Linwood Quarry Community Day

History of the site

The Boral Linwood Quarry, located in Seacliff Park in Adelaide's southern suburbs, has a rich history dating back to 1882. Here's a summary of its development over time:

Early History

- 1882: Quarrying began to supply limestone to the nearby Brighton Cement Works marking the start of industrial-scale extraction in the area.
- 1892: The operation evolved into The South Australian Portland Cement Company Limited becoming a key player in the region's cement production.

Mid-20th Century Changes

- 1956: The site was taken over by Quarry Industries Ltd, which continued to expand and modernize operations.
- The quarry became a major source of hard rock aggregates, supporting infrastructure and construction projects across Adelaide.

Boral Acquisition and Modern Era

- 1994: Boral Limited acquired Quarry Industries, bringing the Linwood Quarry into its national operations.
- Since then, Boral has focused on producing high-quality road-base aggregates and has integrated a concrete batching plant (Boral Marino Concrete) on-site to supply concrete for both commercial and residential projects.

Production at the quarry has grown over the site's history to cope with the increasing demand for construction materials in South Australia.

Linwood is one of the largest construction material quarries (production and sales) in South Australia and the products it produces are of a high quality.

The resource has been described as Adelaide's most valuable resource for the construction industry.

Current operations

The site is located between Marino and Hallett Cove, near the Gulf of St Vincent, the quarry is surrounded by residential areas, golf courses, and conservation zones.

- Current consent for production – 1.2 million tonnes per annum
- Quarry life – 150 more years
- The plant was installed in 1987
- The total area of the Private Mine and tenement holding comprises 190.65 Ha
- We produce over 20 different products
- There are up to 50 truck movements per hour in quarry & 50 per hour in sales
- How much machinery on site?
    - 2 x drill rigs
    - 1 x 120 tonne large excavator
    - 1 x large quarry loader
    - 3 x sales loaders
    - 1 x rock breaker excavator
    - 8 haul trucks
    - 2 water carts
    - 1 x grader
    - contract crushing
    - 1 x excavator,
    - 2 x wheel loaders
    - 5 mobile crusher/screens

What type of rock?

The rock present at the Linwood site is identified as a Calcareous Meta-siltstone, a metamorphic rock which is crushed for use in the construction industry as aggregate for end uses such as road bases, concrete, asphalt (asphalt and road-sealing aggregates) and revetment works.

The sediments in the area of Linwood quarry belong to the Marinoan and Sturtian series of the Adelaidian System. They can be divided into the following main groups, the shales and siliceous blue-grey limestone of the Tapley Hill formation, the buff to brown coloured oolitic limestone's of the Brighton and the chocolate shales of the Marinoan.

Tapley Hill Formation

The Tapley Hill formation is a very thick sequence of calcareous siltstones and shales. The lower sections are comprised of alternating blue-grey to black silty limestone's and shales. This sequence grades into massive grey-blue dolomitic siltstones and limestones. This upper unit has a measured thickness of 325 metres at Linwood quarry. Within the blue-grey sequence there are occasional interbeds of soft, friable, brown to orange siltstones, most of these interbeds are less than one metre thick but significant bands of up to 30 metres in thickness have been measured within the quarry.

Brighton Limestone

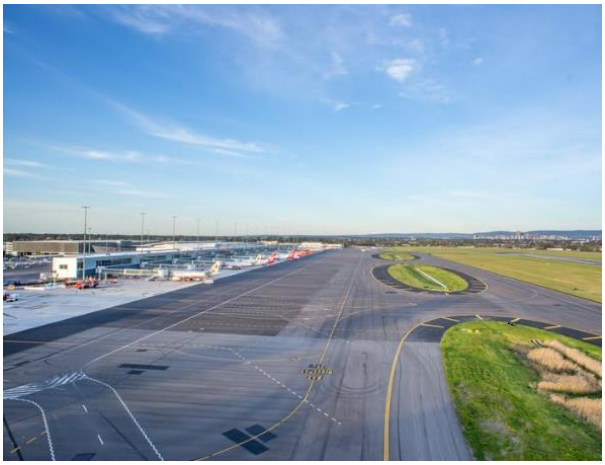
The Brighton limestone sequence at Linwood quarry is composed of oolitic dolomite and massive dolomite members with intercalated siltstones. The thickness of the unit varies between 18 and 20 metres.

Marinoan Shales

The Brighton limestone is conformably overlain by a thick sequence of chocolate-coloured shales.

Local projects and customers we supply

- Fulton Hogan
- Adelaide Airport Runway & Taxiway
- Acciona - Majors Road Project
- Southern Expressway
- Councils - Coastline North of Seacliff Rock Armour



Our staff

We employ 26 full-time staff and support up to 80 contractors and transport workers

Our staff range from 21 years to 63 years old.

Our longest serving employees are:

- Rudi Oors 40 years – plant operator
- Ben Fleming 16 years - Supervisor
- Steve Sutton 15 years – Supervisor

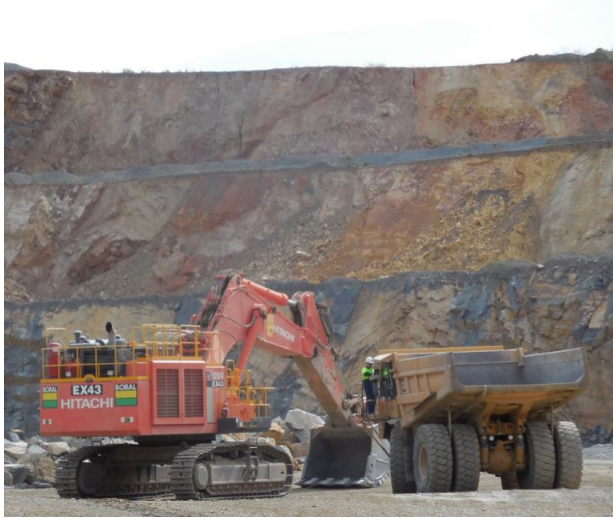
Our equipment

- Newest equipment:
    - 980 wheel loader
    - a 972 wheel loader
    - 740 Cat truck
    - 773 Cat rigid truck
    - 740 water truck

- Oldest Plant:
    - Fixed crushing plant commissioned in 1978
    - CAT 988 Wheel Loader in excess of 30,000 frame hours
    - CAT 773E Dump Trucks in excess of 30,000 frame hours

We have on display:

- Hitachi Excavator & 773 dump trucks working
- Static display of 773 haul truck
- 988 wheel loader
- 980 Wheel Loader
- 740 water trucks & artic trucks
- Concrete agitator



Pantera™ DP1510i Surface top hammer drill rig

A hydraulic, diesel-powered, self-propelled top hammer drill rig. Designed for large hole drilling, it is suited to production drilling in large quarries or open pit mines.

KEY FEATURES	
Hole diameter:	89 - 152 mm (3 ½" - 6")
Rock tools:	T51, CT55, GT60, CT67
Rock Drill	35 / 40 kW
Engine output:	280 kW (Tier 3)
Flushing air:	14 m3/min up to 10 bar (depends on used rock tools)
Production capacity:	2,0 Mt/year

DIMENSIONS	
Weight	22 700 kg
Width	2.5 m
Height	3.28 m/3.34 m
Total length	11.5 / 11.1 m



Dust management at Linwood Quarry

The management of dust emissions is a daily priority for quarry operators and management. The generation of dust at Linwood is greatly influenced by the coastal location of the quarry and local weather conditions, and a standard daily management practice is to discuss the forecast weather and dust controls at the start of every shift with the site team. The function of dust engineering controls is confirmed, and procedural controls may be implemented according to the forecasted weather conditions.

The weather is a significant determinant in potential for generation of visible dust and the start of every shift, forecast weather conditions for the day are reviewed with the workgroup. Additional actions or modified activities may be adopted in addition to the standard dust management engineering controls utilised in all extraction and processing activities on the site.

Adelaide is also the driest Australian capital city with unreliable, light and infrequent rain through summer. The dry and windy conditions exacerbate any 'nuisance' dust factors present in the background. 'Fugitive dust' can be initiated by operational activities and a mixture of sources. Traffic using internal haul roads, crushing plant, and stockpile areas are the most significant contributors to dust emissions.

To account for these factors, the quarry has developed an active system for minimising the risk of dust emissions. This involves:

- Stockpile water spray system - an automatically activated water sprinkler system for 'priority' stockpiles. The 24-hours-per-day system uses pre-set timers which can be adjusted according to weather conditions.
- Water cart - two 35,000 litre water cart vehicles are used to keep roads and unsealed surfaces at the site damp to decrease the chances of fugitive dust from vehicle movements or the prevailing wind. Polymers are regularly added to the water to assist moisture retention and improve dust suppression.
- Wheel wash - all vehicles exiting the quarry must be driven through the wheel wash, to minimise mud and sand carriage onto the roadways.
- Use of dust suppressant in use which helps improve worker safety, protect the environment, and reduce the risk of airborne particles.

- Enclosure of plant - the primary crusher raw material feed hopper is roofed, enclosed on three sides, and has directional fine water sprays to minimise dust generation during tipping operations.
- Conveyers are covered and product transfer points are fitted with fine water sprays.
- The final crushing and screening section of the plant is fitted with a dry dust extraction and collection system ('bag house') ducted to all crushers, screens, bins and conveyor transfer points.
- Street sweeping - depending upon the frequency of sales and weather conditions, a street sweeper is regularly used at the quarry to clean the roads.
- A range of engineering improvements have been undertaken on the fixed crushing plant and additional containment and suppression engineering improvements are in the planning stages.
- Hydro mulching and seeding has been undertaken in two vulnerable areas to prevent wind erosion and improve visual amenity.
- Rehabilitation of the former weighbridge and entrance roadway is nearing completion and will be revegetated in coming months to stabilise and beautify the area.
- Unsealed internal roads are appropriately constructed and graded and where necessary, treated with polymers to limit dust lift-off from transportation activities.
- Adoption of suitable speed limits on unsealed roads.
- Ensuring materials do not extend above truck sidewalls and that all loads leaving the sites are fully covered.
- Monitoring: Dust monitoring 'stations' have been established around the quarrying operations. These include five static deposition monitors, five directional monitors, three weather stations, and three state-of-the-art dichotomous samplers (TEOM's) which measure particulate matter 'PM10', 'PM2.5' in the atmosphere. The TEOM system provides site personnel with real-time data and an alerting function which is used to manage the timing of operational activities. Alerts are set which allows the Quarry Manager to make informed decisions during operations and curtail or cease operations during adverse wind and weather conditions, as required. The system also allows the site to identify background levels and off-site sources and is frequently referenced against local EPA monitors.
- The TEOM system is also utilised for regulatory reporting purposes. Public access to details of the 24-hour average PM10 readings at each of the TEOMs is available on the Boral Linwood webpage www.boral.com.au/linwood.

What is quarrying and why do we need it?

Quarry products are often collectively referred to as aggregates. Aggregates are used in composite materials such as concrete, asphalt, masonry products, bricks and bituminous road surfacing, or on their own such as road base.

Aggregates are essential to our economic prosperity and are the foundation of our built environment. They are crucial in the building of our homes, roads, railways, schools, hospitals, and other types of other essential urban infrastructure.

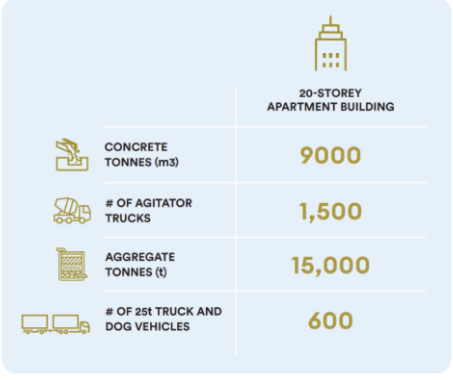
The quarrying industry is a significant part of South Australia's resources sector, which collectively contributed over $9.5 billion in direct and indirect spending to the state's economy in the 2023-24 financial year. This sector supports vital jobs, local suppliers, and public infrastructure projects, and has shown a 61.4% economic uplift over the past five years.

Each year, the building and construction industry needs more than 200 million tonnes of quarry materials.

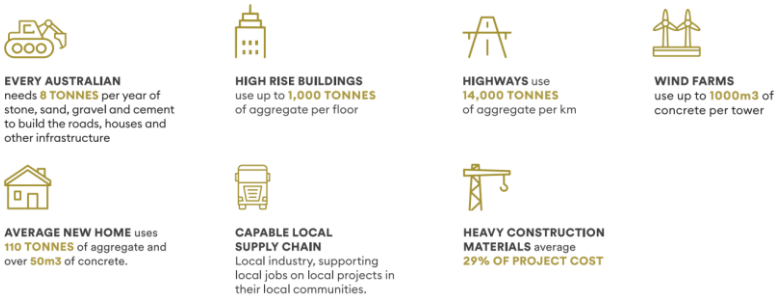
Aggregates are also used for rail ballast, drainage media, landscaping purposes, and larger sized rock such as gabion and revetment stone for erosion, scour protection and construction of retaining walls.

Ideally quarrying needs to be carried out close to where these materials will be used. This keeps transportation costs low, reduces environmental emissions, reduces traffic congestion and helps keep building costs down in local communities. Road transport distance and cost represents around 35% of the delivered costs of aggregates.

Quarries usually coexist with local communities and are bound by stringent planning and operating conditions to minimise their impact.



Source: CCAA member company calculations



The Quarrying Process

The quarrying process begins with clearing vegetation and stripping topsoil/ overburden. Once the site is cleared, drilling and blasting will be carried out to break the underlying rock, creating the required quarry benches.

After blasting, the raw material is extracted and loaded from the pit floor onto haul trucks. These trucks will transport the material to the permanent plant and stockpile area located in the eastern section of the site.

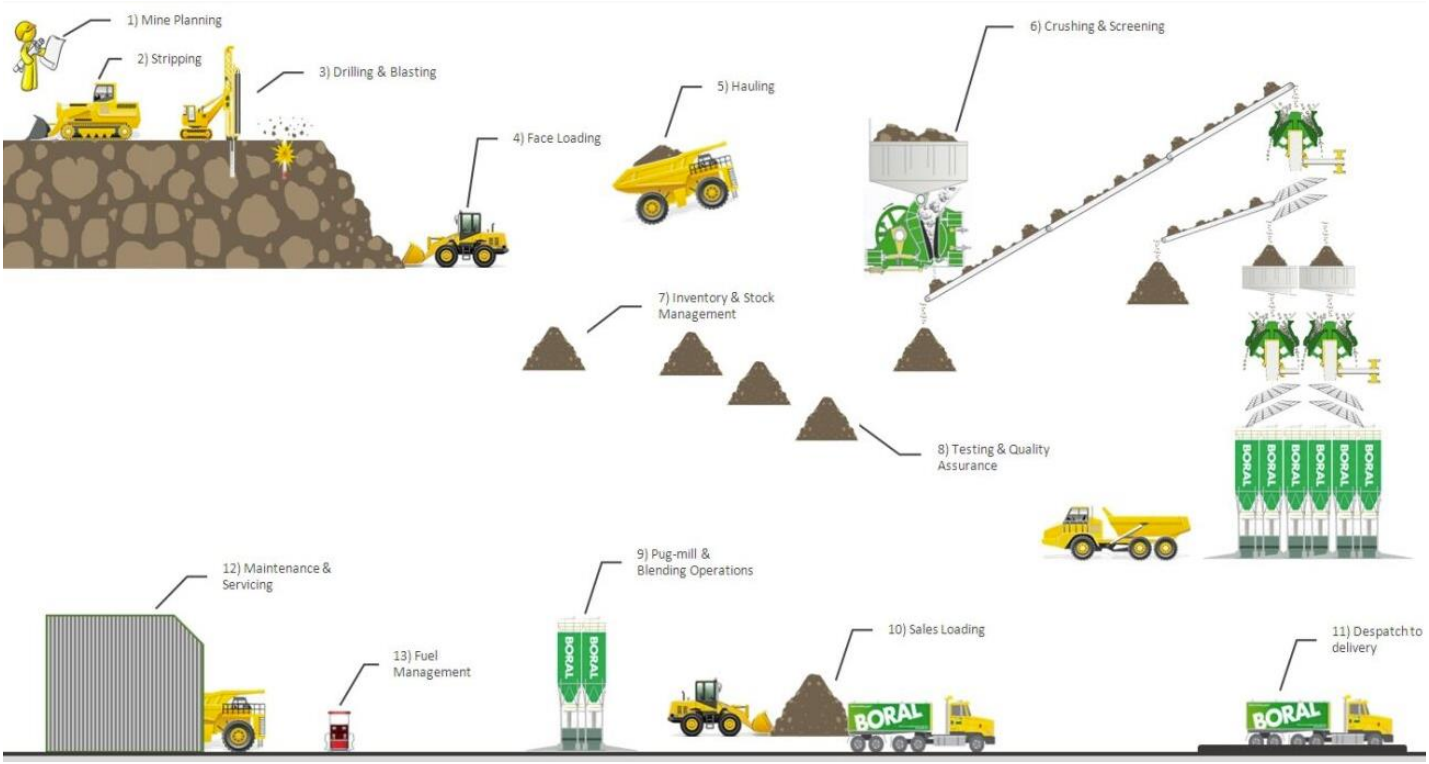
Any larger rock fragments will typically be broken down using a rock breaker before being loaded onto trucks. The load and haul fleet will generally operate continuously during quarry working hours to ensure a steady supply of material for processing.

Crushing and Processing

The crushing stage involves multiple crushers, including a jaw crusher, secondary, tertiary, and quaternary crushers, along with vibratory screens. The crushed material is then stockpiled for further handling.

Material Loading and Transport

Once stockpiled, quarry materials are loaded by front-end loaders onto road haulage trucks. These trucks proceed across the weighbridge, pass through the wheel wash to remove dust and debris and then exit the site for dispatch.



Blasting, Vibration and Air-blast overpressure

Blasting is done weekly at Linwood Quarry, usually on a Wednesday.

Linwood Quarry maintains a blast register and notifies interested people when blasting activities occur. If you would like to join the register, please send an email to community@boral.com.au with your name and contact details (email and mobile) and specify it is for Linwood Quarry.

What is Blasting?

There are a number of ways to extract 'hard' rock, but the most common and effective method is 'controlled blasting'. As blasting is very precise practice, each blast is designed and carried out by an independent third-party blast expert. A blast design is generated and is a carefully planned operation that involves drilling into the rock in a specified pattern, then placing a very precise amount of explosive in the holes. The explosives are then detonated in a precise sequence, designed to maximise the efficiency of rock breakage while minimising noise, vibration and dust. One of the advantages of blasting is that it reduces the need to operate large heavy equipment to extract the rock, in turn reducing noise and greenhouse gas emissions. Depending on how close you live to a quarry, you may notice some vibration or noise associated with blasting, however all blasts as mentioned are precisely designed to prevent and minimise impacts to surrounding neighbours.

What safeguards are in place during blasting?

Strict national safety regulations apply to protect neighbouring homes, buildings and public places from the potential effects of blasting. Blasting operations must adhere to prescribed limits stipulated by the relevant regulatory authority that are well below the vibration levels which could cause structural or cosmetic damage. Blasts are monitored at different locations with sensitive ground and air vibration equipment to ensure they remain within regulations

What else should I know about blasting?

Apart from vibration, the energy used in blasting to move and break rocks may also result in some noise and dust. The further you are away from the quarry, the less you will notice these effects. A quarry's strict operating conditions require that every action be taken to reduce these effects.

- There is a blast once a week in the quarry (usually Wednesdays)
- Each blast produces over 30,000 tonnes of rock
- We use 8 tonnes of explosive emulsion per blast
- For each blast 80 - 100 holes need to be drilled
- .8 per kilo of explosives is needed to blast 1 cubic metre of rock

Driver and Community Road Safety

At Boral we take safe driving extremely seriously and have a number of control measures in place to maintain a positive road safety culture for all road users. These include:

- Boral management regularly reminds our drivers to be vigilant and respectful while driving on any roads, regardless of vehicle type.
- All of our Boral vehicles have telematics installed which allows management to monitor truck movements and real time speed.
- Boral's logistics team works diligently with our contractors when conducting site inductions to ensure that trucks engaged by us are operated safely and responsibly.
- Truck behavioural audits take place by our Fleet Supervisor on a regular basis, to verify that all drivers are indeed demonstrating safe driving behaviours. If we identify a driver or contractor who is not upholding these conditions, we record the registration, communicate it to the relevant company and if necessary - ban the truck from our sites.
- Boral is currently implementing training for a Human Error Behaviour Program 'SafeStart' which will be undertaken by all our employees. This program aims to achieve a step-change improvement in safety performance by engaging with workers, so they understand how mistakes are made and what can be done to rectify behaviour in the future. It is a highly successful program that helps drivers understand states such as 'Rushing, Frustration, Fatigue and Complacency', which are the key causes in 95% of incidents that occur.
- All vehicles must use a wheel wash after being loaded before exiting our site to ensure that quarry debris is not put onto public roads.

Water Recycling

An on-site water recycling network has been established to serve the needs of the concrete plant, the quarry's 'pug mill', and to access road stormwater.

The eco-friendly design allows the site to capture, filter and re-use stormwater by:

- Use of a filtration system for the truck wash, enabling clean water to be used for vehicle cleaning.
- Diverting stormwater to designated storage areas to reduce road maintenance and safety issues from mud and water build up around the plant; and
- Reducing mains water usage by 75 percent through filtering and re-using stormwater and wastewater in the concrete and pugmill plants for production and wash down.

Site Operating Hours

The approved Mine operation plan allows the following hours of operation:

Activity	Times	Days
Drill and blasting	7:00 am - 5.00 pm	Monday to Saturday
Load and haul operations	7:00 am - 10.00 pm 7:00am - 4.00 pm	Monday to Friday Saturday
Crushing and Screening and Pugmill	7.00 am – 10.00 pm	Monday - Sunday
Concrete batching plant, sales and freight distribution	24 hours per day	Monday - Sunday

Maintenance activities may be conducted outside of the standard operating hours.

Community engagement

We are continuously improving processes at our site and Boral welcomes feedback from the community regarding our operations.

If you would like to contact us at any time, please email community@boral.com.au.