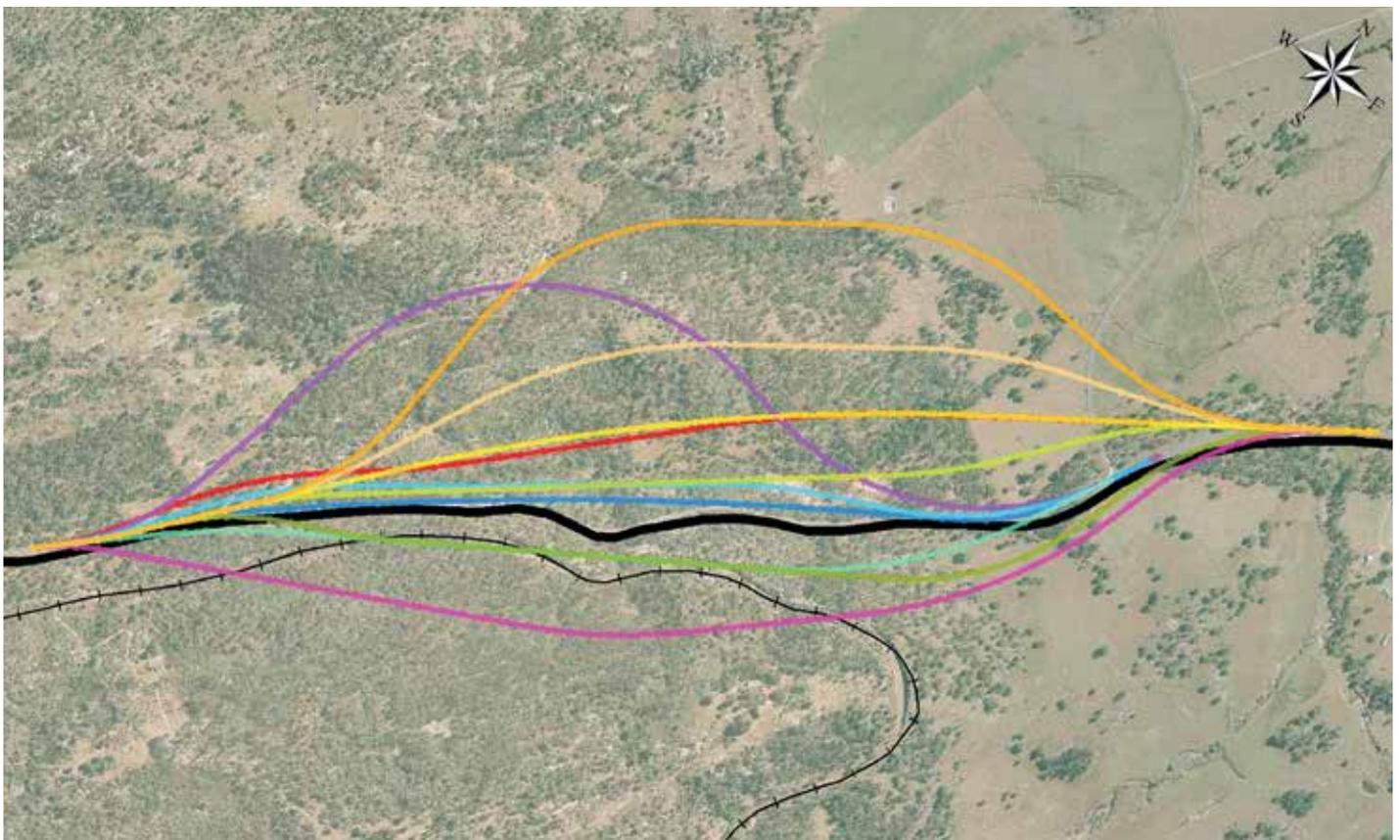


## Bolivia Hill Upgrade Preliminary route option assessment

The 11 preliminary routes identified for further assessment are shown in the below figure and described in the September Community Update.



- |          |          |           |          |           |                     |
|----------|----------|-----------|----------|-----------|---------------------|
| Option 1 | Option 3 | Option 5A | Option 6 | Option 8  | New England Highway |
| Option 2 | Option 4 | Option 5B | Option 7 | Option 9  | Railway Line        |
|          |          |           |          | Option 10 |                     |

The assessment of the preliminary routes involved determining the options which best met project objectives. The best performing preliminary routes were then shortlisted for further investigation.

The table overleaf provides a summary of the assessment outcomes for each route. The assessment of each option is presented against constructability, environment and value for money. All of the options improved road safety through changes to the road's vertical and horizontal alignments to improve geometry standards.

## Option 1

### Cost Range

- \$500 – \$600 million.

### Constructability: Poor

- Long and deep cutting in very hard rock. The variable nature of hard rock presents a high risk and construction difficulties.

### Environment: Poor

- Large footprints due to deep cut and high fills resulting in considerable impact on visual amenity and flora and fauna.
- Cut would require a large amount of rock to be transported away from site.

### Value for money: Poor

- High cost on construction due to hard rock.

### Overall:

Option 1 scored very poorly against all the objectives and was not shortlisted.

## Option 2

### Cost Range

- \$300 – \$350 million.

### Constructability: Poor

- Long and deep cutting in very hard rock.

### Environment: Poor

- The deep cut and high fills would create a large footprint and have a considerable impact on visual amenity and flora and fauna.

### Value for money: Poor

- Cost associated with the large quantity of cut through hard rock required.

### Overall:

Option 2 did not score well against all objectives; however, impacts were less significant than Option 1.

## Option 3

### Cost Range

- \$400 – \$500 million.

### Constructability: Good

- Minimal cutting into hard rock required.

### Environment: Satisfactory

- Smaller footprint than Option 1 or 2.
- Less impact on flora and fauna.
- Potential impact on creek minimised.

### Value for money: Poor

- High cost as long bridge/viaduct required.

### Overall:

Option 3 scored well against the majority of the objectives, however, workshop participants considered the alignment to be a variation of Option 10. Option 10 achieved a better overall ranking than Option 3 as such Option 3 was discontinued.

## Option 4

### Cost Range

- \$ 400 – \$500 million.

### Constructability: Good

- Minimal cutting into hard rock required.

### Environment: Satisfactory

- Smaller footprint.
- Less impact on flora and fauna.

### Value for money: Poor

- High cost due to requirement for a long bridge/viaduct.

### Overall:

Option 4 scored well against the majority of the objectives, however, workshop participants considered the alignment to be a Variation of Option 6. Option 6 achieved a better overall ranking than Option 4 as such Option 4 was discontinued.

## Option 5a

### Cost Range

- \$350 – \$ 400 million.

### Constructability: Poor

- Tunnelling required in hard rock. Tunnelling has additional design, safety and maintenance requirements that are technically challenging in this terrain.

### Environment: Poor

- Large amounts of excavated rock would need to be transported away from site.
- Large amounts of water are required for tunnelling which may impact on surface water quality due to the requirements for extensive wastewater ponds.

### Value for money: Poor

- The variable nature of the hard rock presents high risk and construction difficulties which are reflected in the cost.

### Overall:

Option 5a scored poorly against the majority of the objectives.

## Option 5b

### Cost Range

- \$650 – \$750 million.

### Constructability: Poor

- Tunnelling required in hard rock. Tunnelling has additional design, safety and maintenance requirements that are technically challenging in this terrain.

### Environment: Poor

- Large amounts of excavated rock would need to be transported away from site.
- Large amounts of water are required for tunnelling which may impact on surface water quality due to the requirements for extensive wastewater ponds.

### Value for money: Poor

- The variable nature of the hard rock presents high risk and construction difficulties which are reflected in the cost.

### Overall:

Option 5b scored poorly against the majority of the objectives.

## Option 6

### Cost Range

- \$250 – \$ 300 million.

### Constructability: Good

- Minimal cutting into hard rock required.

### Environment: Good

- Smaller footprint.
- Less impact on flora and fauna.

### Value for money: Satisfactory

- Although the option requires a long bridge/viaduct to minimise environmental impact it is shorter than other options reducing the overall cost.

### Overall

Option 6 scored well against the majority of the objectives and the workshop participants considered that it should be investigated in the next stage of the design.

## Option 7

### Cost Range

- \$100 – \$150 million.

### Constructability: Poor

- The majority of the route length would be constructed under traffic control next to existing highway traffic therefore scoring poorly on constructability and work health and safety in construction and maintenance.

### Environment: Good

- Small area of disturbance of flora and fauna.

### Value for money: Good

- Lowest cost option.

### Overall:

Option 7 scored well in majority of objectives. In addition, a minor upgrade of existing alignment was suggested by many community stakeholders. Although Option 7 did not fully comply with the design criteria it was agreed that it should be investigated in the next stage of design.

## Option 8

### Cost Range

- Greater than \$1 billion.

### Constructability: Poor

- Long and deep cutting required in very hard rock.

### Environment: Poor

- Large footprints due to deep cut and high fills resulting in considerable impact on visual amenity and flora and fauna.
- Large amounts of excavated rock would need to be transported away from site.

### Value for money: Poor

- The variable nature of the hard rock presents high risk and construction difficulties which are reflected in the high cost.

### Overall:

Option 8 scored very poorly against all objectives.

## Option 9

### Cost Range

- \$900 million – \$1 billion.

### Constructability: Poor

- Tunnelling required in hard rock. Tunnelling has additional design, safety and maintenance requirements that are technically challenging in this terrain.

### Environment: Poor

- Large amounts of excavated rock would need to be transported away from site.
- Large amounts of water are required for tunnelling which many impact on surface water quality due to the requirement for extensive wastewater ponds.

### Value for money: Poor

- The variable nature of the hard rock presents high risk and construction difficulties which are reflected in the very high cost.

### Overall:

Option 9 scored poorly against the majority of the objectives.

## Option 10

### Cost Range

- \$300 – \$ 400 million.

### Constructability: Satisfactory

- Shallower cutting in very hard rock compared to other options with large cuts.

### Environment: Satisfactory

- Smaller footprint.
- Less impact on flora and fauna.

### Value for money: Poor

- Long bridge/viaduct required to minimise the impact on the creek to the west of the existing highway.

### Overall:

Overall, Option 10 scored well against the majority of the objectives and the workshop.

The preliminary route assessment resulted in four of the eleven preliminary options being short-listed and optimised to increase its affordability and all options still contain overtaking lanes:



**Modified Option 2**  
Cost range \$120 – \$170 million



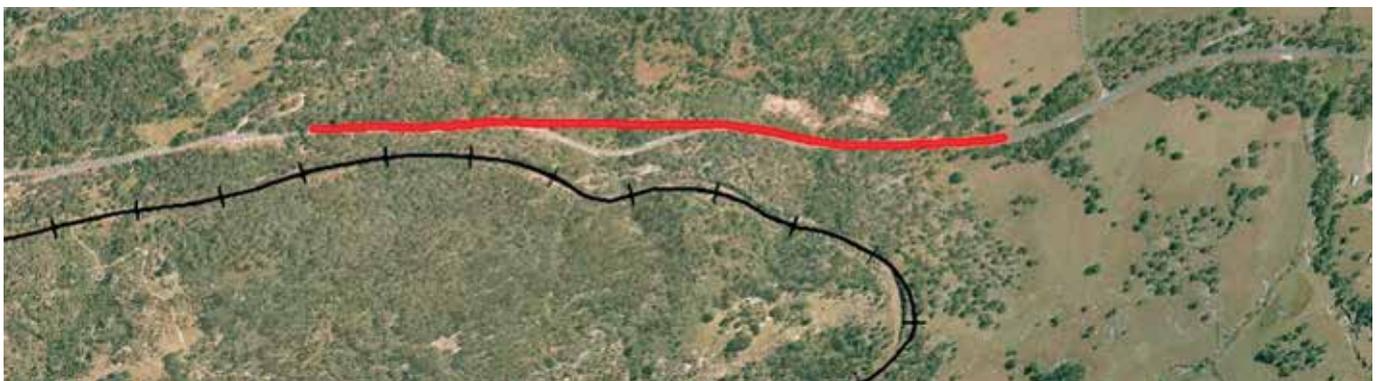
**Modified Option 6**  
Cost range \$100 – \$150 million



**Modified Option 7**  
Cost range \$90 – \$140 million



**Modified Option 10**  
Cost range \$120 million – \$180 million



**Option 7b** – Cost range \$60 – \$100 million

The review by RMS Major Projects Review Committee (MPRC) determined that the short-listed options met the majority of the project objectives, however, the project team was asked by the MPRC to investigate Option 7 with only one lane in each direction as traffic studies carried out demonstrated an overtaking lane was not required as part of the Bolivia Hill upgrade. This option was identified as Option 7b.



© Roads and Maritime Services

This paper is • carbon neutral • Australian-made • recycled fibre  
• elemental chlorine free • pulp derived from sustainably managed sources.

For further enquiries

Roads and Maritime Services – Bolivia Hill upgrade, PO Box 576 Grafton NSW 2460

T 1800 024 535 | E boliviahill@cardno.com.au

[www.rms.nsw.gov.au](http://www.rms.nsw.gov.au)

September 2013  
RMS 13.393A