



# CURRICULUM VITAE MICHAEL SALU

Salu Structural Engineering Pty Ltd · ABN 48 642 098 780

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**DISCIPLINE: STRUCTURAL ENGINEER**



**YEARS OF EXPERIENCE: 40**

**NATIONALITY: AUSTRALIAN**

**EDUCATION: BACHELOR OF ENGINEERING (CIVIL) ADELAIDE UNIVERSITY**

**PROFESSIONAL AFFILIATIONS: M.I.E.Aust. C.P.Eng. N.E.R. R.P.E.Q. R.P.E.V.**

## **SUMMARY OF EXPERIENCE**

Michael is a results-orientated engineer with a strong practical streak that has been honed by a good balance of office-based and on-site roles. He understands the requirement to put himself into his client's shoes in order to achieve the best result and to win future work. Winning a job from a job and successfully managing client relationships over many years has been a hallmark of his engineering career.

He has carried out structural analysis, design, construction supervision, forensic investigation, condition assessment and remedial work for a wide variety of buildings and civil engineering structures.

In addition to technical roles, Michael has filled a variety of engineering management roles such as: design manager for major multi-disciplinary water projects; structures team leader responsible for up to 14 engineers, technical officers and drafters; power and water structures manager responsible for winning work as well as leading a team of specialist engineers; technical executive with a national

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leadership role responsible for mentoring as well as achieving and maintaining technical excellence across a 45-strong structural engineering group.

In the wider engineering profession, Michael has served for several years on the Engineers Australia Queensland Structural Panel Committee as a member, assisting with the planning, organisation and running of technical training events for structural engineers in Brisbane. He has authored and presented a number of technical papers and presentations, including internationally, on a variety of structural engineering practice areas including water retaining structures and underground mining ventilation structures.

As Director of a recently established structural engineering consultancy, SSE Pty Ltd, Michael is concentrating on providing specialist structural engineering services to the Water, Power, Industrial and Mining Sectors using his depth of understanding and years of experience to provide cost-effective solutions that will meet tight schedule requirements.

## PROJECT EXAMPLES

### Water Storage Reservoirs

- 4ML Bolted Steel Tank Design Verification and Base Slab Design, Caboolture, Qld for Pensar and Unity Water. (2022) Independent certification of a bolted steel recycled water tank, originally designed to US and European Codes. Tank walls, roof and stairs were manufactured overseas. Design, documentation and certification of a post-tensioned concrete floor slab incorporating a piled foundation due to difficult site conditions.
- Roof replacements at four (4) reservoirs for Byron Bay Shire Council (2020/21). Design and documentation of steel and aluminium roofs ranging from 12m up to 32m diameter, located in exposed coastal locations. The project also included cut slope stability assessments and documentation of site remediation earthworks at several of the sites.
- Roof replacements at three (3) reservoirs for Gympie Regional Council (2020/21). Design and documentation of steel and aluminium roofs ranging from 10m up to 24m diameter, located in rural and coastal locations. The roofs were designed to minimise costs by re-using as much as possible of the original roof supporting structure and minimising additional construction features such as gables and fascias. All roofs included new or enlarged access platforms to enhance operator safety.
- Reservoir roof replacements at Durambah and Potts Point, NSW for Tweed Shire Council (2020). Detailed design of aluminium framed roofs together with new access stairs and roof access platforms and hatches.
- MIWB South Tank Replacement, Mt Isa, Qld for Mount Isa Water Board (2019/20) Preliminary design and technical design review of waterproof reinforced concrete base slabs for 2 x 4ML bolted steel tanks, (steel tanks designed by others). Difficult ground conditions due to construction on a partially filled former water storage pond site. Remote location and limited construction resources provided further challenges. A single-pour 25m dia. RC slab without joints was successfully achieved.
- Macarthur Water Filtration Plant Upgrade, Appin, NSW for Trility Pty Ltd (2019). D&C Tender design and detailed design of waterproof prestressed concrete base slabs for 2 x 10ML out-of-spec-water (OSW) bolted steel tanks designed by others. Challenges included designing a watertight wall/slab interface and design for potential mining subsidence effects in accordance Subsidence Advisory NSW site specific prescribed design parameters.
- Dunns Road 5ML Reservoir, Wagga Wagga, NSW for Riverina Water County Council (2018). Design Team Leader for design and documentation of a prestressed concrete tank with an all-aluminium roof and roof access platform. Tilt-up precast panels were designed to enclose the access stairs, providing a high degree of security.
- Travis Road 6ML Reservoir, Loganlea, Qld for Logan Water Infrastructure Alliance. (2017) Design Team Leader for design and documentation of a prestressed concrete tank with an all-aluminium roof and roof access platform. A very difficult site required design of a hybrid footing system including ground beams, bored piers and slab on ground to minimise the risk of differential settlement to the tank base causing water leakage.

- Reservoir Roof Replacement, Sunshine Coast, Qld for Unity Water (2013/14) Lead structural designer for a re-roofing project for three existing concrete water tanks. The new roofs were designed fully in aluminium with stainless steel columns for durability and economy. Existing base structures were checked and strengthened where required for increased uplift due to Wind Code revisions since the tanks were first constructed up to 55 years ago.
- Rifle Range Rd Reservoir, Dubbo, NSW for Dubbo City Council, (2012/13) Technical review and construction inspections of a 10ML prestressed concrete water tank with stainless steel columns and aluminium roof construction. Construction phase services included lifting plans, prestressing tendon extension review and structural commissioning procedure for filling and testing.
- Sunshine Coast Water Storage Upgrades, Qld, for Unity Water (2012/13) Technical oversight of design and construction of three prestressed concrete water tanks; 14.2ML, 8.9ML and 7.6ML capacity. All tanks had fully sealed, aluminium roof framing and cladding designed to withstand Cyclonic winds and a coastal environment.
- Tumut South 5ML Water Supply Reservoir, Tumut, NSW for APS (2011) Design Team Leader for design and documentation of a prestressed concrete tank with an all-aluminium roof in a sub-alpine location. Site inspections during construction and certification on completion.
- Riverview 13.2ML Reservoir, Ipswich, Qld, for Ipswich Water (2009). Design Team Leader for design and documentation of a precast, prestressed concrete reservoir. Included was the design of a large above-ground valve house with a removable roof for plant maintenance access and provision for future expansion.
- Sydney Desalination Plant 40ML Clearwater Storage, Sydney, NSW for BlueWater Alliance (2008/09). Principal Designer for an alternative D&C prestressed concrete tank to the existing reference design. Construction of an unusual piled base had already commenced, requiring an innovative base slab design to avoid re-work and still provide a high degree of water-tightness. Due to the large diameter (75m) the floor slab was cast in two separate operations and the halves were stressed together to achieve water tightness.
- 5ML Water Supply Reservoir, East Bowral, NSW for APS. (2005) Design and documentation of a partially buried prestressed concrete reservoir as part of a Design and Construct project with Australian Prestressed Structures. Precast concrete internal columns and aluminium roof sheeting were used for maximum durability. Design works included pipework, valve pits, retaining walls and an overflow dissipation structure.

## **Water and Wastewater Treatment (including Desalination)**

- Byron WWTP Solids Drying Shed Roof Replacement, Byron Bay, NSW, (2020). Principal engineer for design and documentation of a replacement roof for a storage facility where the original roof sheeting and purlins were severely degraded/corroded after less than 10 years in service. Following structural checks, the existing primary steel framing was able to be retained and new aluminium purlins and sheeting were proposed to replace 400 sq.m of deteriorated roof structure.
- Tunnel access shaft stairs at Nightcap WTP, NSW for Rous County Council (2020). Detailed design including construction methodology for safe ladder access into a 20m deep vertical concrete shaft. This challenging project required an innovative solution that was cost-effective and safe to build.
- Beenleigh Waste Water Treatment Plant Upgrade, Qld, for Logan Water Alliance, (2011/12). Structures design manager for \$12M plant upgrade and refurbishment including inlet works, clarifier modifications, sludge processing and minor civil works. Upgrade was constrained by budget requirements and the need to keep the plant operating throughout the upgrade.
- Victoria Desalination Plant, Victoria for Aquasure Alliance. (2009-12) Design manager for selected components of the treatment and transfer systems. Developed project-wide design specifications for liquid retaining structures and carried out verification across the project in particular for all liquid retaining structures. Managed a design team with members located in Brisbane, Melbourne and Auckland.
- Adelaide Desalination Plant, Adelaide, SA for Australian Prestressing Services, (2009-11). Final scope comprised: 2 x 25ML Clearwater Tanks, 6 x 14m dia process tanks and a 6m dia. prestressed intake shaft lining. Prepared APS's Tender design, which was accepted by AdelaideAqua for a "Design and Construct" delivery in a highly competitive market. Detailed construction drawings for a staged design submission were produced was to a tight time frame to facilitate fast-tracking of the approvals and construction process. The original scope only included 2 x 25ML tanks but was widened due to on-time and on-budget performance of the D&C team.
- Gippsland Water Factory, Morwell, VIC for Transfield Services (2006-08). Preliminary design of all storage and process tanks including Main Biological Reactor, Sedimentation and Balance tanks. Peer review of the completed detailed tank designs. Tank diameters varied from 21m to 66m, with precast prestressed concrete walls and a mixture of conventionally reinforced and prestressed concrete floor

slabs. The prestressed wall system allowed rapid pre-fabrication off-site in addition to significant cost savings over the reinforced concrete option originally investigated by Transfield Services.

- Advanced Water Treatment Plant Building, Bundamba, Qld, (2006/07). Team leader for design of the main process building housing water treatment plant and testing and control offices. A modular post-and-beam scheme was adopted, to allow last-minute changes to plant configuration, necessary due to the fast-track nature of the project. Redundant bracing was also provided as part of the original design, as well as removable roof panels, to facilitate construction and commissioning.

## **Inspection, Assessment, Analysis, Remediation and Expert Opinions**

- Structural Condition Assessment of 20 Reservoirs for North East Water, Victoria (2022). 18 reinforced concrete and 2 steel clear water storage reservoirs were inspected to assess the condition of the roofs and also to determine the expected future life of the concrete structures. All reservoirs were inspected while full and, in several cases, while on-line, using an ROV designed for inspections of potable water reservoirs. A full structural engineering report was provided including recommendations for remedial roof and concrete works and prioritisation of the works. The estimated remaining useful life of each concrete reservoir was also provided, ranging from 40 to in excess of 100 years.
- Paradise Dam Structural Assessments for Sunwater (2021/2022). Provision of specialist technical advice and independent structural review of selected ancillary structural elements including intake shaft, bypass tunnel and fishway.
- Concrete and steel reservoirs assessment for Coffs Harbour City Council (2021). Internal inspection of 5 concrete and 2 steel water storage reservoirs using an ROV. The ROV provided vision of the walls, floor, roof framing, floor joints and internal fittings including ladders and pipework. A report was prepared for each reservoir including a structural condition assessment, estimated remaining life for all structural elements and recommendations regarding the steel tank internal coatings.
- Concrete reservoirs condition assessment for Byron Shire Council (2020). Condition assessment of 12 concrete water storage reservoirs, mostly over 40 years old and varying from 0.5ML up to 6.0ML, many within 2km of the surf coast. A combination of non-destructive and intrusive and, in-situ as well as laboratory testing was carried out so that the current structural condition and predicted future life could be determined. Results varied from <1 year to >100 years remaining life and a report was prepared with recommendations for remedial works as well as on-going maintenance of the concrete.
- Red Hill No.2 Balance Tank, Coffs Harbour, NSW for Coffs Harbour City Council (2020). Investigation of unexpected internal corrosion reported in a 17.5ML welded steel water supply tank. The history of the tank was traced back to its original construction in 1985 using Council minutes, tender records and painting contracts, to help determine the origin and then recommended treatments for the tank. Recommendations were provided to allow the tank to remain in use subject to a staged remedial works plan.
- Willans Hill 11ML Reservoir Remediation, Wagga Wagga, NSW for Riverina Water County Council (2019/20). Investigation and assessment of reported low strength concrete placed in the base slab of a new concrete water tank under construction for RWCC. Following a detailed structural assessment, a report was prepared providing remedial options together with recommendations to minimise the risk of future problems due to the out-of-spec. concrete.
- Reedy Creek 3.2ML Reservoir Structural Advice, Gold Coast, Qld for Gold Coast Water (2016) A D&C prestressed water tank had been constructed as part of a land subdivision development and handed over to GCW to manage and maintain. The tank had a number of leakage issues, related to its original design details and some construction issues. Following a detailed structural analysis, engineering advice was provided to GCW regarding remedial options together with tender advice regarding Contractor proposed remedial solutions.
- Restoration of No.3 Reservoir, Casino, NSW for Richmond Valley Shire Council, (2015) Structural assessment, modelling and design of repairs to a 50-year-old wire-wound 9ML prestressed concrete tank water storage tank. The heavily corroded existing 2mm dia prestressing wires were replaced using external prestressing tendons and specialised anchorages. Full original structural capacity was restored and following completion of repairs, the future design life was estimated to be 30-40 years.
- Reservoir Condition Assessment, Sunshine Coast, Qld for Unity Water (2014) Visual condition assessment and non-destructive testing of three concrete tanks constructed 45 to 55 years ago. Concrete deterioration testing and strength testing were performed to provide additional information to that available from visual inspection and examination of existing drawings. A report was prepared predicting the future life of the tanks together with recommendations to extend the useful life of the tanks for another 40 years and beyond.

- Bundaberg flood damage and wind damage building assessments, Bundaberg, Qld for Suncorp Insurance (2013). Technical lead for assessment of over 160 severely damaged houses as part of a rapid response team coordinated by Lend Lease. Teams of engineers were deployed to Bundaberg on rotation to provide continuous engineering support to the private housing recovery and rebuilding effort.
- Condamine Power Station Cooling Tower, Condamine, Qld for QGC (2010). Investigation, assessment and reporting on concrete deterioration observed in a recently completed power station cooling tower basin. Sulphate-resistant concrete that was less than 18 months old was experiencing significant and unexplained surface erosion. Review of water quality reports together with a site inspection and review of “as constructed” drawings were used to determine the cause and propose suitable remedial measures.
- Unexpected concrete cracking in a newly-completed waste water treatment plant in Brisbane, Qld for QUU (2009). Site inspection, review of design documentation and construction records and reports and FE analysis were used to determine the primary cause of severe base cracking in the primary treatment tank. Potential future problems were also uncovered and a report was produced outlining further work required.
- Technical Peer Reviewer/Expert Witness for various Water Supply Authorities including: Brisbane, Melbourne, Adelaide, Gold Coast, Northern NSW (2005 to 2021) Investigation, review and reporting on reinforced and prestressed concrete tank failures, including large circular and rectangular structures. Advanced structural techniques including Finite Element Analysis (FEA) where required, were used to accurately determine stresses and then develop cost effective remedial solutions. Where full repair or remediation was not practical, alternative solutions were developed to provide a range of cost-effective options for Clients to choose from.

## Selected Publications

- 2018 “Seismic Design Lessons for Australia from the Christchurch 2011 Earthquake” Australian Structural Engineering Conference (ASEC), Adelaide, South Australia
- 2017 “The Case for Developing an Australian Technical Specification for Structural Design of Ventilation Control Devices” Coal Operators Conference February 2017 Proceedings, Wollongong, NSW. (joint paper)
- 2013 “Full Scale Explosion Testing and Design of a Gypsum Plaster Seal” Coal Operators Conference February 2013 Proceedings, Wollongong, NSW. (joint paper)
- 2010-2012 Introduction to Design of Pedestrian and Cycle Bridges: Institution of Engineers (Structural Branch) Learning Workshops, Brisbane, Qld.
- 2012 “Successes and Failures in Design and Construction of Large Water Structures” Water Industry Operator’s Association Conference July 2012, Gold Coast, Qld.
- 2012 “Design and Construction of Water Holding Bulkheads at Xstrata Coal’s Oaky No.1 mine” Coal Operators Conference February 2012 Proceedings, Wollongong, NSW (joint paper)
- 2011 “Diversified applications and advancements in underground ventilation control and shotcrete technology” 2011 Mine Ventilation Conference Proceedings, Sydney, NSW (joint paper)
- 2008 “Bundamba Indirect Potable Reuse Scheme” World Water and Environmental Engineering
- 2008 “Analysis, Design and Construction of Complex Concrete Structures for the Water Treatment Industry” 2nd International Conference on Advanced Concrete Structures, Changsha, China
- 2007 “Developments in Australian Concrete Water Tanks” Concrete Australia Seminar, Sydney, NSW.
- 2006 “Concrete Tanks continue to Evolve” Engineers Australia magazine article.
- 2006 “History, Current Practice and Future Developments in Australian Concrete Water Storage Structures” New Zealand Concrete Industry Conference, Christchurch, NZ

## Professional History

2020 – Present	Salu Structural Engineering Pty Ltd - Director
2013 – 2020	Robert Bird Group – Principal Structural Engineer
2001 – 2013	Parsons Brinckerhoff (now WSP) – Technical Executive
1996 – 2001	WP Brown & Partners (now Calibre) – Principal Engineer

1989 – 1996	Multinail Australia – Chief Engineer
1987 – 1989	Bornhorst & Ward – Senior Field Engineer
1982 – 1987	John Connell & Associates (now Aurecon), Adelaide and Darwin – Structural Engineer
1980 – 1991	Australian Army Reserve – Commissioned Officer – RAInf and RAE