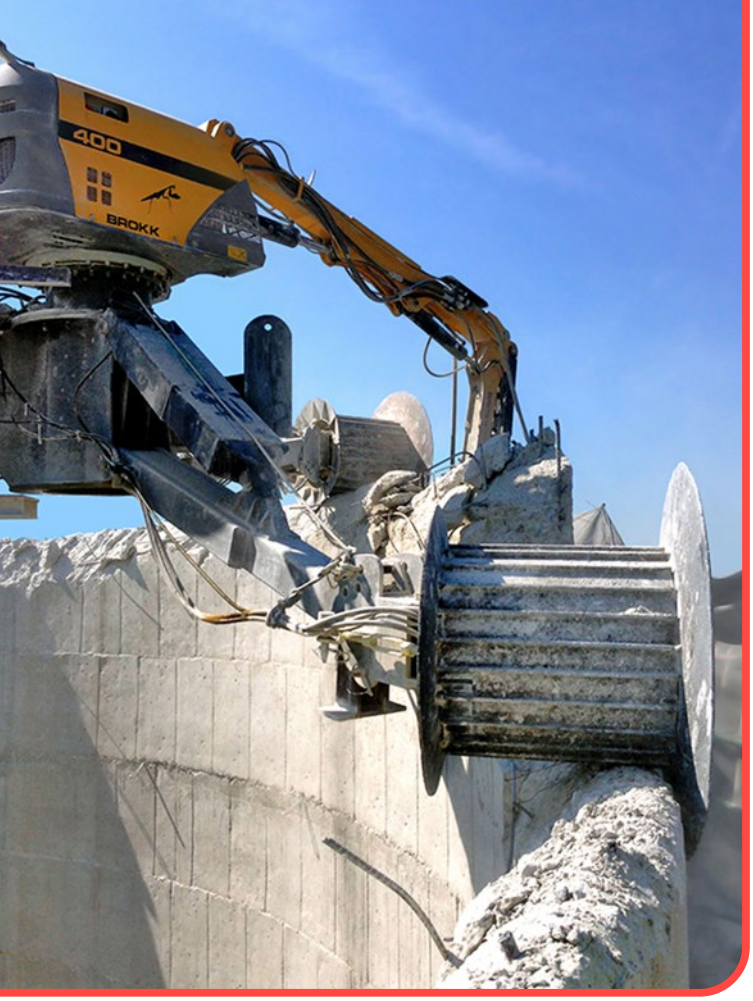
A MANTIS demolition system is set up at the top of the reactor complex stack to safely and efficiently dismantle the structure. (Photo: JoAnne Castagna)



Above: An example of the MANTIS system being used at a stack demolition project outside of Brookhaven. (Photo: ICC Commonwealth)

Additional safety measures were put in place to protect workers and the surrounding environment. Water sprayers were installed on the MANTIS equipment and at the bottom of the stack to suppress dust from the concrete. In addition, air samples were continually monitored to make sure there were no contaminants in the work area, and silt fencing was set up around the work area to prevent any contaminated water from running off the site.

Crews finished dismantling the stack down to the base, approximately 36 ft above ground, before fully demolishing it in February of this year. All contaminated soil, debris, and material was removed and transported to Waste Control Specialist's low-level radioactive waste facility in Andrews, Texas. When the project is completed, a final survey of the site will be performed, and the land will be graded with clean soil.

"Removing this stack is a significant milestone for Brookhaven National Lab's voverarching environmental restoration program that supports the health and well-being of our community and environment,"

said Peter Genzer, manager of Brookhaven's Media and Communications Office.

Below: The exhaust stack's distinctive red and white paint, which contained asbestos and lead, was removed late in 2020. (Photo: DOE)

Brookhaven National Laboratory's army of research scientists are hard at work performing research on a wide range of disciplines. The Army Corps of Engineers is making sure that where they do this critical work for the nation is safe.

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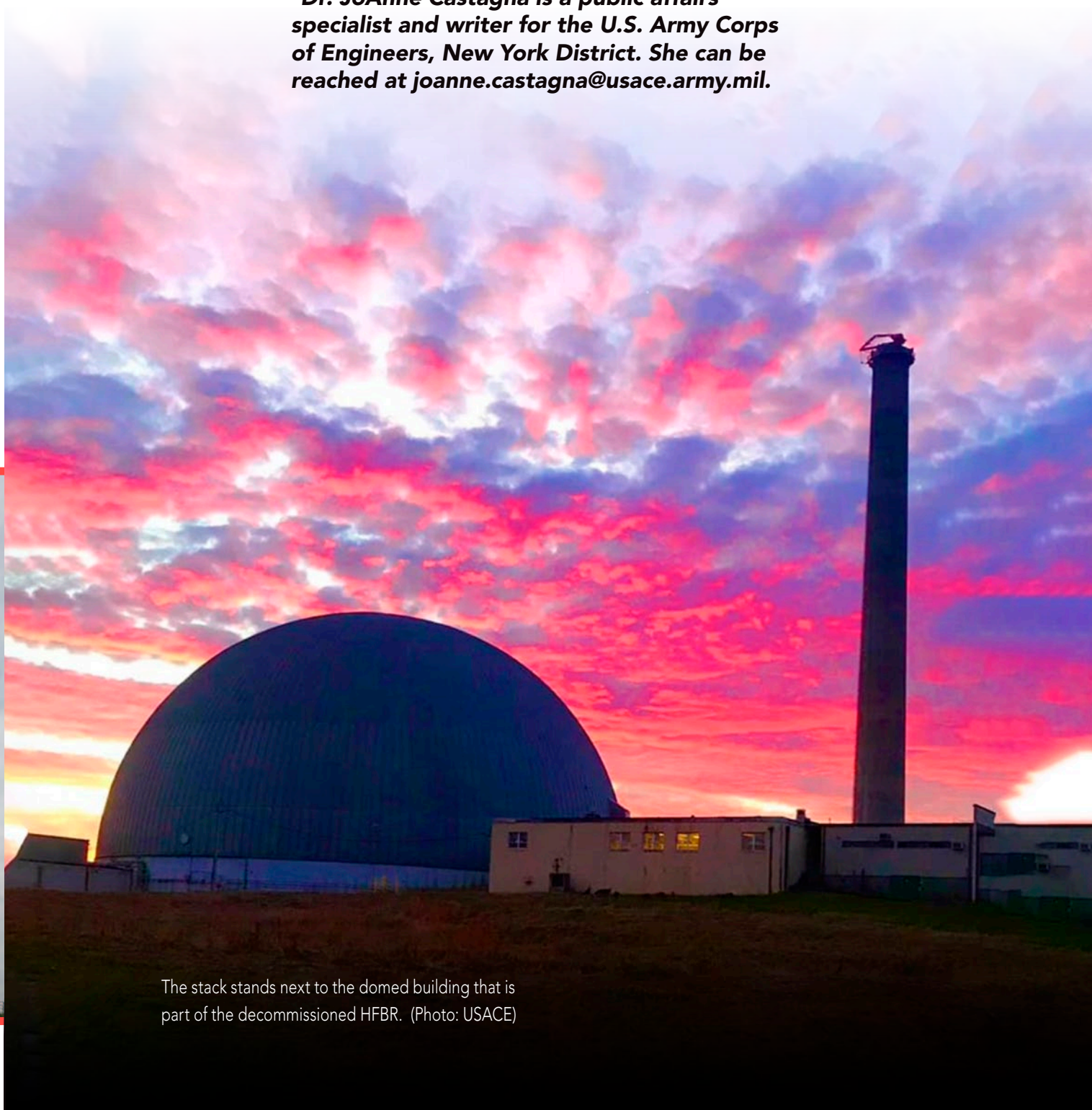

The stack stands next to the domed building that is part of the decommissioned HFBR. (Photo: USACE)