WHAT IS BLASTING?

Blasting is necessary for the Ballarat Gold Mine to operate beneath Ballarat. It involves the controlled use of explosives to break the rock and enable the recovery of the ore. At Ballarat a process of drilling and blasting is used where:

- A number of holes are drilled into the rock, which are then filled with explosives.
- The explosives are detonated (these are referred to as firings) causing the rock to break.
- The waste rock or ore, is removed and the new tunnel surface is reinforced.

1. Preparing to blast underground

TYPICAL FIRING TIMES

Development firings

7 days a week

6:45 to 7:15 am/pm

Stope (Production) firings

Monday to Friday

9:00 am to 5:00 pm

THERE ARE TWO MAIN TYPES OF BLASTING USED IN BALLARAT.

Development Firings. The primary objective for each 12 hour shift team is to advance the 5 metre x 5 metre tunnel approximately 3.5 metre towards the gold deposits. This produces approximately 200 tonnes of broken material. The duration of development firings is around 10 seconds. These firings normally occur every day at the end of each 12 hour shift, typically between 6:45—7:15 am/pm.

These blasts are less likely to be noticed on the surface compared to stope firings. However if you do notice them, Ballarat Gold Mine would like to hear from you as this assists us in improving our practices.

Stope (Production) Firings. In the areas where there is gold detected (stopes) explosives are used to break the rock so that it can be trucked to the surface for processing through the mill. Typically these firings use higher volumes of explosives than day to day development mining and can generate vibrations and noise on the surface.

The blast is designed in two stages of four or five closely spaced individual blasts. The initial blast (rise) creates a void and then a succession of blasts break the remaining rock into the void (rings).

Each blast is carefully designed to determine the best pattern and timing of the individual explosions for maximum effect with minimal vibration and noise.

With the potential impact to the community in mind, Ballarat Gold Mine stope firings are typically carried out during the day 9:00am to 5:00pm Monday to Friday.

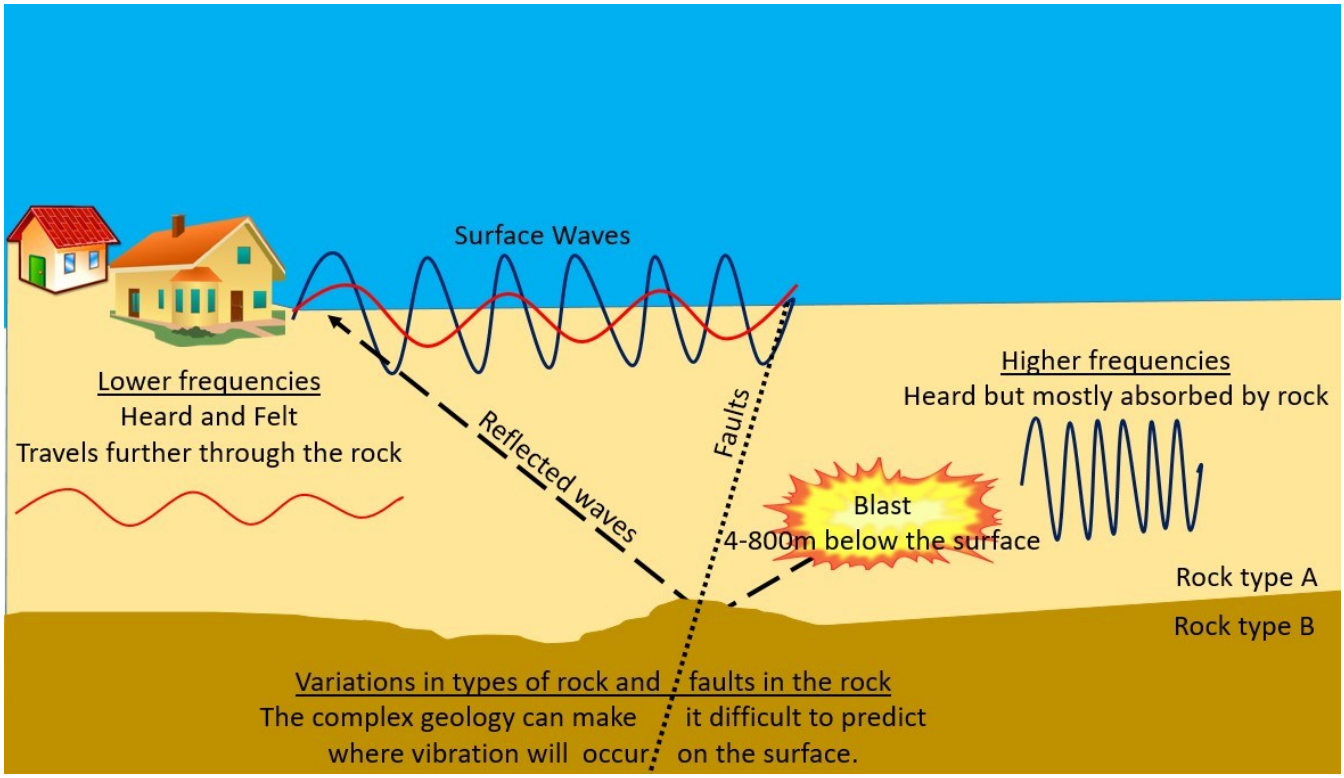
What does this mean to you, the Residents?

As a result of the explosions, a shaking of the ground may be felt which may be accompanied by a noise similar to thunder.

Vibrations from blasting move from the blast site through the earth in all directions similar to the rings caused by dropping a pebble into a pond of water. Ground vibrations travel through the earth, and rapidly decrease in intensity with distance from the blast site. It is measured, using a seismograph, in mm per second (mm/sec).

The size of the movement and the loudness of the noise are dependent on many factors including the amount of explosives used, the type of explosives used, the length of time the blast occurs and the nature of the ground between the blast and the point where the impact is felt.

As mining advances underground, the locations where blasts are most likely to be noticed above the ground will vary. At any given location, the blast may be felt long before the active blast site is actually beneath you. The effects may increase as the tunnel approaches but once the mine passes, the effects will gradually lessen again.



Most people believe that if they can feel the vibrations, their house is likely to be damaged, however, people are able to detect vibration at levels much lower than those required to cause even superficial damage to the most susceptible structures.

Strict regulations are imposed on blasting activities
so that damage to buildings WILL NOT occur.

LIMITS ARE IMPOSED ON BLAST STRENGTH

The strength of blast vibration is measured in millimetres per second (mm/sec). This is the acceleration of the ground caused by the blast. ANZECC 1990 Technical Basis for Guidelines to Minimise Annoyance require that a maximum blast vibration of 10mm/sec must not be exceeded in residential areas.

These limits are designed to protect the interests of the public and:

- Minimise perception and nuisance vibration, and
- Avoid structural damage to surface property.

Earth Resources Regulation requires that 95% of all blast vibrations are less than 5mm/sec. Ballarat Gold Mine designs blasts to be less than a self-imposed target of 2.5mm/sec.

For comparison, vibration levels felt in the home and caused by daily activities are:

Activity	Vibration Level
Walking on a wooden floor	1 mm/sec
Jumping on a wooden floor	7 to 10 mm/sec
Slamming of a door	12 to 15 mm/sec
Hammering a nail	20 to 25 mm/sec
Daily temperature changes (roof creaking)	30 to 70 mm/sec

Although the strength of the blast determines the amount of vibration in a house, the real issue is not the size of the blast but how the vibration passes through the rock to the house, and the structural response of the house to the blast vibration. Thus different rock types and geology beneath houses, and a difference in construction of the houses may result in a different perception of a blast vibration in neighbouring properties.

Whilst the rock type and the housing structure are not able to be controlled, the mechanics of a blast can be controlled so as to reduce the perception of the blast vibration, and ensure there is no likelihood of damage.

Blasting at Ballarat is designed for vibrations to be < 2.5 mm/sec.
• Impacts on property from mine blast vibrations are much lower than stress from natural sources.
• Impacts from mine blasting at Ballarat are much lower than other known potential damage levels.

MONITORING OF BLASTS

We monitor every blast with a number of vibration monitors throughout the community. Some of these monitors are permanent and others are regularly moved in response to feedback from the community. All blasts are then analysed, by computer, for performance against our firing designs.

The results from this monitoring program are reported to our regulators and the community every quarter via Ballarat Gold Mine's Environmental Review Committee.

We value your involvement in this process. If you have any concerns in relation to blast vibration, or to any other aspect of our operations, please feel free to contact the Environment & Community Team on 03 5327 2555 or info@ballaratgoldmine.com.au

It is not possible to completely eliminate perceptible vibration and noise, but by carefully managing blasting activity the affect on the surface can be greatly reduced.

3. Measuring vibrations

4. Measuring vibrations

If you have any concerns in relation to blast vibration, or to any other aspect of our operations, please feel free to contact the Environment & Community Team on 03 5327 2555 or info@Ballaratgoldmine.com.au