menard

Mining

Geotechnical Services

- Rehabilitation
- Soil Stabilisation
- Foundation Innovation
- Tailings Solutions
- Backfilling

Your local specialist in providing design and construction **ground improvement** and **geotechnical solutions**.

Reliable solutions for Dams, Tailings, and Mining sectors

From life-saving medical devices and medicines to the phones we use and everything in between, globally, we rely heavily on the mining industry to provide for us every day. However, as an industry that carries so much responsibility, especially in tailings management, comes significant risks, including ever-fluctuating commodity prices and constant regulatory compliance changes, making the mine operators' responsibility to mitigate a wide range of risks paramount.

That's where **Menard Asia** is here to help; with proven **ground improvement** solutions that are as efficient as they are effective, you can be confident that you will always get the absolute best geotechnical advice, systems, and support you need to ensure that your mining operations continue to run as smoothly, efficiently, and safely, as possible. We are here to help you drastically reduce and better manage your:

- **Environmental Risk:** Reduce Tailings Seepage and Improve Water Management
- **Worker and Public Safety Risk:** Improve the Geotechnical Stability of Overburden Soil and Construction Material used in Dam Raises
- **Regulatory Compliance Risk**: Meet Annual Inspection Requirements and Closure Plan Targets
- **Economic Risk:** Increase the Capacity of the Facility and Optimize Dam Construction or Upgrading

Safety

THUMBS UP FOR SAFE ACCESS

HOME SAFE
SAFETY NEVER SLEEPS

Safety is our number one priority ahead of anything else.

Our safety culture is embedded in the way we work every day. From our project sites to our administrative offices, the goal is to keep our employees, sub-contractors, and clients safe.

Here at **Menard Asia**, we continually strive to maintain an injury-free workplace, no matter where this may be.

Reliable Partner

It is our goal to help mine operators in their responsibility to mitigate a wide range of paramount risks.

At **Menard Asia**, we understand that the mining industry carries responsibility, especially in tailings management. We understand the significant challenges, including ever-fluctuating commodity prices and constant regulatory compliance changes.

We have a proven track record of providing ground improvement in the mining industry, that has offered efficient and effective solutions.

With our long history as the only leading standalone ground improvement specialist, you can be confident that Menard Asia will provide the absolute best geotechnical advice, systems, and support you need to ensure that your mining operations will continue to run smoothly, efficiently and safely.

Our Values

#1 HOME SAFE

At Menard Asia we always strive to be the contractor of choice that clients can trust on and off site. We pride ourselves on being quality driven, and our clients can always bank on the strength of our foundations. However, it is health and safety that forms our first and foremost priority.

#2 LESS IS MORE MENARD

We live in a world in which resources are becoming increasingly scarce, so we develop optimal solutions using the least amount of material possible with a view to improve the sustainability of your projects. The Less is More Menard attitude relies on several simple principles:

- **less quantities** through better designs, better operation, better organization
- **less 'big toys'** but instead ones that are adapted to the task
- **less carbon-emitting resources** when replacements are available through the supply chain.

The Group has set the goal to reduce our Scope 1(1) & 2(2) emissions by 40% and our Scope 3(3) emissions by 20% before the end of 2030.

#3 INNOVATION IN OUR BLOOD

In 1954, Louis Ménard, a young French mechanical engineering student, invented a device to measure the soil's stress - deformation relationship at various depths in a borehole to calculate its bearing capacity and settlement. The pressuremeter was a drastic innovation in the geotechnical industry that continues to inspire the Menard spirit to this day!

Since then, the group has invented and developed the Dynamic Compaction technique for granular soils as well as the Menard Vacuum™ Consolidation for cohesive soils and the Controlled Modulus Columns (CMC) technology for high-level control of ground deformations accommodating higher loads. Working on the most demanding projects, our engineers, technicians and operators concentrate on bringing value to our clients by keeping up to date with the latest state-of-the-art technologies. The performance of thousands of successful projects each year provides a constant flow of information to support our local and group R&D teams in generating a continuous flow of innovations.

(1) Scope 1 (direct emissions): Greenhouse gas emissions directly produced by Group operations, in particular from fossil fuels used by vehicles, equipment and generators owned or controlled by the Group. — **(2) Scope 2 (direct emissions)**: Emissions from the generation of energy purchased by the Group. — **(3) Scope 3 (indirect emissions)**: Downstream activities.

Design-Build

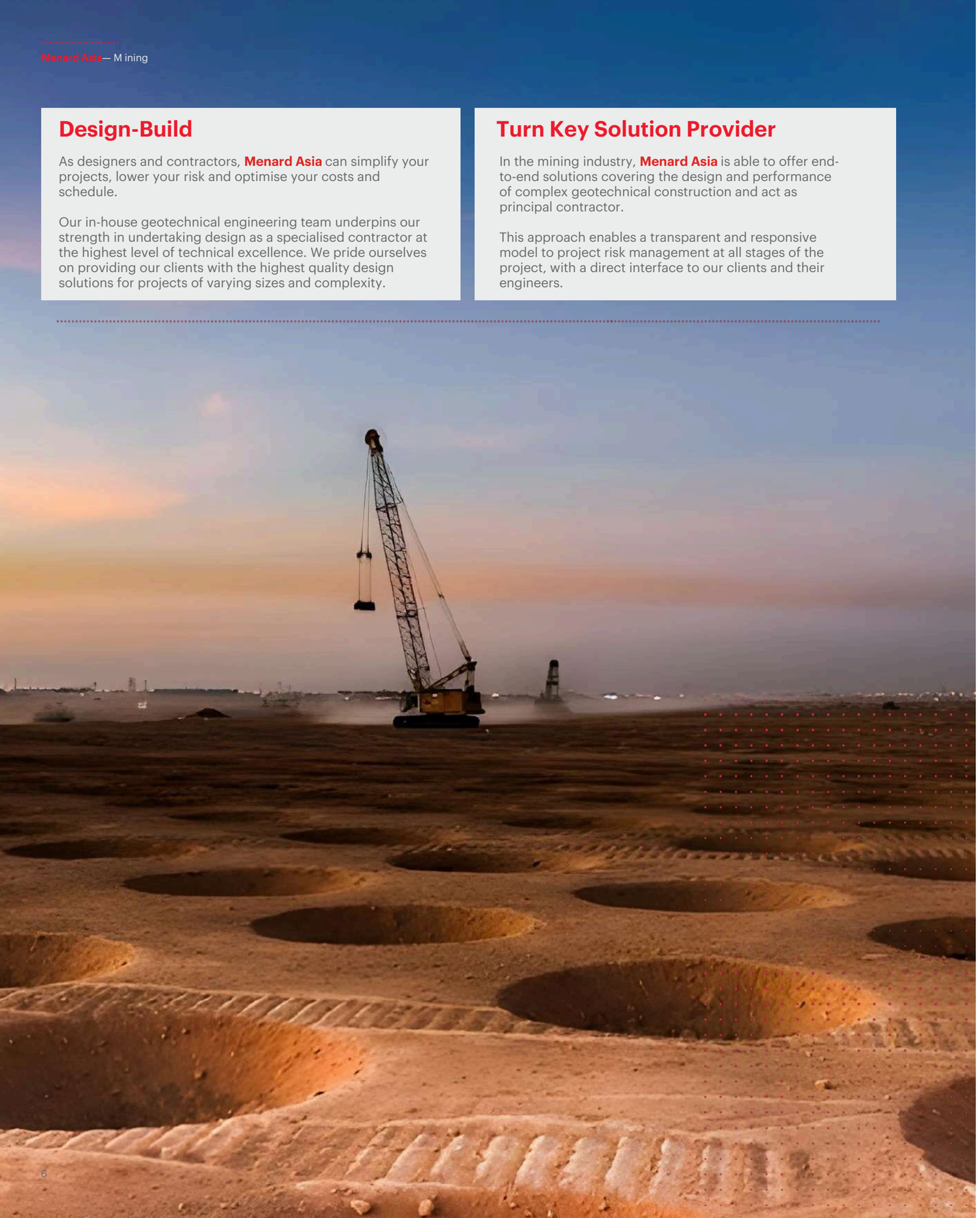
As designers and contractors, **Menard Asia** can simplify your projects, lower your risk and optimise your costs and schedule.

Our in-house geotechnical engineering team underpins our strength in undertaking design as a specialised contractor at the highest level of technical excellence. We pride ourselves on providing our clients with the highest quality design solutions for projects of varying sizes and complexity.

Turn Key Solution Provider

In the mining industry, **Menard Asia** is able to offer end-to-end solutions covering the design and performance of complex geotechnical construction and act as principal contractor.

This approach enables a transparent and responsive model to project risk management at all stages of the project, with a direct interface to our clients and their engineers.



Ground improvement

Ground improvement solutions for mining operations are proven, highly effective approaches for supporting operations, reinforcing, and strengthening the ground for **mine-related structures and activities**.

These include new tailings dams and the rehabilitation or upgrading of existing tailings dams and even tailings ponds, to name just a few applications. We are here to help you mitigate the project geotechnical risk posed by poor ground conditions which may have potentially disruptive, even catastrophic effects on your mine operations.

We do this using highly-effective and efficient **ground improvement** systems that help you by:

- Controlling Seepage
- Stabilizing Slopes
- Seismic Upgrading
- Liquefaction Mitigation
- Compacting Loose Soils
- Increasing Bearing Capacity
- Managing Contaminants
- Optimizing Facility Construction

Our techniques

- Dynamic Compaction (DC)
- Rapid Impact Compaction (RIC)
- Vibrocompaction
- High Energy Impact Compaction (HEIC)
- Controlled Modulus Columns (CMC)
- Stone Columns (SC)
- Compaction Grouting
- Jet Grouting
- Bi-modulus Columns
- Dynamic Replacement
- Vertical Drains
- Menard Vacuum™
- Soil Mixing
- Slurry Walls
- Anchoring, Soil Nails & Rock Bolts
- Void Filling

Dam Construction and Raising

When constructing a new dam, **Menard Asia** provides a number of services that can optimize the construction process.

Menard Asia can improve the original ground or mining fill through Dynamic Compaction, Dynamic Replacement, Rapid Impact Compaction, Soil Mixing, Vibro Compaction or Stone Columns, or even accelerate consolidation and drainage of foundation material through the installation of Wick Drains and Menard Vacuum.

For permeable foundations, **Menard Asia** implements Slurry Cutoff Walls and Rock Mass Grouting to provide new subsurface barriers below tailings facilities.

Whale Tale Dike,
Amaruq, Nunavut

Following the discovery of a gold deposit in Amaruq, Agnico Eagle Mines needed to construct a dike approximately 800 meters long to allow for dewatering of the north part of Whale Tail Lake.

Throughout the advancement of two single-line platforms above the existing water level, we carried out Dynamic Compaction of the material to later facilitate the construction of a hydraulic cut-o wall.

- Treatment Area: 7380 m2,
  Dam Length: 740 m,
  Depth: 3-14 m

Tailings Dam Upgrading

Many tailings facilities in Asia were constructed years ago and are in need of an upgrade to increase the factor of safety against slope failure, increase tailings storage capacity, and mitigation of seepage control.

Menard Asia offers many ground improvement techniques that will allow ground conditions to support heavier loads or decrease the permeability of a tailings facility.

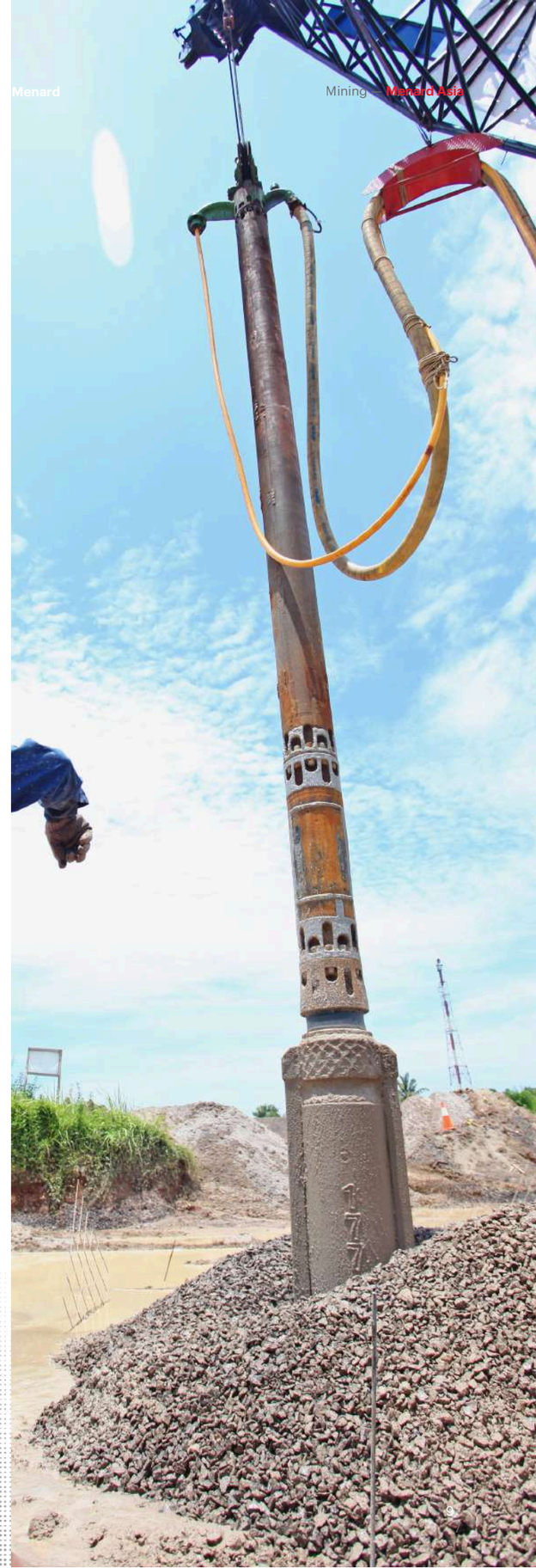
Techniques including, Jet Grouting, Stone Columns, Deep Soil Mixing, and Slurry Cut-Off Walls are used to achieve the specifications required by our clients.

Hume Dam
New South Wales

Hume Dam required additional support for the increased loading during seismic activity.

Menard was brought in to install 1100 stone columns varying in depth from 5 to 11 m.

- Treatment Area: 7500m2,
  1,033 Stone Columns,
  Depth: 5-11m



Seepage Control and Water Management

Rehabilitating dams is an efficient and cost-effective way to upgrade dams without the significant cost associated with full replacement. Installing a new impervious core can significantly lengthen the lifespan of an aging dam, especially in tropical, high-rainfall zone like Asia where seepage is the major risk.

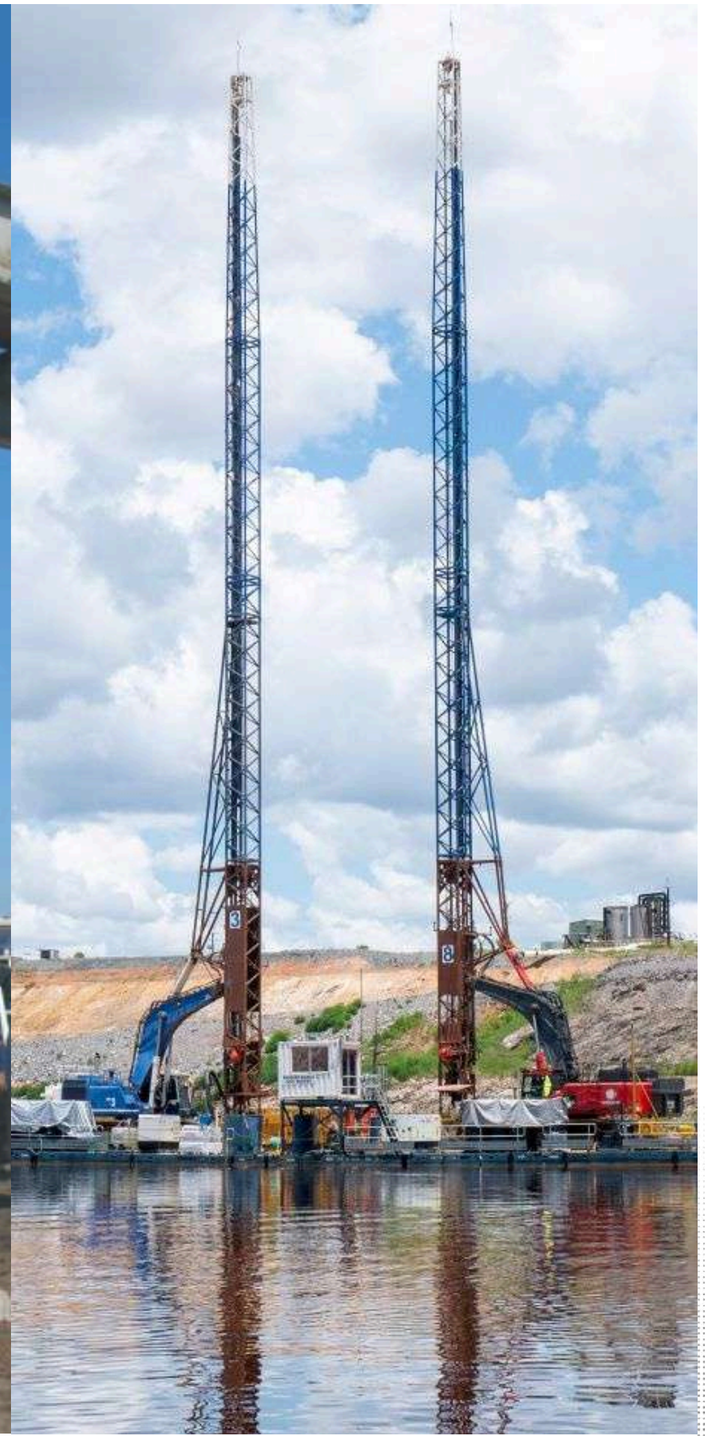
Menard Asia offers services such as Jet Grouting, Rock Mass Grouting, Deep Soil Mixing, cement-bentonite and soil-bentonite Slurry Wall installation that will help facilitate this type of rehabilitation.

BHP Mayfield Former Steelworks

In 2006, **Menard** successfully installed the world's deepest soil-bentonite groundwater barrier wall using a continuous open trench method at the former Newcastle Steelworks site.

As part of the remediation strategy for the site, **Menard** designed and constructed the barrier wall to reduce the migration of contaminated groundwater to the adjacent Hunter River.

Treatment: World's deepest soil-bentonite slurry wall (50m deep).



Tailings Consolidation for Raises or Closure

Slurry tailings deposits often contain a high volume of fines or "slimes". These can create geotechnical risk if a site is planning on raising their facility upstream or capping with fill for mine closure.

An approach to accelerate the consolidation process and drainage of these deposits, is by installing a grid pattern of vertical Wick Drains in the tailings material. Additional loads can then be added sooner and more effectively (i.e., pre-load, upstream raise or material cap).

Ranger Uranium Mine

The mine has come to its end of life and is now required to rehabilitate the site to return it back to parkland. To do so, tailings were moved to one of the open-cut pits for permanent storage.

Menard was brought in to consolidate this material due to its extremely high content of fines without compaction and its submersion in process water.

To carry the ground improvement works, **Menard** installed prefabricated vertical drains up to 45m deep through innovative moonpools in the barge decking.

Treatment: 1,700,000lm of PVD to a depth of 45m.

Void Filling, Sinkhole / Karst Void Backfilling

Mine backfilling is a technique where filler material (sand, fly ash, or gravel) is mixed with cementitious material to fill and stabilise underground cavities. **Menard Asia** has an in-depth knowledge of grout mix composition and can tailor the selection of grout mix used to suit strength and rheology technical requirements with consideration of cost and material availability.

Mine backfilling can be used in mining operations: it stabilises the mine, provides safe working areas, enables extraction from condemned areas, and reduces the amount of material stored at the surface. It is also used to stabilise new urban developments located on derelict historical mine shafts and galleries.

Menard Asia has access to a large fleet of drilling rigs able to reach treatment depths over 100 meters.

Lambton Garden

The mine workings around Lambton, NSW, date back to 1906. Borehole Seam, welsh board, and pillar workings have been carried out over the life of mine with some areas of pillar extraction.

Over time mine workings can collapse and may cause subsidence in the overlying areas. In early 2000s subsurface settlement was observed in the overlying residential development. As such, a void filling campaign was required to remediate the underlying mine workings and prevent further progressive collapse of the mine workings.

Menard successfully delivered a low strength void filling grout varying from 1MPa to 5MPa. Treatment was undertaken between 25 - 30m in line with the anticipated mine workings. **Menard** delivered our work within the active residential community, with positive feedback received from the NSW Mine Subsidence Board in terms of safety, environment, quality, program delivery, and cost savings for this project.

- Void filling treatment: Total volume of 4,000m3 was pumped through 22 cased holes at 25m to 30m depth.

Karst voids – Injection hole grid averaging from 3m x 3m to 5m x 5m

Slope Stability / Pit Wall Optimisation

Mine pit design is typically undertaken with consideration to un-reinforced batter slope and benching designs. As a result, the batter slope may result in a large mine footprint. On remote projects this design approach may be feasible; however, some projects have adjacent sensitive infrastructure or highly important environmental / heritage areas to be considered.

The application of civil type slope stability controls offers the mining industry an alternate way of approaching their projects. Typical controls may include **soil/rock anchors/nails, walers, shotcrete** and **rock mass grouting**. The application of these controls offers the mining industry the ability to both locally remediate existing unstable batters and further optimise the mine pit wall for a reduced mining footprint.

Major Project location in Papua New Guinea

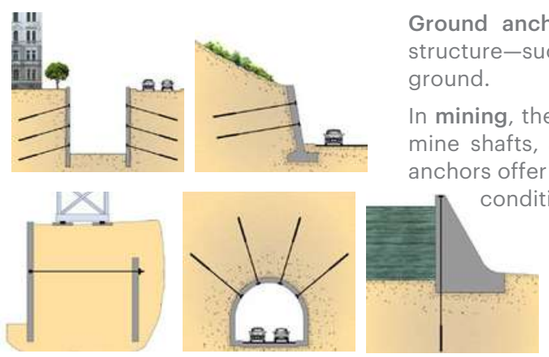
The largest anchor project in the southern hemisphere comprises the installation of over 3,000 anchors up to 80 m in length.

The anchors, in conjunction with walers, are shotcreted to effectively retain an excavation that is 200 m deep and 550 m wide. Up to 8 drilling rigs and a team of 300 persons, were successfully mobilised by Menard to deliver this project.

- Treatment: Over 3,000 anchors.

Additional Services

Ground Anchors



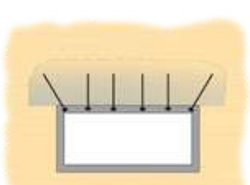
Ground anchors are designed to transmit tensile forces from a structure—such as a wall, shaft lining, or deep foundation—into the ground.

In **mining**, they are particularly effective in stabilizing retaining walls, mine shafts, and slopes cut into fractured or loose ground. These anchors offer deep-seated support in challenging geological conditions, preventing structural movement and collapse.

Soil Nails and Rock Bolts

To increase the resistance of soils and rocks in excavation areas, we apply **soil nailing** in soft ground and **rock bolts** in more rigid formations.

These reinforcements are used for stabilizing slopes, preventing erosion near haul roads or tailings structures, and supporting deep cuts or tunnel portals. In underground cavities, bolting can recreate a “beam effect” by connecting fractured rock layers.



Structural Systems for Mining Operations

Mining facilities demand reliable structures to support material flow and operational continuity. Poor containment, unsupported equipment, or underperforming structures can lead to production delays, safety risks, and costly remediation.

We deliver structural systems that support the essential flow of mining and energy operations. Our solutions enable the accessing, processing, storing, containing, and transporting of bulk minerals, metals, liquids, and gases.

From investigation and feasibility studies to long-term service, upgrade, and replacement, we provide reliable, high-performance systems for every stage of use.

TMF Filtration Plant - Martabe Gold Mine,
North Sumatra | MSE Wall

At the Martabe Gold Mine, space constraints and steep terrain challenged the development of a filtration plant and filter cake storage area. To create a stable working platform, we delivered a reinforced earth wall system.

MSE wall system was used to control wall deflection due to the use of sandy backfill. This solution enabled efficient use of limited land, without compromising safety or stability.

- Treatment: total facia of 1,237 m² Reinforced Earth® Wall

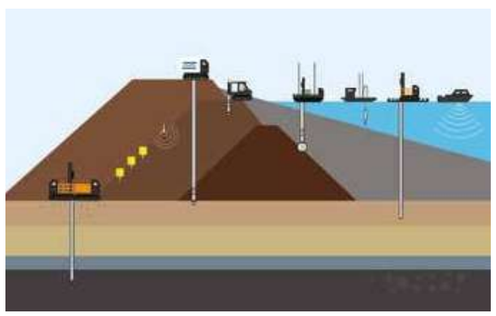
Characterisation and Monitoring

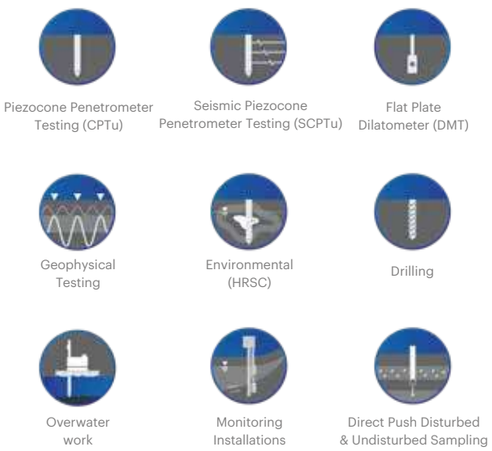
Site Characterization

Menard Asia is specialised in geotechnical site characterisation.

All projects are performed by specially trained personnel and supported by experienced site investigation professionals, delivering safe and productive, high quality tailings characterisation programs.

With Menard Asia’s experience, knowledge, and safety culture we offer our clients high quality solutions to meet the diverse challenges unique to the mining industry.





Monitoring

Menard is specialised in integrated geotechnical, structural and environmental instrumentation and monitoring solutions tailored for your projects.

Menard Asia provides fully integrated turnkey solutions for your monitoring needs, including:

- Instrumentation supply
- Design
- Procurement & delivery
- Installation & commission
- Automatic/Manual data collection
- Monitoring & QA/QC
- Alarm & reporting
- Maintenance

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