

CHRISTIES BEACH WASTEWATER TREATMENT PLANT

The Christies Beach Wastewater Treatment Plant (WWTP) in Adelaide, has undergone several capacity upgrades since it was commissioned in the 1970s but the current \$272 million upgrade by principal SA Water, has involved a much broader scope of objectives and many leading contractors over the 3 year project period.

A Joint Project Team (JPT) from the South Australia Water Corporation (SA Water), United Water International (UWI) and Kellogg Brown and Root (KBR) is delivering the project by providing engineering, procurement and construction management services.

The project will increase the treatment capacity of the plant, provide improved effluent quality primarily through the construction of a new upgraded inlet works and a new membrane bioreactor secondary process train as well encompassing augmentation works for power supply and on-site power generation, effluent disinfection and outfall capacity, additional sludge digestion capacity with on-site sludge dewatering and biosolids loading facilities for off site reuse of the biosolids.

The works are being delivered over three major construction phases, which have been designed so as to allow construction of the first stage while design of the rest of the project was still in progress and work on other stages to be completed while the plant was still operational.

Phase 1 involved the construction of biosolids dewatering and reuse stage and the new outfall; Phase 2 involved construction of the inlet work and sludge handling and power generation; and Phase 3, the construction of C Plant Secondary Process Train and UV Disinfection and A/B Plant Modifications. This phase of the project won a number of awards in 2010 including the national category winner of the Australian Institute of Project Management and the project innovation winner of the South Australian Water Association. A commendation was also received from Engineers Australia South Australia.

BMD Constructions has been involved with the project on three main contracts.

The scope of the early works involved relocation of existing services, the main earthworks, preparation of the site and construction of the road network and associated services.

BMD faced challenges with the need to relocate and upgrade a dense network of underground pipework and electrical services which was constructed in the sixties and upgraded in the eighties, but presenting little reliable records.

The Outfall Project, a 1.2m diameter pipe extending 600m into the Gulf of St Vincent, was delivered by a JV between BMD Constructions and Smithbridge Australia and involved construction of the Ocean Outfall Pipe and associated pipework and concrete structures. This required construction of a temporary 200m jetty to allow access of a 150 tonne crane to facilitate construction of a sheet pile coffer dam in the wave zone.

The construction required the steel pipe to be coated with a layer of 160mm of reinforced concrete, welded together in one piece and pulled out to sea using cables, winches and roller guides. This project was the winner of the South Australian Charter of Civil Contractors Federation Award for projects up to 20 million in 2010.

BMD's scope of works for the C Plant project included the civil components, construction of the activated sludge reactor and membrane structure, the UV Disinfection Facility, Chemical Storage Facility, Transformers and Generators Area, Strain Press Structure and Ethanol Unloading Area and construction and upgrade of all the

roads network, including street lighting infrastructure and all in ground services for the road network.

With a lengthy and impressive history of working with SA Water, Leighton Contractors were involved in Phase 2 of the project, with a design and construct contract to deliver the mechanical and electrical works associated with the sludge handling systems and power generation equipment.

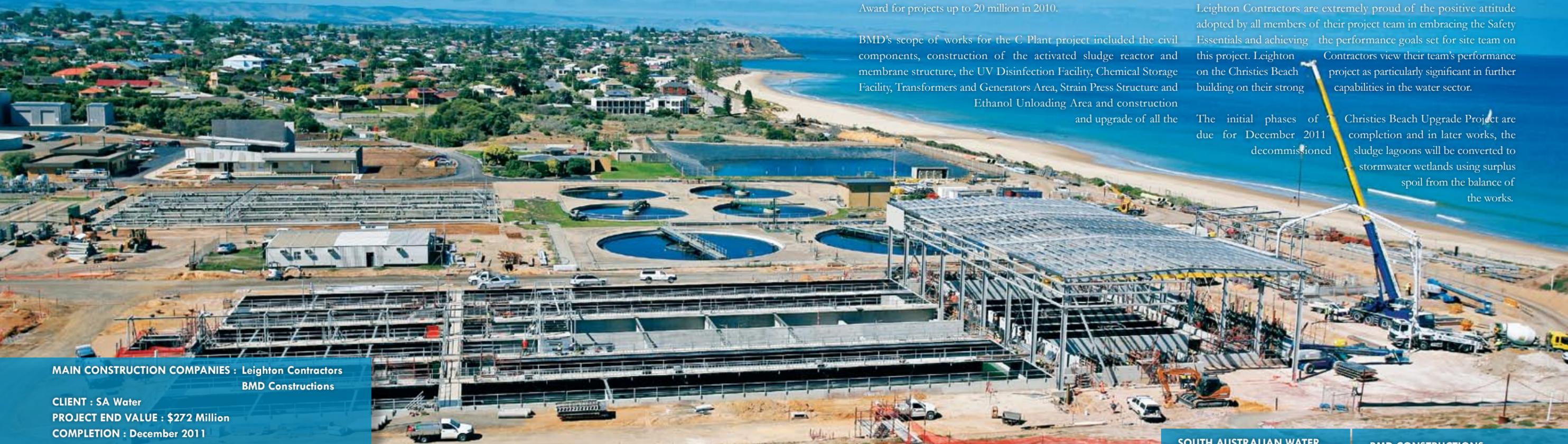
The scope of the works included the inlet screens and conveyor system; the DAFT, effluent system and sludge system; digester upgrades, sludge recirculation and transfer system; gas handling and conditioning, amongst other works.

The power generation system comprised a digester gas cogenerator and a diesel standby generator, all instrumentation, controls, radiator, exhaust system, diesel storage tank in a weatherproof enclosure, synchronisation panels and all LV, controls and instrumentation cabling.

Due to the nature of the phases of the project, the team faced interesting challenges in regard to access and working alongside and around the civil contractors and completed various phases while the treatment plant was still operational.

Leighton Contractors are extremely proud of the positive attitude adopted by all members of their project team in embracing the Safety Essentials and achieving the performance goals set for site team on this project. Leighton Contractors view their team's performance on the Christies Beach project as particularly significant in further building on their strong capabilities in the water sector.

The initial phases of Christies Beach Upgrade Project are due for December 2011 completion and in later works, the decommissioned sludge lagoons will be converted to stormwater wetlands using surplus spoil from the balance of the works.



MAIN CONSTRUCTION COMPANIES : Leighton Contractors
BMD Constructions

CLIENT : SA Water
PROJECT END VALUE : \$272 Million
COMPLETION : December 2011



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LEEDING THE WAY AT CHRISTIES BEACH

Their projects may not seem glamorous and many not even seen by the people who actually use the completed infrastructure, but the team at Leed Engineering and Construction are extremely proud of their achievements in constructing infrastructure for local communities.

Since setting up 10 years ago, Adelaide based Leed has completed major infrastructure projects for both public and private sectors in mining, water management, structural concreting, plant construction, road building and environmental preservation.

A diverse and innovative company, Leed has become a first-choice contractor for many projects and were chosen for the highly complex Christies Beach Wastewater Treatment Plant upgrade in South Australia where they were

contracted to supply and install the pumping station and associated pipework for the Southern Urban Re-use Project.

Leed looked after all the civil and mechanical installation and managed their main subcontractors to handle associated works including: Nilsen for the electrical installation; SAGE Automation for all control systems and telemetry and SADB for the drilling works.

The scope of their civil work on the project included installation of 375 PVC pipeline; 2 HDPE bores under Christies Creek; excavation of below ground manifold (6m deep); slab and small concrete pedestals and the laying and installation of HV cable and pits.

The mechanical works included pump installation and pipe and fittings installation and the electrical works covered the installation of the transformer, magflow, level sensor, pressure sensors and all cabling and ultra link.

In addition, the company supplied and installed the control systems including the switchboard and all programming and data systems.

Leed has a team of over 200 highly skilled personnel working together within a culture that encourages open communication, support and access at all levels. A culture of cooperation, which has proven extremely beneficial in developing effective solutions to issues such as those confronted on the Christies Beach project.

On this project, Leed were confronted with an interesting scenario to solve. They found that the inlet manifold was 6m deep and their site area was confined by a storage pond, large concrete tank and weather station.

This caused major construction issues because as the pit was excavated, the excavator itself became boxed in and could not move back to the front of the pit if the excavation commenced to cave in.

The Leed team solved this issue by implementing a crane for lifting of shoring and pipework and to ensure costs were significantly contained, they coordinated the work to ensure that the crane was only required on site for 4 days, not the entire duration of the works.

To speed up installation of the inlet manifold Leed changed the joints from welded joints

to flanged connections, which were all pre fabricated off site. This however, presented another set of issues in that it meant Leed had to be extremely accurate at the only closing collar in both the horizontal and vertical axis.

Leed Engineering and Construction Pty Ltd was set up in 2001 by its current Directors – Graeme Lawler, Andrew Millar and Mark Jones and provides a wide range of civil and building works including: water management, recycled water and sewer including pump stations and pipelines; Structural concrete including dams, water storage and bridges; process plant construction; mining infrastructure; bulk and detailed earthworks; road works and drainage; services installation and precast, pre-stressed concrete manufacture and installation.

The company owns and operates a modern fleet of plant and equipment, which ensures that they are well positioned to provide the latest and most efficient resources possible.

Leed projects may not be glamorous but their people take great pride in the fact that when you turn on a tap or cross a bridge, they have contributed to the wellbeing of the community, their lifestyle and economy through their activities.

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CLARKE ENERGY

As one of the industry leaders in providing total 'gas to energy solutions', Clarke Energy was contracted to supply the GE Jenbacher Biogas Engine to Leighton Contracting for SA Water's upgrade of the Christies Beach Wastewater Treatment Plant.

Clarke Energy provides complete turnkey solutions for generating clean power from natural gas for cogeneration applications such as CHP to non natural gases and coal gas.

In order to achieve a more sustainable plant with less environmental impact on the local environment and community, Clarke Energy designed a cogeneration system to maximise energy efficiency for the Christies Beach project.

Clarke Energy supplied a GE Jenbacher JMS 312 GS-BL at 625kWe, 50Hz engine coupled to a Stamford brushless rotating field alternator, an exhaust gas fired heat exchanger and two heat recovery skids with redundant pumps to the project.

The GE Jenbacher engine will run on digester produced biogas, which is generated on site from the waste water sludge and generate power to the treatment plant. In turn, the waste heat produced by the engine through combustion will be used to generate heat for the digesters increasing gas production.

This solution presents its own challenges as the engine is operating on biogas with fluctuating methane levels and gas contaminants that need to be removed for use in the engine.

Established in Australia since 1999, the Clarke Energy team of professionals is unparalleled in this industry, with over 380MW of GE

Jenbacher gas engines installed in Australia and NZ. All fully supported by the company's critical mass of parts and service across the region.

Clarke Energy operates from purpose designed premises in Adelaide, which houses the engineering, project, sales, service, parts and workshop support functions to service the Australian and New Zealand operations.

In addition to the Christies Beach project, Clarke Energy is also working on the supply of 4 engines totalling 4MW to both a landfill site in Redvale, NZ and the Woodlawn Bio-Reactor Power Station in Tarago NSW; 1MW gas trigeneration for the 111 Eagle Street and King George Central in Brisbane; 834kW natural gas trigeneration for the Queensland University of Technology Science and Technology Precinct and Community Hub in Brisbane; and 600kW natural gas trigeneration for 20 Bond Street in Sydney.

Worldwide, Clarke Energy employees over 400 staff with offices in UK, Australia, China, France, India, Ireland, NZ, Nigeria and Tunisia.

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