Pumping and Piping Engineering

Capability Statement

COMPETENCY
CAPACITY
COMMITMENT

BG&E
RESOURCES

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 Kaurna 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.

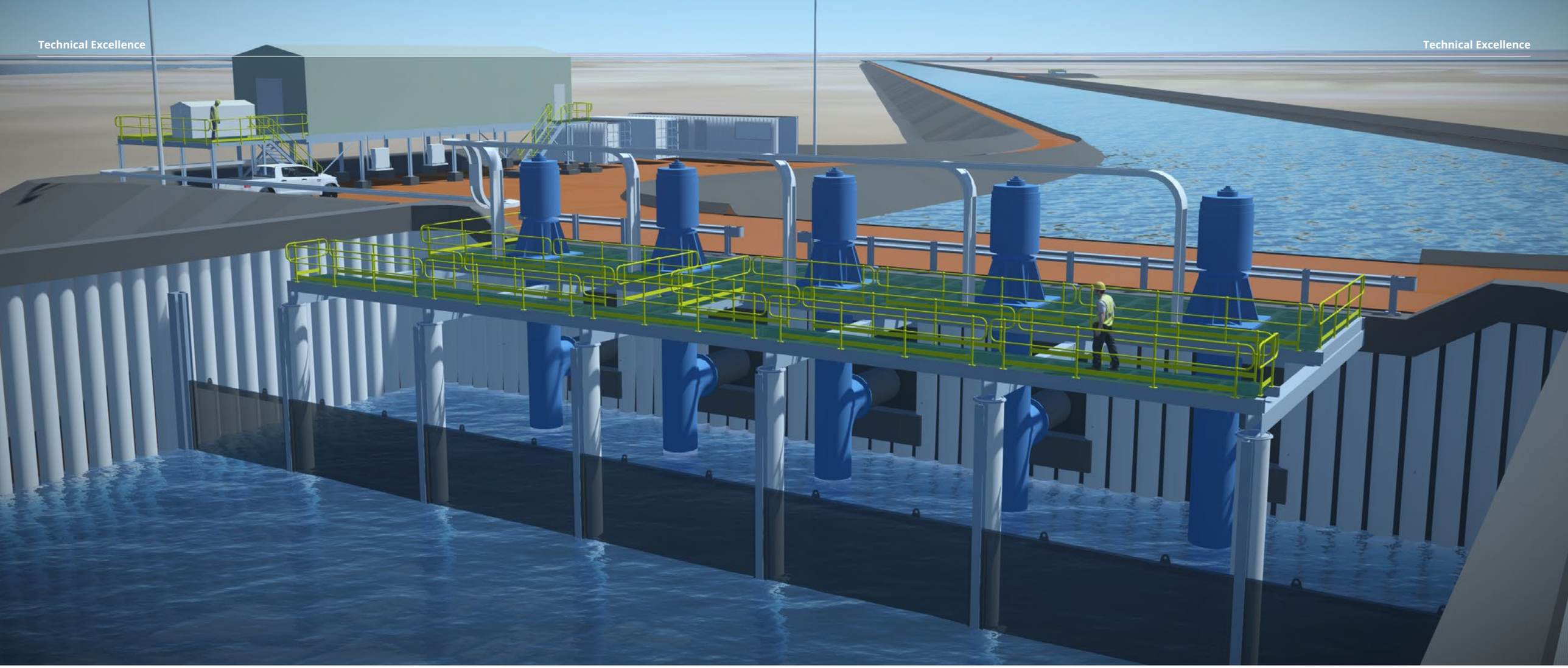
We honour the wisdom of, and pay respect to, Elders past and present, and we acknowledge the cultural authority of all Aboriginal and Torres Strait Islander peoples across Australia.

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).

Acknowledgement of Country

Technical Excellence



Pumping and Piping Engineering and Design for Asset Optimisation

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.

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.

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

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.

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.

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.

Respecting, Protecting and Preserving our Cultural Heritage

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

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 non-destructive 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.

Pumping and Piping Engineering

Specialising in mineral and chemical process pumping and piping engineering.

BGER has a longstanding track record in Brownfield and Greenfield projects including detailed engineering design, assessment of existing pump and piping assets, construction support and process design.

Our experience spans the full suite of large bore water and slurry transfer projects including marine works, bore fields, raw water, wastewater and process water handling.

We use the latest technology, software applications and inhouse methodologies to complete complex calculations and analyses as required, depending on the individual project requirements.

Our team has a deep understanding of the potential issues with pumping system installations, having been involved with numerous plant commissioning and start-up activities, as well as investigation into pump operations.

Capabilities

- Slurry Pumping and Piping Systems
- Computational Fluid Dynamics (CFD)
- Process Water Pumping and Piping Systems
- Settling Velocity Calculations
- Network Analysis using Fluid Flow Software
- Site Troubleshooting
- Slurry Storage Tank Design
- Oxygen Injection Recirculation Circuits
- Thickening and Filtration Circuits
- Multistage Pumping Systems – Series and Parallel
- Chemical Storage and Dosing Systems
- Fire Water Systems
- Process Plant and Infrastructure
- Air, Water and Wastewater Services
- Gravity Flows and Launder Designs
- TSF Pumping System

Project Phases

Our Pumping and Piping team offers services throughout the project life cycle covering concept, PFS, FS, Detailed Design through to construction and commission support.

Capabilities

- Concept Studies
- Pre-Feasibility Studies
- Bankable Feasibility Studies
- Front End Engineering Design
- Detailed Design
- Independent Review
- Construction Support
- 2D & 3D Design

Projects

Projects

Projects

Ultrafines Detailed Design WHIMS 1.5

Client: Roy Hill

Ultrafine recovery is extremely important for incremental tonnage costs, grade quality and extending the mine lifespan.

BGER provided detailed design to optimise ultrafine Hematite product recovery at the Roy Hill Processing Plant.

Our Mechanical team delivered pump designs, hoppers and tanks, piping support and piping and instrumentation diagrams. The new processing units required different process water consumption depending on the desired operating mode. We identified that the existing process water system was insufficient and required modifications.

Modifications included the addition of a new 1,200 kW process water pump to join the three existing that supply a DN1200 header pipe. This pipe supplies the WHIMS building with process water, before reducing to a DN500 header that supplies the WHIMS Expansion and Spirals buildings.

Our team also verified the pump selection and delivered the design for the new DN1200 and modifications to existing large bore pipework. Due to the complex desired operating capability, the entire process water system was hydraulically modelled across several scenarios.

Image: Ngungaju Plant - Coutesy of Pilbara Minerals.

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.

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 Paraburdoo TSF.

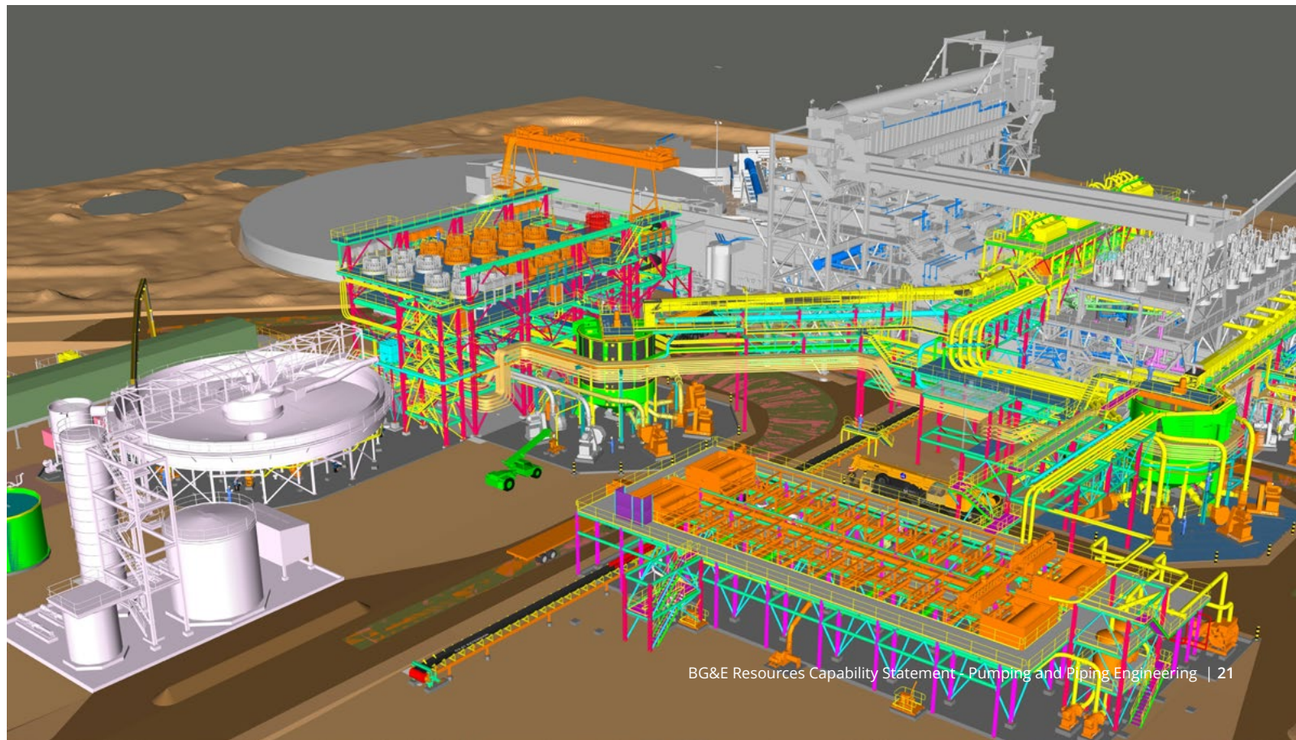
BGER is executing the study for the proposed Tertiary Hydrocyclone Plant upgrade.

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 Paraburdoo 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.



Process Water System – Brownfield Debottlenecking

Client: Roy Hill

We were engaged to design a new process water system to complete Roy Hill's debottlenecking studies.

Further to completing a series of debottlenecking studies – to enable Roy Hill to achieve 60 Mtpa throughput at one of its processing plants – we were engaged to design a new process water system to support future demand.

The new system included tie-ins to existing borefields piping, a dam, a pump station, a return discharge arrangement, and interconnecting pipework ranging from small bore piping to DN1200 Galvanised steel.

The pump station consists of seven 1,200 kW pumps connected to three buried DN1200 pipelines (>750 m in length total) that feed two different processes within the plant. Tie-ins into existing underground piping, extension of existing distribution, new valve stations and new booster pumps were required.

The return arrangement comprises of >1.6 km of DN1000 distribution manifolds complete with expansion loops and a total of eighty DN300 discharge spigots.

Pump Transfer Station – Mardie Salt and Potash

Client: BCI Minerals

Delivering the detailed design of the pump transfer stations at the Mardie Salt and Potash Project.

We have supported BCI Minerals Limited in its development of the Mardie Salt and Potash Project, a sustainable opportunity to develop a large-scale, multi-generational solar evaporation operation on the Pilbara coast of Western Australia.

The facility utilises nine evaporation ponds across the site, Due to topographical constraints, gravity feed of the brine was not possible across all the seawater evaporation ponds. BGER was engaged to deliver the detailed design of the pump transfer stations.

Pump Station 2-3 consisted of three 250 kW pumps with a combined capacity of 25,000 m^3 per hour feeding three DN1200 pipelines between Pond 2 and 3. Pump Station 3-4 included two 250 kW pumps capable of supplying 20,000 m^3 per hour to two 300 m long buried DN1200 pipelines crossing underneath a flood plain.

The high saline environment was a challenge for material selection. Co-extruded High-Density Polyethylene (HDPE) was selected for the pipeline to maximise value as it is not susceptible to degradation by seawater brines, has a high UV degradation resistance and ease of installation / maintenance.

Our Experts

Our Pumping and Piping Engineering Team

Tony Comerford
Technical Director

25 years of experience in technical engineering delivery, project, construction and commissioning management with a diverse background covering metals processing and refining, chemical plant, port facilities and industrial projects. Tony is experienced in alternative project contract delivery models from client and contractor delivery sides including alliances for sustaining capital and maintenance projects.

Joe Allen
Director, Operations and Director, Resources

15 years of experience in design, construction and operation of process plants with diverse experience across mining, power generation and infrastructure projects. Joe has proven experience in leading teams through all scales and phases, having overseen projects across Lithium, Power Generation and Water. His skills include concept studies and layout development, and capital cost estimates for complete project lifecycle.

Jamie Cigulev
Discipline Lead - Mechanical

10 years of experience in conveyor, piping and non-process infrastructure in the iron ore, gold, rare earths, lithium and industrial chemical sectors. He has a broad range of skills in delivering a variety of brownfield design projects and managing multidisciplined teams. Jamie's focus is on delivering projects which exceed the expectations of clients whilst meeting budget and schedule requirements.

Mark Todd
Principal Mechanical Engineer

22 years of experience in mechanical engineering spanning both operational and engineering design-based roles. Mark is an industry leader in the delivery of materials handling solutions. Mark strives to simplify mechanical systems ensuring the solution implemented is cost effective, easy to maintain and operate to provide the client with the best possible facility.

Todd Molloy
Lead Mechanical Engineer

17 years of experience in engineering, procurement and construction management (EPCM). Proven experience as a Structural/ Mechanical/Piping (SMP) Field Engineer during the construction of a multi-billion dollar project. Todd has been involved in a variety of projects and roles from large scale iron plants through to infrastructure projects, pipelines and mine dewatering roles.

Tony Daniel
General Manager - Sustaining Capital

10 years of experience in design and project engineering both in the engineering office and field environments. Tony's roles have included a broad range of activities in Greenfield and Brownfield contexts. He has undertaken field-based assignments that entail the management of multiple, concurrent sustaining capital and production improvement projects within operating facilities.

Our Experts

Our Pumping and Piping Engineering Team

Michael Ullrich
Study Lead

25 years of experience in the mining industry including management and engineering roles. Michael has completed various mining operations including underground and open pit mining, processing and mining supporting infrastructure. Projects undertaken cover a wide range of commodities, including; most recently, iron ore and nickel, as well as gold, platinum, uranium, manganese, copper and coal.

Matt Moreland
Engineering Manager

10 years of experience working in the mining, minerals processing and oil and gas industries. Matt has extensive experience in mechanical design, operations, maintenance, repair and upgrade of complex utility and processing equipment. He has undertaken projects for BHP, Rio Tinto and FMG; designing and constructing reagents packages, conveying systems, processing equipment and compressed air and gas separation packages.

Gary Bingham
Design Manager - Mandurah

18 years of design, detailing and site experience, Gary has been exposed to a wide range of materials handling and wet plant operations, in both brownfield and greenfield projects. Gary is a strong advocate for smart and effective design which promotes operability and safety while working within strict budgets. His passion for technology in design enables him to meet and exceed client expectations though 3D modelling and visualisation.

Kieran Maher
Design Manager

16 years of experience in structural design and detail drafting experience across the commercial, industrial and mining industries. His experience includes on-site experience working with brownfields projects, producing detailed design drawings, as well as developing scopes and providing technical support to clients.

Daniel Fullwood
Lead Mechanical Designer

15 years of experience in engineering design and project management of both brownfields and greenfields projects. He has effectively project managed operational support projects, from acquiring the task to completion and delivery. He has strong practical skills in structural, piping, mechanical and industrial project planning and design drafting.

Terrence Tarboton
Lead SMP Designer

38 years of experience providing mechanical design in various mineral and processing plants, with attention to detail and dedication to the task ensuring positive and professional outcomes.

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