FACT SHEET

Blasting and Vibration

Underground mining

Underground mining consists of two main aspects: **development drives** for access and **production stopes** for mining.

Development drives are the tunnels that provide access to the gold bearing ore. Production stopes are voids mined to extract ore for processing. Both aspects of mining require the use of blasting to break or fracture the rock.

SGM then excavates the rock or ore from underground using machines, such as loaders and trucks.

What is blasting?

Blasting, also known as firing, is an essential part of the gold mining process and is used in both open pit and underground mining operations around the world. Blasting breaks or fractures the rock using a calculated amount of explosive so that a predetermined volume of material is broken.

Several blasting methods and technologies are used by mines. For a particular mine to determine the most appropriate blast design various factors are considered including rock type, density and strength. Planning, design controls and community amenity are also considered when selecting the blasting method.

Different drilling patterns and detonation sequences influence the amount of broken rock produced and ground vibration levels and effects.

Development firings (or tunnelling)

Development blasting is used to construct the underground access drives (tunnels). Blast holes are drilled in a precise pattern in the tunnel's rock face, filled with explosives and detonated in a controlled manner. This blast fractures a small amount of rock, typically no more than 300 tonnes. This rock is then excavated and generally used to backfill another part of the mine.

About development firings:

- Create access tunnels (approximately 5x5 m wide and high);
- Use small (45 mm) diameter charge holes with up to 70 holes charged in a rock face;
- Use up to 15 predetermined delay detonators for timing of the firing;
- Have a maximum charge hole length of around 4.3 m;
- Typically use around 250 kg of explosive in total with each charge hole containing between 5 to 7 kg of explosive; and
- Each blast lasts 8-10 seconds and produces a small amount of rock.

Drill holes in a development drive in preparation for blasting

Production firings (or stopes)

Production blasting is how gold bearing ore is broken down into transportable material. This involves the use of long holes up to 30 m in length, which are filled with explosives and detonated. The rock falls into a development tunnel which can be accessed by a loader and transported to the surface via truck for processing. Production firings can produce several thousand tonnes of rock in each firing, which generally lasts between 2-4 seconds.

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Drill rig preparing holes for a production firing

Why does blasting produce vibration?

Vibration is caused by the release of energy from an explosive as it is detonated. Each hole is timed (down to the millisecond) to detonate in a sequence so the vibrations can cancel each other out. The resulting vibrations from each firing, do not continue for more than 10 seconds. There are Australian Standards that address safe vibration levels for the control of damage from blasting activities.

How is blast vibration managed?

Victoria has legislative requirements and guidance limits governing vibrations that originate from blasting activities; these conditions are detailed in SGM's Mining Licence.

Mining licence limits ensure that there is no damage to structures and the impact on amenity from ground vibration is minimised. SGM's Mining Licence states that firings must comply with the legislative limits for surface vibration which are:

- No firings or ground vibration to exceed 10 mm/s at any time; and
- 95% of firings must be less than 5 mm/s within a rolling 12-month period.

How is blast vibration monitored?

Controls are applied to SGM's blasting practices to ensure compliance with the Mining Licence limits. Minimising community impact and improving amenity are key drivers in the mine's blasting design, which has a strong focus on environmental and social considerations.

SGM has five fixed vibration monitors, which are installed on the surface at designated locations above areas of activity. The monitors (geophones) measure peak particle velocity (PPV) in mm/s.

The vibration monitors and data are managed by an external consultant. Vibration results are used for compliance assessment, blast planning and design, and complaint investigation/response.

Why can some residents fell/hear blasts and not others?

There are a number of reasons why some blasts are felt by residents and others are not. The type of blast, whether it is a production or development blast, its location in relation to a resident, building type and materials, will influence how a person feels a blast and its vibration.

Some blasts will be conducted further away from a resident than others and in different positions within the mining area. At times blasts will be conducted in levels high up in the mine and deeper down at other times.

Blast Notification System

SGM offers a blast notification text message system when production blasts will occur with the date, approximate time, and the location of the firing. Any resident who would like to be included in the blast notification text message system is encouraged to contact Stawell Gold Mines on 03 5358 1022 or enquiries@stawellgoldmines.com.

Vibration monitors used to measure the peak particle velocity of blast events