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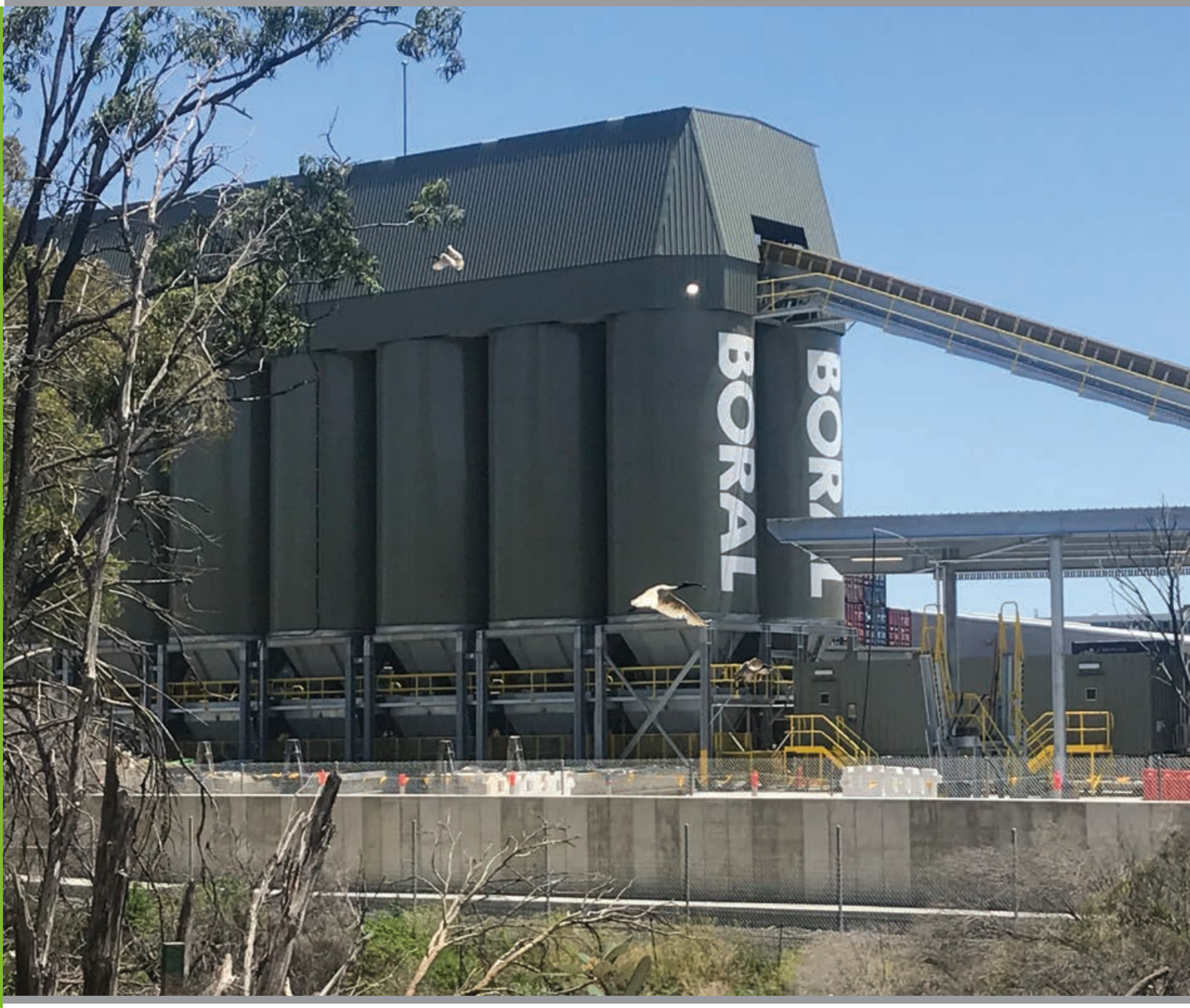
Asia Pacific Edition
HOT DIP GALVANIZED STEEL

AWARD WINNING GALVANIZING DELIVERS DURABILITY, SUSTAINABILITY AND COST-EFFECTIVENESS

In this issue



Welcome to the latest edition of *Galvanize.* This edition profiles the 2018 Sorel Award winners, with detailed case studies illustrating the skill and expertise clearly present in each of the award-winning projects.

The Sorel Award is designed to highlight the high standards of design, fabrication, construction and corrosion protection achieved when hot dip galvanizing features as a key component of a project. In 2018, there were three entries into the Sorel Awards, all of which were evaluated by our expert judges, Arun Syam (Liberty OneSteel) and Peter Dove (GHD).

According to Syam and Dove, "All three projects exhibited strong sustainability credentials and, combined with the durability aspects, provide excellent market development potential. They are all worthy Sorel entrants."

Peter Golding
Chief Executive Officer

galvanizers ASSOCIATION OF AUSTRALIA

Editorial
Sally Wood, Wordly
Prepared by
Galvanizers Association of Australia

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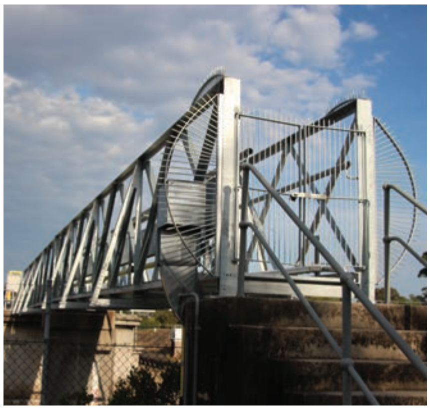
AWARD WINNING GALVANIZING DELIVERS DURABILITY, SUSTAINABILITY AND COST-EFFECTIVENESS *CONTINUED*



The **Boral CBD Concrete Manufacturing Plant** in Melbourne won the 2018 Sorel Award. This project is a stand out example of why hot dip galvanizing is the surface coating of choice, particularly compared to the traditional option of paint over steel.

Boral's previous CBD concrete manufacturing facility was compulsorily acquired for the Melbourne Metro Tunnel Project. As such, Boral chose to build a new high capacity plant in West Melbourne. The brand new, three acre site has the greatest capacity of any Boral concrete plant in Australia and is expected to produce 120,000m³ of concrete in the first year of operation, with an overall capacity of up to 350,000m³ per annum.

Originally specified as a 'paint over steel' project, Boral switched to hot dip galvanizing due to its superior performance in an aggressive environment. Steel structures in concrete manufacturing facilities are exposed to water, aggregate, cementitious binders and additives. Over 380 tonnes of steel is used on this three acre site, with approximately 85% of the steel galvanized. Hot dip galvanizing offers Boral an extended time to first maintenance and its performance delivers total life cycle cost benefits to the facility.

"Boral were quite visionary for using hot dip galvanizing. The project's environmental commitment and community engagement in inner city Melbourne demonstrated its responsibility to the community at large," said Syam and Dove.

The $9.8 million **Les Wilson Barramundi Discovery Centre** received a High Commendation. The project involved the redevelopment and expansion of a visitor centre on a barramundi farm and hatchery in Karumba, a remote town near the Gulf of Carpentaria in Far North Queensland. Hot dip galvanizing was used in the 87 tonnes of structural steel members (including tubular sections), which are visible to the Centre's visitors.

According to the judges, "Architectural merit and sustainability combine in a remote location. Galvanizing combined with the architect's vision provides a durable iconic land mark for the community and tourists alike."

The **Potts Hill Pressure Tunnel Bridge** also received a High Commendation. Metal structures at the Potts Hill Pressure Tunnel intake tower had deteriorated. As such, Sydney Water deemed it necessary to replace the truss bridge that provides access to their operational assets. This project involved the design, fabrication and installation of a replacement truss bridge that not only looked similar to the existing heritage-listed Potts Hill bridge, but was compliant with today's design codes and standards. The new bridge consists of two 12.3m long, 1.5m wide fully welded truss frames that were each galvanized in a single dip.

"There were some inherent complexities for the hot dip galvanizing process. The Potts Hill Pressure Tunnel Bridge provides an innovative example of a heritage replica which incorporated elements of the original structure while meeting modern design requirements," said Syam and Dove.

We hope you enjoy this issue and welcome feedback from readers. If you require further information about any of the stories in this edition, please feel free to contact GAA.

All three projects exhibited strong sustainability credentials and, combined with the durability aspects, provide excellent market development potential.

BORAL CONCRETE MANUFACTURING PLANT

SOREL AWARD
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Boral's existing CBD concrete manufacturing facility in Melbourne was compulsorily acquired for the Melbourne Metro Tunnel Project.

As such, Boral chose to build a new high capacity plant in West Melbourne. The location provides excellent site accessibility to road infrastructure and expands Boral's supply radius to 20km.

The new three-acre site has the greatest capacity of any Boral concrete plant in Australia and is expected to produce 120,000m³ of concrete in the first year of operation, with an overall capacity of up to 350,000m³ per annum.

Originally specified as a 'paint over steel' project, Boral switched to hot dip galvanizing due to its superior performance in aggressive environments. Steel structures in concrete manufacturing facilities are exposed to water, aggregate, cementitious binders and additives. Hot dip galvanizing offered Boral an extended time to first maintenance and its performance delivers total life cycle cost benefits to the facility.

The Use of Hot Dip Galvanizing

Over 380 tonnes of steel were used in the construction of the manufacturing plant, approximately 85% of which was hot dip galvanized for a range of applications.

Boral's plant was purpose built with an expected life span of 30 years. The selection of hot dip galvanizing delivered a protective coating manufactured to last for the life of the plant. In comparison, 'paint over steel' offered a shorter life span, which would have contributed to additional costs in scheduled maintenance to retain corrosion protection.

Galvanizing was used in:

- The building framework and substructure, as the site sits 1.5m to 2m above the ground with a storm water capture system established under the plant floor.
- Silos and hoppers, as well as conveyor systems, cable trays, truck cleaning bays and access systems.
- The slump stand; this is where mixer trucks measure the concrete consistency, then add water or additives to achieve the optimal consistency.
- The 4.5 tonne grates in the vehicle bays; these grates hold quarry trucks weighing up to 45 tonnes as they release the raw materials (such as rock and sand) into the holding bins beneath the grates.

The concrete manufacturing process requires quarry trucks to dump rocks and sand through galvanized grates into catchment bins. The rocks are separated, transported by conveyor and stored by size; 20mm, 14mm, sand and dust, in silos. As such, Boral's plant also consists of large galvanized storage silos that hold various bulk ingredients (like cement, aggregate and water), mechanisms for the addition of various additives and amendments, machinery to accurately weigh, move, and mix some or all those ingredients, and facilities to dispense the mixed concrete, often to a concrete mixer truck (concrete agitator truck). It is an aggressive environment that requires high performance structures to support the high-capacity demands of a plant with a time sensitive product.

In an environment with large rocks moving through the production process, along with chemicals, additives and water, hot dip galvanizing delivers long term performance. Galvanizing not only prevents corrosion in water prone areas of the plant, it also offers a low maintenance alternative to paint in less corrosive zones of the plant and has greater resilience to chemical residues used during the manufacturing process.

BORAL CONCRETE MANUFACTURING PLANT *CONTINUED*

Technical and Engineering Innovation

The West Melbourne site is designed for efficiency. It has the largest capacity of any concrete manufacturing plant in Australia, with 24-hour production capabilities and 16 storage silos.

The site features process flows that maximise production volume, product storage and vehicle filling for high efficiency output. The site architecture flows light vehicles anti-clockwise and heavy vehicles clockwise for more efficient traffic flows across the site. This system combined with a three-lane structure for truck loading and the site configuration enables mixer trucks to be loaded in three minute intervals.

Environmental and Social Responsibility

Several environmental and social initiatives were implemented across the Boral site. Concrete production can create dust and water run-off due to the nature of the products involved in the manufacturing process. As such, all concrete manufacturing sites require mitigation strategies to avoid effecting local neighbourhoods or waterways.

Water is used for two main purposes at a concrete plant: to mix with the dry products to create concrete; and to clean (or 'washout') the concrete equipment. To avoid any contaminated water entering the local storm water system, the site sits 1.5m to 2m off the ground, with a storm water capture system running under the plant.

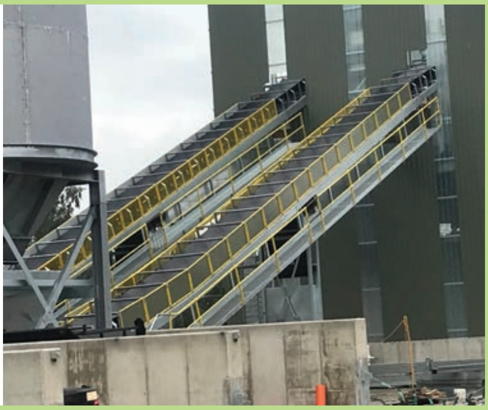
Choosing galvanized steel for the framework and substructure of the site delivers life cycle cost benefits due to the long-term performance of galvanized steel in wet areas. The site captures and stores approximately 400,000 litres of storm water; 250,000 litres sits in above ground storage, while 50,000 litres are stored below ground. Another 100,000 litres are held throughout the site. This water is filtered to achieve the right pH balance and then used in the concrete manufacturing process.

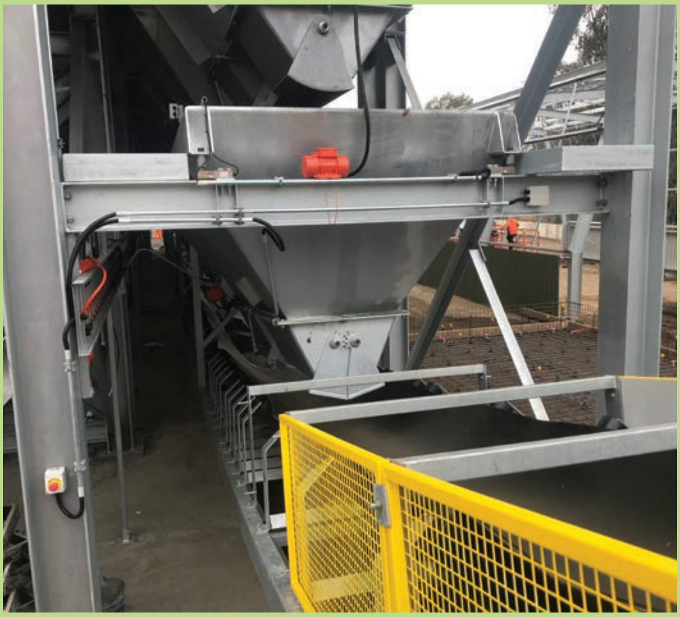
Industry best practice dictates that water and solids associated with the concrete 'washout' process are collected and retained in holding pits, and then recycled. This way, the caustic material does not reach the soil surface and cannot then migrate to surface waters or into the ground water. In such a corrosive environment, hot dip galvanized steel offers superior performance capabilities for corrosion protection.

PROJECT TEAM

Client: Boral
Architect: P&P Products
Main Contractor: P&P Products
Hot Dip Galvanizer: Kingfield Galvanizing
Steel Fabricator: P&P Products
Steel Manufacturer: OneSteel
Steel Distributor: BlueScope

Choosing galvanized steel for the framework and substructure of the site delivers life cycle cost benefits for the long-term performance of galvanized steel in wet areas.





THE LES WILSON BARRAMUNDI DISCOVERY CENTRE

SOREL AWARD
WINNER 2018
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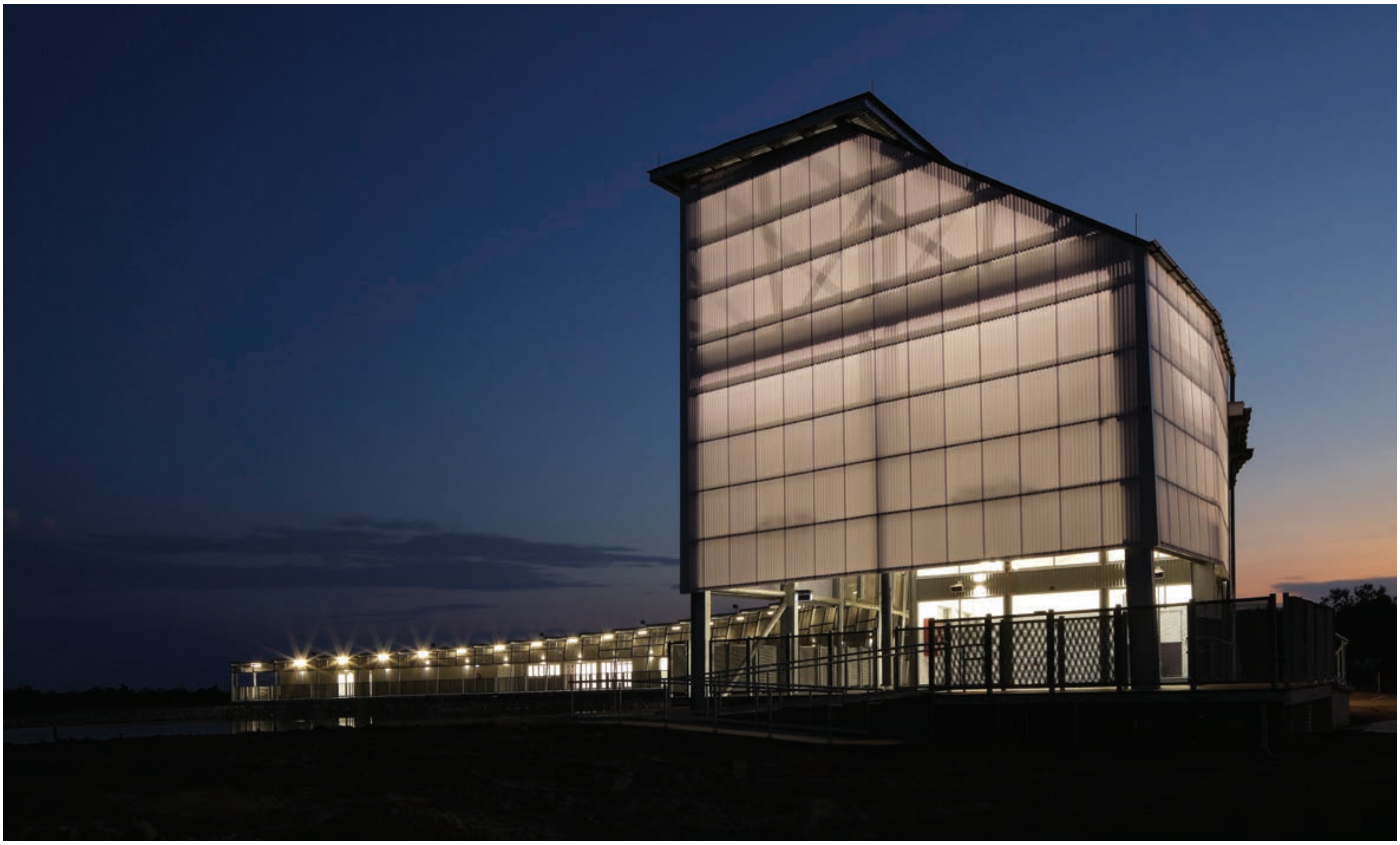


Designed by Brisbane-based practice Bud Brannigan Architects for the Carpentaria Shire Council, the new Les Wilson Barramundi Discovery Centre project involved the redevelopment and expansion of a visitor centre on a barramundi farm and hatchery in Karumba, a remote town near the Gulf of Carpentaria in Far North Queensland.

The 130m long building is suspended 1m from the ground and takes the form of a linear arc which wraps around a $2,500m^2$ growing pond. The building increases in height from the southern to northern end, where a pitched-roof tower covers an external arrival and gathering verandah.

The growing pond contains several thousand young barramundi from the hatchery. On the pond side of the building, a continuous verandah shaded by a perforated metal screen provides external circulation and access to internal spaces and outdoor pathways.

The Centre was constructed using 87 tonnes of (mostly) hot dip galvanized structural steel, 11,000 bolts, and 50 tonnes of hardwood joists to form the floor frame.

With a construction cost of $9.8 million, the project was funded by the Queensland Government *Building Our Regions Program*, local council and other Queensland government sources.

> Karumba is remote, a corrosive environment, and often subject to extreme weather events, requiring a robust materials and assembly strategy for the building.

The Use of Hot Dip Galvanizing

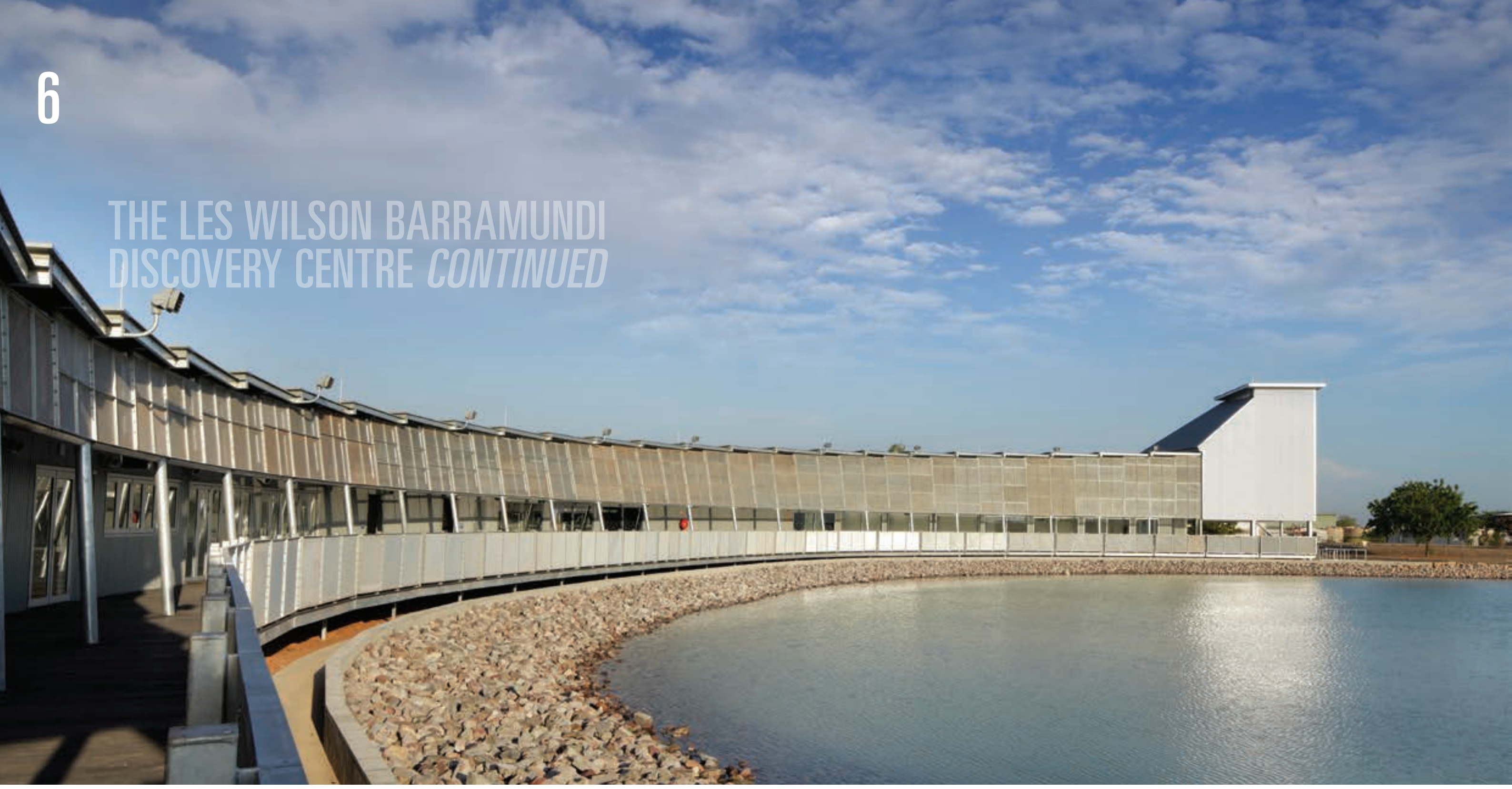
Hot dip galvanizing was used predominantly in the structural steel members (including tubular sections), which are visible to the Centre's visitors.

The Centre is located on the banks of the Norman River, approximately 4km inland from the Gulf of Carpentaria. While it is described by the council as a highly corrosive environment, the site is also remote, being about 2,200km equidistant from both Darwin and Brisbane, or approximately 24 hours driving. The use of low maintenance materials was critical for the council and the designers.

Obviously, the remoteness of the site demanded the use of materials that could travel long distances by road with only minor damage – a factor critical to the use of hot dip galvanizing with its hard, abrasion resistant zinc-iron alloy layers.

Also important was the compatibility of the preferred building materials, with the architect's preference to use hardwood joists for longevity in the elevated underfloor areas, which are susceptible to collection of airborne salts.

Finally, the location experiences cyclonic activity. Although these have been somewhat rare (six in the last 130 years), the area is classed by AS 1170.2 as Region C (Cyclonic), with ultimate design wind speeds of 248km per hour, and rainfall averaging over 800mm per year. This meant the structure had to have a robust design, for which hot dip galvanized structural steel was a perfect fit.



THE LES WILSON BARRAMUNDI DISCOVERY CENTRE *CONTINUED*

Technical and Engineering Innovation

The technical and engineering innovation for this project rests in the design of the structure. Lead architect Bud Brannigan stated that the design for the Centre's simple plan and structure was derived from a consideration of the barramundi itself, as well as an appreciation for the harsh local conditions.

"Karumba is remote, a corrosive environment, and often subject to extreme weather events, requiring a robust materials and assembly strategy for the building," Brannigan wrote in his design statement. "The structure comprises a series of prefabricated skeletal steel portals set out on a regular radial grid, connected on-site, onto which standard framing and metal external cladding is applied, simplifying construction."

Economic, Environmental and Social Benefit

The redevelopment and expansion of the Les Wilson Barramundi Discovery Centre will not only draw more tourists and students to the local area but will give locals jobs and a community meeting place.

The Carpentaria Shire Council estimates that the old Barramundi Discovery Centre generated approximately $2.6 million in gross regional product each year. The Council expects this to increase with the expansion of the Centre. This project can support 26 ongoing jobs, including a full-time tourism officer, tour operators and hospitality staff, and contribute to the existing labour force of over 1,000 people in the shire.

The project is also expected to generate new opportunities for council to partner with the tourism, retail, fishing and education sectors, including James Cook University.

The structure comprises a series of prefabricated skeletal steel portals set out on a regular radial grid, connected on-site, onto which standard framing and metal external cladding is applied, simplifying construction.

Tourism Queensland has identified the Barramundi Discovery Centre as one of 18 catalyst projects across the region drawing significant domestic and international visitor numbers.

The upgrade will create a social, educational, sporting and recreational facility for locals and visitors through the interpretive Centre, which will explore the lifecycle of the barramundi and include ponds for growing the hatchlings and for visitors to fish in, a souvenir and merchandise shop, a restaurant and a conference centre. Residents will have a wider range of recreation and social options in high-quality indoor and outdoor spaces.

The expansion will create a key environmental education resource for schools across Australia and enhance the understanding of sustainable fishing, the unique Gulf environment and local cultural heritage values.

PROJECT TEAM

Client: Carpentaria Shire Council
Fabricator: Wrens Construction
Architect: Bud Brannigan Architects
Galvanizer: Valmont Coatings (Townsville)
Steel Supplier: Tonkin Steel

POTTS HILL PRESSURE TUNNEL BRIDGE

SOREL AWARD
WINNER 2018
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Sydney Water's Potts Hill Reservoir and Water Pressure Tunnel have serviced Sydney since the mid 1920s.

The Potts Hill Water Supply Reservoirs were an integral part of the Upper Nepean Water Supply Scheme, which was crucial to the development and growth of Sydney from the late nineteenth century. The construction of the Reservoirs was a major achievement in hydraulic technology and associated construction methods for the time.

The complex also includes the inlet for an early twentieth-century high pressure tunnel and bridge. When it was built, the tunnel was an outstanding engineering feat and the third largest water supply tunnel in the world.

While today, the lower reservoir is not used for bulk water storage, the connecting infrastructure is still an operational network asset. Due to the deterioration of metal structures at the tunnel intake tower, it was deemed necessary to replace the tower's metal roof and truss bridge that provides access to Sydney Water's operational assets.

The truss bridge—like several bridges around the reservoir—is of historical significance and is, therefore, heritage listed. This necessitated an extensive approval process for the design and aesthetics of any components requiring replacement.

Process Engineering Technologies (PET) was engaged to design, fabricate and install a replacement truss bridge that not only looked similar to the existing Potts Hill bridge, but was compliant with today's design codes and standards.

To help retain the bridge's original, heritage-listed appearance, the original painted bridge gate and intruder bars were salvaged and blasted, and the corroded sections were repaired, prior to hot dip galvanizing.

The Use of Hot Dip Galvanizing

The new bridge consists of two 12.3m long, 1.5m wide fully welded truss frames that were each galvanized in a single dip. Galvanized grating and handrails were also used across the access walkway.

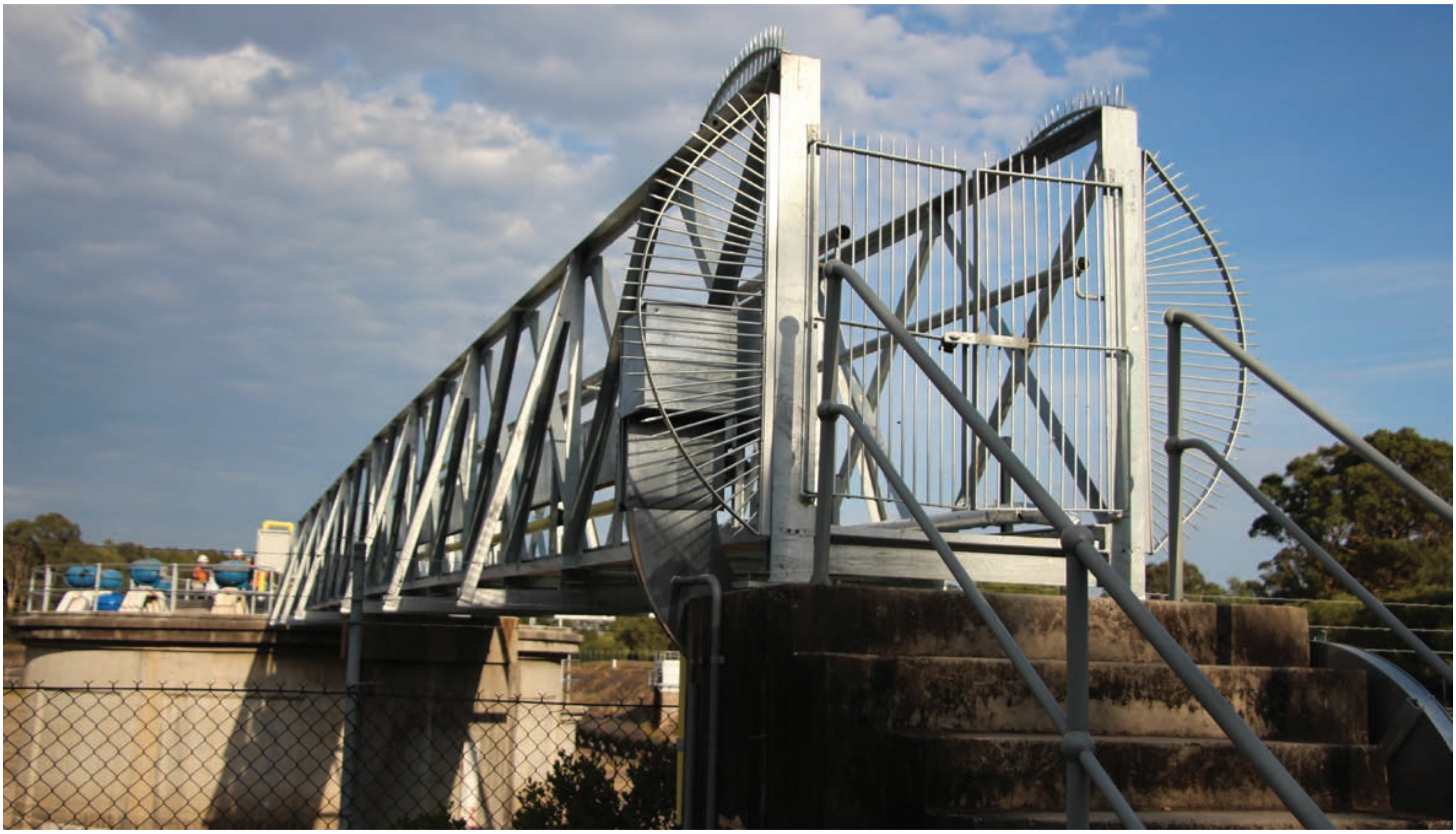
Galvanizing of the bridge was considered a superior solution, particularly compared to traditional painted coatings that had been used previously, which required a significant amount of ongoing maintenance and inspection. This was an important consideration for Sydney Water given the reservoir assets are of heritage significance and the other (non-operational) bridges around the reservoir site remain painted.

Technical and Engineering Innovation

The main challenges faced by the project team were logistics and execution, particularly concerning how the large truss frames would be fabricated, transported, and galvanized.

Valmont Coatings reviewed the project constraints during the initial concept of the project to ensure that the truss frames could be galvanized using a single dip process—this all depended on the size of the galvanizing bath at Valmont Coatings premises in Girraween, Sydney.

The Potts Hill Water Supply Reservoirs were an integral part of the Upper Nepean Water Supply Scheme, which was crucial to the development and growth of Sydney from the late nineteenth century.



POTTS HILL PRESSURE TUNNEL BRIDGE *CONTINUED*

To ensure that the 12.3m long truss frames could be galvanized using a single dip process, the stabilising members on the exterior of the truss frame (a feature designed to maintain the historical appearance of the bridge) were removed during the galvanizing process. This required the installation of temporary cross bracing inside the frames during transportation and lifting. The stabilising members were then bolted onto the outside of the truss prior to installation. Once installation was complete, the temporary cross bracing was removed.

Galvanizing such a large, fully welded structure meant that consideration had to be given to preparing weld joints, corners and lapped joints. Valmont Coatings inspected the completed fabrications at PET's workshop before they were transportation to their premises in Girraween.

This collaborative working relationship between the fabricator and the galvanizer ensured the smooth delivery of the project not only during the galvanizing process, but throughout the transportation and installation phases.

The existing bridge gates and security spikes (another historical feature of the bridge's appearance) were also salvaged, grit blasted and the damaged elements repaired. It was discovered that one security spike was missing. As such, PET fabricated a replica to complete the installation. The original spikes were not welded but were a brazed fabrication. Unsure of how the low temperature of brazing would perform during the galvanizing process, a test piece was successfully galvanized prior to undertaking the remaining repairs.

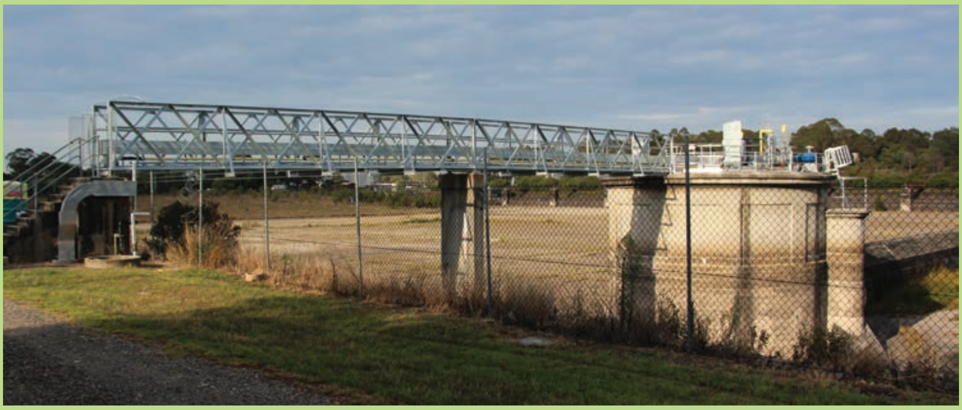
Economic, Environmental and Social Benefits

Sydney Water's decision to invest in a galvanized solution for the new bridge – as opposed to a painted steel structure – demonstrates the long-term cost benefits offered by galvanizing. In addition, the fast turnaround time achieved via galvanizing enabled faster delivery to site in preparation for installation. Having all components galvanized (grating, cable tray, and so on) also ensured that mating surfaces were more durable to fastened connections during installation.

The longevity of a galvanized system will reduce the need for maintenance and repairs, which often involves working at elevated heights. As such, the bridge has improved the overall safety of the facility. What was classified as a condemned bridge is now one that the asset owner can safely utilise to maintain their water supply assets.

PROJECT TEAM

Client: Sydney Water and Ventia Services
Design, Fabrication and Installation: Process Engineering Technologies
Galvanizer: Valmont Coatings (Girraween)
Steel Supplier: Horans Steel



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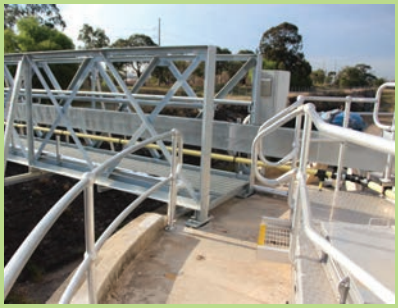

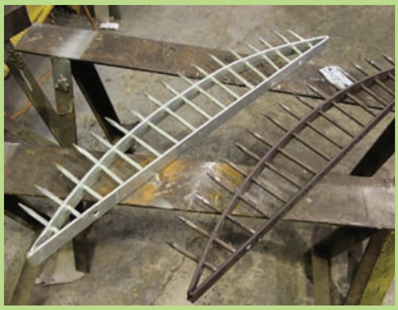

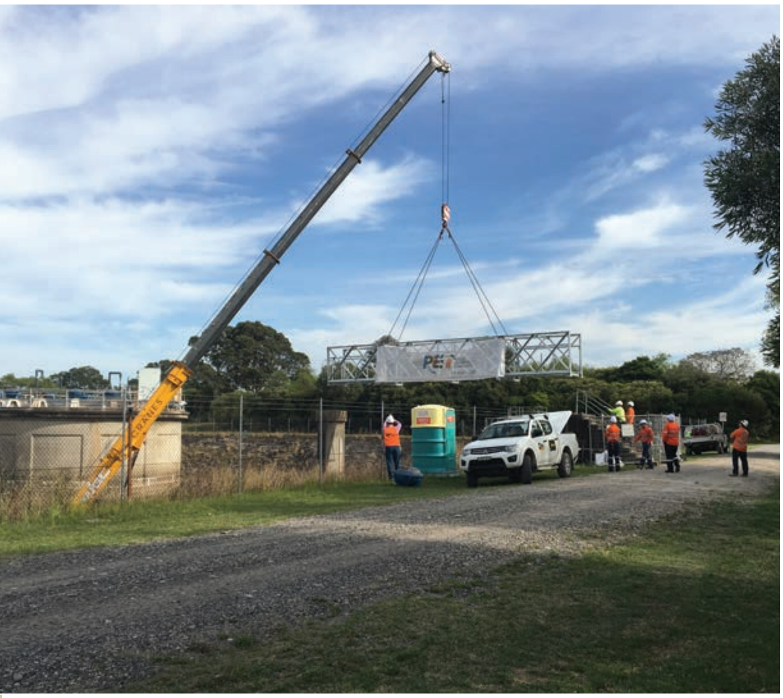

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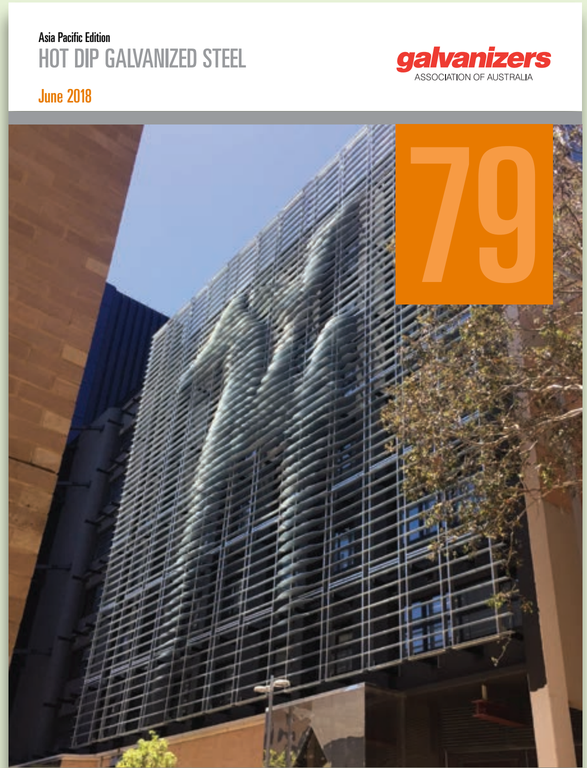

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