



# MACKAY WATER RECYCLING PROJECT

TENIX ALLIANCE  
MACKAY QLD

## FORMING AN ALLIANCE

Tenix Alliance is one of the largest Australian-owned engineering service providers, operating in the water, gas, industrial and power sectors. The company is unique in its ability to provide total engineering solutions from design, construction to commissioning; and operation for wastewater transfer, treatment and reuse.

Tenix Alliance specialises in the provision of advanced wastewater solutions using sequential treatment processes and membrane technology. It has built over thirty wastewater treatment plants in Australia using SBR (Sequence Batch Reactor) technology, including two plants as part of the Mackay Water Recycling Project. The Mackay North and South Recycling Plants have been designed to treat wastewater from close to 120,000 people, making the project one of the largest applications of SBR technology in the world.

The Mackay Water Recycling Project was conceived by Mackay City Council (now Mackay Regional Council) to reduce damaging nutrients being discharged to waters surrounding the Great Barrier Reef. By providing a reliable and high quality source of recycled water, it also reduces local farmers' reliance on ground water for irrigation. The use

of groundwater had been causing significant salt water intrusion into local soils and aquifers.

The Mackay South site also presented a major design challenge. Although the new plant was nearly ten times the capacity of the existing plant, it was still required to fit within the existing site. SBR technology allowed efficiencies to be gained in construction and plant operation. Reactor volumes were optimised, lowering construction costs. The sequential treatment processes mean that power usage will be optimised during operation.

Together with its joint venture partner, John Holland Pty Ltd, the Tenix Alliance-John Holland Joint Venture was responsible for project delivery. Tenix Alliance was responsible for process, civil, mechanical, electrical design and testing, and commissioning. John Holland was responsible for the construction. Construction is essentially complete with commissioning and testing by Tenix Alliance underway. Following process-proving, Tenix Alliance will be solely responsible for plant operation of the water recycling facilities for a minimum period of ten years.

Tenix Alliance is currently delivering similar wastewater treatment projects around Australia including the Wagga Wagga Sewer 2010 Project, in NSW. This project involves the upgrade of three wastewater treatment facilities, all using SBR technology, and is valued at over \$40 million. Tenix Alliance is also building four additional aeration tanks at Melbourne Water's Eastern Treatment Plant, each measuring 100m long, 50m wide and 6m deep, making it one of Australia's largest water industry construction projects.

Tenix Alliance is also delivering several advanced wastewater treatment facilities for municipal and industrial reuse. Tenix designed innovative MBR (Membrane BioReactor) treatment plants to produce recycled water for reuse within local communities, as part of the Bega Valley Sewerage Program. MBR technology is also being used, in conjunction with Reverse Osmosis (RO), to produce high quality recycled water for use in the maltings process for Joe White Maltings in Perth and Ballarat.

Tenix Alliance has also designed and built UF (Ultra Filtration) treatment plants for innovative reuse schemes in Victoria. UF plants

at Mount Hotham and Mount Buller are producing recycled water for snow-making purposes at local ski resorts. An Ultra Filtration plant at Brushy Creek was designed, built and commissioned within a 16-week fast-track program to enable Yarra Valley Water to meet commitments to enable the irrigation of community parks and sporting facilities.

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## UNRIVALLED EXPERIENCE

John Holland provides engineering and construction management services throughout Australia, with capabilities in the fields of water, healthcare, mining, power, rail, roads, structural mechanical process, communications, tunneling and aviation services.

The Mackay Water Recycling Project was an equal joint venture project between John Holland and Tenix Alliance. The 140 million dollar joint venture began in 2007 and, now largely complete, is the largest water reuse facility in regional Australia. The scale of the project is reflected in the thirty-five strong design team and forty-five staff on site for the construction phase.

The aim in building the new waste water recycling facility at Mackay, commissioned by the then Mackay City Council (now the Mackay Regional Council) was to create a more sustainable approach to water use and management by recycling ninety percent of Mackay's waste water to a Class A standard for use in the irrigation of local sugar cane crops and sport fields.

The Mackay Water Recycling Facility will allow groundwater resources to be rehabilitated. As farms draw fresh water from bores, it is replaced by seawater and over time creates saline soil, which is not conducive

to growing crops. The use of recycled water to irrigate the sugar cane crops on twenty-seven properties will allow the groundwater levels to be restored and the quality of groundwater and soil to be maintained to a greater level.

The Great Barrier Reef will also benefit hugely from this project by eliminating the 250 tonnes of nutrients that are currently expelled out to sea every year, threatening the reef with high levels of phosphorous and nitrogen concentrations. Instead the facility will treat waste water using an advanced system known as a Sequential Bio Reactor. Unique in its design, the Sequential Bio Reactor separates and filters waste water in a deep filter gallery using a sand and coal filtration system.

Wastewater will be transferred from the city of Mackay out to the Baker's Creek site to the water recycling facility in new 900mm and 650mm diameter pipes, adding up to a total of 18km of pipelines. Water is then treated in the Sequential Bio Reactor tanks to Class A water standard and directed to the large storage dam, with a capacity of 2,200 ML, where it is stored before being distributed to the twenty-seven smaller storage ponds for use in crop irrigation.

While Tenix was able to provide the design, commissioning and operations resources they relied on John Holland for resourcing of the construction activities, and to lead the construction phase, initially providing constructability advice for the design and then managing all construction activities. This Construction Management role included managing staff, both direct workforce and subcontractors, to complete the capital works section of the project. John Holland also co-ordinated the engineering aspects between structural, civil, mechanical and electrical disciplines with a view to ensure the final product was both cost efficient and constructible.

The specialist skills of the John Holland's Water business were required in the Mackay Water Recycling Project. John Holland Water specialise in water treatment, wastewater treatment, desalination, water recycling and reuse, bulk water catchment, water and wastewater transfer and network distribution, plant operation and asset management.

John Holland's Water business provided specialist procedures during various stages of the works on the Mackay Water Recycling Project. The need to cut over existing town infrastructure into the new scheme, while still maintaining the ability for the residents and businesses to continue without interruption to the network was an extremely challenging yet

crucial aspect of the overall project. Other existing constraints included the need to retrofit a small part of the old water plant for reuse in the new facility, and the need to consider creek crossings. The construction of the facility also needed to comply with the license conditions of the existing water plant, in accordance with the conditions of the Environmental Protection Agency.

John Holland has been involved with other projects of a similar size and scope including the Murrumba Downs Alliance in Queensland, Rouse Hill Recycled Water Plant (RWP) Stage 2 Amplification in New South Wales, Coffs Infrastructure Alliance and the Sunset Coast Water Alliance in Western Australia.

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(Before)



(After) BASF Concrecive 2525 and Sand Repair with a Mastertop 1080 Floor Coating Sandvik Prok Mackay

## CONSOLIDATING MAINTENANCE

With over twenty years of experience, Consolidated Plastics and Epoxy are specialists in preventative maintenance products and services such as concrete coating and repair work in the mining, sugar, construction and process industries. Based in Mackay, and with a staff of fourteen, Consolidated Plastics and Epoxy is ideally located to play a leading role in preventative maintenance products and services across Queensland. Their recognised level of expertise, however, puts them in demand on projects right across Australia.

The range and variety of products and services offered by Consolidated Plastics and Epoxy is immense, from engineering plastics and grouts to polyurethane, epoxies and rubbers. What this range of products and services has in common is the aim to provide solutions that will reduce the need for maintenance and improve the working life of infrastructure and equipment.

Consolidated Plastics and Epoxy has a leading edge in the business by providing both on-site services as well as the supply of components and construction chemicals. The on-site, or construction, component of the business includes services such as concrete repairs and coating, grout injection, acid proof coatings, polyethylene pipe welding, and grout placement.



BASF Ucrete Application  
Incitec Pivot Acid Plant Mt Isa

Consolidated Plastics and Epoxy's role in the Mackay project involved stabilising the SBR tank walls with M Brace, which is a BASF construction chemical. The M Brace was coated with concrecive 1446 to provide long lasting protection from corrosion associated with waste water facilities.

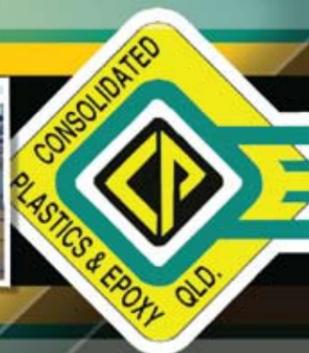
The other side of the business is the supply of construction chemicals such as Epirez, BASF, Flowcrete and Parchem. Consolidated Plastics and Epoxy are also distributors for Crane Resistoflex, lined piping and valves.

Consolidated Plastics and Epoxy are leaders in providing preventative maintenance and service solutions and have worked on projects for the Lady Annie copper mine, the Incitec Pivot Acid Plant, Mackay Sugar, and Orica's chemical plant at Gladstone. Consolidated Plastics and Epoxy can travel to any destination in Queensland and right across Australia to supply services and components for a wide range of projects.

The Consolidated Plastics and Epoxy website provides in-depth listings of all of its large range of products and services as well as technical data and industry-specific information for projects associated with the sugar, process and construction industries.

## CONSOLIDATED PLASTICS & EPOXY QLD Preventative Maintenance Products

- High Density Polyethylene Machine Guards and Covers
- Filter Belt Wear Slides
- Polyethylene Easy Clamp Skirting Clamp
- Steel Pipe Polyethylene Lined
- Custom Polyurethane Components
- Workshop Safety Equipment and Floor Coatings
- Concrete Repairs and Acid Proof Coatings
- Polyurethane Scrapers
- Ultra High Molecular Weight Polyethylene Linings





## A PASSION FOR MAKING THE GRADE

Earth Commodities Bundaberg, (formerly Sunstate Sands (Aust) P/L) has been producing high quality silica sand in various grades for specialist and landscaping/construction applications since 1996. Located on the picturesque Queensland coastline, Earth Commodities Bundaberg comprises three plants; wet, dry and coarse, taking the product through varied processes including washing, drying, and sieving in order to generate specific gradings for industry and other end users.

In order to supply specialist gradings such as the filtration media supplied for the Mackay Water Recycling Project, raw material is washed, tested, dried, graded over several different grading machines and tested again before packaging for the customer. The stringent site quality process that Earth Commodities Bundaberg maintains, is vital to the integrity of the grading and gives the quality customers know and expect. This reputation for superior products has resulted in the company supplying a variety of tailor-made gradings for water filtration projects in Queensland and New South Wales, customised gradings to meet highly specialised requirements becoming a company speciality.

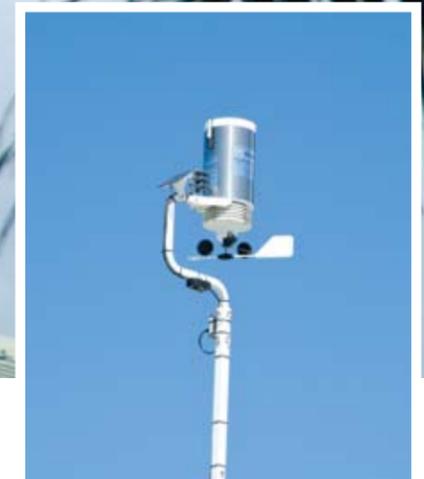
In 2006, Earth Commodities purchased Sunstate Sands (Aust) P/L as one of many mine and quarry sites that formed part of a long term plan to create a strong group of independent quarries and pits providing quality products to local, national and global customers. Now the largest independent quarrying company in Queensland, Earth Commodities

owns seven sites in total providing our customers with a broad range of materials. Annually, their dedicated and hardworking staff of 70-plus provide clients with approximately 2 million tonnes of products.

Earth Commodities has locations at Gladstone, Helidon, Rockhampton, Yaamba, Yeppoon and Mackay, in addition to Bundaberg and the Head Office in Brisbane. From these depots with their diverse geological resources, they supply not only high quality silica sand, but also alluvial sand, blue metal, granite and sandstone. The range produced from these key materials includes railway ballast, roadbase, concrete aggregate, paving and sealing aggregate, fill, drainage aggregate, landscaping rocks, boulder wall rocks, cement blend sand, bedding sand, 2mm and 3mm pebble mix for concrete pools, and river pebbles from 7mm to 50mm.

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## WEATHERING THE STORM

Envirodata is a weather station and weather sensor specialist that has been operating in Australia for twenty-six years. Envirodata supplied weather station equipment and software to the Mackay waste water recycling project to determine when the wind conditions are suitable for the release of recycled waste water from the storage ponds to irrigate the sugar cane crops.

While the Bureau of Meteorology operates weather stations across Australia, their focus is largely on the macro-scale weather patterns across regions. Envirodata supplies weather stations and sensors that are designed to measure the micro-environmental conditions of a specific location.

As we become increasingly mindful of our impact on the environment, there is more awareness about the impact of certain activities on the environment. This has also led to requirements about the way certain activities are carried out, such as on industry and mining sites that need to measure whether the requirements of the Environmental Protection Agency are met.

A key component of the Mackay waste water recycling facility is the distribution of the Class A recycled water amongst twenty-seven farm properties for use in irrigation. It is important that irrigation occurs using the recycled water at times when the wind-speed and direction is not going to encourage the spread of odour associated with the water. Envirodata supplied its AirData vector analysis software with

the equipment, which is used in applications where it is necessary to determine the precise wind direction and wind speed in a given location such as on cotton farms, feedlots and water treatment plants.

While there are systems that measure the wind direction and speed when it is constant, it is a more challenging task to measure an exact wind direction and speed that, in reality, will vary. Using vector analysis the AirData system overcomes this problem by measuring wind direction as affected by wind speed.

Envirodata provides customised weather station solutions that are specifically designed and manufactured to fit the needs of each project, which has the added assurance of the provision of a mobile on-site service unit to deal with any repairs or re-calibration of equipment each year.

### ENVIRODATA

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## REINFORCING VALUES

Monaco Distributors is a family owned business that specialises in fibre reinforced polyester (FRP) products such as stair treads and floor gratings. Monaco Distributors is the Australian distributor for Powergrid products, a wide range of which were used in the Mackay North and South Water Recycling Project.

A mission of Monaco Distributors is to give sustainability and the environment a high priority in their design decisions. In conjunction with these environmental priorities, there is also a strong ethos at Monaco Distributors to develop FRP composite solutions in a way that embraces new age engineering challenges where performance, sustainability and the environment are key factors in influencing the final decision.

The decision to use Powergrid FRP products in the Mackay project rather than conventional stainless steel solutions was driven by both cost and performance factors. Powergrid pultruded structural profiles, including I-Beam and Equal Angle, were used extensively as the structural support members for the Inlet Works Odour Covers, Flow Meter and Pump Station Pits, and Filter Structures.

This proved not only to be a cost effective alternative to using stainless steel, but also a solution that has been proven to last. Metal grating can be corroded or chemically attacked in certain applications including in the use of wastewater facilities. The strong performance of Powergrid products in these conditions is due to the ability to maintain excellent chemical resistance through the use of premium resin systems,

continuous E glass rovings and quality fillers. This system provides the best available resistance against chemical attack and corrosion across a wide range of applications.

All Powergrid products are UV treated, conform to international standards, are self-cleaning, are fire retardant rated to ASTM-E84 and ASTM-D635 standards, and do not require painting. The non-slip feature of the floor grating is an added benefit, particularly where walkways are exposed to the elements, including the open mesh FRP grating that was used for the surrounding areas above the inlet works, walkway and stair treads in the Mackay waste water facility.

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## TOTAL SUPPLY

Total Fasteners is a specialist fastener supplier to the mining, construction, engineering and manufacturing industries. Operating for over fifty years, Total Fasteners is highly experienced in the supply of special fasteners to industrial projects. With 13 branches across Australia, and a total of 140 staff, Total Fasteners can provide both standard and special fastener solutions to projects around the country.

In addition to the vast range of standard fasteners available off the shelf, Total Fasteners has the capability to source and supply all types of special fasteners to suit almost any specification. Total Fasteners has supplied fasteners to the BMA mine sites, sugar mills, the ammonium nitrate project in Moronbah, the Mackay waste water recycling facility and many other projects around Australia.

The Paget branch of Total Fasteners, with its staff of 20, supplied and installed fasteners to the Mackay Wastewater Recycling Facility. Their role in the Mackay wastewater recycling project was to supply specialised stainless steel and galvanized fasteners for the construction of the underground pipelines that would carry effluent between Mackay city and the water recycling plant. They also supplied fasteners for the pipelines to carry recycled Class A water from the water recycling plant to the storage ponds. In total 22km of new pipeline was constructed for the new waste water recycling facility at Mackay using special fasteners that were supplied by Total Fasteners.

Total Fasteners can supply specifications or custom drawings. In many cases, however, Total Fasteners can find a standard, off the shelf alternative that will often save the time and money associated with custom solutions. In addition to supplying fasteners, Total Fasteners also carry a large range of safety, abrasive, hand and power tools and general consumable and industrial products.

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## SPECIALIST SOLUTIONS FAST

Waiting up to five months for essential parts can really complicate a project. That's why the Tarago Water Treatment Plant in Victoria has components from Allflow Supply, who can deliver made-to-order couplings, special piping system components and valves within 8-10 weeks. Their success is founded on relationships with manufacturers worldwide which expedite their orders.

For Mackay's new water recycling project, they provided large bore couplings and dismantling joints in 928mm and 1027mm sizes. These are a specialty cast iron product manufactured by Pipemate, featuring a fusion bonded epoxy coating for corrosion and abrasion resistance.

"They are like a shock absorber," explained Allflow Supply's General Manager Peter McLennan. "They are used in pipework for structures like bridges, where there is going to be movement of the pipe. The Pipemate couplings take up that movement, to retain the integrity of the pipework."

"In terms of projects like Mackay Water Recycling facility, these particular couplings have the ability to handle high pressures, so there doesn't need to be a major range of different pressure ratings. "A fully epoxy coated coupling is better because all the steel is encased reducing long term corrosion often seen with conventional painted or stainless steel couplings. Couplings are used to take up expansion, contraction and other movement, such as seismic events. If a standard welded flanged joint is used it may crack and fail with movement."

Pipemate are based in Malaysia, and are one of the world's largest suppliers of couplings. Hundreds of their couplings were used in the Southern Regional Pipeline project.

Allflow Supply's product range also includes dismantling joints, flange adaptors and step flange adaptors. These are all no-weld, creating a time and cost saving not only during construction, but throughout the pipework's life, as the need to x-ray welds for deterioration is removed. Another product line is plastic chemical piping which is a specialised hazard rated non-corroding piping with a 25 year lifespan. Bundaberg Ginger's factory recently installed this to replace metal piping which was deteriorating within six months due to the acidity of ginger.

Based in Brisbane, the company can provide specialist pipework solutions Australia wide within short timeframes, and can also provide projects with advice at tender stage.

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## PUTTING OUT ALL THE STOPS

Traffic Control Mackay & Districts is a locally owned and operated company that began operations in March 2007 servicing the Mackay & Regional areas. Traffic Control Mackay & Districts provides all Traffic Management Plans and Approvals and the highest standard in Traffic Control. Traffic Control Mackay achieves this by employing staff that are reliable and dedicated to their role of erecting the appropriate signage for each project and by undertaking the necessary risk assessments. Traffic Control Mackay & Districts is dedicated to delivering safe & efficient work sites, as reflected in their business logo "Safety is our Business".

Traffic Control Mackay & Districts was contracted by McCourt Dando (Service Stream) which was involved in the Mackay Wastewater Recycling Project. As a large project, constant liaising

was needed between Traffic Control Mackay & Districts, McCourt Dando (Service Stream), Tenix Alliance John Holland and the Mackay Regional Council. This ensured that all the appropriate Traffic Management Plans and Approvals were in place and aided in the efficient productivity of the project.

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Owners David and Susan Peulen



## TRUE BLUE SUCCESS STORY

Neil Mansell Group's Premix division performed some of the largest concrete pours ever undertaken in Mackay at the main pumping station for the Mackay Water Recycling Project. "One of the pours was 1,000m<sup>3</sup>," said Mansell's spokesperson Gary Blackburn. "That was done at night, and we had 23 agitators on it at one stage."

There were three night pours required during the twelve months 35 company staff supplied and delivered concrete to the project from Mansell's Mackay plant.

Other major works include supplying 16,000m<sup>3</sup> concrete for Wivenhoe Dam Upgrade, 25,000m<sup>3</sup> for Burdekin to Moranbah Pipeline, and ongoing supply exceeding 38,000m<sup>3</sup> for Darling Downs Power Station. Mansell Premix Pty Ltd operate Mobile and Fixed Batch Plants throughout QLD.

Managing Director Neil Mansell began his company hauling produce from North Queensland to Sydney as an owner-operator back in 1962. Today, the group has grown to 13 divisions including engineering companies, steel fabrication, heavy transport, concrete, neonatal transport, property development, panel and paint, metal supplies, welding, crane hire, mining and quarrying, landscaping and aircraft. Neil Mansell Transport P/L division is the major company moving Oil Rigs and Gas and Oil pipelines throughout Australia.

Approximately 460 staff are employed across the group, with headquarters in Toowoomba, and offices in Adelaide, Moomba - Cooper Basin and Maroochydore. Mansell Premix has concrete plants in Mackay, Moranbah, Bowen, Gympie, Tin Can Bay, and Bundaberg.



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