The San Diego Union-Tribune.

Tunnel blasters

Water project to link Lake Hodges, Olivenhain Reservoir about two-thirds done

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May 21, 2006

DEL DIOS – Before you enter the tunnel that's being excavated between Lake Hodges and Olivenhain Reservoir, they hand you two shiny metal disks with the same number stamped on each.

You hang one on a board at the open maw of the tunnel, and you stuff the other in your pocket.

- Tunnel's turbines will be producing hydroelectricity

That's so if they find you stiff and cold, they know whose loved ones to inform.

Even before you get that far, they show you a video on the correct way to use the "MSA W-65 Self-Rescuer," which you clip to your belt before you enter the tunnel. The self-rescuer is a breathing apparatus that you break open if your rock home begins to fill up with carbon monoxide.

The man on the training tape delivers his message in a monotone as still as swamp air. He intones the phrase "instant death" a lot.

The workers performing surgery in the heart of Mount Israel have not cracked open their self-rescuers once.

Mike Shough, a superintendent with Kiewit Pacific, said no two tunnels are alike.

"Each one of them's got its different challenges even though it's the same type of rock and everything else," he said. "It always changes."

The San Diego County Water Authority hired Kiewit Pacific to dig a 5,800-foot-long tunnel from Lake Hodges that will connect to a 500-foot-long tunnel that already extends below ground at the Olivenhain Reservoir.

Project details

Construction of a 6,300-foot tunnel that will connect Lake Hodges with Olivenhain Reservoir is about two-thirds finished. When complete:

- The tunnel will be 14 feet in diameter and will encase a steel pipe 10 feet in diameter.
- The $104 million project will link Lake Hodges for the first time in its 88-year history to aqueducts that bring water from Northern California and the Colorado River.
- A pump station equipped with turbines will be able generate electricity when water flows back down the pipe.

When Lake Hodges and the Olivenhain Reservoir are connected, scheduled to be operational by September 2008, the $104 million project will link Lake Hodges for the first time in its 88-year history to the aqueducts that carry water from the Colorado River and Northern California.

Olivenhain Dam, which sealed up a cup-shaped valley in Elfin Forest 2 1/2 years ago, gets nearly all its water through the aqueducts.

In contrast, Lake Hodges, which is owned by the city of San Diego but serves customers of the Santa Fe Irrigation and San Dieguito Water districts, is fed by a 300-square-mile watershed.

The tunnel project is part of the County Water Authority's $939 million emergency storage project, a system of reservoirs, pipes and other systems to provide water if a catastrophe were to cut off supply.

The tunnel will rise 700 feet in elevation from Lake Hodges to Olivenhain Reservoir. The tunnel, 14 feet in diameter, begins at a nearly level half-percent grade at Lake Hodges and stays that way for about 2,000 feet. Then it turns and slants to a steeper 13 percent grade for the middle third of its length. For the final third, it tilts to a 19 percent grade, rising 1 feet for every 5 horizontal feet it advances.

To link the two lakes, workers began to bore through granite on Lake Hodges' north shore last September. This August, they expect to connect with the Olivenhain Reservoir shaft to complete the tunnel. When it's done, the project will include the tunnel, a pump station, electricity-generating substation and power lines.

Sean Menge, the Kiewit Pacific project manager, said that Mount Israel's rock is hard by geological standards. That makes it tough to bore through.

“The excavation method is drill and shoot,” Menge said.

The cycle begins with drilling a pattern of 58 to 65 holes, each 1 3/4-inches in diameter, into the rock wall, then packing explosives into the holes.

The crew leaves the tunnel and the explosives are set off electronically from outside. That fractures the rock.

Then machines called muckers enter the tunnel and scoop up the rubble, backing out to dump their load. They go in and out several times until they have exposed the new end of the tunnel.

“That process is repeated 600 times to complete the excavation,” Menge said, noting that his crews extend the tunnel 24 to 36 feet every day.

Three five-man crews rotate through three eight-hour shifts throughout the day, Menge said, so crews are on the job 24 hours a day, Mondays through Fridays.

On weekends, they pour concrete on the tunnel floor and perform maintenance chores.

They are working around the clock so the County Water Authority can complete the emergency storage project as soon as possible, authority spokesman John Liarakos said.

The crews have run utility lines through the shaft – electricity, water, a water discharge line, even air. A long line of lights dangles from the jagged rock ceiling, alongside two large tubes that circulate air.

They don't worry about noise now, because they've advanced 4,000 feet underground and have 150 feet of rock between them and the surface.

At the deepest point, the crews will be 400 feet below ground.

“When we're done, we'll put a 10-foot-diameter steel can of varying thicknesses” in the shaft, then grout between the pipe and the rock wall, Menge said.

The tunnel project includes a pump station, construction of which began two weeks ago. The pump will be used to force water up the pipe from Lake Hodges to Olivenhain Reservoir.

The authority also can hold the water in the pipe, then release it to run back downhill through a turbine to generate electricity, which can be sold.

“When the water flows back down, we'll generate 40 megawatts of electricity,” said Joe Bride, the water authority's tunnel project manager.

Shough, the tunnel superintendent, said he spends nearly all of his eight-hour shift underground, experiencing daylight once or twice during that period.

He said he's been doing similar jobs since he was hired to help dig the Washington, D.C., subway tunnels in 1970.

Asked what's the appeal of laboring below the Earth's surface, Slough said, “You can see what you've accomplished. You can see what you've done. Not like some guys who work behind a computer.”

Then, bothered by the questions, he went back underground.

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