

# **Bluff Road Rockfall Treatment Options - March 2016 Reassessment**

---

<b>TO</b>	Infrastructure Committee
<b>FROM</b>	Matt Busch - Roading Manager
<b>DATE</b>	29 February 2016
<b>SUBJECT</b>	<b>Bluff Road Rockfall Treatment Options - March 2016 Reassessment</b>

---

## **1 Purpose of Report**

To seek a recommendation from the Infrastructure Committee to Council, regarding the preferred treatment option for the section of Bluff Road closed prior to Christmas 2014 due to rock fall safety concerns and again in late December 2015 following a significant rock fall incident.

## **2 Background**

Safety concerns were raised in November 2014 regarding an overhanging bluff on Bluff Road approximately 350m east of Matarangi. An initial geotechnical site inspection confirmed that this section of road should be closed to protect the public from a high risk of rock fall. On 8 December 2014 this 500m section of Bluff Road (between Matarangi and Suckers Rock) was closed pending a more detailed geotechnical site investigation report which would enable Council to make an informed decision regarding the most appropriate treatment for this site and the future use of Bluff Road.

The detailed geotechnical site investigation was completed by Opus in March 2015 including the site investigation, assessment and treatment options.

Council considered an options report presented at the 24 June 2015 meeting and passed the following resolution:

*That the Thames-Coromandel District Council:*

1. *Receives the 'Bluff Road Treatment Options' report, dated 5 June 2015.*
2. *Approves the Infrastructure Committee's preferred option, as supported by the Mercury Bay Community Board, of repairing Bluff Road through:
 
  - *Option 1 - Blasting and mesh with an estimated cost of \$330,000 in 2015/16;**
3. *Approves the deferral of the Dalmeney's Corner improvement project on Hot Water Beach Road to 2016/17.*

**Moved/seconded by: Fox/McLean**

The blasting and rockwork was completed in December 2015, with mesh installation scheduled for completion in early January 2016, however a subsequent substantial rock-fall on 25<sup>th</sup> December 2015 closed the road.

A site meeting between TCDC staff and Opus network management and geotechnical staff was completed in January 2016. The outcome from this meeting was that Opus would complete a reassessment of the site in order to qualify site risks and likely costs, enabling evidence based consideration of site options going forward.

### 3 Issue

Staff require a recommendation from the Infrastructure Committee to inform Council's direction regarding the preferred future use of this section of Bluff Road.

### 4 Discussion

Following completion of the blasting and rock removal portion of work in the second quarter of the 2015/2016 year (as approved by Council in June 2015), a substantial rock fall occurred in an adjacent section of the site which closed Bluff Road. This rock fall was estimated at 100m<sup>3</sup> or 35% of the volume of rock removed by the blasting. The concrete wall under the road was also damaged by the rock fall and will require repair if the road is to be reopened.

The recent rock fall has left two zones where large loose blocks could fall onto the road at any time, meaning the area is unsafe for any traffic and warning signs and fences were erected to prevent public access to these areas.

The rock face stability was reviewed during January 2016 by an Engineering Geologist and the contractor engaged to complete the December 2015 blasting works. The technical report prepared as a result of that review is appended to this report (**refer attachment A**). The following updated options are based on these technical observations.

#### Option 1: Blast two unsafe rock zones and install rock fall mesh.

This is an extension of the original scope of the approved work through blasting to create a 15m long bench 1m wide and approximately 10m above the road level. Mesh would then be installed held to the rock face by bolts drilled at the top of the bluff, sides and base.

There remains a low risk that a new fracture promoting a large block slide could be discovered behind the rock face with this option.

A 1m wide bench will help catch some blocks should these fall from the upper parts of the face but would not prevent all from reaching road level. The bench may also need periodic maintenance if this approach was adopted for reopening the road.

Provided no major potential block failures are revealed, a passive mesh system as previously envisaged should be capable of preventing small scale block fall from endangering public on the road.

This option will require a variation to the existing resource consent; however this is expected to be possible within a one month timeframe.

The volume of blasting/rock removal is 260m<sup>3</sup> and the area of mesh netting is 500m<sup>2</sup>.

The estimated additional cost for this option is \$120,000.

The total project cost including \$200,000 spent to date plus \$100,000 for sea wall repairs/improvements and fees equate to a total project cost of \$420,000.

#### Option 2: Blast two unsafe rock zones and install rock fall mesh and partial rock anchors.

This option is the same as Option 1 above but with the addition of rock anchors over 25% of the rock face.

The use of rock anchors over part of the rock face further reduces the risk of rock fall and allows the flexibility to stabilise any identified risk areas uncovered by the blasting

The blasted rock volume will remain the same with the rock mesh volume reduced to 375m<sup>2</sup> and the rock bolting area being 125m<sup>2</sup>.

The estimated additional cost for this option is \$205,000.

The total project cost including \$200,000 spent to date plus \$100,000 for sea wall repairs/improvements and fees equate to a total project cost of \$505,000.

#### Option 3: Blast overhanging rock and install rock anchors and structural mesh.

Same as Option 1 above, but using 'active' rock anchors and structural mesh to achieve a higher factor of safety. The use of rock anchors also increases the estimated cost of work

The estimated additional cost for this option is \$320,000.

The total project cost including \$200,000 spent to date plus \$100,000 for sea wall repairs/improvements and fees equate to a total project cost of \$620,000.

#### Option 4: Remove entire corner.

Remove a substantial part of the corner just past the site and remove most of the rock above the road.

This option removes a substantial volume rock from the slope above the road in order to establish a safe slope without the need for rock mesh or rock bolting. Volumes of rock have been estimated from existing survey data. No detailed geotech assessment has been carried out and the underlying rock structure is unknown. For these reasons there is a high degree of uncertainty as to the level of stability of this option. If this option is progressed further, detailed geotech investigation will be required.

A resource consent application for this scope of work is expected to require public notification, and take between six to twelve months to be issued and estimated to cost up to \$80,000. The blasted rock volume is estimated at 5000m<sup>3</sup>.

The estimated additional cost for this option is \$200,000.

The total project cost including \$200,000 spent to date plus \$200,000 for sea wall repairs/improvements and consenting fees equate to a total project cost of \$600,000, however; the timeframes for this option are longer and there is a greater level of uncertainty over the scope of works.

#### Option 5: Closure of Bluff Road

Full closure of Bluff Road between Matarangi and Suckers Rock to all transport modes (including vehicles, cyclists and pedestrians).

The safety risk to all road users associated with this section of Bluff Road is eliminated, with alternate pedestrian access provided via the inland DoC walking track and for vehicles via State Highway 25 and either Matarangi Road (to Matarangi) and Bluff Road (to Rings Beach/Suckers Rock).

The cost for permanent closure is estimated at \$10,000.

The total project cost including \$200,000 spent to date plus \$10,000 for permanent road closure equates to \$210,000.

## Options Comparison

The table below provides comparative remedial option risks and costs.

Option	Number of high threats	Number of moderate threats	Weighted Score	Total Project Cost Estimate	Remaining Cost Estimate
Situation elsewhere on Bluff Rd	3	3	15	N/A	N/A
Option 1 - Blasting and mesh	1	4	12	\$420,000	\$220,000
Option 2 - Blasting and partial rock bolting	1	4	12	\$505,000	\$305,000
Option 3 - Blasting, bolting and structural mesh	1	2	7	\$620,000	\$420,000
Option 4 - Re-align road	Unknown (expected to be less than elsewhere on Bluff Rd.)	Unknown (expected to be less than elsewhere on Bluff Rd.)	Unknown (expected to be less than elsewhere on Bluff Rd.)	\$600,000	\$400,000
Option 5 - Road closure	0	0	0	\$210,000	\$10,000

The estimated rough order construction cost for each remedial option (options 1 - 4) includes all rockwork, detailed design (preparing construction drawings and works specification), resource consenting, and construction of beach front retaining structures and guardrail on the seaward road edge.

The lower the risk assessment score, the better the level of protection. However, cost invariably increases as well. The risk assessment scores indicate, as expected that remedial work options 1 to 5 have a score that is lower than that for the situation elsewhere on Bluff Road. Blasting is required on options 1 to 3 in order to remove the big rocks which the mesh would not prevent falling on the road.

Option 5 has both the lowest safety risk and lowest cost option, however permanent road closure may not be the preferred outcome for some community members and road users, who value this alternate road link between Kuaotunu and Matarangi.

Bluff Road also has areas of instability between Rings Beach and SH25 at Kuaotunu, where remedial work is programmed prior to June 2016 as well as increased monitoring planned for this area to minimise the risk of road closure east of Rings Beach.

### Legislative Requirements

In terms of s319 Local Government Act, Council has discretion over whether roads are maintained and if they are to be maintained, the level of service to be provided.

### Budget Implications and Risk Assessment

Council's 'minor safety improvement' budget and can be subsidised by NZTA at 46% up to a project cost of \$300,000. As all of the options (except for option 6 - road closure) would now exceed NZTA's \$300,000 minor improvement funding threshold, the remedial work is unlikely to qualify for NZTA subsidy. This means that even for the lowest cost option with an estimated total project cost of \$420,000, Council's contribution will change from the original \$178,000 to \$420,000.

### Community Views and Preferences

Staff presented this Infrastructure Committee report to the 2<sup>nd</sup> March Mercury Bay Community Boards meeting for feedback. With the exception of the Community Board Chair (who abstained from comment), Board members were unanimous in their support for the recommended option to close this section of Bluff Road, however wished to consult further with the Matarangi Community ahead on any decision to close the road being finalised.

### **Staff Recommendation - Option 5**

Staff recommend that Option 5 is preferred as closing this section of Bluff Road provides the lowest safety risk and lowest cost of all the options considered. Should this section of Bluff road be closed, alternate access is provided via State Highway 25 and either Matarangi Road (to Matarangi) or Bluff Road (to Rings Beach/Suckers Rock) for vehicles and cyclists; and via the inland DoC walking track for pedestrians.

## **5 Suggested Resolution(s)**

That the Infrastructure Committee:

1. Receives the 'Bluff Road Rockfall Treatment Options - March 2016 Reassessment' report, dated 29 February 2016.
2. Recommends to Council the preferred treatment option for Bluff Road is Option 5.

## **References-Tabled/Agenda Attachments**

**Attachment A** Bluff Road Engineering Options Report

**Attachment A - Bluff Road Engineering Options Report**