

HRBT EXPANSION Magazine



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Message from Jim Utterback

2022 has been a flurry of activity as we continue to prepare the launch pit for the Tunnel Boring Machine (TBM) on the South Island. The marine team has been busy placing piles, caps and girders that will form the foundation for the new trestle bridges. Over on the Eastern Shore, where the new tunnel segments are being manufactured, crews have completed more than 500 rings of the 2,388 that will be needed for the new twin tunnels. On the landside, work zones have been established for the safety of our construction team while they work to widen the interstate.

The HRBT Expansion Project was honored to be selected as the featured project of the kick-off event for the 2022 National Work Zone Awareness Week. A project of this size and complexity means that we must be even more vigilant when it comes to work zone safety. As our team is in the field, they rely on motorists to stay alert, maintain posted speed limits and drive distraction-free so that they can return home to their families each day.

James S. Utterback
HRBT Expansion Project Director



Scan the QR code
to learn more.



Mason Creek Bridge



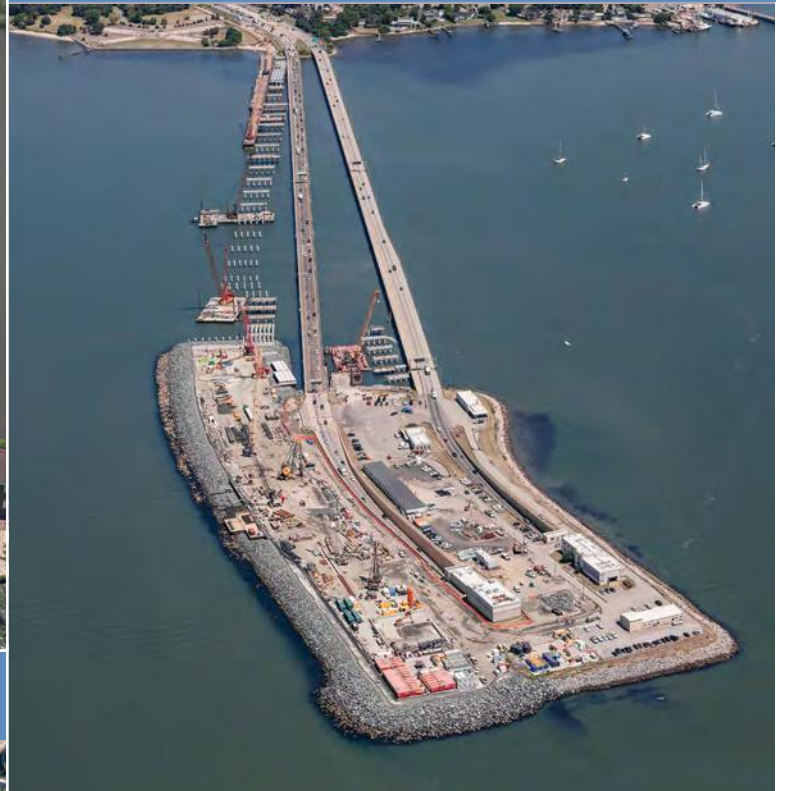
Willoughby Bay Bridge



PROJECT UPDATES

The HRBT Expansion Project continues to make progress on the waterways. With 5 bridges to be replaced and 23 bridges to be widened, there is a significant amount of bridgework. Nearly half of the 1,200 piles for the marine trestles for the project have been driven to date. Now that the piles have been driven and pile caps installed, crews have been adding girders to support the bridge deck for the new North and South Trestles, as well as the widening for Willoughby Bay and Mason Creek bridges.

North Trestles



South Trestles





1

1 Aerial view of the South Island. 2 A teledipper removes excavated soil from the launch pit. 3 A view of the launch pit where crews are preparing the headwall. 4 A crane lowers the sealing ring, which serves as an interface between the TBM and the tunnel approach structures. 5 An aerial view of the TBM launch pit. 6 Crews install the base slab at the bottom of the launch pit.



2



3



4



5

Digging It:

Preparing the TBM launch pit

In order to get Mary, the TBM, tunneling, she needs a good start. The HRBT Expansion Project team has been working for months to prepare a home for Mary's launch from the South Island. The launch pit is constructed in three "cells," or overlapping circles that form its peanut shape. The first step to prepare the TBM shaft is the installation of the slurry walls, which form the perimeter of the launch pit. Next, crews added struts and a capping beam around the top of the shaft to provide support and stability to the structure as the launch pit was excavated.

Since November, crews have been working around the clock to excavate the launch pit for Mary. The team uses heavy equipment to dig, including a specialized machine called a teledipper, which has a telescoping arm to remove excavated soils from the pit into an awaiting dump truck for removal.

The goal is to excavate to a depth of over 80 feet at the front of the launch pit to accommodate Mary's cutterhead and nearly 50 feet at the back end of the shaft for the trailing gantries that support the tunnel boring operations. This equates to roughly 120,000 cubic yards of soil that were excavated in preparation for Mary's journey.

Once the soil is removed, the slurry walls that form the perimeter of the launch pit are smoothed, and crews install a specially engineered waterproofing system to prevent groundwater from seeping into the pit. This system, comprised of geo-textile material, waterproof PVC membrane, waterstop barriers and seals, is installed on the walls and floor of the shaft.

After the waterproofing is complete, crews place a 7- to 9-foot-thick concrete base slab that will support Mary's weight while at the same time providing added weight to counteract buoyancy of the launch pit. While it's hard to imagine at nearly 4,700 tons that Mary could float, the water pressure underground pushes upwards at a force of up to 5,000 pounds per square foot.

Finally, a concrete headwall is installed at what will become the opening of the new tunnel. The TBM will drive and cut directly through the headwall to start her journey. The headwall provides a perpendicular surface ensuring equal pressure across the face of the cutter head to provide traction as Mary starts tunneling.

A lot of preparation is needed to get Mary ready, and the reward will be watching her work in the coming year as she constructs VDOT's first bored tunnel.



6

Piecing It Together

TBM reassembly process



[ABOVE]: The TBM was fully assembled for the Factory Acceptance Test in Germany.

[BELOW]: A barge transports the larger pieces of the TBM to the South Island.

Mary, the Tunnel Boring Machine, was manufactured in Germany before being disassembled for shipment to the United States. Mary arrived in the U.S. in November 2021 in 140 bulk pieces and 30 containers of parts. Before Mary could be reassembled, special accommodations had to be prepared. Crews have been working for months to excavate the launch pit on the South Island where she will start her tunneling journey. At 4,700 tons, it's not feasible to move Mary around once fully assembled. While some components can be pre-assembled, the majority of Mary's assembly must happen inside the launch pit.

As crews are busy making the final touches on the launch pit, pieces of the TBM have been welded together to expedite reassembly in the launch pit.

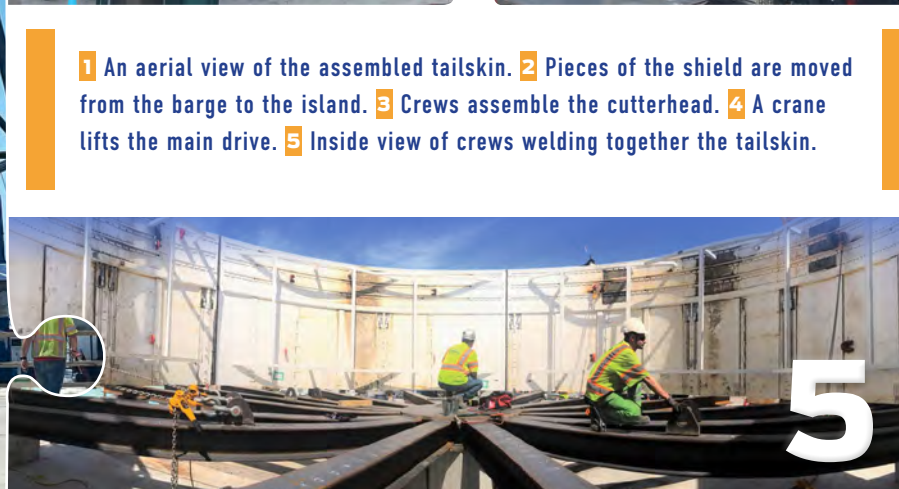
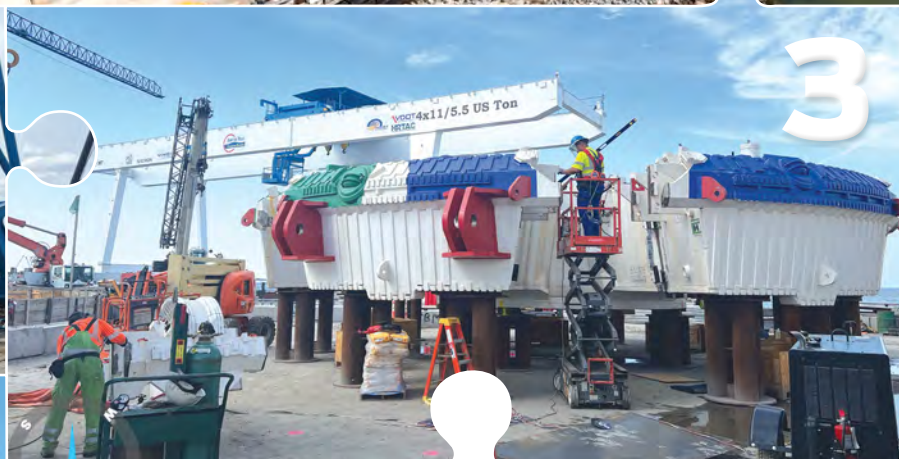
At Mary's face is the cutterhead with a striking design reflecting the Hampton Roads regional flag. The cutterhead features numerous tools called disc cutters, bits, and scrapers that break up the soil. Behind the cutterhead and housed within the shield, Mary's main drive includes the motor and bearings that move and rotate the cutterhead. Behind the shield comes the tailskin, which is a seal designed to prevent water from seeping in as the TBM works to install the tunnel segments. These three components make up the TBM shield.

Behind the shield are four trailing gantries. These movable frame-works provide supporting equipment and services needed for tunnel operations.

The first gantry houses the control room for the TBM operator, as well as the oil for the hydraulic station. The second gantry holds the substation that will distribute power across all components of the TBM. The third gantry contains the conduits and pipes for the electrical, air and water utilities needed to operate the TBM. The fourth and final gantry supports the extension of all cables, wires and pipes as the TBM advances. As Mary journeys to the North Island to form the first tunnel and then back to the South Island for the second tunnel, crews will need to extend connections up to 16,000 feet. These extensions carry power, air, water and slurry from the South Island to the TBM.

Mary is a complex piece of industrial machinery specifically designed for the HRBT Expansion Project. As she tunnels, crews will perform preventative maintenance including changing out the cutterhead tools as needed, to ensure that Mary stays in shape for peak performance.





1 An aerial view of the assembled tailskin. 2 Pieces of the shield are moved from the barge to the island. 3 Crews assemble the cutterhead. 4 A crane lifts the main drive. 5 Inside view of crews welding together the tailskin.

Powered Up —

Dominion Energy completes work to provide power for TBM operations



Electricity is a vital resource for our everyday lives. If power is needed, you find the nearest outlet and voila! Powering a tunnel boring machine

(TBM) is slightly more complicated and requires years of planning and preparation. With 16 electric motors and a total of 12,000 horsepower for all her electrical systems, Mary the TBM uses as much power as 6,000 households.

The HRBT Expansion Project team partnered with Dominion Energy to build the electrical infrastructure necessary for Mary. Dominion added new substations, enhanced existing substations and upgraded miles of electrical lines to provide 30,000 volt-amps (VA) of additional power capacity in advance of tunneling operations. These upgrades enable Mary (and Katherine, the slurry treatment plant) to have a direct power source without impacting the region's electrical grid.

To complement Dominion's upgrades to the electrical infrastructure, the HRBT Expansion project team installed a substation on the South Island to support tunneling operations. The substation allows the project to receive Dominion's 34 kilovolt-amps (kVA) feed and step down the voltage as necessary, using a switchgear to direct power to the TBM and supporting construction equipment. This system feeds power directly to the substation located within Mary's trailing gantry. Mary's substation will distribute electricity to each component of the TBM, powering the motors, cutterhead, thrusters and all mechanical operations.

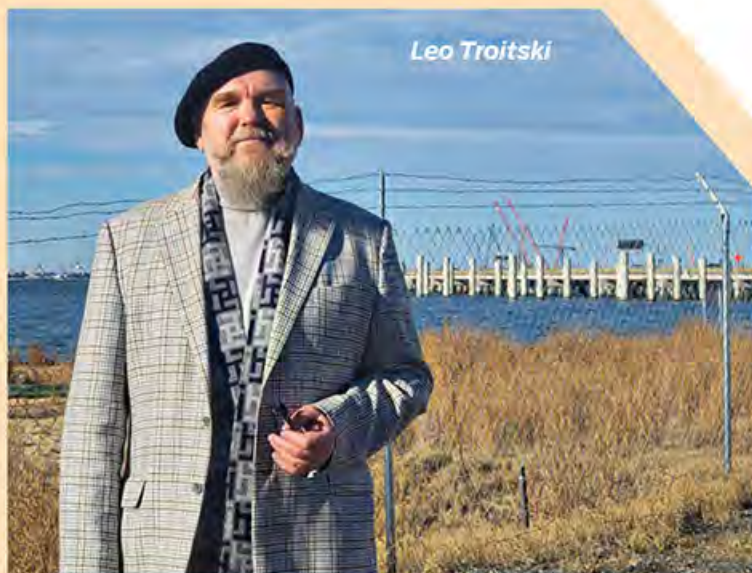
Once Mary completes tunneling, the upgraded utilities will continue to benefit Hampton Roads by providing additional capacity within the region's power grid that will support future growth and development.



- 1 A new substation was constructed on the South Island.
- 2 Once assembled, the TBM will house an electric substation within one of the trailing gantries.

“Dominion’s 30,000 volt-amps (VA) power upgrade will provide energy for Mary and also support the region for years to come.”

STAFF SPOTLIGHT



BUILDING NEW TUNNELS

The new twin tunnels are the centerpiece of the HRBT Expansion Project. Leading the charge for this area of the project are two veteran tunnel engineers – Leo Troitski and Luca Pellegrini. They oversee the complex work on the islands and tunnels.



LEO TROITSKI

VDOT Resident Engineer Tunnels/Islands

Leonid (Leo) Troitski is VDOT's consultant Resident Engineer for Tunnels/Islands for the project. It's his job to provide oversight and monitor contract compliance for the new tunnels, managing a team of specialty engineers and inspectors.

Born in St. Petersburg, Russia, Leo moved to the United States in 1992 to work on a rapid transit project in Texas. Leo worked his way from a field engineer to quality control manager to resident engineer on projects across the world, including the U.S., Canada and India. Leo's largest project was over \$7.5 billion and involved 11 working TBMs.

In his downtime, he enjoys sailing (he's a former mariner) and has sailed throughout the world, including the Mediterranean and Thailand.

LUCA PELLEGRINI

HRCP Tunnel/Island Area Manager

Hampton Roads Connector Partners Area Manager Luca Pellegrini is leading a construction team responsible for all work on the HRBT Expansion Project's North and South Islands. Luca's team will ultimately construct the new tunnels using Mary the TBM.

Luca is of Italian origin but hails from South Africa and studied engineering and business in Johannesburg and Cape Town. He has worked on major infrastructure projects in Africa, Jamaica, France and here in the United States. He was part of the team that delivered Florida's first underground transportation project – the Port of Miami Tunnel – which was also the first bored highway tunnel in the U.S.

AT HOME UNDER THE SEA

HRBT Expansion Project participates in the VMRC Artificial Reef Program

While adding much needed capacity on one of the most congested roadways in the region, the HRBT Expansion Project is also building new homes for marine life. This is done by upcycling construction materials from the project to create new artificial reefs in surrounding waterways.

Artificial reefs provide hard surfaces where invertebrates such as oysters and barnacles, as well as corals, attach. The accumulation of this sea life makes artificial reefs popular with other species of fish who will visit the areas to feed. Artificial reefs provide shelter and food necessary for a rich diversity of marine life and a productive and healthy ocean.

Artificial reefs are frequently constructed from demolished construction components, and this project has plenty of materials. The bulk of the material will come from the demolition of the existing trestle structures, including concrete girders, piles, caps and parapets. There are a total of 311 spans to be demolished and donated to the artificial reef program.

The Virginia Marine Resources Commission (VMRC) started Virginia's Artificial Reef Program in the 1970s with the goal to replicate fish habitats similar to those which occur close to that which occurs naturally. Each site provides feeding grounds and shelter for reef-dwelling fish, which in turn attract larger predator fish. Artificial reef construction is part of a continuing effort to replenish fish populations for sport fishermen. Currently, Virginia has 23 artificial reef sites (18 inshore and 5 offshore).

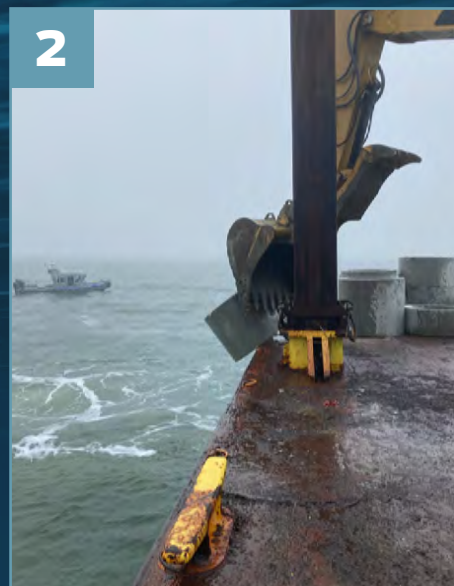
There are four artificial reefs that will potentially benefit from HRBT Expansion Project materials: Bluefish Rock Reef, Back River Reef, Cabbage Patch Reef, and Newport News Middle Ground Reef.

In order to ensure that the concrete material is safe for the environment and navigation, the concrete and its placement must meet certain conditions such as being free of petrochemicals, paints, heavy metals, PCBs or other environmental pollutants, and the

material must be at least 12 to 14 feet below the surface of the water. The program is closely monitored by VMRC, including inspection of concrete materials and oversight of placement.

The project's first reef deployment of concrete debris took place on February 2, 2022, in the Chesapeake Bay at the Back River Reef. A total of 70 tons of concrete was placed. VMRC was onsite and approved the first barge load of concrete pile tops for reef placement. As the North and South trestle bridges are demolished, Hampton Roads Connector Partners will work with VMRC to place additional material in the artificial reefs.

Environmental impacts are always top of mind during roadway projects. In addition to ensuring compliance with environmental regulations, the HRBT Expansion team works to be good stewards of the environment. Participating in the Artificial Reef Program is one way the project can make a positive impact on marine habitats in the Chesapeake Bay.



To the Rescue

The HRBT Expansion Project team assisted in the rescue of two sea turtles in 2021, including a Loggerhead sea turtle and a Kemp's Ridley sea turtle. HRCP coordinated with the Virginia Aquarium Stranding Response program to rescue these endangered turtles discovered on the project site.

[CLOCKWISE]: 1 A map shows the locations of the VMRC artificial reefs. 2 3 4 Placement of 70 tons of concrete material at the Back River Reef.

Taking the Show on the Road



In 1957, the Hampton Roads Bridge-Tunnel was the first in the world to be constructed between two man-made islands. Now, the HRBT Expansion Project will be VDOT's first bored tunnel. With such fascinating engineering, there is a lot of interest in the tunneling process and especially Mary, the Tunnel Boring Machine. At 46 feet in diameter and 430 feet long, Mary cannot be easily moved around. That's why the HRBT Expansion Project team has secured several models that allow the team to showcase this innovative first for Virginia.

A 12-foot model of Mary, the TBM, was a featured exhibit at the Virginia Transportation Construction Alliance (VTCA) Spring Conference in April 2022. While smaller than the gigantic construction equipment on display, Mary drew quite the crowd. Over 900 attendees were able to get a first-hand look at the illuminated miniature replica. Additionally, Project Director Jim Utterback provided a project update as part of the conference's closing session.

Additionally, there are several smaller models that demonstrate the tunnel segments, the tunnel boring and placement process, and a cross section of the new tunnel. The project team has been out in the community at outreach presentations and farmers markets sharing the technology behind the tunneling process. While the main goal of the project is to relieve congestion in the region, there's a huge opportunity to educate and motivate future generations of engineers and tunnelers.

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HRBT Tunnel Talk: A Boring Podcast is back with more great guests and content. Explore the engineering and people behind the HRBT Expansion Project through in-depth conversations. Listen to the podcast on Apple, Spotify or the HRBTExpansion.org website.

Now, you have the chance to be part of the HRBT Tunnel Talk podcast. The HRBT Expansion Project Team will answer your questions about the science and technology behind the project.

We want to hear from you! Share your comments and questions on the next HRBT Tunnel Talk: A Boring Podcast. Listen closely to the next podcast, where we may share your questions and comments.

Call 757-304-0305 and leave a message with your name, city and comment or question. Then stay tuned and listen for your question on a future podcast.

**HRBT Tunnel Talk:
A Boring Podcast
Call-In with Questions
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Work Zones are a Sign to Slow Down



[LEFT TO RIGHT]: **1** 28 safety cones pay tribute to the 28 lives lost in work zones in 2021. **2** National Work Zone Awareness Week kick off event. **3** A traveling tribute to recognize those who have died in a work zone. **4** Workers listen to Secretary of Transportation Shep Miller. **5** Speakers included (from left to right) Virginia State Police Colonel Gary T. Settle; Keynote speaker Cameron Hutt; Federal Highway Administration Virginia Division Administrator Thomas L. Nelson, Jr.; and Virginia Secretary of Transportation Shep Miller.

Did you know that National Work Zone Awareness Week (NWZAW) was started right here in Virginia?

In 1997, a group of Virginia Department of Transportation (VDOT) staff members, located in southwestern Virginia, wanted to dedicate a week to raise awareness about work zone safety among all district employees before construction projects picked up during the warmer months.

NWZAW is now an annual spring campaign held at the start of construction season to encourage safe driving through highway work zones, reminding drivers to be extra cautious in these areas. This year's theme, "Work Zones are a Sign to Slow Down," was aimed to reduce work zone fatalities and injuries.

NWZAW was held April 11-15 this year, hosted by the VDOT with the HRBT Expansion Project as the featured site of the kick-off event, on April 12 in Hampton. Virginia Secretary of Transportation Shep Miller and representatives from VDOT, the Federal Highway Administration (FHWA), and the Virginia

State Police (VSP) spoke at the event. Keynote speaker, Cameron Hutt, lost her father to a work zone accident when she was in kindergarten. She shared a heartfelt plea to all motorists, "We can and must do better by protecting workers like my father."

The event also featured the traveling National Work Zone Memorial, a living tribute to the memory of men, women and children who have died in work zones. In addition, 28 safety cones were placed together to represent the 28 lives lost in work zones on Virginia highways last year, a significant increase from 11 fatalities in 2020. This alarming trend underscores the need for awareness of work zone safety not just during NWZAW but throughout the entire year.

At the HRBT Expansion project, safety is our top priority. We strive to create a safe work zone to protect our workers. Motorists should maintain posted speed limits, stay alert to traffic shifts, use hands-free devices and drive safely.

Everyone needs to do their part when it comes to work zone safety.



IN THE NEWS

HRBT Expansion Project

While much of the focus has been on Mary the Tunnel Boring Machine, crews have been busy on the Eastern Shore manufacturing the segments that will form the new tunnels. In May 2022, the HRBT Project Team hosted the media for a behind-the-scenes tour of the Technopref Precast Plant in Cape Charles, VA, where they are producing precast concrete segments that will form the rings of the new tunnels. The news media was invited to view the entire manufacturing process, from placement of concrete in the customized molds to quality control measures ensuring the strength and durability of the tunnel segments to the completed segments housed in the precast yard. All three television stations shared this behind-the-scenes look with their viewers.

In other outreach news, the HRBT Expansion Project is being highlighted on Viewpoint by Dennis Quaid. VDOT Project Director Jim Utterback and HRCP TBM Engineer Kayla Jones are interviewed in this documentary focused on careers in critical industries like tunneling. Stay tuned to watch this documentary on PBS later this summer.

Also check out on:



JIM UTTERBACK, PMP | INSIDE BUSINESS 2022 POWER LIST

The Power of Opening Up Traffic

Project Director Jim Utterback was featured on Inside Business' Power List with the Power of Opening Up Traffic. Jim leads a world-class team building the largest infrastructure project in the history of Virginia, in order to alleviate congestion at one of the region's biggest chokepoints.

POWER PLAYER



For more project details visit:

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