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Big Pipe will burrow into east side

Sewer project - A huge boring machine will begin its four-year journey under the Willamette's east bank

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The last, biggest and most challenging leg of Portland's \$1.4 billion Big Pipe sewer-tunneling mission is about to begin its four-year grind along a six-mile route beneath the Willamette's east riverbank.

Commissioned to build a jumbo pipe to help keep rain-driven sewage from spilling into the river, the 960 ton boring machine and gear will start this week and do its work 10 stories under the earth.

"It's more than a machine," says Bill Mariucci, project director for the eastside Big Pipe contractor of Kiewit-Bilfinger Berger. "It's like its own factory. A moving factory."

All underground, but not without its topside action:

Tunneling will produce, over four years, as much as 800 barge loads of excavated gravel, rock and sand for shipping as fill to a nearby Ross Island lagoon.

And about 40 truckloads of precast concrete pipeline rings a week will converge at the starting point for tunneling -- an open-air construction shaft thrumming with heavy machinery at Southeast Water Avenue and Caruthers Street. That's just south of the Hawthorne Bridge near the Oregon Museum of Science and Industry and the Hampton Opera Center.

The pipeline will amount to a six-mile subterranean tube of donut-shaped concrete rings that the boring machine will mechanically assemble and install while tunneling. Each assembled ring will stand 25-feet tall and weigh 32 tons. Each flatbed truckload will deliver the eight pieces of each ring for assembly underground.

All of that construction work can create commotion up on top, but the city says the contractor's goal is to keep things clean and safe.

"From a community relations standpoint, it's important," says Diana Hinton of the Bureau of Environmental Services. "From a safety standpoint, it's critical.

"Our main concern is to be good neighbors."

For some, the start of tunneling might sound familiar. Already done under the west riverbank, this is the east bank counterpart.

Workers will build a nearly six-mile underground route between Southeast 17th Avenue and McLoughlin to the city's new pump station on Swan Island. There, it will link with the completed westside pipe, sending sewage and storm water from both sides of the river into the longtime city treatment plant on North Columbia Boulevard.

Both projects use the same tunneling technology. The difference is that one is big, and the other is bigger.
25-foot-tall cutterhead

Two westside tunneling machines used 16-foot-tall cutterheads to grind out space for a concrete pipeline with a 14-foot-wide interior. The single eastside tunneling machine, named Rosie, will use a 25-foot-tall cutterhead while building a pipeline with a 22-foot inside diameter.

Custom-built by the German manufacturer Herrenknecht, the 500-ton boring machine, hauling 460 tons of trailing gear at a total length of 240 feet, will begin by heading north at the expected average daily rate of 40 feet.

"I always compare it to a submarine," says Christof Metzger, Kiewit-Bilfinger Berger's eastside tunnel manager. "We're always underwater."

All below the water table, tunneling depths will range from 110 to 170 feet. A challenge is to avoid bridge pilings that could cause the machine to get stuck. Paul Gribbon, the city's tunnel manager, says the course calls for it to not come closer than about 30 feet to the only piles that pose a risk -- dozens under Interstate 84, some driven in at angles.

As westside tunneling showed, the first challenge comes at startup.

On Feb. 2, 2004, as one of the westside machines bored its way through the concrete wall of its starting-point "breakout zone" and into the unstable environment of groundwater and soils, a tunnel gateway gasket failed. Thousands of gallons of underground water and soil poured into the shaft. Near the top, a 30-foot-wide sinkhole appeared. Workers refilled the hole and resumed tunneling within three weeks. **Biggest city-paid project**

Prompted by an environmental lawsuit in 1991 and sealed by a 1994 agreement with the state, the Big Pipe is Portland's biggest city-paid construction project. Financed by sewer-bill ratepayers, the two-decade effort is supposed to stop most overflows of sewage and storm water into the river. The city expects it to cost \$1.4 billion for a finished system, by 2011, of vastly bigger pipelines and storm-water diversion along the Columbia Slough and both sides of the river.

Kiewit-Bilfinger Berger's eastside Big Pipe contract is \$426 million in projected 2011 dollars.

As time passes along the 21,000-foot northbound run, the boring machine will grind farther from its starting point near OMSI.

In terms of pumping air and slurry in and out, that will test logistics.

It also raises the point of what powers the boring machine.

Electricity.

What keeps it tunneling, Metzger says, is a long extension cord -- the same thing that powers, say, a vacuum cleaner at home.

"Only a lot bigger," he says.

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