

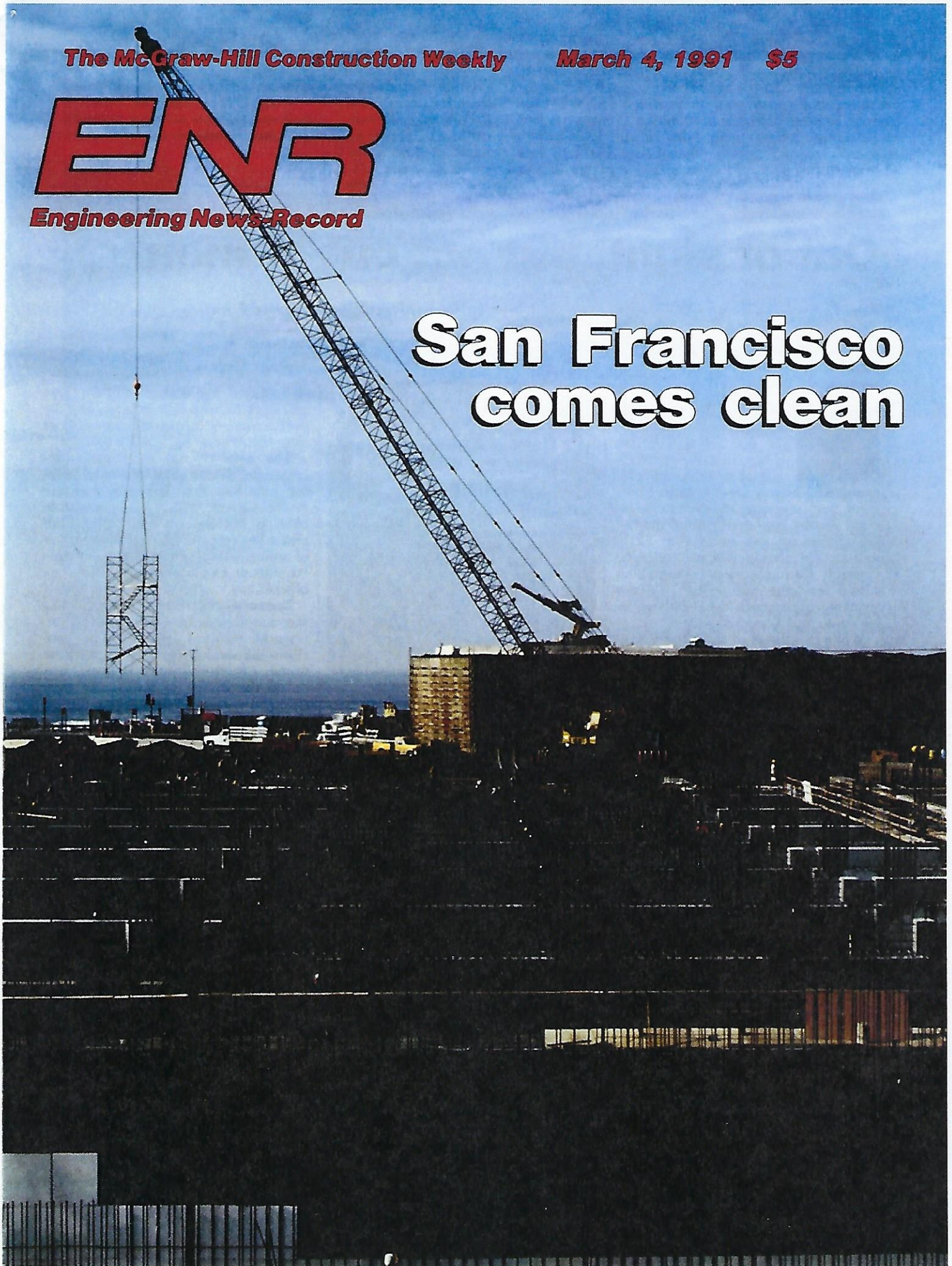
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San Francisco comes clean



WASTEWATER TREATMENT

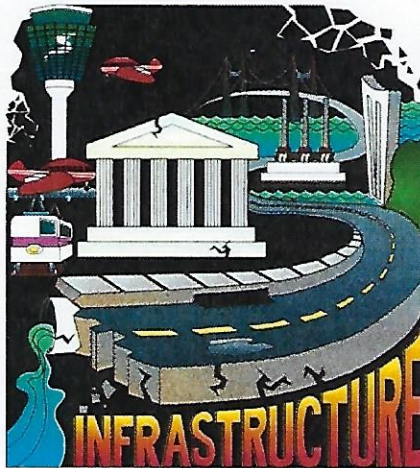
Out of sight, but not out of mind

Underground plant is key link in San Francisco's new sewerage network

Compared to other major cities in the U.S., San Francisco is shaping up as one of the tidiest. The city is now 85% complete with an estimated \$1.3-billion, 20-year push to expand and upgrade its sewage treatment system. And even one of the last big chunks in this effort, the \$212-million Oceanside Water Pollution Control Plant, is now being built where residents will neither see nor smell it—underneath the San Francisco Zoological Gardens.

While two-thirds of the 12-acre sewage treatment plant will be buried beneath 6 ft of earth, it won't be out of the U.S. Environmental Protection Agency's view. Under an EPA administrative order, the city faces fines of \$10,000 per day if it fails to complete the 43-million-gal-per-day secondary treatment facility by April 1994.

Nevertheless, project officials are confident that they will finish it on



schedule. By then, the San Francisco Clean Water Program, the city agency that is directing the massive sewerage upgrade, will have built more than 15 new facilities. These include storage boxes, treatment plants, pumping stations and outfalls that will ring the 49-

sq-mile city. The network will intercept and store rain-swollen sewage until the overburdened treatment plants can treat the excess.

The network will significantly decrease the discharge of untreated effluent into San Francisco Bay and the Pacific Ocean. While the Oceanside plant is not the city's largest, it will play a key role in reducing the number of annual ocean discharges of untreated effluent from 58 to just eight, city officials say.

Concerns. The plant's design had to accommodate a host of geographical, physical, political and aesthetic concerns—all within a very tight time frame. CH2M Hill Inc., Denver, produced the design in little more than six months in 1988 in order to meet a deadline for the city to receive nearly \$30 million in federal construction grants from EPA.

The cramped location near a middle class neighborhood created considerable concern among residents, and even forced the city to convene a panel of "odor sniffers" in 1986 and 1987 to aid the plant's designers in determining how odors might be tolerated.

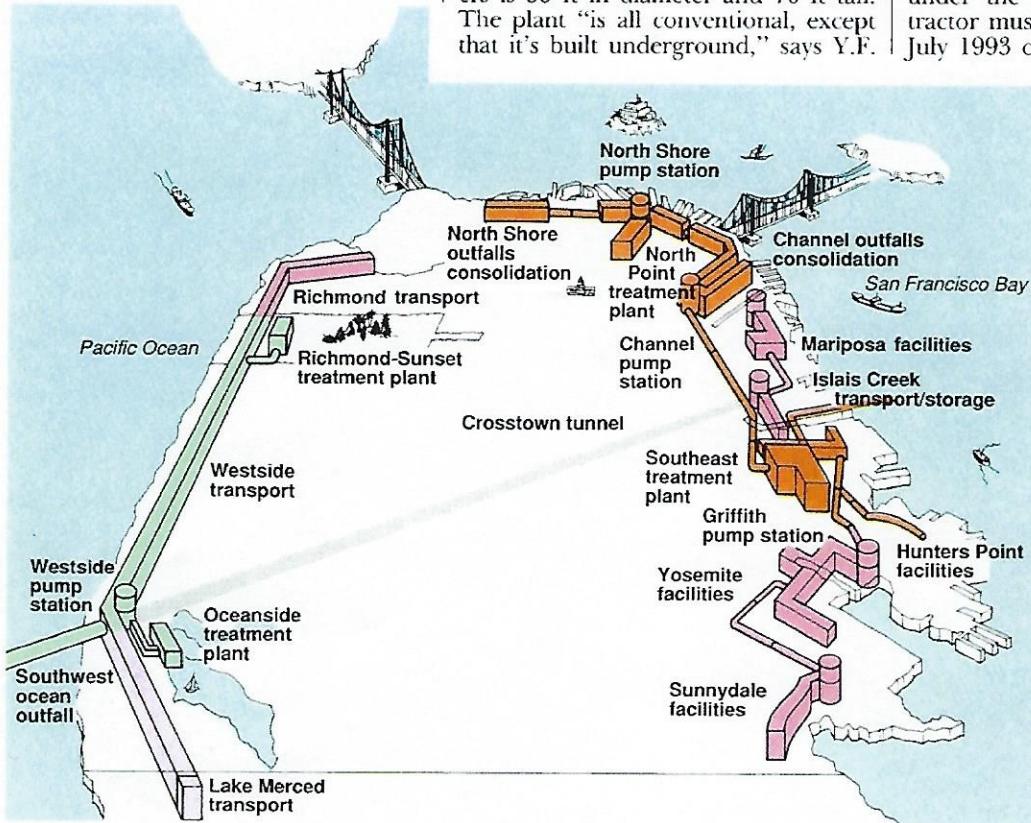
The project also won voter approval only on condition of co-use of its site with the existing zoo. "The combination of the zoo and the residential area is what's unique here," says Donald T. Munakata, project manager for the Clean Water Program. "I think you'll see a lot more [treatment plants] that are covered as we get short of land in metropolitan areas."

CH2M Hill and its subconsultants located plant components with the greatest potential for odors farthest away from the zoo. Liquid treatment facilities are located 6 ft beneath the zoo's elephant area. Such weight considerations require the underground



Oceanside plant, to be operational in 1994, will cut untreated flows into the Pacific.

Sewerage network, which will eventually cost \$1.3 billion, will include the \$212-million Oceanside secondary treatment plant (lower left) and a number of related facilities.



egg-shaped digesters instead of the traditional cylindrical ones because they take up less space and are easier to clean. Each of the four steel digesters is 55 ft in diameter and 70 ft tall. The plant "is all conventional," except that it's built underground," says Y.F.

The project has also recovered from a two-month construction delay caused by the birth in March 1989 of Shango, the zoo's prize gorilla. Nevertheless, under the project contract, the contractor must complete construction by July 1993 or pay liquidated damages.

Even as the Oceanside plant takes shape, city officials are pushing ahead with plans for six more facilities costing close to \$200 million.

Connected. The Oceanside plant will operate in conjunction with other systems on the city's west side, including a new Lake Merced transport and storage facility that will control storm sewage overflows into the ocean. A contract for that \$35-million structure is expected to be awarded this month, although project officials decline to identify either the bidders or the bids.

Next month, the city expects to complete an in-house design of the Richmond transport, an underground storage structure along the

complex to be covered by a 2-ft-thick concrete deck, supported by 5-ft-deep concrete beams, with walls as much as 4 ft thick and 30 ft high. That structure will bear on a 4-ft-thick mat foundation for withstanding soil liquefaction in the event of an earthquake.

Seismic safety. Since the San Andreas Fault lies less than 3 miles offshore, engineers designed the plant to withstand a quake registering as high as 8.3 on the Richter scale. "You're talking major earthquake requirements here," says Jerry C. Wilson, CH2M Hill's resident engineering manager. "The plant would probably be the safest place in the city," adds Munakata.

Influent will flow into the plant through concrete rectangular structures that can also store excess flows during wet weather. Flows will be routed to primary treatment—screening and grit removal and primary clarification. Wastewater will then flow to secondary aeration tanks and clarification tanks before disinfection and chlorination.

Solids will be handled in compact

Shango the gorilla (left, on mother's back) held up construction with 1989 birth.

Wong, the Clean Water Program's resident construction manager.

With 35% of the plant now completed, construction by a joint venture of Homer J. Olsen Inc., San Francisco, and Ohbayashi Corp., South San Francisco, is on schedule. While Olsen has built other treatment facilities for the city, "this is the biggest project [it] has taken on," says Munakata. As a result, the contractor's Japanese partner is providing 30% of its bonding capacity.



ocean near the Golden Gate Bridge. Construction is set to begin in August 1992 at an estimated cost of \$43 million.

One remaining wild card is whether or not the city will build a crosstown tunnel to link Oceanside with the 210-mgd Southeast treatment plant and divert sewage sludge away from the bay and into ocean outfalls. The city will decide on that scheme—which could cost as much as \$200 million—by next year, says Alexander Mamak, a Clean Water Program spokesman. One alternative is construction of a new bay outfall and pump station near the Southeast Plant.

While an expansion of existing east side facilities would be cheaper than the tunnel, local residents are again likely to have the last word. Mamak says that residents living near the Southeast treatment plant "don't want all the sewage in the area collected there."

By David B. Rosenbaum

This article is part of a series ENR is publishing throughout 1991 to demonstrate the many ways that vital infrastructure is being repaired and improved.