

# Ground Engineering

Capability Statement



# Acknowledgement of Country

**BG&E Resources acknowledges Aboriginal and Torres Strait Islander peoples as the first peoples of Australia and the Traditional Owners and Custodians of lands and waterways on which we work and live.**

**Our operations are conducted on the traditional lands of the Whadjuk people of the Noongar nation in Perth, the Bindjareb people in Mandurah, the Larrakia people in Darwin, the Kurna people in Adelaide, the Gurambilburra Wulgurukaba, Bindal, Nywaigi, and Gugu Badhun peoples in Townsville, the Turrbul and Jagera peoples in Brisbane, the Awabakal people in Newcastle, the Gadigal people of the Eora nation in Sydney, and the Wurundjeri and Boon Wurrung peoples of the Kulin nation in Melbourne.**

**We honour the wisdom of, and pay respect to, Elders past and present, and we acknowledge the cultural authority of all Aboriginal and Torres Strait Islander peoples across Australia.**

**We also acknowledge the vital contribution made by our Aboriginal and Torres Strait Islander employees and we thank those who have guided our approach and generously shared their insights.**

Image: Aboriginal artwork created by Jayda Sebire (Indigenous Artist and former BG&E Resources People and Culture Assistant).  
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# Ground Engineering for a Sustainable Future

BG&E Resources (BGER) is a multidisciplinary engineering, design, project delivery and advisory consultancy, providing technical solutions for clients in the Resources, Energy and Industrial sectors.

With offices on the East and West coasts of Australia, we are majority owned by our employees and committed to helping clients decarbonise in a net zero economy.

Our fit-for-purpose engineering solutions enable mining and raw material proponents, energy and water utilities, and port authorities to optimise the performance of their assets, minimise operational disruption, improve safety and mitigate risks.

BGER's proven approach to deliver schedule and cost benefits through clever engineering and true collaboration is what sets us apart.

Our people pride themselves on providing smart and sustainable solutions to complex engineering problems; and importantly, on being great people to work with.

Image: Loui Drake at Lot 1 at Tom Price Mine (Rio Tinto), Pilbara WA.



# Technical Excellence

**Our people are passionate about leveraging their technical ingenuity to solve complex problems.**

Technical excellence is the bedrock of our business. It drives our people and propels the outcomes that we provide for clients, communities, asset owners and operators, and financiers.

Our dedicated professionals and subject matter experts focus on understanding our clients' business objectives, their desired project outcomes, as well as the latest industry research for the sectors in which we operate.

## A Premium Client Experience

The success of our project work depends on leveraging the best expertise of our people. That's why we allocate the most qualified professionals to help realise our clients' development vision and bring their projects to life.

Our work is underpinned by strong engineering design principles, industry-leading technology and pragmatic advice to deliver exceptional outcomes, every time.

This approach provides the following benefits:

- Ease of understanding of regulatory frameworks
- Efficient navigation through the development approvals process
- Protection and preservation of our cultural heritage, the environment and waterways
- Healthy, transparent and trusted relationships are established with stakeholder groups
- Respectful liaison with Traditional Owners is undertaken
- Fair and equitable outcomes are achieved for First Nations' communities
- Project knowledge is retained, including lessons learned
- Innovation is embraced and deployed.

## Technical Leadership Team

The quality and excellence of our world and ability to deliver the best technical and cost-effective solutions for our clients is guided by our Technical Leadership Team.

Led by the most senior members of our business, this team facilitates learning and knowledge transfer, professional collaboration and mentorship to drive continuous excellence in our technical capabilities. It also encourages our people to perform to high technical standards and rewards staff for incorporating innovation into projects.

Image: Steve Ash and Kanishka Pathirana at Paraburdoo Train Load Out Facility, Pilbara WA.

# Safety is at the Heart of our Business

## Our diverse and culturally aware teams embrace safe work practices that are environmentally sound.

Safety is integral to everything we do at BG&E Resources. We care about our people, clients, and the communities in which we operate, and strive for zero harm in everything we do.

Health, safety and quality are embedded in our work practices, while heritage and sustainability are considered throughout the entire project life cycle.

We recognise the importance of continuously reviewing safety in design issues at all stages of a project, from investigation, design, construction, operation (including maintenance), closure and rehabilitation.

Exceeding regulatory obligations, we leverage a formalised Health, Safety, Environment and Quality Management framework that allows us to analyse and implement practical measures to mitigate risks.



### Leadership

- Understanding of client needs
- Technical Leadership Team governance
- Strong Chartered presence
- Adherence to Technical Standards & Regulatory Instruments
- Committed to Technical Excellence
- Striving for low-carbon impacts



### Systems

- ISO Accredited Quality Management System (QMS)
- Design Assurance
- Engineering Verification Procedures
- Safety in Design
- Net Zero in Design
- Risk Mitigation & Management
- Project Governance (Action Tracking, Monitoring, Performance & Auditing)
- Continuous Improvement (Lessons Learnt)



### Characteristics

- Client Centric
- Risk Adverse
- Reliable
- Accountable
- Innovative
- Simplification
- Community & Culture



Image: Lucy Nguyen at Cape Lambert Port Facility, Karratha WA.



Image: Indigenous peoples' hands. Copyright approved via Shutterstock.

# Respecting, Protecting and Preserving our Cultural Heritage

## Diversity across our workforce and our supply chain is vital.

Our clients trust in our ability to enhance their social license to operate, including through the provision of mutually rewarding cultural heritage consultation and management, healthy Indigenous partnerships, and ethical procurement from Aboriginal-owned and operated businesses.

Working with Traditional Owners, First Nations peoples, Indigenous Prescribed Body Corporates and Aboriginal Corporations, is seeded in early engagement as it enables our team to deliver benefits for today (across the life cycle of proponents' projects) and for future generations.

Early engagement underpins our approach to cultural heritage management as it enables us to understand the needs and desires of all stakeholder groups, as well as any existing Indigenous Land Use Agreements (ILUAs) which have been registered with the National Native Title Tribunal (NNTT).

We partner with highly experienced local archaeologists and ethnographic specialists to provide clients with access to an abundance of heritage site data, and to collectively undertake walk-throughs of proposed project sites.

From the Kimberley in the North to Esperance in the South of WA, across central Australia and along the Eastern seaboard – we engage with Traditional Owners and Custodians, Prescribed Body Corporates (PBCs), Aboriginal development corporations and First Nations communities to preserve their cultural heritage and when helping proponents and/or government agencies to deliver projects.

### Cultural Heritage Management Capabilities

- Stakeholder consultation and engagement to help Traditional Custodians of the land and Native Title Claimants to establish IULAs, registration to the NNTT and compensation frameworks (among others).
- Advice for proponents regarding the application of legislation including the Native Title Act 1993, Heritage Act 1972 (Aboriginal Cultural Heritage Bill 2021) and Repeal Bill 2023.
- Developing scopes for archaeological and ethnographic surveys.
- Indigenous business contracting (including teaming with Aboriginal-owned and Supply Nation-certified businesses to develop First Nations regional workforces).
- Capacity building (including coaching, mentoring and career pathway development, etc. for First Nations peoples).
- Reconciliation Action Plans.

### First Nations' Partnerships

We have a range of actions in place to increase Aboriginal and Torres Strait Islander employment and engagement in our business, to help First Nations communities become self-sustaining (current participation is approximately 1.5 per cent of our workforce and we are striving to increase that to three per cent by December 2025).

We proudly support Aboriginal and Torres Strait Islander owned businesses and have established a majority-owned Aboriginal company, TICS (WA) Pty Ltd (TICS). TICS is a NATA-accredited laboratory to ISO 17025, providing nondestructive testing (NDT) services.

Similarly, we have strategic partnering arrangements with several Aboriginal-owned businesses, including Karlayura Contracting, which provides design and construction support for clients.

We have also established a similar partnering agreement with i24s, an Aboriginal-owned and operated workforce company, providing security, civil works and commercial cleaning services for mine sites in remote locations across Australia, as well as for commercial premises in capital cities (their clients include BHP, Horizon Power and Cundaline Resources, among others).

Most recently, we also established a partnership with Pirrpala, a 100 per cent Aboriginal-owned and operated small scale project delivery provider.

Our partnerships also span the globe, specifically in China, for the procurement of equipment and professional services, including on Country inspections of fabrication, testing, compliance and design reviews.

### Reconciliation

Review our [Innovate Reconciliation Action Plan](#), [Aboriginal and Torres Strait Islander Engagement Strategy](#), [Human Rights Statement](#) and [Anti-Discrimination Policy](#).

# Meeting Complex Challenges with Ground Engineering Expertise

Image: Mardie Salt Project Pilbara, WA.

Focused on getting the geology right, we develop robust geotechnical designs that are underpinned by an accurate representation of the subsurface profile.

Our Ground Engineering team provides exceptional client service and technical solutions by drawing on the combined technical and project management experience of our professionals.

We balance cutting edge innovation and design with pragmatism developed from delivering technically challenging onshore and nearshore projects. We pride ourselves on working collaboratively with our clients to understand their challenges and drivers so that optimal schedule, cost and technical outcomes are achieved.

Successful project outcomes start with an early understanding of geological hazards and ground risks, followed by active management of these risks throughout the project life cycle.

BGER's engineering geologists and geotechnical specialists work collaboratively to plan and execute site investigations, analyse and design while using the latest software and technology to provide construction phase support and undertake asset condition assessments.

Our experience gained on projects in Australia, New Zealand, Indonesia and Africa, allows us to assess key geotechnical risks and adopt practical design measures to manage them. We leverage historical project learnings to better inform solutions to unforeseen ground conditions, construction difficulties, construction material characterisation and supply.

**Capabilities**

- Site Investigation
- Rock and Soil Slope Stability
- Soft Ground Engineering
- Deep Pile Foundations
- Earth Retention
- Dam Engineering
- Tailings Storage Facilities, & Mine Closure & Rehabilitation
- Pavement Design
- Temporary Works
- Construction Support

Image: Dampier Fuel Wharf, Pilbara WA.





Image: Mardie Salt and Potash, Pilbara WA.



# Optimising Asset Reliability

We collaborate with our clients through the full project life cycle and focus on developing a deep understanding of the asset. This enable us be highly responsive and mitigate risks from asset inception through to decommissioning and renewal.

## Capabilities

### Ground Investigations

- Foundation Designs
- Shallow Footings & Piles Designs
- Settlement & Groundwater Analyses
- Ground Improvement Design & Monitoring
- Back Analysis of Foundation Performance
- Pile Driveability Studies
- Ground Anchor Designs

### Slope Stability

- Assessment of Existing Slopes
- Instrumentation & Monitoring
- Risk Assessments – Quantitative & Qualitative
- Slope Remediation Works Designs

### Nearshore and Marine Geotechnics

- Offshore Drilling Investigations
- Design of Foundations – Piles, Mooring Points, Monopods, Dolphins
- Design of Retaining Structures
- Reclamation, Dredging, Ground Improvement Designs
- Materials Sourcing for Breakwaters

### Tunnels & Retaining Structures

- Deep Excavations Assessments
- Design of Temporary & Permanent Retaining Structures
- Advice During Construction
- Site Specific Designs
- Rock Bolting, Soil Nailing & Ground Anchors
- Cut & Cover Tunnel Design
- Back Analysis of Failed Structures

### Ground Improvement

- Design Surcharge / Pvd
- Vibro Compaction / Replacement (Stone Columns)
- Controlled Modulus Columns
- Jet Grouting
- Deep Soil Mixing & Dynamic Compaction

### Specialist Services

- Geohazard / Geotechnical Risk Assessments
- Site Selection / High Level Feasibility Assessments
- Forensic Geotechnical Analyses
- Seismic Engineering & Liquefaction Analysis
- Specifications for Earthworks, Piling, Retaining Systems & Ground Improvement
- Integrated Geological / Geotechnical Assessments
- Construction Support
- Asset Condition Assessment
- Construction Material Assessment
- Tailings Storage Facilities
- Mine Closure & Rehabilitation
- Pumping & Piping Engineering

### Engineering, Procurement & Construction Management (EPCM)

- End-to-End Project Delivery - Engineering, Procurement, Commercial Support, Construction Management, Completion & Commissioning



# Numerical Modelling

**An integral part of our geotechnical engineering approach, numerical modelling helps us overcome complex challenges in the construction environment.**

Our team is experienced in using both 2D and 3D numerical modelling software to analyse a range of problems including:

- Soil Structure Interactions – Tunnels, Retaining Structures & Foundations
- Ground Settlements / Heaves
- Ground improvements
- Mechanically Stabilised Earth Slopes & Walls
- Dynamic Loading
- Transient & Steady State Groundwater Flow

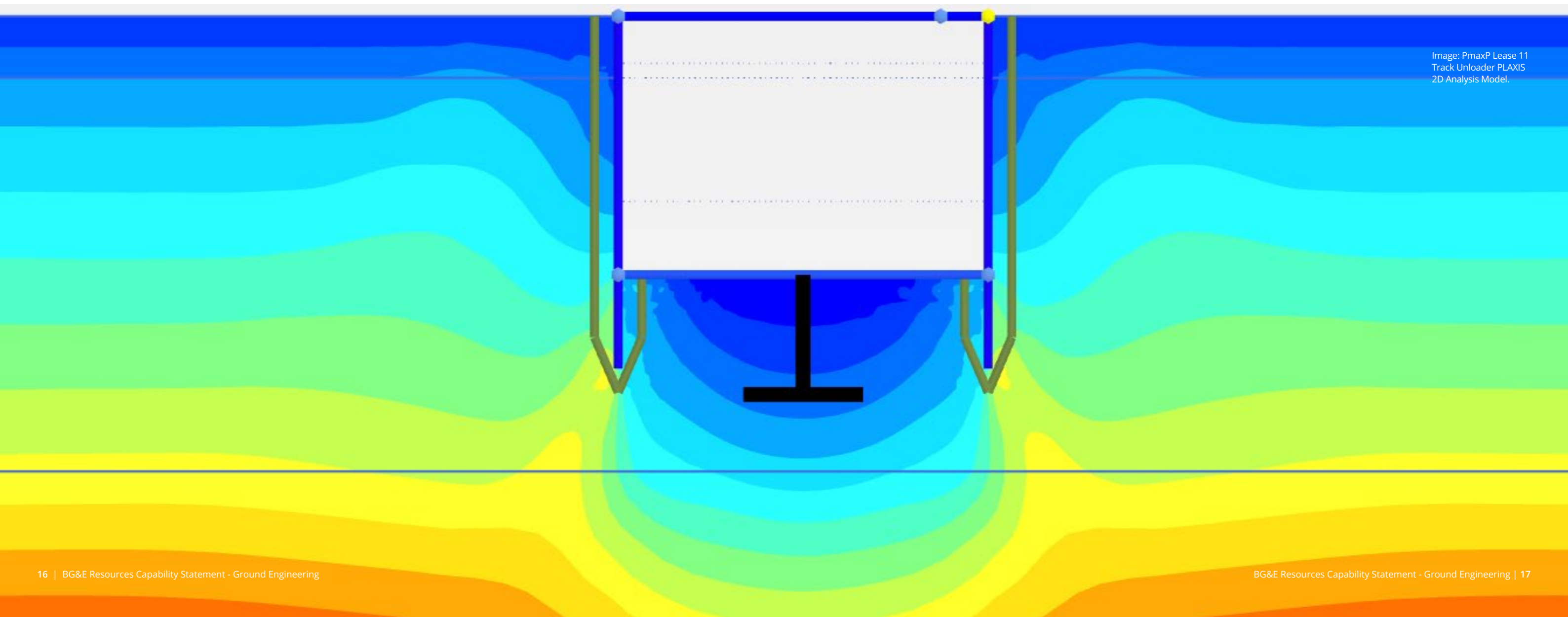


Image: PmaxP Lease 11  
Track Unloader PLAXIS  
2D Analysis Model.



Image: Balcatta Senior High School, Balcatta WA.

# Geotechnical Investigation, Interpretation and Reporting

**Careful investigation of ground conditions is critical to the design of all infrastructure built on or in the ground.**

Our team of engineering geologists and geotechnical specialists apply their experience, skills and a range of site investigation techniques to identify and characterise geological hazards and site development opportunities. The techniques used include both conventional and non-conventional, intrusive and non-intrusive methods tailored to the challenge.

- Remote Sensing Site Characterisation
- Preliminary Geologic Assessments (Data Search, Terrain Analysis & Field Reconnaissance)
- Site & Route Assessments
- Designing, Planning & Managing Site Investigations
- Geophysical Survey Scoping & Interpretation
- Borehole Drilling, Cone Penetration Testing, Trial Pits, Costeans & Geological Mapping
- Instrumentation & Monitoring
- Laboratory & In Situ Testing
- Interpretation, Analysis & Reporting
- Construction Material Search



Image: New Parallel Runway, Brisbane Airport, QLD.

# Projects

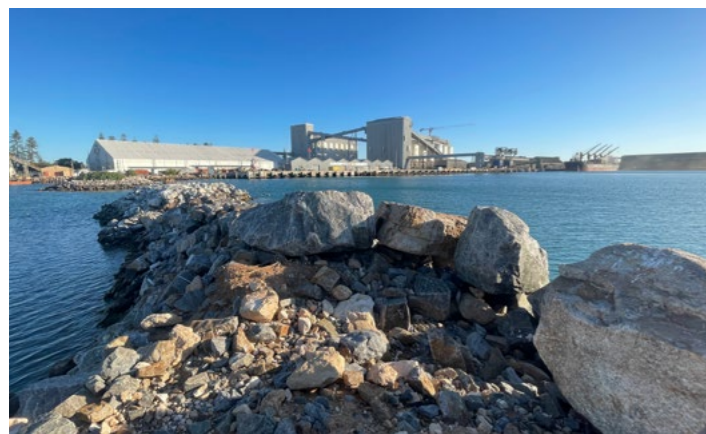


Image: Geotechnical works performed in Port Hedland WA.

# Geraldton Port Maximisation Project (PMaxP)

Client: Mid West Ports Authority (MWPA)

Our team is providing Engineering, Procurement, Construction and Management (EPCM) project delivery services.



The \$350 million infrastructure project will enable MWPA to facilitate diverse and emerging trade opportunities and significantly increase throughput capacity over the next 10 years.

Delivered over four years, the project is designed to facilitate growth by allowing MWPA to increase trade at Geraldton Port from 16 million tonnes per annum (Mtpa) to 25 Mtpa by 2026.

The geotechnical scope includes:

- Carrying out onshore and nearshore investigations.
- Preparing designs for IFC Status for a new multiuser storage shed, the demolition and redevelopment of berths 1 and 2 and a new conveyor network.
- Assisting with the management of all site works to ensure they are delivered safely, to the required quality and in accordance with the established budgets and schedules.
- Overseeing the commissioning and project handover to MWPA Operations.

Images: Geraldton Port Maximisation Project (PMaxP), WA.



# Advancing Green Steel

Client: Undisclosed

**With the global energy transition underway and the need for organisations to decarbonise, a new green steel precinct is being considered in Australia.**

It is intended to provide a long-term hub for the development of downstream iron ore processing technology, supported by a transition to green energy and green steel.

Our client, one of the world's leading steel manufacturers, is proposing to develop a Hot Briquetted Iron (HBI) and Pellet Processing Plant, powered by green hydrogen – potentially comprising wind, solar, electrolysers and pipelines. This is a crucial component of our client's strategy to achieve carbon neutrality by 2050.

BGER has been engaged as a key engineering delivery partner for Phase 1 of the pre-feasibility study.

Comprising plant design for a 3.5 Mtpa pellet plant and a 2 Mtpa HBI plant, Phase 1 considers a range of aspects for future expansion and development flexibility, including direct export options for the pellet product.

Our initial involvement began with completing the engineering concept study for Phase 1, followed by a detailed civil and hydrology feasibility study and a geotechnical study.

Our team of engineering geologists and geotechnical engineers are steadily making progress in gathering valuable data and insights to support the development of the project. We are working closely with our client, Traditional Owners and First Nations communities to take measures to protect sites of environmental and heritage significance.

The spatial extents of the geotechnical investigations include the plant, ponds and pump station, natural gas station and power receiving station to acquire critical geotechnical information for the design and construction of the above structures.

Phase 2 of our client's project entails the initiation of a pre-feasibility study for the development of green hydrogen production including the establishment of a concept for electrolysis facilities.

# WTS2 Northern Access Road Tunnel

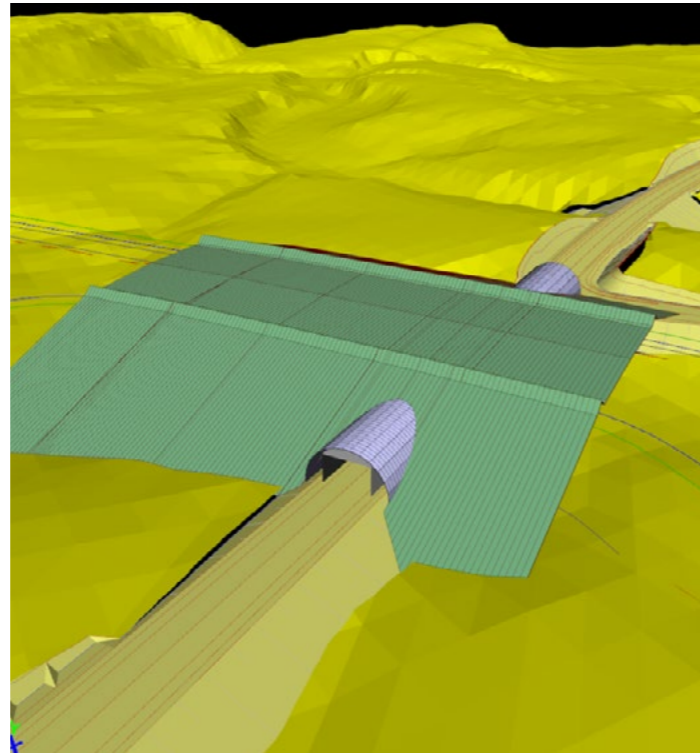
Client: Rio Tinto

## Ongoing pit expansion works for Rio Tinto required a new haul road to cross the existing Northern Access Road.

The Western Turner Syncline Phase 2 (WTS2) Northern Access Road Tunnel project includes a 100 m long concrete arch with haul road overpass, a 600 m long bypass road and significant earth embankments for the overpass ramps.

Geotechnical works included desktop studies and a ground-breaking investigation, interpretive ground models including cross sections relevant to the tunnel alignment, haul road and fill embankment.

Our engagement also included the identification of geohazards and risk mitigation strategies, foundation assessments of tunnel and a finite element analysis of the tunnel / soil interaction, slope stability analysis, ground improvement and earthwork recommendations and borrow materials assessments.



Images: WTS2 Northern Access Road Tunnel — Pilbara, WA.





Image: Stanley Point  
Berth 3 Port Facility —  
Port Hedland, WA.

## Stanley Point Berth 3 Port Facility

Client: Roy Hill

### Detailed Bankable Feasibility Study for a new 50 Mtpa iron ore export terminal in Port Hedland for Hancock Resources.

The terminal's two berths are designed to accommodate two 12,500 tph ship loaders and bulk carriers up to 320,000 DWT.

The project also includes 2 km of elevated overland conveyors and bridges from the inland stockyards to span a major transport and conveyor corridor as well as sensitive estuary mangroves.

The study provided detailed Class C ( $\pm 15\%$ ) CAPEX and OPEX assessment.

Geotechnical works included desktop and gap analysis studies, preliminary pile berthing and conveyor pile design, ground improvement optioneering, proposed car dumper excavation impacts to existing infrastructure and the development of a geotechnical scope of work to progress the project further.



Image: Eldo Plateau  
Haul Road —  
Nhulunbuy, NT.

## Eldo Plateau Haul Road Construction Support

Client: Rio Tinto

### Rio Tinto engaged BGER to provide civil and geotechnical design support to build 5.3 km of new haul road and 6 km of public access road.

The project also involves the construction of a high flow HME culvert crossing. Works include client and contractor liaison, rostered site presence, development of ITP's, technical advice on borrow materials, subgrade and pavement development plus culvert foundations and backfilling.

In addition, BGER provided assistance in updating specifications and audit reporting.



Image: Cranbrook Rail and Civil Works — Cranbrook, WA.

# Cranbrook Rail and Civil Works

Client: CBH Group

We have undertaken the rail and civil design works required for the expansion works at the Cranbrook grain storage facility.

BGER's scope included the modelling of the site stormwater management, civil design of pavements, structural foundations for the Freight Rail Loading (FRL) facility, and rail design of the siding.

Key challenges incurred on the project included the rail formation design with respect to ground conditions and levels, together with management of the catchment drainage.

BGER has provided value add services throughout the project by utilising our inhouse geotechnical capability for optimisation of the rail formation design.

# PBO Tertiary Hydrocyclones Plant

Client: Rio Tinto

To improve Processing Plant recovery, Rio Tinto required future recovery of high-grade SOP of the operational life in the Paraburadoo TSF.

BGER is executing the study for the proposed Tertiary Hydrocyclone Plant upgrade.

There is a significant opportunity to recover alternate size range particles from future plant feed. Recovering this material will decrease plant per/ton operation costs, increase production and reduce Life of Mine (LOM) TSF costs.

Installing this process infrastructure will also enable increased potential for future recovery of high-grade SOP that has been deposited over the course of the operational life in the Paraburadoo TSF.

The project aims to improve plant recovery, through improvement of fines production, reducing per ton operation costs and decreasing LOM capital costs.

Image: PBO Tertiary Hydrocyclones Plant — Pilbara, WA.

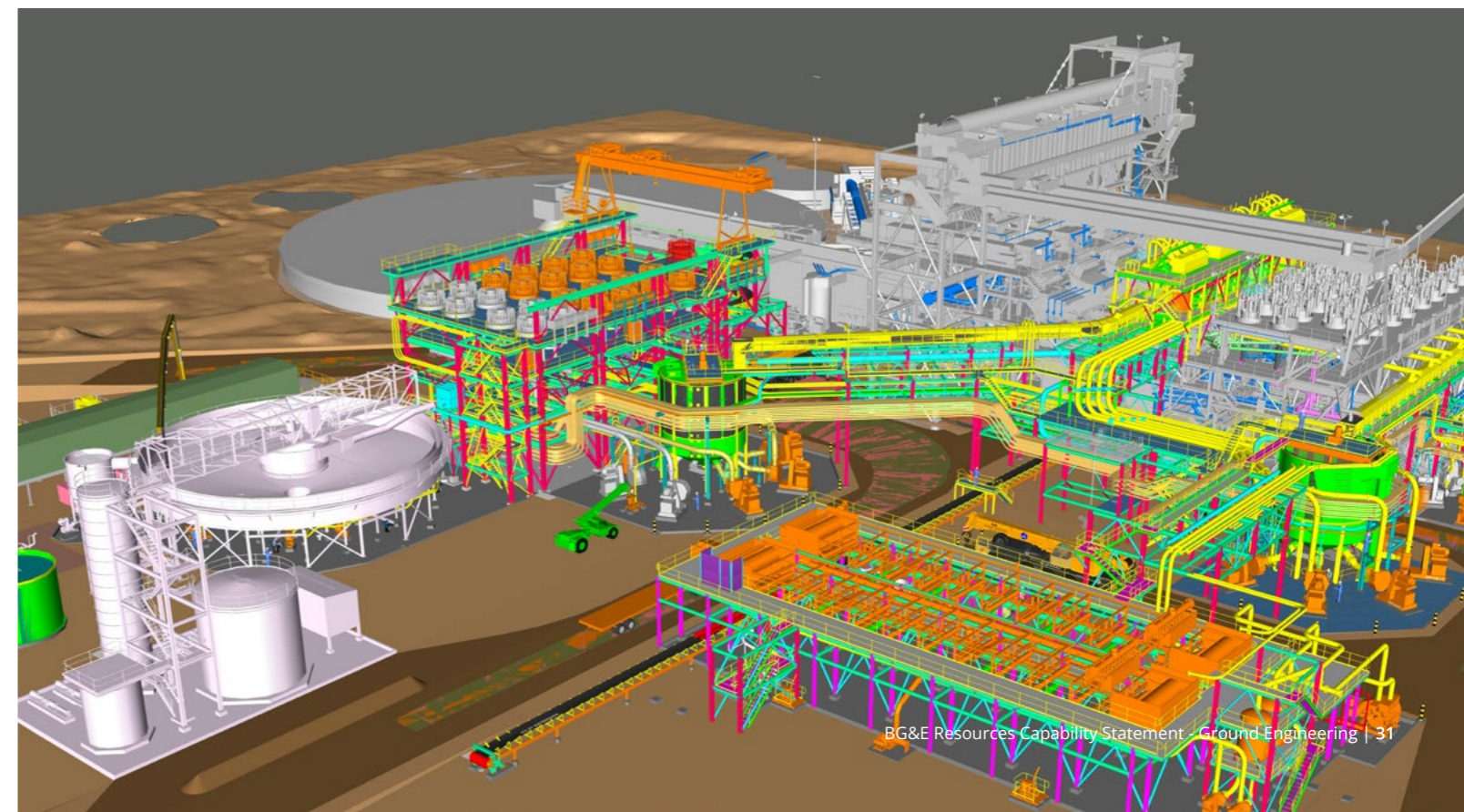






Image: Ngungaju Plant - Courtesy of Pilbara Minerals.

# Mardie Salt and Potash Project

Client: BCI Minerals Limited (BCI)

We have supported BCI Minerals in its development of this large-scale, multi-generational solar evaporation facility in the Pilbara.

BCI Minerals is in the detailed planning and early project execution phase to produce high purity industrial grade salt and Sulphate of Potash (SOP) via solar evaporation, crystallisation and dry harvesting of raw salt.

The facility has been designed to produce and export 5.35 Mpta of salt with the facility comprising of seawater intake pump stations, seawater salt evaporation ponds and salt crystallisers, salt wash plant and stockyards, SOP crystallisers and SOP plant with a dedicated new transhipment port marine facility.

Matt Watts, BGER's Discipline Lead for Ground Engineering has provided geotechnical support including in-house secondments from PFS. Early works included geomorphologically mapping the project area to identify borrow opportunities.

Our early involvement transitioned into large scale nearshore and onshore geotechnical investigations which brought the project through to FEED. Significant value has been provided in terms of fill optimisation and limiting haul distances.

The BGER Ground Engineering team is now providing geotechnical design support for several pump stations, the secondary seawater intake and the optimisation of the Crystalliser Pond layout.

# Hydrology and Waterways Study for Mine Road Upgrade

Client: Pilbara Minerals

We completed a hydrology and waterways assessment of the Pilgangoora Mine Site and Wodgina Mine Access Road, including the conceptual design of floodway crossings.

Following the conceptual design phase, BGER's Geotechnical and Civil teams have been working in a joint effort with Pilbara Minerals to progress detailed design and site investigations for the delivery of the road upgrade project.

The operation consists of two processing plants, the Pilgan Plant located on the northern side of the Pilgangoora area, produces a spodumene concentrate and a tantalite concentrate, and the Ngungaju Plant, located to the south and produces a spodumene concentrate.

The Wodgina Access Road to the Pilgangoora Mine Site is situated between Port Hedland and Mulga Downs in Western Australia's Pilbara Region. The road is currently unsealed and extends approximately 24 km from Great Northern Highway, where a new intersection will be required.

The design scope involves upgrading 24 km of the Wodgina Road to a sealed road to facilitate increased haulage capacity via super quad road trains. This includes 11 major floodway crossings, 12 km of site access and haul roads, and a new intersection at Great Northern Highway.

Our involvement initially commenced in Dec 2022 with completion expected in November 2023.

When complete, the road upgrade will improve the efficiency and safety of transporting critical minerals to Port Hedland to meet the increased demand for resources to enable the global transformation toward clean energy and a sustainable future.

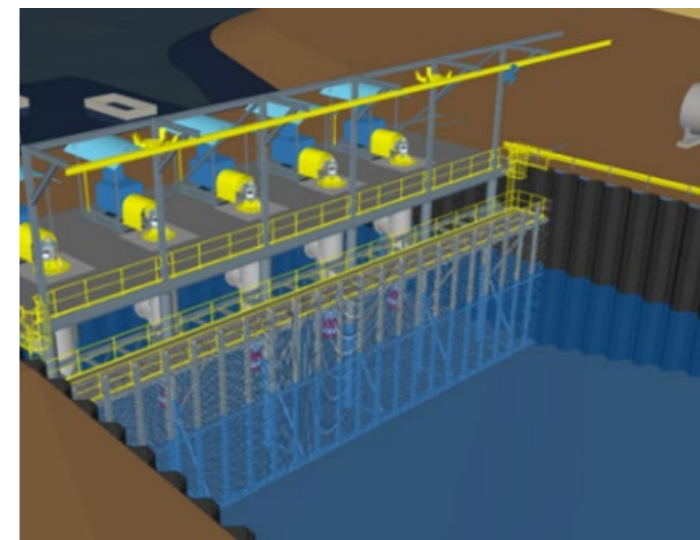


Image: Mardie



Image: Mardie Marsh Buggy, Pilbara WA.

# Our Ground Engineering Leadership



**Jason Fong**  
**Director - Geotechnical**

30 years of extensive experience as a geotechnical engineer in the geotechnical aspects of long linear infrastructure including planning (geotechnical constraints), site investigation, construction materials assessment and geotechnical design of slopes, retaining structures, ground improvement and foundations.

**Hugo Acosta-Martinez**  
**Technical Director - Geotechnical**

29 years of consulting experience including geotechnical site investigation, analysis and design of foundations for buildings, retaining structures for deep excavations in soft soils, heavy haul railway infrastructure, marine structures, industrial facilities, bridges, pipelines, slope stability and landslide risk assessment.

**Matt Watts**  
**Discipline Lead - Geotechnical**

15 years of experience as an engineering geologist with a broad understanding of soil mechanics gained from industry experience, overcoming inter-disciplinary challenges and working directly with clients. Matt's skills range from large scoping studies and working closely with clients from PFS through to FID to limit construction costs, while producing high quality engineering outcomes.

**Stuart Begg**  
**Principal Engineering Geologist**

30 years of experience in the infrastructure, hydrocarbons and mining sectors. Stuart specialises in engineering geology and has extensive experience in geotechnical site investigations, construction materials, terrain assessment, geological modelling and geohazards, foundation investigation, materials testing and characterisation, and dredging studies.

**Stephen Kariuki**  
**Lead Geotechnical Engineer**

16 years of experience in project delivery and management in construction and design industries. Stephen's geotechnical experience includes the planning and execution of geotechnical site investigations for a range of highways, rail transportation corridors and mining industry enabling infrastructure. Stephen has also been involved with the design of foundations, slopes and retaining structures.

**Jit Lim**  
**Principal Geotechnical Engineer**

21 years of experience in geotechnical design focusing on Finite Element (FE) analysis, pile design, pile drivability and pile load testing assessments, temporary works design, earth retaining systems and ground improvement. Jit is innovative with strong experimental and numerical modelling skills, always striving for high quality, practical and cost-effective engineering solutions.

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BG&E Resources is a multidisciplinary engineering, design, project delivery and advisory consultancy, providing technical solutions for clients in the Resources, Energy and Industrial sectors. We are majority owned by our employees, who are united by our purpose – together, we embrace innovation to solve complex problems, for today and future generations.

[bge-resources.com](http://bge-resources.com)

