



# Water Reuse

EXPERTISE IN EVERY TYPE OF END USE

BUILDING A WORLD OF DIFFERENCE®



**BLACK & VEATCH**





WASTE NOT, WANT NOT  
WITH BLACK & VEATCH

Water resources reclaimed and recycled for any level or type of demand

Water resilience strengthened in the face of uncertain supply

Water quality aligned with the latest research and regulatory requirements

PROVIDING PLANNING-TO-OPERATIONS SERVICES AND LEADERSHIP IN ALL TREATMENT TECHNOLOGIES, BLACK & VEATCH DELIVERS WATER REUSE SOLUTIONS FOR ANY END NEED.

AGRICULTURAL | COOLING WATER

Reuse Program Management  
City of Escondido, California

With roots in Escondido’s founding in 1888 and higher water demands than most stakeholders, the local agriculture industry strongly supported expansion of the city’s recycled water system. Investing in reuse meant in the short term that Escondido would not need to upgrade its near-capacity, 14-mile long wastewater outfall. Long-term, the investment promoted a new, reliable, local water supply for agricultural irrigation and other uses, including power plant cooling. As prime consultant, Black & Veatch led an integrated planning study in phase one of the \$250 million capital program, developing a fit-for-purpose solution that ultimately is planned to supplement Escondido’s potable water supply. We also designed an MFRO treatment facility for agricultural use.



INDUSTRIAL

Richmond Advanced Recycling Expansion (RARE)  
East Bay Municipal Utility District, Richmond, California

The RARE project was a public-private reuse development by East Bay Municipal Utility District (EBMUD), the West County Wastewater District and Chevron. Totalling \$55 million in capital costs, it delivered an advanced treatment facility that produces highly purified recycled water for use as high-pressure boiler make-up water at Chevron’s San Francisco Bay area refinery. Black & Veatch provided a feasibility study, pilot testing support, process evaluations, the final design, and construction services. The project enabled EBMUD to conserve potable water supplies and reduce imported supplies. Also, because Chevron was responsible for capital, operations and maintenance costs, the project had virtually no effect on EBMUD’s rates for other customers. The project was a win for Chevron as well, delivering a more reliable and higher quality water supply than it had been using.

GROUNDWATER RECHARGE |  
INDIRECT POTABLE REUSE | SEAWATER  
INTRUSION BARRIER

Groundwater Replenishment System Initial  
Expansion, Orange County Water District,  
Fountain Valley, California

Orange County’s water and sanitation districts developed the Groundwater Replenishment System (GWRS) to

supplement local water supplies. The system produces recycled water that exceeds California and federal drinking water standards, which is used to recharge the county's groundwater basin and protect the basin from seawater intrusion. Black & Veatch provided preliminary and final design and construction support on the initial expansion of the GWRS, increasing its capacity to 100 million gallons per day (MGD). Considered the largest advanced water purification system in the world, the GWRS provides a reliable, high-quality alternative water supply, enough for 850,000 residents, reducing California's dependency on imported water.

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POWER PLANTS | INDUSTRIAL |  
AGRICULTURAL | INDIRECT POTABLE REUSE

**Bundamba Advanced Water Treatment Plant,  
Western Corridor Recycled Water Project,  
South East Queensland, Australia**

The Bundamba Advanced Water Treatment Plant (AWTP) was one of three such treatment plants that were built under the \$1.7 billion Western Corridor Recycled Water Project. Including a network of large-diameter underground pipelines, the project was developed in response to severe drought across Australia. Black & Veatch was part of the Bundamba Alliance joint venture that provided master plan, pilot, design, construction and commissioning services on the fast-tracked Bundamba AWTP. The first of the three plants to come on line, it delivered first water in less than



10 months after the joint venture team received access to the site. It also featured the world's largest application of 18-inch reverse osmosis membranes. In addition to delivering purified recycled water to power plants and industrial and agricultural users, the Bundamba AWTP can augment drinking water reservoirs when needed.

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COOLING WATER

**Polk Power Station Regional Reclaimed Water  
Partnership Initiative, Tampa, Florida**

The Polk Power Station is a state-of-the-art power generation unit. Featuring a first-of-its-kind combination of coal gasification and combined cycle technologies, the plant is one of the cleanest, most efficient and most economical units in the U.S. For its cooling water needs, it relies entirely on a reclaimed water system developed



via a \$120 million public-private partnership. Black & Veatch provided design, procurement, construction and commissioning services for the conversion of the plant to the new technologies.

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INDUSTRIAL | FUTURE INDIRECT  
POTABLE REUSE

**Changi NEWater Treatment Facilities, SembCorp  
Industries, Singapore**

Singapore's signature NEWater process produces recycled water that meets or exceeds the World Health Organization's guidelines for drinking water quality. Used primarily by industry since it was introduced, NEWater is a core tool in the country's long-term strategy to become water independent. The NEWater plants at Changi are among the world's largest dual-membrane water reclamation projects. The first was built on top of an existing wastewater reclamation plant, which minimized construction costs and lessened the project's footprint in land-scarce Singapore. Both plants were developed under design-build-own-operate contractual structures with Black & Veatch providing conceptual and detailed engineering design plus construction and startup services.

Cover image: Silicon Valley Advanced Water Purification Center, Santa Clara Valley Water District, City of San Jose, California.  
End uses: Industrial processes, irrigation, landscaping, recreation, cooling water, direct potable reuse (future).

