



# SYDNEY AIRPORT R.E.S.A.



**CLIENT :** Sydney Airport Corporation Limited  
**MANAGING CONTRACT CONTRACTOR :** Baulderstone Pty Ltd  
**DESIGN CONSULTANT :** Aurecon Pty Ltd  
**PROJECT END VALUE :** \$100 Million  
**COMPLETION :** June 2010  
**AREA SIZE :** 8,100m<sup>2</sup>  
**SURVEYING SERVICES :** Ross Robinson Surveys  
**DILAPIDATION SURVEY :** Tasman Associates  
**TEMPORARY DESIGN WORKS :** Hawkins Engineering  
 MJ Civil Engineering



## MORE THAN MEETS THE EYE

**B**aulderstone has successfully completed construction of the Runway End Safety Area (RESA) at the western end of Sydney Airport's Runway 25. Despite enormous inherent difficulties in both the planning and construction phases of the project, Baulderstone completed the construction well within the estimated time frame.

RESAs are cleared ground areas located at each end of a runway at international airports. They are intended to minimise the harm to passengers in the unlikely event that an aircraft overruns or lands short of a runway. The complex work took a year and a half to complete at a cost of around \$100 million.

There is not a lot to see - only a paved and concreted area of flat space. Most of the impressive work is below the surface of the ground.

Spanning the M5 East Tunnel and Sydney's largest sewer culvert, the RESA was constructed on a series of land-bridges, making it Australia's first suspended concrete RESA deck. The deck is a 8,100m<sup>2</sup> surface of raked concrete, designed to enhance aircraft deceleration and to support emergency vehicles and equipment. The SWSOOS culvert is supported on a separate structure which was

constructed used the largest pour in Australia of specially mixed self-compacting concrete.

Sydney Airport Corporation Limited (SACL) was required to provide a Runway End Safety Area (RESA) at the end of all its runways to comply with new Civil Aviation Safety Authority (CASA) requirements. The new standards - which are consistent with international requirements - aimed to improve aviation safety and ensure the requirements of larger, new aircraft such as the A380 are catered for. As well it required a load bearing capacity to accommodate the heavier aircraft that are likely to be developed in the future.

The RESA for Runway 25 was the last and most complex of the six constructed at Sydney Airport. Work on the site was complicated by its proximity to an operating runway, the Cooks River, and the site difficulties of construction within reclaimed ground following disturbances from previous work on the sewer and the M5 tunnel. More significantly, the project faced critical engineering challenges because the new 25 RESA spans:

- The busy M5 East Motorway Tunnel
- The largest sewer culvert in Sydney, Sydney Water's heritage listed

and extremely fragile South Western Sydney Ocean Outfall Sewer (SWSOOS). This sewer - the largest in Sydney - is capable of carrying over 4 million litres of sewage per hour and serves a major portion of western and south-western Sydney

- The existing airside, perimeter road
- Energy Australia's realigned 132kV gas impregnated HV cables
- Ethane gas pipeline

Problems were successfully resolved following rigorous consultation and cooperation with Sydney Water, Energy Australia, the RTA and Sydney Airport to ascertain and thoroughly implement their requirements for the new construction.

To reduce the time the runway use was restricted, work was carried out seven days a week, generating around 770 construction jobs. There was also ongoing night works including excavation and jet grout piling works, removal of substantial volumes of excavated material, pavement construction work, and construction of a storm water detention basin.

The project also included a significant community consultation and stakeholder engagement program. On-going 24/7 construction noise

monitoring, as well as the unavoidable disruption to aircraft noise sharing during the 19 month construction period, each had a potential impact on people living close to the work site and, more broadly, on people living around the airport or under flight paths. SACL ensured affected residents were kept regularly informed about progress with the project, and ensured an effective complaints handling process was in place. The completion of the work means that the usual aircraft noise sharing arrangements have resumed.

Baulderstone was the managing contractor entrusted with the management and delivery of the construction works. Despite the complex technical difficulties of the project, the work was completed successfully to the satisfaction of SACL and its stakeholders as well as the Australian Government.

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# BUILDING IN MUD

Menard-Bachy specialises in a wide and comprehensive range of geotechnical and civil engineering services. It has been involved in the business of soil stabilisation since the 1960s. Its original founder, Louis Menard, started the Menard Company in France fifty years ago.

Louis Menard developed many of the ground improvement techniques in use today including inventing a now commonly used Pressuremeter to predict the settlement of soils and their load bearing capacity. The company has since had an impressive history.

Boulderstone retained Menard-Bachy in 2008 to stabilise the ground for the construction of the underpass of the perimeter road for the now finished Sydney Airport's Runway End Safety Area (RESA). The perimeter road goes underneath the heritage listed main Sydney Southern Sewer. The construction of the underpass, with its foundations at a depth of 6m below sea level, was mostly in the soft clay and presented specific geotechnical problems.

The site at the RESA was originally low lying but the ground contours had been altered during previous construction works, leaving the density and composition of the earth highly variable to depths of 14 metres.

Menard-Bachy proposed the use of the technique of Jet Grouting to resolve the multiple problems of ground stabilisation. Temporary works involved a buttressed cofferdam of interlocking Jet Grouted columns, designed to prevent water seepage and provide ground retention. The base of the coffer dam was treated by Jet Grouting which allowed the then improved ground to provide a brace for the excavation, as well as reinforcing the soft clay material, creating stable ground for the construction of the base slab, drainage lines, pit and pump station.

The complex scheme of Jet Grouting included around 1600 columns ranging in length from 1.5m to 13m. Despite movement being limited around the sensitive structure, 500 of these were installed under the sewer and in between its supporting piles. Jet Grouting columns were also installed down to the sand layer to support the formwork of the Sewer Support Structure, before the load was transferred to four external large bored piles and the old piles removed.

The overall results were extremely satisfactory and both Menard-Bachy and Boulderstone were pleased with the outcome.



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# Soils ain't soils.

Enviropacific is a company that prides itself on its overall capabilities in the specialist fields of environmental remediation and demolition.

Enviropacific maintains a core focus on contaminated site remediation, including the safe and reliable handling and disposal of complex wastes.

Enviropacific specialises in asbestos management, hydrocarbon remediation of contaminated areas like former gasworks and petrochemical industrial sites, and treating contaminated water in and ex situ. It also undertakes large scale demolition works.

Enviropacific were enlisted by Baulderstone to manage and treat the estuarine soils that were excavated from the Sydney Airport's RESA site adjacent to the Cook's River. This involved treating the potential and actual acid sulphate soils, and restoring their pH balance for beneficial reuse on site.

The problems at the RESA site were typical of the wide range of obstacles remediation specialists must overcome. Enviropacific had some issues regulating the end pH of the estuarine mud, however on re-evaluation of the treatment procedures this problem was overcome. All treatment work successful, resulting in safe, neutralised, reusable fill which was then used in the backfilling process.

Enviropacific works with impacted soils of all kinds. The company offers a broad range of environmental services, a proven track record in project delivery, Quality Health and Safety and Environment accreditation, with the in-house resources to undertake remediation projects of all complexities.

An example of this is the former BHP steel works site at Mayfield, NSW (see picture above). Site work involved the 'capping' of over ten hectares using a combination of site sourced fill, slag and imported capping material. Contaminants included acid sulphate soils, heavy metals and hydrocarbons. Enviropacific's role was to coordinate all validations and reporting requirements with the environmental consultant, as well as providing extensive material tracking and treatment for the project.

Other projects Enviropacific are currently working on include a creek restoration and contamination capping project in Balmoral, and a challenging remediation project at the Australia Post Distribution centre in Alexandria. With the latter site covering an area of 25,000 square metres, this is arguably Enviropacific's most technically complex undertaking to date.

Meanwhile their demolition team is dismantling and packaging up a textiles factory in Lisarow on the NSW Central Coast for relocation overseas.

Enviropacific has been operating in New South Wales, Queensland, South Australia and Victoria for nine years. They employ seventy people, amongst them in-house staff consisting primarily of environmental and civil engineers supported by a diverse range of project managers, engineers, and environmental and chemical scientists. Enviropacific makes full use of all of their staff's wide and varied expertise in the development and management of all projects.

Enviropacific has a vast inventory of mobile specialised environmental remediation equipment that can be deployed for treatment of contaminants in soil sludges, industrial residue and groundwater. A substantial amount of this equipment has been designed and constructed in-house and is based and derived from improvements suggested by hands on experience.

Their state-of-the-art pieces of equipment include a mobile Direct Fired Thermal Desorption Unit, a highly mobile direct injection unit for in situ ground water treatment; an Hitachi soilfixer with remarkable capabilities for soil stabilization; and ozone injection systems capable of in situ and ex situ groundwater treatment.

Enviropacific invests heavily in research and development to ensure they offer sustainable and scientifically robust solutions to contaminated soil and water problems. They are always trialing new products and techniques and their in-house chemists are constantly occupied in the research and development of such products and techniques. They have a strong relationship with other research centres and the various regulatory bodies which ensures the company has its finger on the pulse in a rapidly evolving industry.



STA Bus Depot Remediation; Ph stabilization of excavated spoil for reuse onsite



BHP Mayfield Closure Area Stage 1- The identification and management of Spoil from 1050m of two open drains treating 9038m3 of PASSsite



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