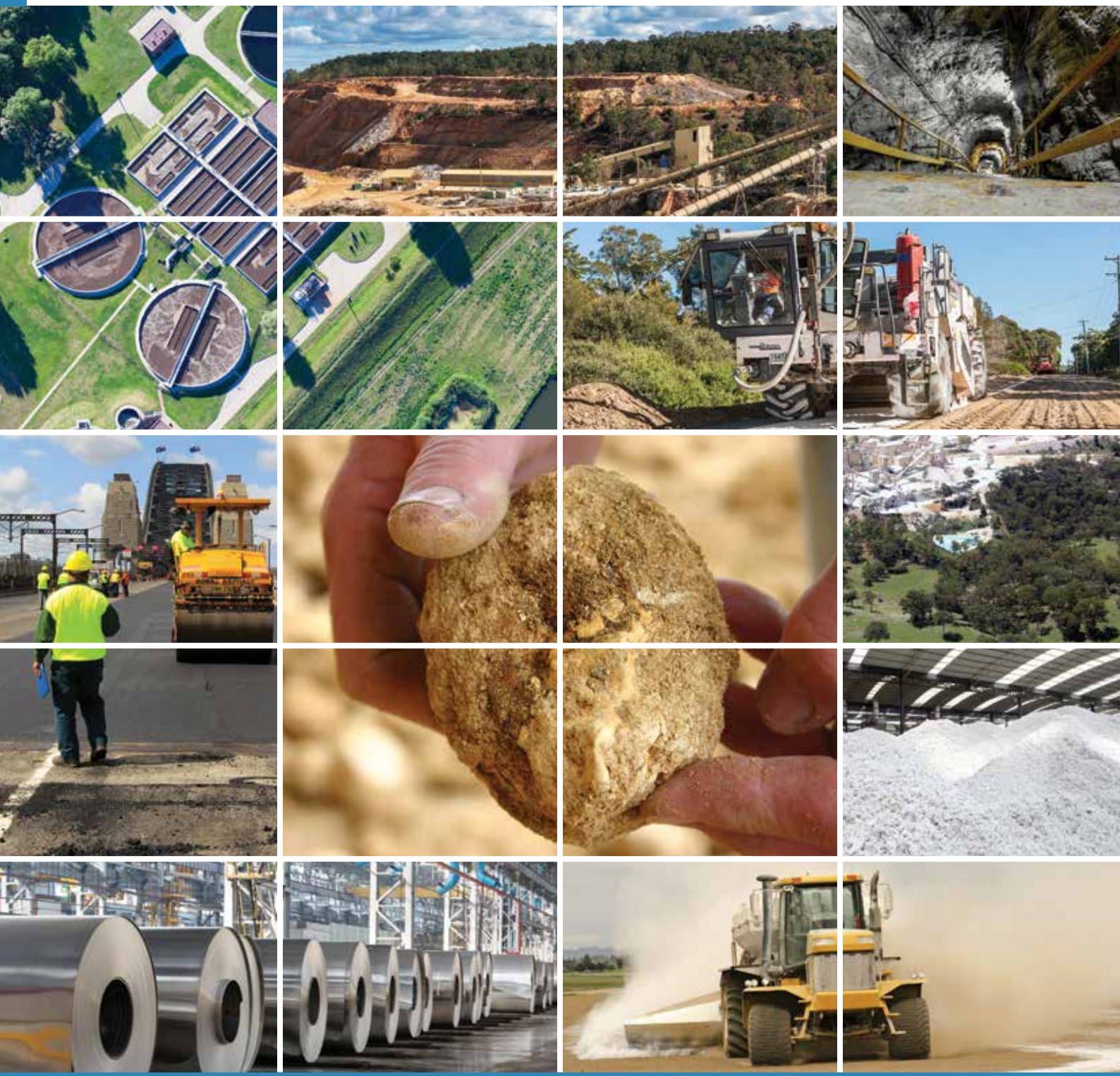
BORAL CEMENT
Build something great™



lime & limestone **minerals**

PROFILE BROCHURE

overview

BORAL CEMENT (MINERALS) IS PART OF BORAL LIMITED, AN ASX 100 COMPANY. WE HAVE ONE OF THE LARGEST LIMESTONE MINES IN THE SOUTHERN HEMISPHERE, SUPPLYING LIMESTONE AND LIME PRODUCTS TO CUSTOMERS THROUGHOUT SOUTH EAST AUSTRALIA.

BORAL CEMENT'S HIGH QUALITY MINERAL PRODUCTS ARE USED IN A DIVERSE RANGE OF APPLICATIONS INCLUDING: AGRICULTURE, ASPHALT, WATER TREATMENT, STEEL MANUFACTURE, GROUND STABILISATION, MINING, AND GENERAL CONSTRUCTION.

DELIVERING QUALITY

Boral invests significantly to ensure we can guarantee that our products are of the highest quality.

Boral Cement is ISO 9001 2008 accredited and operates a fully-approved National Association of Testing Authorities (NATA) laboratory for limestone and lime testing.

Our laboratory facility complies with ISO/IEC 17025:2005. Daily testing is carried out according to the relevant Australian standards.

Boral Cement supports customers by providing complete solutions, including technical support. Our dedicated technical expertise ensures the best value outcome for our customers.

limestone

THE ORIGINAL MINERAL

Boral Cement's limestone mine at Marulan, in New South Wales, is one of the largest in the southern hemisphere. The mine provides limestone for our Marulan kiln, which can produce 150,000 tonnes of lime per annum. The Marulan limestone quarry has an estimated 70 years of life remaining and an output of approximately 3 – 3.3 million tonnes per annum.

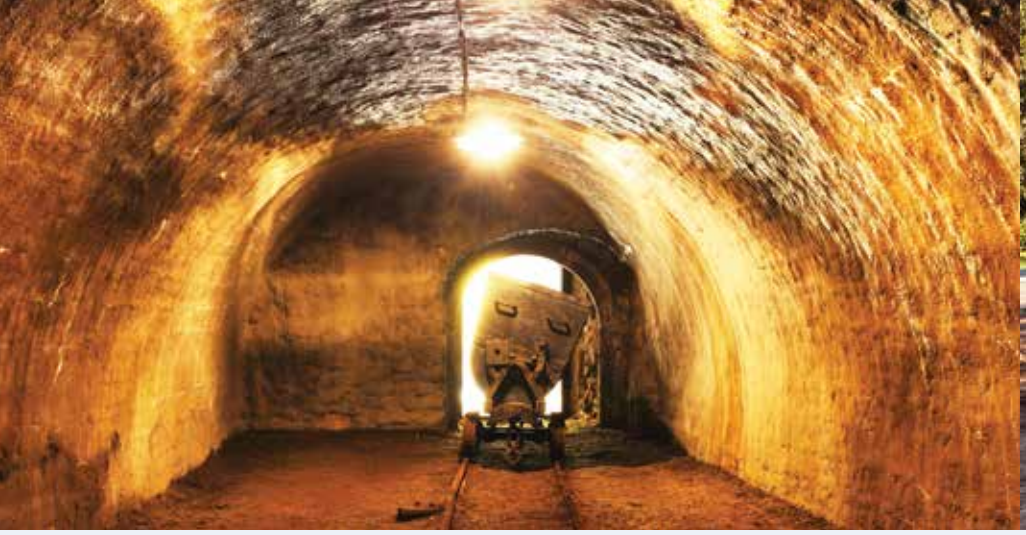
Limestone mining began in Marulan in around 1875. The mine is located 165 kilometres south of Sydney near Goulburn. It is bordered by Bungonia State Recreation Area in the south and Morton National Park in the east.

Limestone is a naturally-occurring and abundant sedimentary rock, consisting of high levels of calcium and/or magnesium carbonate, dolomite (calcium and magnesium carbonate), and other minerals.

uses

LIME AND LIMESTONE

- Production of aggregate for road base and foundations
- Molten iron impurities removal
- Cement production
- Concrete aggregate
- Soil conditioning for neutralising acidic soils
- Pulp and paper production
- Sugar purification
- Stone dust to help suppress coal mine explosions
- Road stabilisation
- Asphalt modification
- Water purification
- Paint additive
- Decorative landscaping rock
- Metallurgical applications;
  - Iron and steel
  - Non-ferrous metals
- Environmental applications
  - Bio solids and sludge treatment
  - Waste water treatment
  - Hazard waste
- Building construction
  - Masonry mortars
  - Plaster
  - Bricks



typical applications

PULP AND PAPER

Lime is an important product for the pulp and paper industry.

Most pulp and paper facilities operate their own kilns and regenerate lime after use, and can rely on Boral Cement to provide the balance of their lime needs.

The largest application of lime in pulp manufacture is as a causticising agent in sulphate plants. Here, the waste sodium carbonate solution is recovered and reacted with high-calcium lime to generate caustic soda for re-use in the process. The lime assists with the chemical recovery process, by purging non-process elements from the cycle and converting sodium carbonate in the green liquor to sodium hydroxide.

MINING

In the coal mine industry, stone dust helps to prevent and suppress explosions underground.

Boral Cement offers a specialised product designed for this purpose. Our stone dust is fully compliant with WHS (Mines) Regulation 2014, MDG 3006 MRT5.

Boral Stone Dust is available in bulk, 1.2t bulka bags, and 20kg bag configurations.

Bulk product is delivered in a pneumatic tanker to a fixed silo at the customer's site.

STABILISATION

Lime is used to modify and stabilise soil for road and similar construction projects. It can substantially increase the stability, impermeability, and load-bearing capacity of the subgrade. Both quicklime and hydrated lime can be used for this purpose. Applying lime to subgrades can significantly improve engineering properties.

Lime is a very effective binder for plastic soils. In clays, there is usually a degree of pozzolanic material, which reacts chemically with calcium hydroxide, to form a cementitious material.

Lime is usually used in subgrades or unsealed roads, resulting in:

- Improved strength
- Improved workability
- Elimination of swelling
- Improved grading
- Improved water resistance.

By improving these elements, pavements can be improved significantly.

ASPHALT

While hydrated lime has long been acknowledged as an anti-strip additive for asphalt pavements, recent studies confirm that lime imparts other important benefits:

- It stiffens the binder and HMA (hot mix asphalt) to resist rutting
- It improves toughness and resistance to fracture growth at low temperatures
- It changes oxidation chemistry in the binder to reduce age hardening
- It alters clay fines to improve moisture stability and durability.

Hydrated lime substantially improves each of these properties when used alone, and also works well in conjunction with polymer additives, helping to create pavement systems that will perform to expectations for many years.

METALLURGICAL USES

Lime is used in steel manufacturing, where it serves as a flux to remove impurities (silica, phosphorus, and sulphur). Lime is used in basic oxygen furnaces and electric arc furnaces, as well as in secondary refining. High-calcium lime used in the steel industry must meet specific physical and chemical properties.

Lime is also essential to the production of non-ferrous metals. For example, it is used to beneficiate copper ore, to make alumina and magnesia for use in manufacturing aluminium and magnesium, to extract uranium, and to recover gold and silver.

typical applications

ENVIRONMENTAL USES

Municipalities, industrial facilities, utilities, and mining operations rely on lime to help comply with environmental regulations.

Lime is used to treat stack gases from power plants, industrial facilities, and medical and hazardous waste incinerators.

Lime absorbs and neutralises sulphur oxides from these gases, helping to prevent acid rain and reduce emissions of hazardous air pollutants, including mercury.

WATER TREATMENT

Lime is important to municipalities who use it for potable water softening and to remove impurities from drinking water.

Lime is also a cost-effective method to treat sewage sludge and animal waste from concentrated animal feeding operations. Similarly, industrial facilities and mining operations use lime to treat wastewater, by adjusting the pH of acidic wastewater, removing phosphorus and nitrogen, and promoting clarification.

CONSTRUCTION

The dominant construction-related use of lime is in soil stabilisation for roads, building foundations, and earth dams. Lime is added to low-quality soils to produce a useable base and sub-base.

Boral Cement offers general purpose lime in 20kg bags, which is ideal for use in many construction and industrial projects. These can include mortar and rendering, and pH balancing in soil applications.

Limestone sand and aggregates are used in certain types of civil and construction work, complementing fine and coarse aggregates marketed through our Boral Construction Materials division.

CHEMICAL AND INDUSTRIAL USES

Used in sugar refining, hydrated lime is essential for producing sugar from both sugar cane and sugar beets. It is also used to purify sugar from other sources such as maple or sorghum, although these are produced in much smaller quantities.

Sugar cane and sugar beets are harvested and processed with water to form raw juice, which has low pH and contains dissolved impurities. Hydrated lime is added to the juice to raise the pH and to react with the impurities, forming insoluble calcium organic compounds that can be removed. Excess lime is removed by carbonation or by adding phosphoric acid. This process may be repeated several times depending on the required purity of the final product.

technical analysis

KEY PRODUCTS

Quicklime can be processed into hydrated lime by crushing the quicklime, adding water to the crushed lime (water accounts for approx. 1% of raw hydrate) and then classifying the hydrated lime to ensure it meets customer specifications before it is transported:

1. Typical Analysis of Boral Limestone

Boral Limestone		% Estimate Composition
Calcium Carbonate	$CaCO_3$	97
Magnesium Carbonate	$MgCO_3$	1.1
Aluminium Oxide	Ai_2O_3	0.5
Silicon Dioxide	SiO_2	1.1
Sulfur Trioxide	SO_3	0.1
Potassium Oxide	K_2O	0.1
Iron Oxide	Fe_2O_3	0.2

2. Typical Analysis of Boral Quicklime

Boral Quicklime		% Dry
Calcium Oxide	CaO	90
Calcium Carbonate	$CaCO_3$	2.4
Magnesium Oxide	MgO	1.2
Ferric Oxide	Fe_2O_3	0.5
Alumin Oxide	Al_2O_3	0.8
Silicon Dioxide	SiO_2	3
Available Lime Index	ALI	87
Residue on Slaking	RAS	4
Specific Gravity		3.2-3.4
Bulk Density		1000-1050kg/m^3

3. Typical Analysis of Boral Hydrated Lime

Boral Hydrated Lime		% Dry
Calcium Hydroxide	$Ca(OH)_2$	88
Calcium Carbonate	$CaCO_3$	1.7
Magnesium Oxide	MgO	0.7
Ferric Oxide	Fe_2O_3	0.3
Alumin Oxide	Al_2O_3	0.4
Silicon Dioxide	SiO_2	1
Residue 75um		5 (Maximum)
Specific Gravity		2.2-2.3
Bulk Density		450-560kg/m^3

Boral Cement offers a specialised product designed for use as an aid to prevent and suppress explosions underground:

4. Typical Analysis of Boral Stone Dust

Size	% FIner	CMRA Requires
250 UM	99	>95%
75 UM	78	>60% & <80%
Free Silica		<3%

Our Stone Dust is fully compliant with MDG 3006 MRTS.

Boral Cement Limited

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A.B.N. 62 008 528 523

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