

Craig Butterworth

CEng, MICE, CPEng, FIEAust, RPEQ
Director / Principal Geotechnical Engineer

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Craig is a professionally qualified geotechnical engineer with over 20 years' experience in Australia, New Zealand, UK and the Middle East, including ground investigations, interpretation of geotechnical data, supervision of groundwork's, deep basement design and temporary works design for excavations. Craig currently acts as one of the technical leaders at CMW, based in Perth, WA. He has significant experience in the design of temporary works and the design and construction of deep basements and high rise structures. His knowledge of construction enables Craig to offer clients safe, practical and efficient geotechnical solutions to projects.

Fields of Geotechnical Expertise

Site investigation
Deep basement and retaining wall design
Soil structure interaction and building damage assessments
Finite element modelling
Deep foundations
Raft and piled raft design
Geotechnical data management

Education and Affiliations

University of Newcastle, 1995, Civil Engineering and Geotechnical Engineering (Hons) (M.Eng)
Chartered Member of the Institution of Civil Engineers, 2007, UK (CEng, MICE)
Member, Engineers Australia, 2010 (CPEng, MIEAust)
Member, Australian Geomechanics Society, 2010 (AGS)
Registered Professional Engineer of Queensland (RPEQ)

Career Summary

2013 Now	Director/Principal Geotechnical Engineer, CMW Geosciences
2010 2013	Senior Geotechnical Engineer, Golder Associates
2007 2010	Principal Geotechnical Engineer, Pell Frischmann, England
2001 2007	Geotechnical Engineer, Buro Happold, England
1999 2001	Geotechnical Engineer, Structural Soils, England
1997 1999	Geotechnical Engineer, Fugro Ltd, England

Relevant Technical Experience

Infrastructure Projects

Lloyd Street Underpass, Midland

Temporary works support and liaison with rail asset owners during construction of the Lloyd street dive structure to allow grade separation of the rail and road.

Perth City Link Rail, Perth

\$360M rail upgrade project including construction of a cut and cover dive structure and the complex underpinning of existing structures. Craig was involved in a technical support capacity whilst also working as independent review of the permanent works.

Mitchell Freeway Southbound Widening

Engaged by BMD to carry out temporary works for elements including sheet pile retention for proposed PSP excavations, platform design for piling plant and impact assessment of adjacent assets. With works close to existing buildings and retaining walls the temporary works were required to consider the impact on adjacent assets as well as monitoring and assessment.

Armadale Road to North Lake Road Bridge

Geotechnical designer within Armadale Access Alliance. Working as lead geotechnical engineer mainly in high level technical review role on the project. Geotechnical works included site investigation within existing heavily used road network, piled and shallow foundation design and design of cost effective method of temporary excavation and permanent earth retention.

Karel Avenue Upgrade

Geotechnical Designer for complex bridge duplication over Roe Highway and extension of road over rail bridge for future METRONET, Thornlie-Cockburn Link. Geotechnical aspects included complex interaction between existing and proposed MSE walls, pile design within MSE wall panels and significant temporary works.

Mandurah Road Bridge

Independent verifier for the design of a piled road bridge to replace the Old Mandurah Bridge. Works included the design of slope stabilisation works, rigid inclusions and driven piles.

Northlink Stage 1, Perth

Tender design and subsequent independent verifier for a road upgrade project. Works included design of bridges for grade separations including high cantilever structures and an integral bridge.

Pilbara, WA

Substructure interaction analysis and design of bridge abutments for a proposed rail/road bridge. Significant works included staged construction modelling of the bridge abutments using 3D finite element modelling. The modelling allows significant reduction in construction costs via improved construction sequencing and reduced tie back requirements and forces for piled abutment foundations.

Great Northern Highway

Design and construction supervision for piled bridge foundations and retention structures.

Elizabeth Quay, WA

Design of bored piles for iconic pedestrian bridge forming part of the Perth Elizabeth Quay project. Design included tight ultimate limit state deflection values under complex loading combinations. Scope of work included site supervision of sock construction and preliminary pile testing.

Swan River Bridge, WA

Design of a driven piled foundations for a proposed pedestrian bridge in Perth, WA.

Transmission Line, WA

Design of driven and bored piles for a 200km transmission line, including preliminary pile design, pile driving assessment and construction support.

Reid Highway, WA

Design of temporary works to allow construction of footing for a major road bridge as part of the Reid Highway bridge duplication.

Esperance, WA

Geotechnical reviewer for a number of tunnels and bridges for a road and rail re-alignment project in Esperance.

Soft Soils

Jakarta Bay, Indonesia

Design for a land reclamation project in Jakarta. The project comprised the construction of a 160 hectare island, formed within the shallow bay north of Jakarta. Works including forensic analysis of failures that occurred during reclamation works and design of surcharging, wick drains for the reclamation over normally consolidated soft silt/clay soils in the bay.

Perth Stadium, WA

Settlement analysis in soft soils for a surcharge ground improvement scheme for the new Perth Stadium. Use of hand calculations and advanced creep modelling using PLAXIS to carry out predictions in terms of magnitude and time rate.

Wheatstone, WA

Stability assessment for a temporary embankment over soft soils.

Darwin, NT

Investigation, design and construction supervision for a temporary earth embankment and trench excavation over normally consolidated marine clays. Embankment construction included use of geotextiles to reduce embankment thickness.

North Somerset, UK

Design and monitoring of a noise bund adjacent to a motorway over soft normally consolidated soils. Works included design and installation of settlement monitoring for stability assessment during construction and monitoring of consolidation following construction and prior to final sign off.

Ground Improvement

Al Khiran, Kuwait

Design and supervision of dynamic compaction for a large scale residential development. Evaluation of re-use of excavated dredge materials, load testing, verification works and geotechnical investigations were also carried out.

JVC, London

Design, specification and construction support of stone column ground improvement works for an office and storage facility in a contaminated urban site. Included load testing of columns using zone testing and plate load testing.

Bath, UK

Investigation of abandoned mine workings beneath the site of a proposed water treatment and storage facility. Subsequently carried out risk assessments and assisted in the design of the facility to minimise geotechnical risks.

Basement Design and Retaining Walls

QT Hotel, Perth

Detailed design of diaphragm wall and piled raft for a proposed hotel development. The basement is within an urban area surrounded by highly sensitive heritage structures and high rise developments. Design considered temporary and long term movements, whilst maximising the efficiency of the design to allow fast construction.

Roy Hill Wharf, WA

Design of a 16m tie back sheet pile retaining wall to facilitate the construction of a temporary wharf.

Darwin Cofferdam, NT

200m long cofferdam adjacent to a temporary embankment. Design issues included potential global instability of the cofferdam due to the adjacent embankment and risk of insufficient penetration of piles during driving operations.

Elizabeth Quay, Perth

Geotechnical investigations tender stage design for a major urban regeneration scheme. Included preliminary design of retaining walls, ground improvement works in the river channel to allow construction of embankments, pile driving assessment, and obtaining approvals for excavations in the vicinity of Public Transport Authority (PTA) assets. Subsequently provided ongoing design advice during the enabling works contract.

Browse LNG, WA

Working within a joint venture tender team carrying out design of retaining walls for a major marine facility.

Ord Street, West Perth

Design of retaining wall and buttress support scheme for a piling contractor. Included the use of contiguous piles, in situ concrete walls and ground anchors.

North One, Subiaco

Design of temporary retaining walls based on combined contiguous bored piles, in situ concrete walls and ground anchors. The combination of two parallel retaining walls required use of finite element modelling to study global stability and performance.

Town Hall, Perth

Design of temporary ground anchors and grouting to support the existing heritage listed Town Hall to allow construction of a new basement. Included finite element modelling to assist in prediction of ground movements for approval of the scheme from the City of Perth.

Heathrow Terminal 5

Design of temporary and permanent anchored secant retaining wall in over consolidated clay. Included evaluation of movements and design of extensive real time monitoring scheme for working adjacent to existing London Underground running terminals.

Birmingham, UK

Geotechnical investigation and tender design of a 20m deep basement adjacent to existing heritage structures and canals excavated in mudstone.

The Strand, London

Tender design of deep foundations and retaining walls for a hotel development. Work included excavation close to an existing cut and cover tunnel, and retention of an existing heritage façade.

Various, Perth

Design support to specialist contractors for numerous temporary and permanent anchored sheet pile, contiguous and secant pile wall projects in and around Perth, WA.

Deep Foundations**1 The Esplanade, Perth**

Site investigation and detailed design of a pile supported 29 level office development adjacent to the Elizabeth Quay Inlet. Input included design of diaphragm retaining walls, large diameter single piles and hydrogeological assessment of groundwater flow.

Ritz Carlton, Perth

Design of a raft enhanced piled hotel development combined with a three level basement adjacent to the Swan River. The design incorporated CFA piles in a top down construction format, requiring detailed consideration of constructability including verticality and position tolerance and the design of plunge columns.

Peppers Hotel, Perth

Design of a raft enhanced piled hotel development. The combined use of a reduced thickness raft with CFA piles allows a significant reduction in both pile numbers and pile lengths compared to a fully piled design. By adopting this approach.

Perth City Link, WA

Design and professional supervision of large diameter bored piles for support of the Perth underground bus station and subsequent above ground high rise developments. Work included state of the art testing of piles using osterberg cells and strain gauges.

Kings Square, Perth

Design of single large diameter bored piles for a precinct of commercial developments. Pile diameters up to 1.8m, embedded into the underlying bedrock formation. Scope of work included structural design of piles and dynamic load testing.

Wheatstone, WA

Static compression, tension and lateral testing and dynamic testing of driven piles for the Wheatstone development.

Perth Airport, WA

Design of Continuous Flight Auger (CFA) piles for radar tower structures at the airport. Design included significant tension and lateral loads that needed to be accommodated in the geotechnical and structural design.

South Fremantle, Perth

Design of settlement reducing columns beneath a proposed apartment block for a piling contractor.

Treasury Building, Perth

Tender design of a piled raft beneath a high rise hotel development.

Battersea Power Station, UK

Evaluation of re-use of existing power station piled foundations and scheme design of new deep foundations including under-reamed bored piles and large diameter bored piles. Work included intrusive investigation of existing foundations and piling trials.

Millennium Dome, UK

Design and supervision of driven piles for construction of an arena within the existing dome structure. Included specifications, approvals and monitoring for pile installation adjacent to existing tunnels.

Ascot Racecourse, UK

Geotechnical investigation and pile design for a new grandstand, including instrumented testing of continuous flight auger piles.

Cutty Sark, UK

Design of short bored piles subject to significant lateral loading within fill materials adjacent to the River Thames. Piling was required to provide support following rising of the ship out of its existing dry dock.

Offshore and Nearshore**Wheatstone, WA**

Independent design verification works for dredging design for the Wheatstone LNG project.

North Sea, UK

Supervision of offshore geotechnical investigations for oil platforms and subsea structures. Included work on re-float of Maureen platform.

St Andrews, Scotland

Nearshore geotechnical investigation on a jack up rig for a proposed outfall structure.

Gulf of Suez, Egypt

Evaluation of jack up oil platform stability prior to pre-loading. Work carried out on board jack up rig and combined geotechnical investigation and analysis.

Geotechnical Investigation and Other Projects**Elizabeth Quay, Perth**

Geotechnical investigation and scheme design for high rise tower and three level basement.

Gateway, Perth

Geotechnical support during the tender process as part of a joint venture bid team.

Port Coogee, WA

Management of geotechnical investigation and assistance in scheme design for basement construction in limestone. Shallow groundwater and highly variable ground conditions.

Children's Hospital, WA

Specialist geotechnical design advice for assessment of retaining wall performance and impact assessment of adjacent assets including a chimney structure.

QEII Hospital, WA

Geotechnical investigation, design and construction support for a multi storey car park structure. Scheme was designed to high footing loads to provide cost savings. Subsequently the performance of the footings was monitored during and following construction to check performance against predictions.

Various, UK

Temporary works co-ordinator for Wessex Water, designing and approving temporary works excavations. Included caisson excavations, temporary shoring, open excavations and dewatering.

Penarth Marine, Wales

Evaluation of an unstable 150m long escarpment above an existing car park. Detailed risk assessments were carried out to assist the selection of appropriate short term and long term remedial measures. Final recommended solution comprised cut off drains, improved managed of vegetation and improved catch fences. The project included regular slope inspections.

Clevedon, UK

Design and specification of rock slope stability works included scaling of a rock face, rock netting, catch fences and rock bolts. Included tender assessment and site supervision during construction.

Somerset, UK

Specification of long term slope inspection works for a local authority to manage risks to public from existing abandoned quarries.

Oxford University, UK

Evaluation and tender support for a closed loop shallow geothermal project for the Oxford University Earth Science building. Due to site restraints the vertical borehole loops were installed beneath the floor slab of the structure. Consideration was given to the interaction between footings and ground loops and the impact on the construction programme.
