Explore how we're submersing 16,000-ton segments to create Virginia's newest tunnel

Since 2018, drivers who use the Midtown Tunnel to get between Norfolk and Portsmouth, Va., have twice as many lanes available to them, thanks to an expansion. To make that possible, the Elizabeth River Tunnels project's latest phase involved submersing 16,000-ton hollow concrete elements into a special trench carved in the river bottom. This is amazing work that requires great precision – yet most of it will occur unseen in the Elizabeth River's waters. To share what's involved with building this critical infrastructure that will further connect this region for at least 120 years, we've outlined the process here:

Elizabeth River Tunnels

A partnership of SKW Constructors, erc elizabeth river crossings, VDOT Virginia Department of Transportation

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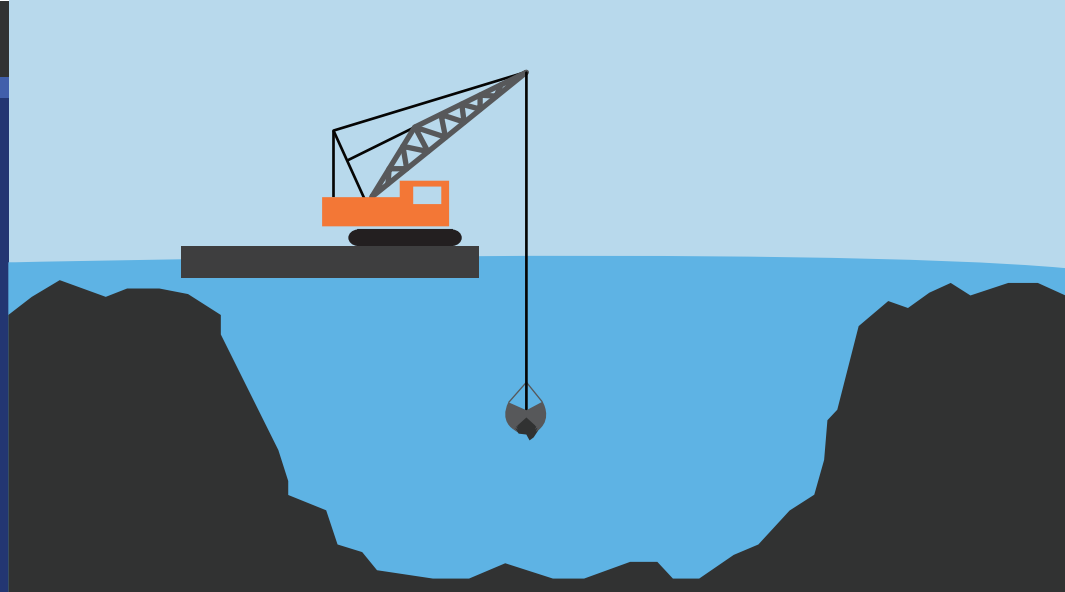
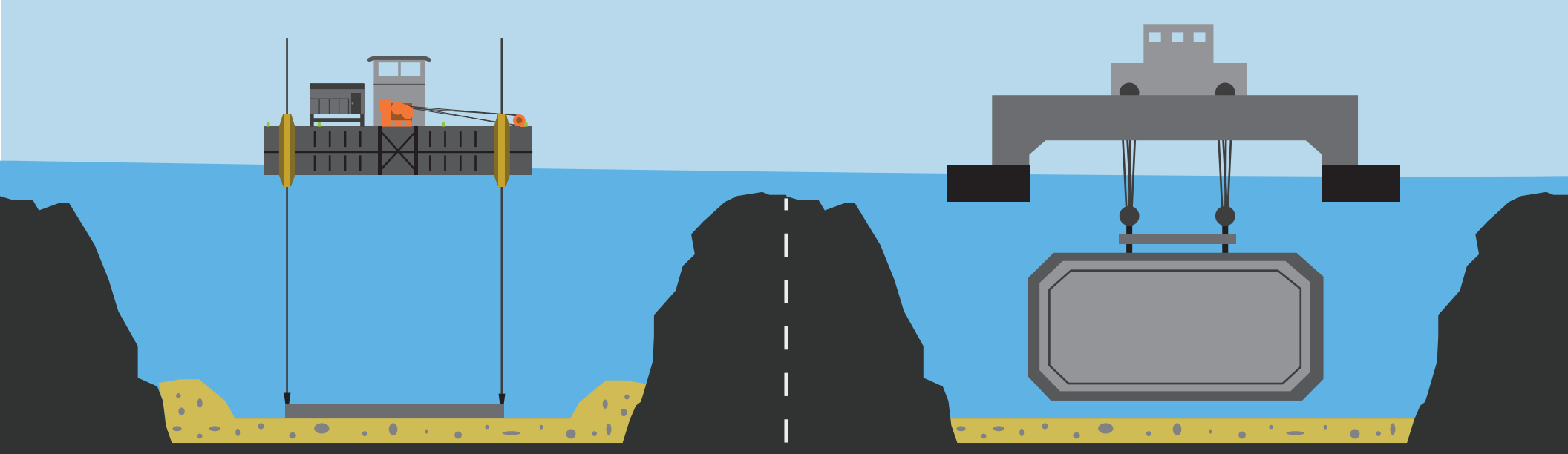


1. Scooping out the river bottom

To protect the tunnel and ensure it doesn't interfere with ship traffic, this Midtown Tunnel expansion is being buried below the surface of the river bottom. That requires a trench up to 95 feet deep, bigger than the 11 tunnel elements that are each about 29 feet tall, 54 feet wide and 342 feet long. **About 1.2 million cubic yards of material – enough to fill 85,000 dump trucks – are being removed by barge, mostly for disposal in an approved ocean area.**

x 85,000



2. Preparing the foundation

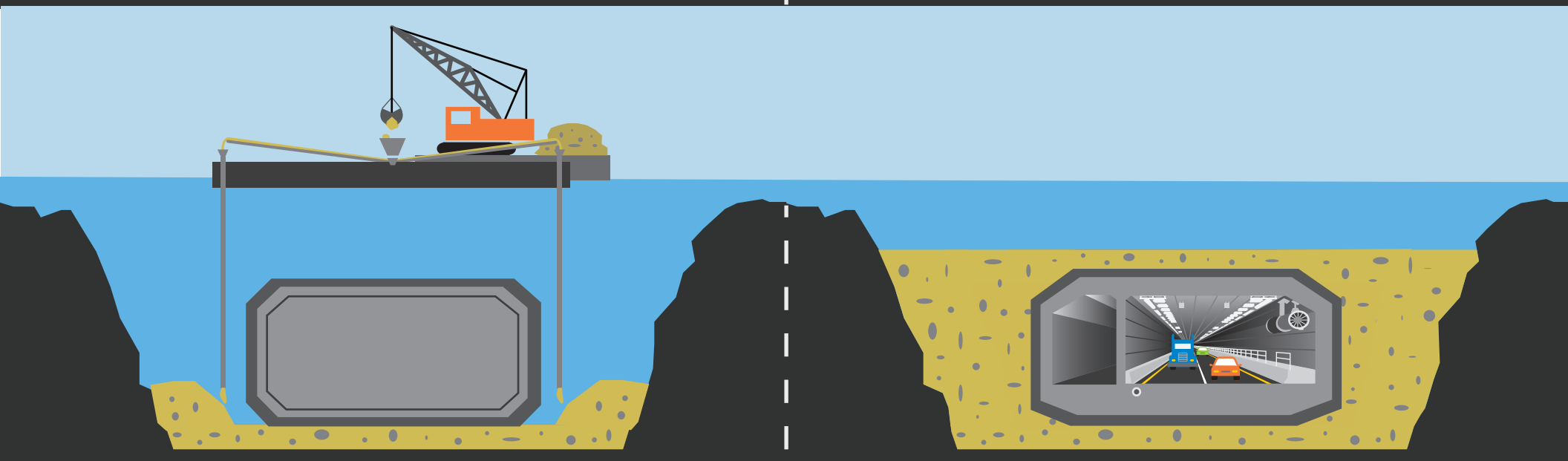
Designed to withstand the weight of a Nimitz-class aircraft carrier, the tunnel elements need all the strength they can get. **Properly positioning and supporting them requires a base comprised of 40,000 tons of aggregate and sand, which is placed two feet thick in the trench and graded to a tight one-inch tolerance.** A snow plow-like blade hanging from a barge above shapes the foundation to the proper slope.

± 1 inch

3. Taking the plunge

As big as the elements are, they still needed to be buoyant to float 220 miles from where they were cast near Baltimore, Md., to the Virginia installation site. Submersing them requires counteracting that buoyancy. **That's done by pumping in two feet of concrete, stacking a layer of four-foot-thick concrete blocks on top and adding four million gallons of river water to the ballast tanks.** Guided by a special barge, once an element reaches the bottom – a process taking about 12 hours – a hydraulic arm pulls it together with the adjacent tube to form a watertight seal.

x 4 million gallons



4. Layering it on

Thirty-inch diameter pipes are used to backfill the elements, spreading about 675,000 tons of aggregate and soil that are delivered by barge. A computerized guidance system helps ensure that both sides of the elements are backfilled equally to prevent the structures from shifting. **Topping off the tunnel are another 68,000 tons of large-diameter armor stone to protect against ship anchors.**

x 743,000 tons

5. Now let's do that again

Elements are lowered one at a time – each about a month apart – until a string of 11 tubes connects Norfolk and Portsmouth. Each element's shape is slightly different, as the tunnel curves both horizontally and vertically on its path. Interior work involving ventilation, lighting, emergency systems, finishes and the roadway surface begins within a few weeks of each element being installed.

x 11