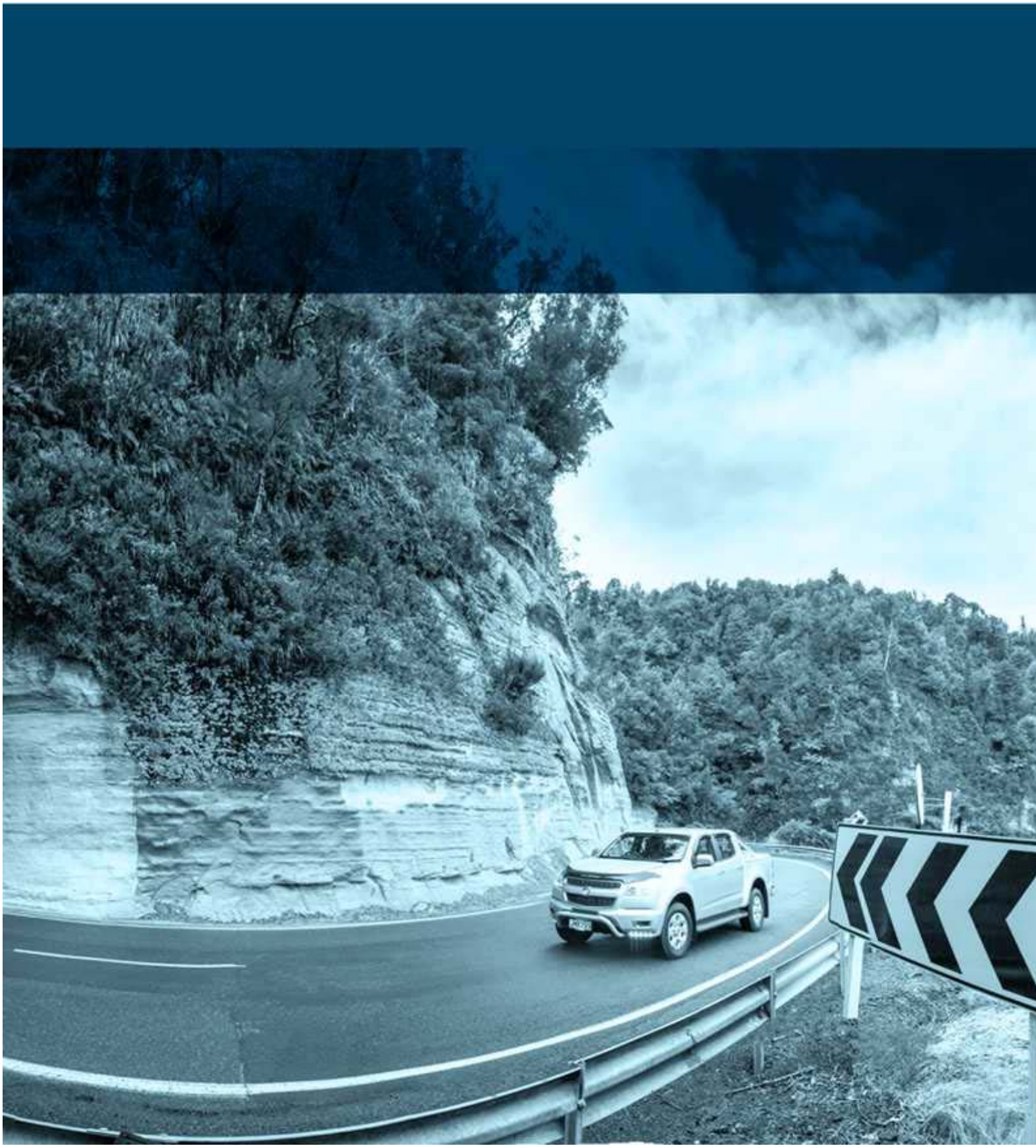
# Section 6 – Assessment of alternatives



# 6 Assessment of alternatives

## 6.1 Introduction

The Transport Agency has carried out a robust and detailed assessment of alternative sites, routes and methods for completing the Project, before arriving at the form of the Project as described in this AEE. This Section summarises the process followed by the Transport Agency in considering alternatives for the Project.

The statutory context for that process is set out below; followed by a high-level summary of the various stages of the assessment of alternative options for the Project.

## 6.2 Statutory Context

The consideration of alternative sites, routes and methods is relevant to both the NoR and the applications for resource consent for the Project. The relevant requirements are discussed below.

### 6.2.1 Section 171(1)(b): Notice of Requirement

Section 171(1) of the RMA provides that a District Council, when considering the NoR and any submissions received, must "*subject to Part 2, consider the effects on the environment of allowing the requirement, having particular regard to*" a number of listed matters, including (under s171(1)(b):

> "*whether adequate consideration has been given to alternative sites, routes, or methods of undertaking the work if –*
>
> *(i) the requiring authority does not have an interest in the land sufficient for undertaking the work; or*
>
> (ii) *it is likely that the work will have a significant adverse effect on the environment*."

As detailed elsewhere in this AEE, the Transport Agency does not at this time have all the property interests necessary to allow it to undertake the work; and accepts it is likely that the Project will have significant adverse effects on the environment (before mitigation and offsets are taken into account). This means the District Council is required to have particular regard to the adequacy of the consideration of alternatives by the Transport Agency.

The alternatives considered by the Transport Agency are those that are within its powers to undertake. They have focussed on bypassing the Mt Messenger section of SH3 (between Ahititi and to the north of Uruti), which is the scope of the Project ("work") being undertaken by the Transport Agency.

### 6.2.2 Resource consent applications

Schedule 4 of the RMA requires that alternative location or methods of undertaking an activity be described, where the proposed activity is likely to have any significant adverse effects on the environment. The Transport Agency has met this requirement when carrying out its consideration of alternative options for the NoR, as discussed below.

In addition, s105 of the RMA requires decision-makers on applications for discharge permits to have regard to matters including "*any possible alternative methods of discharge, including discharge into any other receiving environment*."

Discharge permits are being sought in respect of stormwater runoff from earthworks; and the discharge of dust during the construction of the Project. Detailed consideration has been given to methods for addressing any potential adverse effects of these discharges, and appropriate methods have been adopted (including through design and construction methods (refer Sections 4 and 5) and construction management plans (refer Section 10)) to ensure effects are appropriately managed. Further details are presented in the Air Quality Assessment (Technical Report 11) and Construction Water Assessment Report (Technical Report 13).

## 6.3 Project identification and investigation of alternatives

A robust and detailed process of assessing alternative options for the Project was carried out in 2017, including through a two-stage multi-criteria analysis (MCA) process. This followed the initial identification of and investigations into the Project commenced by the Transport Agency in 2016. The 2017 assessment of alternative options for the Project ultimately led to the Project as described in the NoR and resource consent applications and the AEE.

### 6.3.1 2016 funding announcement and assessment of options

In early 2016 the Minister of Transport announced that the Crown would fund improvements to the Mt Messenger and Awakino Gorge corridor of SH3 as part of the ARRP. A bypass of Mt Messenger was specifically identified as one of the individual projects to be progressed. The ARRP announcement followed initial Transport Agency investigations into the Mt Messenger and Awakino Gorge corridor, including the Mt Messenger section.

Also in 2016, the Transport Agency carried out an investigation into possible options for bypassing the Mt Messenger section of SH3. 19 options were considered through a MCA process, with assessments made of each option in terms of performance against a range of relevant factors, and the then 'draft' Project objectives (2016 MCA). The 2016 MCA identified and considered a range of potential options (both 'online' improvements within the current SH3 designation, and bypass options). Indicative costs for the options were also considered at a high level through the 2016 MCA.

The 2016 options assessment built on earlier options assessment work completed by Transit New Zealand (the Transport Agency's pre-cursor organisation) in 2002, which highlighted a corridor to the west of the existing SH3 alignment as being a preferred bypass option.[30]

[30] Beca 2002 Scheme Assessment. Subsequently the 'Western' corridor alignment land was returned to Ngāti Tama through the Treaty of Waitangi Settlement process.

### 6.3.2 November 2016 – January 2017 public consultation

As described in Section 7.5.3 of this AEE, the Transport Agency undertook a seven-week period of public consultation on the broader Awakino Gorge to Mt Messenger Programme[31]. This consultation ran from November 2016 to January 2017, and included consultation on three Mt Messenger Bypass route options, following on from the 2016 MCA:

- Improving the existing route by opening up and widening the Mt Messenger Tunnel and making safety improvements to the existing SH3 route (Option 1).
- A 6.4km bypass route running west of the existing highway (Option 2).
- A 5.3km bypass route running further west of the existing highway (Option 3).

In the consultation material, the Transport Agency stated:

> *"At this stage of the investigation work, this option (Option 2) appears to offer the best solution of the three options. It provides a bypass with moderate to significant journey improvements, while impacting less on sensitive ecological areas and costing less than the other bypass option. It also improves the highway's resilience by providing a bypass built to modern safety standards."*

A key outcome from the consultation process was strong support for Option 3. However, concerns about environmental and cultural impacts were raised through the consultation process.[32]

### 6.3.3 2017 assessment of alternatives for the Project

With the appointment of the Mt Messenger Alliance in March 2017, it was recognised that a further, more detailed assessment of alternative options for the Project was required. Central to that assessment process was a more detailed two-stage MCA process carried out in 2017 (refer Volume 4 of AEE).

#### 6.3.3.1 Introduction to the 2017 MCA process

In deciding to carry out a more in-depth MCA process in 2017, it was recognised that the 2016 MCA was carried out with a lower level of design development, limited availability of site environmental data and without cultural scoring of options.

As part of commencing the 2017 MCA process the design philosophy was updated, existing information reviewed and feedback from the November 2016 – January 2017 consultation received. Importantly, between the 2016 and 2017 MCA processes, Ngāti Tama provided a Cultural Values Assessment in respect of the Project, and agreed to participate directly in the MCA assessment and scoring process.

[31] That followed targeted early engagement from August to November 2016; and a pre-2016 MCA consultation process carried out in 2014 – 2015.

[32] Refer to Section 7.5.3 for more detail on consultation outcomes

#### 6.3.3.2 2017 MCA methodology

The 2017 MCA process was designed, led and co-ordinated by the Mt Messenger Alliance[33], including the detailed analysis of the MCA process findings. Details on the MCA methodology, the options, expert assessments and scoring, and the analysis and findings from the MCA process are presented in Volume 4 of this AEE (refer MCA Longlist report, and MCA Shortlist report).

Key features of the 2017 MCA process are summarised below.

*Two-stage process*

The intention from the outset was that there would be two stages to the 2017 MCA process:

- an initial assessment of 'longlist' options to develop a shortlist (MCA1); and
- a subsequent assessment of a refined list of 'shortlist' options to support a decision on a preferred option (MCA2).

A range of options were developed by the Alliance for the first longlist stage (MCA1) assessment, as discussed below. The process for selecting and refining shortlisted options, taking into account the results of the MCA1 results, is explained below.

*Assessment criteria*

A range of assessment criteria were developed in order to assess the options at both the longlist and shortlist stage. The development of criteria took into account:

- key matters for consideration under the RMA and other relevant statutory documents (including Part 2 of the RMA and the policy framework established through the Regional Policy Statement, and Regional and District Plans);
- the four Project objectives;
- likely Project effects identified by previous investigations; and
- criteria used for the 2016 MCA, and MCA processes for other similar projects.

For the MCA1 assessment, nine assessment criteria were used, covering the following key environmental and transport issues:

- Constructability: the difficulty of constructing the option;
- Transport;
- Resilience: major event resilience including instability, earthquake, liquefaction and lateral spread and flood and storm damage;
- Landscape;
- Historic Heritage: focussing on archaeology in particular;
- Community: at the longlist stage, this was a high-level assessment of impacts on known recreational activities in the area and ‘way of life’ for people directly impacted;
- Property: focussing on the extent and nature of property that would need to be acquired for each option;
- Ecology; and

[33] The process was led by Mr Peter Roan, an expert consultant planner and the Alliance's Planning and Environmental Manager for the Project

- Cultural Heritage: impact on cultural heritage and values as assessed by Ngāti Tama representatives.

As outlined in the MCA Longlist report, a range of other possible criteria were considered but ultimately not included.[34]

For the MCA2 assessment, the same criteria were used, with the following exceptions:

- The ecology criterion from MCA1 was split into two separate criteria: terrestrial ecology and water environment. This was a result of the MCA1 process highlighting that different routes tended to have different levels of effects on the terrestrial and water environment; and also as more information was available on effects on the water environment at the shortlist stage (including specialist erosion and sediment control inputs).
- The community criterion was adjusted to provide for input from recreation, social and noise / vibration assessments. Sub-criteria scores were provided by experts in each of those separate subject matters, with an overall community criterion score then agreed between those experts.

*Scoring of options by subject matter experts*

The 2017 MCA was designed to rely on, and capture, assessments of the effects of each option by subject-matter experts.

For each criterion, experts were assigned to assess every option against that criterion. Of particular note is that representatives of Ngāti Tama assessed and scored the options against the cultural heritage criterion at both the longlist and shortlist stage. Ngāti Tama also provided valuable insight to the MCA workshops (discussed below) based on their intimate knowledge of the area.

Experts were given the option of developing and scoring sub-criteria if they considered it appropriate to do so, but were instructed ultimately to provide a single overall score for their criterion.

A specific scoring methodology was devised, to be applied based on the expert judgment of the specialists, as follows:

- Options were scored on a 9 point scale (+4 to -4, plus 'fatal flaw') scale based on the level of effects (adverse or positive) of each option for each criterion:
    - 0 was the neutral or baseline score, representing the continued operation of the existing road, with none of the options being constructed. This baseline meant that, for a number of criteria, it was unlikely that positive scores would be assigned for any of the options;
    - Scores assigned were to take into account the application of 'standard' or normally expected mitigation; but not bespoke mitigation or offsetting; and
    - There was also the option of assigning a "fatal flaw" (F) negative score. This score was to be used only where there are unacceptable adverse effects associated with the option, and that there is no reasonable way to appropriately

[34] This includes cost, which was considered to be a matter for the Transport Agency rather than for expert assessment.

avoid, remedy, mitigate or offset those effects (in other words, even bespoke mitigation or offsetting was to be considered before an F score was assigned); and

- Scoring was on an absolute rather than relative basis, with experts instructed not to create artificial distinctions in scores between the options.

*Discussion and presentation at workshops*

Two-day workshops were held for each of MCA1 and MCA2. The workshops were attended by the experts (including Ngāti Tama representatives) and members of the Alliance design and planning team. The MCA2 workshop was also attended by two Department of Conservation staff in an observer capacity.

At each workshop:

- The options were presented in detail by the designers (including via a 3D digital terrain model showing the options with drone aerial photography overlaid (at MCA2) allowing experts to discuss options with the designers and seek clarifications;
- Each expert presented their assessments, including their scores for each option, and fielded any questions from other attendees; and
- Of particular note, the Ngāti Tama representatives played a full part in the 2017 MCA process, attending the workshops and providing scores for the cultural heritage criterion.

*Analysis and weighting of scores*

By adding the scores assigned by the experts, an overall total 'raw' score could be determined for each option.

The raw scores were also subjected to three additional weighting systems, which emphasised various criteria.

The three weightings applied were:

- An overall or RMA weighting. This was developed from analysis of the RMA and statutory documents and an eye to the RMA consenting process and the weight likely to be given to relevant statutory provisions. This weighting took particular account of the key matters reflected in the provisions of Part 2 of the RMA, the relevant statutory documents and the Project objectives;
- An 'environmental' sensitivity analysis weighting, which prioritised those criteria that relate most directly to effects on the natural environment, including as represented in effects on cultural heritage values; and
- A 'transport' sensitivity analysis weighting, which prioritised those criteria that relate most directly to the transport performance of the route.

The intention of the weightings was to apply three varying, but realistic perspectives to the relative importance of the various criteria. This provided for further comparative analysis of the performance of the various options.

*Provision of expert reports and overall Longlist Report and Shortlist Report*

The results of the 2017 MCA processes, including reports and scoring from each of the subject matter experts, were collated and analysed in two overall 2017 MCA reports (contained in Volume 4 of the AEE), being:

- The Longlist Report; and
- The Shortlist Report.

*Selection of preferred option*

The 2017 MCA process was fundamental to the Transport Agency's robust assessment of alternative options. However, the decision as to what form the Project would take was not made directly through the 2017 MCA process. Rather, the 2017 MCA process and results were utilised by the Transport Agency as an important tool in making decisions as to the nature of the Project. Ultimately, it was the Transport Agency as requiring authority that determined the form of the Project as set out in the NoR and resource consent applications and in this AEE. That decision had due regard to the results of the MCA; however, the Transport Agency as requiring authority was not obliged to choose the "best" performing option from the MCA.

#### 6.3.3.3 Longlist assessment of options

For the 'longlist' stage of the 2017 MCA, 11 'offline' corridors (to bypass the existing Mt Messenger section of SH3) and one 'online' corridor (located largely within the existing Transport Agency SH3 landholding) were developed, to a greater level of detail than for the 2016 MCA. The corridors included a range of options to the west of the existing SH3, as well as an online corridor. This meant that the three options consulted on in the November 2016 – January 2017 process were broadly represented in the 2017 MCA process. Options to the east of the existing SH3 were also included.

For each of the 11 offline corridors, two different options were developed (for the same alignment):

- an 'earthworks' option, which relied on cuts and fills to cross valleys and ridges; and
- a 'structures' option, utilising a combination of bridges and tunnels to avoid or minimise effects on the valleys and ridges.

Four separate options were developed for the online corridor.

The corridors and options were developed using the '12d' geometrics software, a package that allows roads to be designed to meet specified geometric criteria. Each road model was combined with the 3D digital terrain model in Autodesk InfraWorks 360 derived from a Lidar survey.

The location of each longlist corridor is shown on Figure 6.1 below.

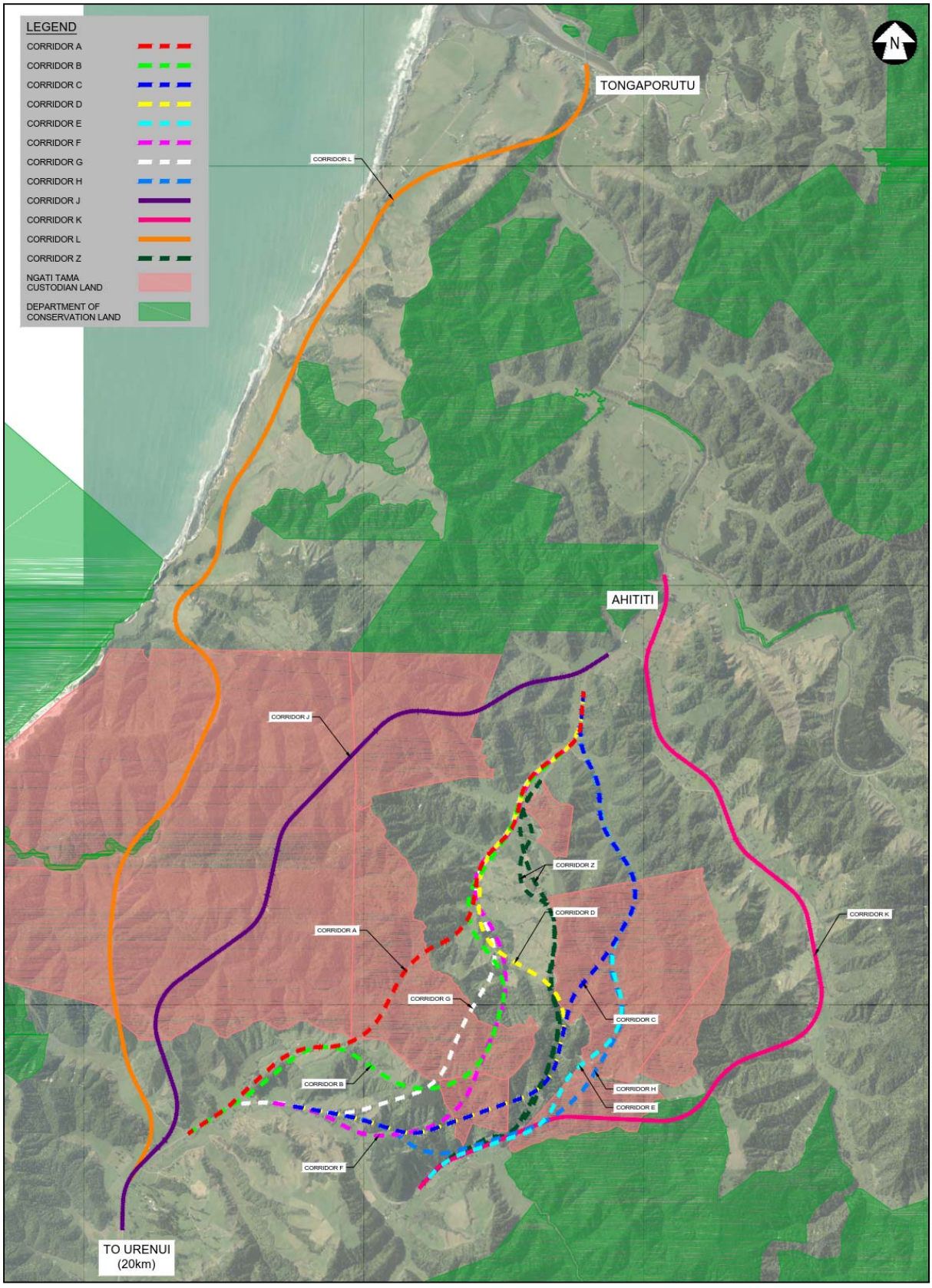



*Figure 6.1 – Map of longlist options considered at 2017 MCA1*

All offline options and two of the four online options (a total of 24 options) were then assessed through the MCA process.[35]

The scores for each option were tallied and the weightings were applied. The detailed results of the assessment, including all scores assigned to all options, are set out in the overall Longlist Report.

Figure 6.2 below shows the relative rankings of each option when the raw scores for each criterion are added together, alongside the rankings when each of the three weightings are applied. Figure 6.2 also indicates where an option received one or more "fatal flaw" scores.[36]

The Longlist Report contains an analysis of the results of the longlist MCA1 process. Key conclusions included:

- The online options (Z2 and Z4) were the two best performing options overall, providing a strong basis on which to consider at least one online option in the shortlist MCA process.
- A group of offline structures options performed relatively well. A1, C1, D1 and E1 received the 3rd – 6th best sum totals of scores (in some order) under all weightings (and raw scores). These options provided a mix of routes to both the west and east of the existing SH3 corridor, for potential consideration through the shortlist MCA process
- The other offline structures options (B1, F1, G1, H1 and K1) did not score as well. However, as none of those options received a fatal flaw score, it was considered that it would not be unreasonable to take one or more of these options forward to the shortlist.
- At the other end of the spectrum, nine of the options received a fatal flaw score under one or more of the ecology, cultural heritage, and landscape criteria. This included all four of the far western and coastal options (J1, J2, L1, L2), as well as the earthworks options A2, B2, C2, F2, and G2. It was considered appropriate to discard those options based on those unacceptable adverse effects.
- Of the offline earthworks options that did not receive fatal flaw scores, options E2 and H2 performed better than D2 and K2.
- For all corridors, the earthworks options performed more poorly than the structures options, due largely to the higher level of adverse environmental effects the earthworks options would bring.

The Longlist Report also records the rough order cost estimates that were developed for each option (noting that these were not considered as part of the MCA1 assessments). These are reproduced in Figure 6.3 below.

[35] It was considered that it was sufficient to formally assess two of the online options; noting that the two options not assessed had design speeds below 70kph, which was not considered adequate.
[36] Noting that the (C) notation for Option C2 indicates the fatal flaw for that option was for cultural heritage.

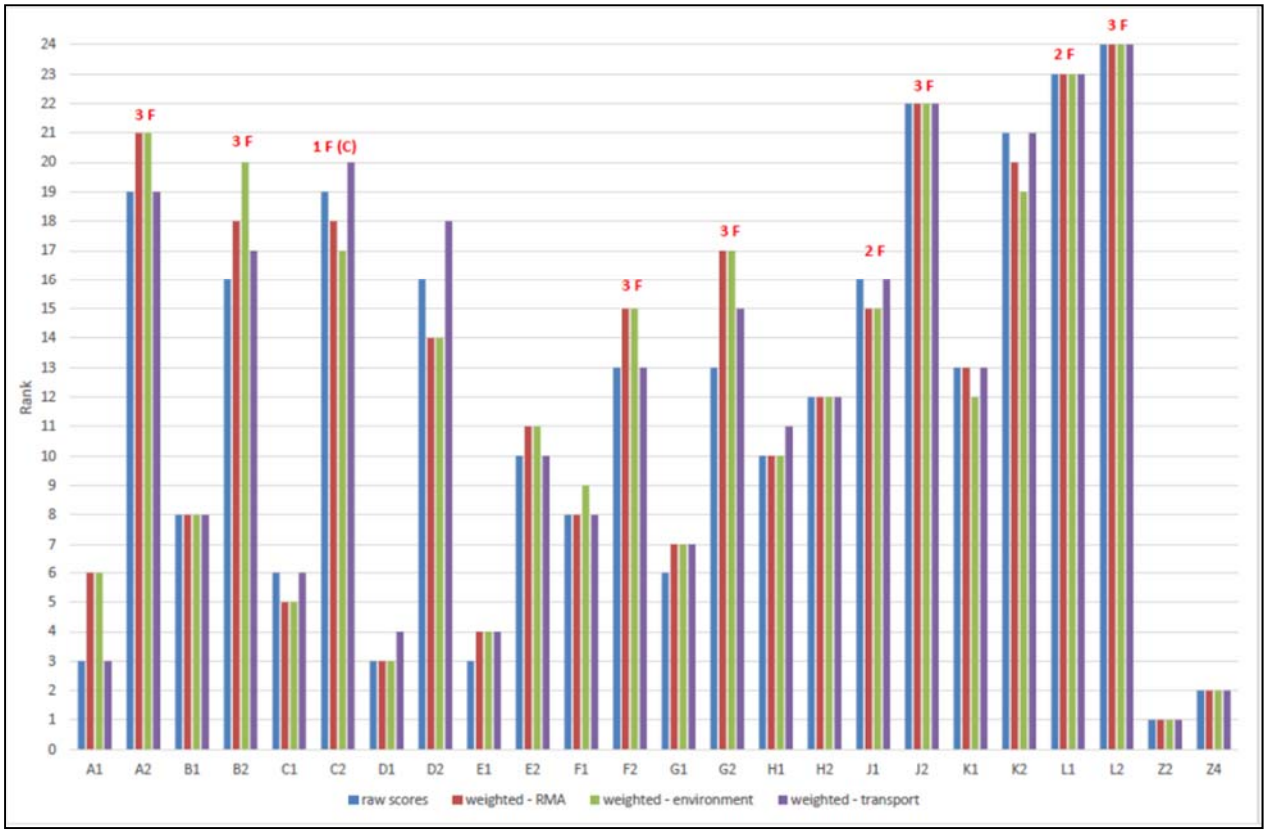



*Figure 6.2 – Longlist MCA ranking of the 24 options*

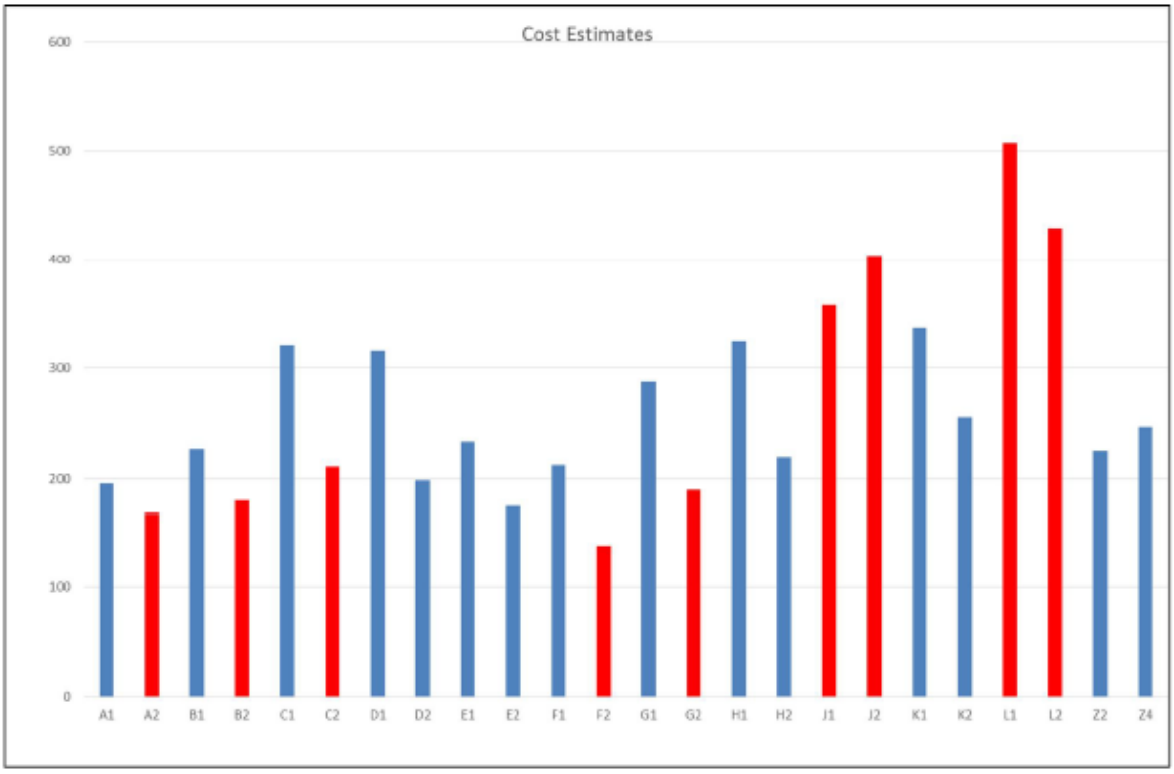



*Figure 6.3 – Cost estimates for the longlisted options (red bars – fatal flaw scores)*

The outcomes of the MCA1 workshop process were considered, along with cost estimates for each of the longlisted options.

Five options were subsequently identified for further refinement and inclusion in a shortlist:

- Option A1;
- Option E1 / E2;
- Option F1;
- A hybrid option, which focused on a combination of the B, F and G corridors;
- An on-line Option (taking in D1, D2, Z2 and Z4).

During the period between the MCA1 and MCA2 workshop, design investigation and refinement work continued on these identified shortlisted options. By way of brief summary, the five shortlisted options put forward for assessment through the MCA2 process were:

- Option A: was a refined version of longlist Option A1 (which was one of the best performing offline options in MCA1). Between the MCA1 and MCA2 workshops, refinements to this option were carried out, including to take into account constructability (noting a significant area of geotechnical instability was identified) and cost issues.
- Option E: was a refined version of longlist Option E1 (which again was one of the best performing offline options in MCA1). Of particular note is that a bridge structure was added in response to comments from the ecologists, to avoid effects on the high-value Mimi swamp forest. Some of the earthworks (fill) elements of E2 were incorporated in this shortlisted option.
- Option F: was a refined version of longlist Option F1 (which performed relatively well in MCA1). Between the MCA1 and MCA2 workshops, the design team carried out further refinements to this option.
- Option P: the hybrid option, comprising a combination of the B, F and G corridors. It was based primarily on the 'structures' (B1, F1 and G1) rather than 'fill' (B2, F2 and G2) versions of those corridors. These three options performed relatively well in the MCA1 assessment, and traverse similar routes. The indicative alignment of Option P was established after a walk over of the potential route by a Ngāti Tama runanga member (Mr Conrad O'Carroll), followed by an assessment from the Alliance designers. While close to Option F, it avoided a gulley area which would required a difficult sidling fill or curved bridge, and hence was deemed worthy of further consideration. Option P also avoided a stand of podocarps on the southern ridgeline of the western Parininihi land.
- Option Z: was the 'online' option for the shortlist assessment. Option Z2, Z4, and the D corridor (primarily option D1, which was one of the best performing options in MCA1) were represented in the shortlist through this option. Work was carried out to refine this online option during the period between the MCA1 workshop and the MCA2 workshop.

These shortlisted options provided a representative selection of the better performing options from the MCA1 process. The shortlisted options also provided for a geographic

spread of the longlisted options, while omitting the poorly performing western (J, L) and far eastern (K) corridors.

Figure 6.4 below shows the location of the five shortlisted options as considered in the MCA2 process.

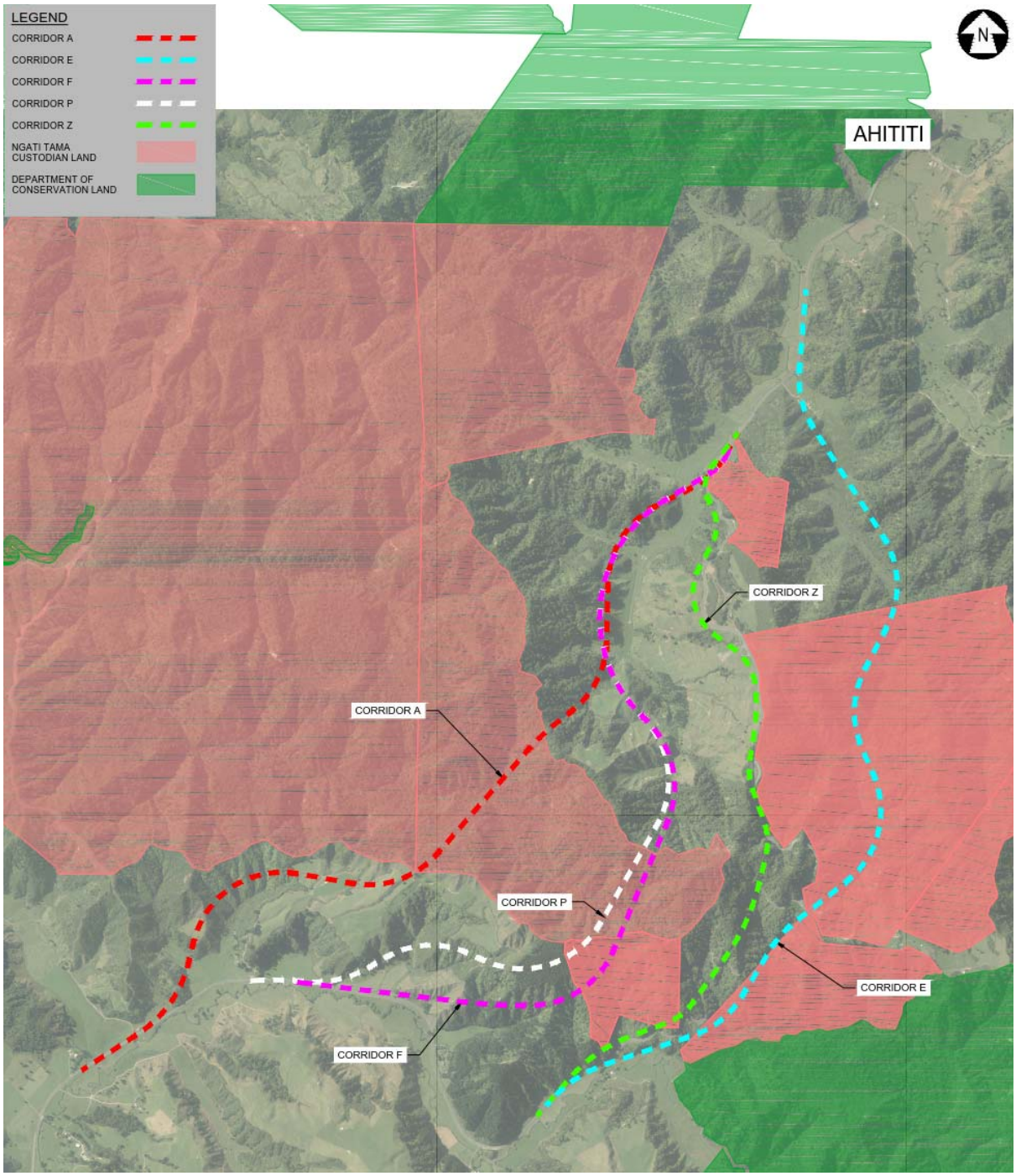



*Figure 6.4 – Location of shortlisted options*

#### 6.3.3.4 June 2017 consultation on shortlisted options

In June 2017, a public consultation programme was undertaken to gain input from local communities and key stakeholders on the five shortlisted options. That process is described in Section 7.5.4 of this AEE. The key themes from the feedback included:

- A strong focus on travel reliability, safety, and long-term resilience;
- Concern about environmental (particularly native bush and wetlands) and cultural impacts; and
- The economic benefits of a new route.

As noted in Section 7.5.4, public feedback was broadly in favour of Option A, with the general consensus of views being that this option provided the best transport outcome (reliability and travel time savings).

#### 6.3.3.5 MCA2 assessment of the shortlisted options

The shortlisted options were subject to an MCA process (MCA2), which was carried out on a similar basis to the longlist MCA1 process (as described above). The Shortlist Report (refer Volume 4) describes the MCA2 process and results in detail. Expert reports on each criterion were also provided, as for the MCA1 process.

The MCA raw scores for the five shortlisted options are set out in 1 below. Comparative rankings of each of the options when applying total raw scores, and each of the three weightings, are shown in Table 6.2 below.

**Table 6.1 - MCA 2 raw scores**

| Criteria | Option A | Option E | Option F | Option P | Option Z |
|---|---|---|---|---|---|
| Constructability | -4 | -3 | -2 | -2 | -4 |
| Transport | 3 | 2 | 2 | 2 | 2 |
| Resilience | -3 | 1 | 2 | 2 | 1 |
| Landscape | -3 | -1 | -4 | -3 | -1 |
| Historic heritage | -2 | -1 | -1 | -1 | -1 |
| Community | 1 | 1 | 1 | 1 | 0 |
| Property | -3 | -3 | -3 | -3 | -2 |
| Terrestrial ecology | -3 | -3 | -4 | -3 | -3 |
| Water environment | -3 | -3 | -3 | -3 | -2 |
| Cultural heritage | -4 | -4 | -4 | -4 | -4 |
| Total Raw Score | -21 | -14 | -16 | -14 | -14 |
| Raw Score Rank | 5 | 1 | 4 | 1 | 1 |

**Table 6.2 – Relative option ranking from MCA2 process**

| Option | Option Rank: Raw score | Option Rank: Overall RMA Weighting | Option Rank: Environmental sensitivity analysis weighting | Option Rank: Transport sensitivity analysis weighting |
|---|---|---|---|---|
| A | 5 | 5 | 5 | 5 |
| E | 1= | 2 | 2 | 2 |
| F | 4 | 4 | 4 | 4 |
| P | 1= | 3 | 3 | 1 |
| Z | 1= | 1 | 1 | 3 |

In respect of the overall performance of the five shortlisted options in MCA2:

- While Option A received the best raw transport score, it was nevertheless the worst performing option overall, ranking last on total raw score and under all three weighting systems.
- Scoring for the other options was relatively close, though there were differences between each option.

All options presented technical and environmental challenges, including in respect of effects on ecological, landscape and cultural values. It is noted that the scores assigned in the MCA2 process did not provide for 'bespoke' mitigation, or offsetting of effects (other than to avoid assigning fatal flaw scores).

#### 6.3.3.6 Further consideration and selection of Project option following shortlist MCA

Following the MCA2 workshop, the scores assigned were analysed, again along with other factors including cost.

Further work was subsequently done to refine Options A, P, E and Z. Option A was retained for comparison purposes rather than on the basis of an expectation it might ultimately be selected as the preferred option. Consultation had identified that Option A was generally the public preference of the five options, and the MCA2 process confirmed it was the best performing option from a transport perspective. However, the MCA2 process identified that Option A was the worst performing option overall, which reflected its relatively poor performance in terms of adverse environmental and cultural effects.

Option F was not subject to further refinement work, on the basis that it was a similar route to Option P, but performed worse in the MCA2 assessment.

The costs of the MCA2 options following that refinement process is presented in Table 6.3.

Table 6.3 – Cost estimates for MCA2 options[37]

| Option | A | E | P | F | Z (online) |
|---|---|---|---|---|---|
| Base | $228.0M | $174.5M | $211.4M | $209.1M | $364.4M |
| Expected | $251.3M | $199.6M | $231.3M | $234.9M | $382.5M |
| $P_{95}$ | $293.3M | $218.7M | $274.2M | $276.4M | $430.1M |

Following the analysis of the results of the MCA2 process and subsequent refinement work, and having regard to cost estimates, the Transport Agency determined that Option E would be taken forward as the preferred option.

This preferred option is reflected in the Project as proposed in the NoR and associated plans and application documents.

[37] Cost estimates prepared in accordance with the Transport Agency 'Cost estimation manual' SM014.
Base = total sum of the elements that make up an estimate but not including a contingency.
Expected = base estimate including an allowance for contingency calculated as per SM014.
$P_{95}$ = The expected estimate plus an allowance for funding risk, calculated as per SM014.