CASE STUDY

Flyrock control in trench blasting

Riverstone Rise, Gladstone

Site Profile

Riverstone Rise is a housing development project undertaken by the Devine Group (Devine) in Gladstone, Central Queensland. The development consists of 2,900 homes and several businesses to support the long term population growth in the area. Earthworks for the site, including the design and construction of the services trenches, roads and other works, were undertaken by Shadforths Civil Contractors (Shadforths).

Blast area and total area Rock mapped

The Situation

Shadforths approached Orica in February 2013 to conduct a detailed rock mapping program. Rock mapping is a process that involves drilling a series of holes across an area of interest and logging the exact location of the geological horizons.

The volume and type of rock in the area of interest can then be identified, allowing civil contractors such as Shadforths to understand how much blasting may be required. This information can then be used to formulate accurate production schedules and cost estimates.

Rock mapping was conducted over several days, led by a Senior Blasting Technician from Orica's Construction team. Working together with the drilling contractor and Shadforths, it was agreed that rock mapping should be undertaken where 335m of service trenches, 2.5m deep, needed to be constructed and 2,031m^3 of rock would require blasting to facilitate excavation.

Orica was engaged to blast the 2,031m^3 of hard rock in the trenches as identified by the rock mapping. The blasting process included creating a Safe Work Method Statement and Blast Management Plan, submitting a Blasting Activity Notification to the Department of Natural Resources and Mines (DNRM) and working with survey information supplied by Shadforths to design the blast. The blast area was only 250m from residential properties already released to the public by Devine. These properties were to be occupied during drilling and loading operations and on the day of the blast.

Technical Solutions

The blasting methodology allowed the trenches to be blasted in two successive blasts within the one blast event window. The major technical challenge faced by Orica was managing the risk of airblast overpressure, ground vibration and flyrock, with occupied properties in close proximity to the blast. It was also essential to eliminate the requirement for any secondary breakage by ensuring that the trench profile was fully blasted.

The blast was designed by an Orica Blasting Engineer using an offset square pattern, in conjunction with electronic detonators to allow novel timing to be used.

The uni tronic™ 600 Electronic Blasting System was used in order to allow an optimal timing design, with precise and accurate individual hole initiation. This enabled the blast designer to control the ground vibration by reducing the number of holes firing within a given window of time as well as directing the resultant shockwaves away from the occupied properties.

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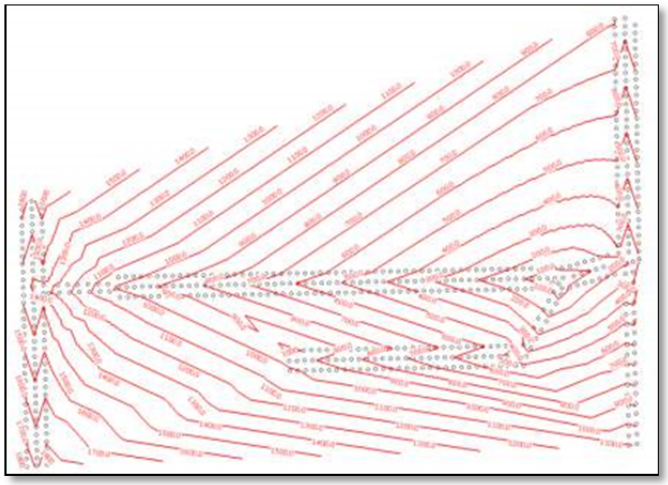
This design approach also allowed the blast designer to pull the blasted material away from the edges of the trench to ensure that the trench would have a clean profile while maximising fragmentation for easier excavation and reducing the risk of over break of the trench walls.



Angles of initiation along the trench alignment

A key aspect of managing the risk of flyrock involves maintaining an appropriate stemming height to contain the explosive energy within the blast. Centra™ Gold Bulk explosives was loaded through a Mobile Manufacturing Unit (MMU™) at a precise delivery rate, ensuring charges as low as 2kg could be loaded into over 600 holes. This allowed for both trenches to be fully loaded to design in a single day, minimising site downtime and reducing the need for multiple days of loading and security guard requirements.

Centra™ Gold was used due to its high energy and water resistant nature. These properties ensured that an appropriate stem height could be utilised for flyrock control while still providing enough energy to result in minimal oversize throughout the stemming zone. As an added control in managing the risk of flyrock, the trench alignment was covered with 1.5m of fill material.

The Result

The blast was fired using the uni tronic™ electronic blasting system on 3 July 2013. Due to the precise loading and timing design, and the care and attention to detail shown by the blast loading crew, there was no flyrock from the blast and ground vibrations at the houses were well below environmental limits. The combination of electronic initiation and a high strength bulk emulsion produced consistent muckpile heave and better than anticipated fragmentation results. The trench was fully excavated in the following days with no delays to the development schedule.

Covering of the trench blast to assist in flyrock control

Testimonial

“We really struggled with the viable extraction of the hard rock that was found at a specific section of the estate via excavation, ripping and hammering using excavators so it was decided that the blasting of rock in deep service trenches was a path that should be investigated.

We are very satisfied with Orica’s services; from the first contact by their Senior Blast Technician, I received a very clear outline of the process, followed by detailed information about the safety aspects of the blasting.

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The blast was a success with the trenches being disturbed so that an excavator could easily remove the rock.

All in all, a successful outcome which saved us both time and money compared the costs with conventional extraction means".

Nick Hamblyn – Project Manager, Shadforth Civil Contractors.

Acknowledgements
Orica would like to thank Shadforths Civil Contractors for the opportunity to deliver this blasting solution for the Riverstone Rise Project.