IN THE MATTER OF	The Resource Management Act 1991
AND	
IN THE MATTER OF	Notices of requirement for designations under section 168 of the Act, in relation to Te Ahu a Turanga; Manawatū Tararua Highway Project
BY	**NEW ZEALAND TRANSPORT AGENCY** Requiring Authority

STATEMENT OF EVIDENCE OF ANDREW MARK WHALEY (PROJECT DESIGN) ON BEHALF OF THE NEW ZEALAND TRANSPORT AGENCY

8 March 2019

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INTRODUCTION

1. My full name is **Andrew Mark Whaley**.

2. I am a Principal of GHD and hold the position of Technical Director – Civil Infrastructure.

3. I hold a Bachelor of Engineering, obtained from the University of Canterbury (1994). I am a Chartered Engineer with the Institute of Civil Engineers (UK) – C.Eng MICE.

4. My work experience includes 24 years in the delivery of highways and transportation projects in New Zealand and the United Kingdom. My experience over the last 17 years has been primarily in the design of major highway projects for the Highways Agency (UK) and the New Zealand Transport Agency ("**Transport Agency**"). This includes team leadership of multidisciplinary design teams on improvement projects on the M1, M11, and A10 in the UK and SH1/SH76 Christchurch Southern Motorway, SH82 Kurow Bridges Replacement, and the SH1 Russley Road: Harewood Road to Avonhead Park 4-laning.

5. I have previously given evidence at hearings, have undertaken detailed design, and have assessed construction effects relating to civil engineering projects such as the SH1 Russley Road: Harewood Road to Avonhead Park 4-laning, Central Plains Water Enhancement Scheme, Mokihinui Hydro Project, and the Cleddau River Flood Protection.

Background and Role

6. In respect of the Notices of Requirement ("**NoRs**") lodged in respect of Te Ahu a Turanga; Manawatū Tararua Highway Project ("**the Project**"), I have:

   (a) led, as Design Manager, the development of options through long-list and short-list processes, and have carried out preliminary design development of the recommended option as presented in the Detailed Business Case ("**DBC**");

   (b) played an active role in stakeholder workshops and have been responsible for managing consideration and development of indicative options for the Project route, to inform the boundaries of the proposed designations; and

   (c) led, as Road Design Specialist, the preparation of the Assessment of Environmental Effects ("**AEE**") drawings (which formed Volume 4 of the NoRs) and refinement of the indicative design as influenced by the

assessment of environmental effects and stakeholder feedback in the development of the proposed designations.

7. As well as the combined plans and drawings, I also prepared background design information where drawings have been prepared by others.

8. In preparing the drawings and my evidence I have:

   (a) undertaken numerous site visits and have a detailed understanding of the Project area; and

   (b) been involved in numerous stakeholder workshops, specialist workshops and expert meetings.

Code of Conduct

9. I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2014. My evidence has been prepared in compliance with that Code, as if it were evidence being given in Environment Court proceedings. In particular, unless I state otherwise, this evidence is within my area of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

Purpose and scope of evidence

10. The purpose of my evidence is to give the Hearing Panel a brief overview of various processes and inputs that have informed the shape of the designations now sought by the Transport Agency, within which a new road is proposed to be designed and built.

11. My evidence addresses the following matters:

   (a) initial matters influencing the form of the Project; Project objectives, the design philosophy, and design standards;

   (b) option development, a description of the Project's function and key design elements, and future design processes;

   (c) environmental and other factors influencing design, including iterative processes to inform effects assessments (and vice versa);

   (d) the indicative construction methodology and its influence on the proposed designations;

   (e) specific design elements, including proposed tie-ins to existing transport networks (including the roundabouts at either end of the new

road), potential structures, the staging of works, spoil sites, earthworks, and management of hazardous substances;

(f) the assessment of alternative boundaries for the designation corridor (that is, the development of the preferred Short List Option 3);

(g) comments on submissions;

(h) responses to questions from the Hearing Panel; and

(i) comments on the section 42A report.

PROJECT OBJECTIVES, DESIGN PHILOSOPHY, AND STANDARDS

The Transport Agency's Project objectives and the Preliminary Design Philosophy Statement

12. The objectives for the Project are summarised in Volume 1, Section 3.1 of the AEE, and are discussed in the evidence of **Sarah Downs** for the Transport Agency.

13. The Project objectives relate to the construction and operation of a new, more resilient highway to reconnect State Highway 3 ("**SH3**") on either side of the Tararua/Ruahine ranges, and essentially to replace the connection severed as a result of the closure of SH3 through the Manawatū Gorge, with a safer and more efficient connection than the Saddle Road and Pahīatua Track.

14. I am the author of the Road Design Philosophy Statement ("**DPS**") that is ix 3 to Volume 2 of the AEE. That Statement was developed initially as part of the DBC process, and then further following (and in response to) the outcomes of the technical assessments. The document was prepared to support the Project objectives and enable the translation of the outcomes sought for the Project into a set of standards and principles used by the Project team to guide the preliminary design and option consideration and assessment.

15. I summarise below the relationship between design standards / philosophies and environmental and social constraints, as well as how they have influenced the form of the Project corridor.

Highway and other roading standards

16. A key outcome of the Project is to provide a resilient/reliable and safe highway that reconnects the severed SH3 while relieving the currently experienced negative impacts arising from the closure of the Manawatū Gorge connection.

17. The key features of the highway that influence its design are:

    (a) provision of a minimum of two lanes (one lane in each direction) with continuous median separation between the major intersections, together with shoulders, medians and barriers;

    (b) additional provision of crawler lanes to the two-lane road (making two lanes in each direction) where gradients are greater than 6%, including crawler lanes between subsequent sections greater than 6% gradient, resulting in continuous crawler lanes for the length of the traverse of the ranges;

    (c) an operating speed of 100kph and design speed of 110kph, with appropriate transitions back to the existing State Highways and local roads at the Project ends; the design speed dictates the minimum horizontal and vertical curvature for the main alignment;

    (d) roundabout intersections where the new alignment intersects with the existing State Highway 57 and local roads, providing safe and efficient intersection forms and a positive threshold transitioning from the new modern standard highway to the existing road network;

    (e) limited access to the highway, with property access via the local road network with overpass structures (highway passing over) providing cross-highway connectivity to otherwise severed land parcels; and

    (f) a minimum available over-dimension envelope on the highway of 10m horizontal clearance and 6m vertical clearance, to cater for over-dimension vehicles using the route.

18. As outlined in the DPS, the geometric design of the Project is to be consistent with the standards in Austroads' Guide for Road Design, which is accepted as best practice. These and other standards provide guidance on minimum radii, super-elevation, warp rates, gradients and other factors, that relate to the type and operations speed of the road and in turn influence the shape of the highway.

Road Safety Audit process

19. The application of a Road Safety Audit ("**RSA**") process is part of a best practice approach to developing safe roading projects. This process has been applied to the Project design using a team of independent safety

advisors to challenge the Project from a road user safety perspective, and to inform indicative design development.

20. For this Project, this has involved a RSA being undertaken on the recommended option from the DBC (referred to as the 'concept stage'), with subsequent indicative design development focused on addressing the issues raised at that time and the agreed mitigation measures. Further RSAs will be carried out after the preliminary design (the 'Stage 2 RSA') and detailed design ('Stage 3 RSA') and pre-opening/post-construction stages ('Stage 4 RSA') of the Project.

21. In response to each RSA there is a formal process of assessing the issues raised by assessors and the nature of any improvements that should be incorporated as the design is developed.

22. The RSA process has helped shape the Project's indicative design, in particular the form of the major intersections at each end (which are roundabouts, to ensure a safe transition back to the existing State highway network), together with safe transition from two lanes plus crawler lanes back to two lanes.

OPTION DEVELOPMENT, PROJECT FUNCTION, KEY DESIGN CRITERIA, AND FUTURE DESIGN PROCESSES

Introduction

23. As highlighted above, the Project will provide a safer, more efficient, and more resilient route than the Saddle Road and Pahīatua Track, and the closed SH3 through the Manawatū Gorge.

24. In this section of my evidence I give a high-level overview of the development of potential route options for the Project (which were analysed through processes summarised in the evidence of **Scott Wickman** for the Transport Agency, and then describe the Project function, elements of the indicative design, and note the further design processes to come.

Route selection process

25. The DBC focused on determining the route and appropriate standards required to meet the Project objectives. This involved the development of a long list of options (which involved both alternate routes and design standards), further analysis of a short list of potentially justifiable options, and finally the recommendation of a preferred route. These processes (together

with a related process regarding a connection at the Ashhurst end of the Project) are discussed further in **Mr Wickman's** evidence.

Long list development

26. Long list option development was cognisant of the need to identify suitable options to meet the transport outcomes sought, minimise impacts on the community and environment, and be feasibly delivered.

27. A total of 18 options were developed, albeit with differing risk, impact and cost profiles, against which a multi-criteria analysis was undertaken to determine a recommended short list.

28. The long list of options included consideration of options previously developed (Ministry of Works, 1977; Worley Consultants, 1997; MWH, 2012), three options within the Gorge, two tunnel options, an upgrade of Saddle Road, two new options north of the Gorge and four new options south of the Gorge. Two of the southern options connected with SH3 south of Ashhurst (closer to Palmerston North).

29. The new options north and south of the Manawatū Gorge were developed following the existing terrain, to the extent possible with the desired vertical and horizontal geometry, to minimise the total volume of earthworks and footprint extent.

30. Following further investigation and stakeholder feedback, an additional northern option was added traversing to the north of the Te Āpiti Wind Farm, and two further Saddle Road options with alignments with 80kph and 60kph design speeds, to assess the potential for providing alternatives with lower cost or different effects profiles.

31. A fifth southern option, which became Option 4 of the short list, was developed following feedback from the Key Stakeholder Workshop (which formed part of the long list assessment process) held in October 2017. This fifth southern option was developed through the merging of the 'best parts' of several of the southern options.

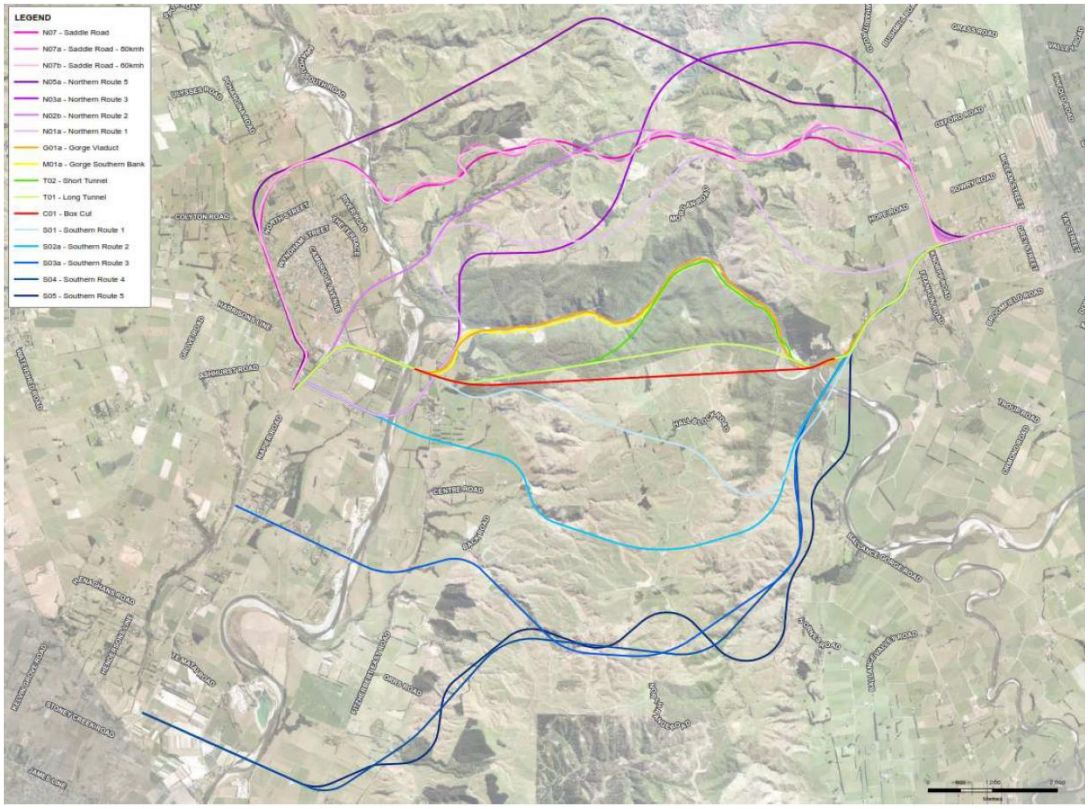


Figure 1 - Long List Options

Short list development

32. The short list of options (renumbered) taken forward following the long list MCA recommendation comprised the option to the north of the Te Āpiti Wind Farm (Short List Option 1), upgrading of Saddle Road to an acceptable modern State highway standard (Short List Option 2), an option north of the Gorge through the Te Āpiti Wind Farm (Short List Option 3, which formed the basis of the Project), and an option south of the Gorge (Short List Option 4).

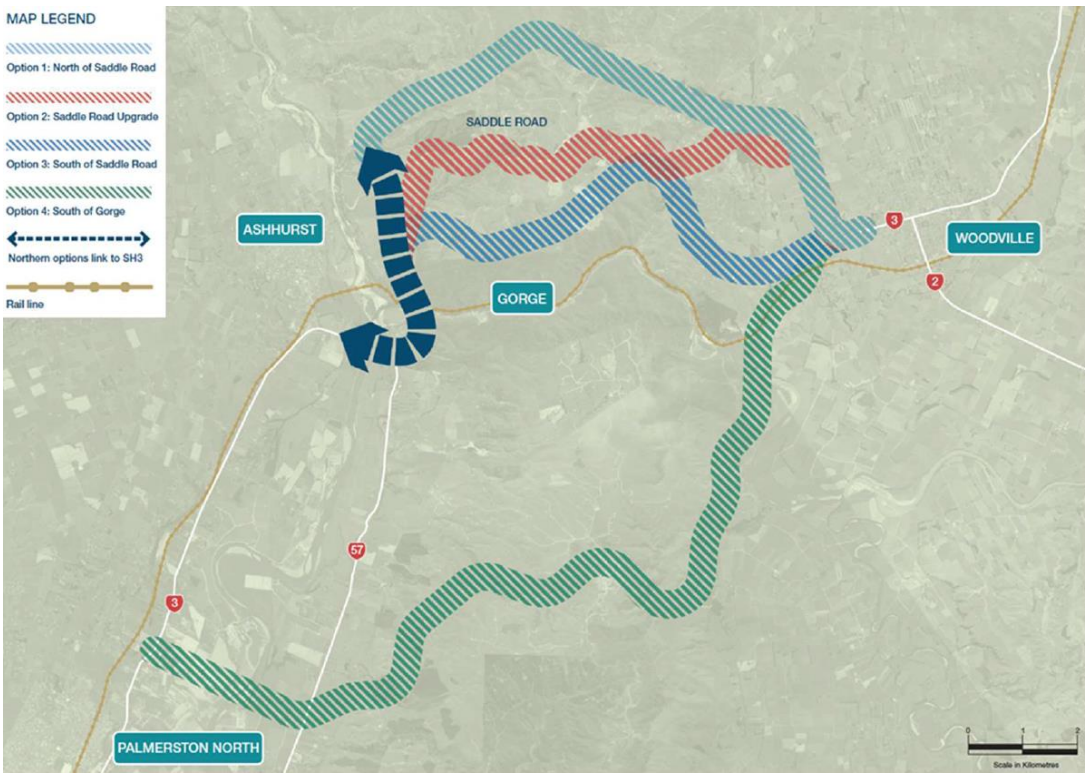


Figure 2 - Short List Options

33. All four options tied in at the eastern end to the existing SH3 at the intersection of Woodlands Road/Troup Road near Woodville. The three northern options tied in to the eastern abutment of the existing SH3 bridge over the Manawatū River near Ashhurst. The Southern option crossed SH57 and the Manawatū River and tied in to SH3 near Palmerston North.

34. Following the MCA assessment of the short list options, and feedback provided through stakeholder and public consultation, Option 3 was recommended, including for the following reasons:

    (a) delivering the desired transport outcomes for a likely cost that was relatively more expensive than Option 2, but considerably less expensive than Option 4;

    (b) providing a more direct connection than Option 1, with the lowest average gradient of all the options;

    (c) being able to be constructed almost entirely offline, and expected to be at least one year quicker to construct than Option 4;

    (d) having the lowest-risk option, on balance, in terms of impacts on social and environmental factors (noting that all options would have had significant adverse effects, given the nature of the terrain across the Ruahine and Tararua Ranges; and

(e) with some further consideration of options for improving connectivity to Ashhurst Road, providing similar network benefits as Option 4.

35. Reasons that Option 1 was not recommended included:

(a) being the least direct option and offering the longest average travel time for key journeys; and

(b) having a medium to high risk of significant archaeological finds along the Pohangina River edge.

36. Reasons that Option 2 was not recommended included:

(a) providing a lower level of service than the other options, yet costing almost as much;

(b) being very difficult to construct, while maintaining normal flow along Saddle Road; and

(c) not offering the same level of network resilience as the other options, as it would have resulted in only two route options for crossing the ranges (ie the new road and Pahīatua Track), rather than three.

37. Option 4 was not recommended, including because of the following reasons:

(a) it had the most potential to cause adverse effects on the environment (noting again that all options would have significant effects);

(b) it was substantially longer than the other options in terms of the new road to be built, and would have taken at least one year longer to build the alignment;

(c) it ran parallel to a major known fault line, resulting in an increased resilience risk;

(d) it had the greatest impact on private properties – including the Te Matai Road and Stoney Creek Road communities; and

(e) it was the most expensive option, being at least $200 million more expensive, while delivering the same or similar transport benefits as the other options.

DBC recommended option

38. The recommended option ran – as the Project now does – from the western entry of the closed SH3 Gorge route at the State Highway 57 intersection,

across the Ruahine Ranges north of the Gorge, emerging near Woodville (Figure 3). Some of the key attributes of the recommended option were:

(a) constructed length of 11.46 km of new State highway;

(b) a maximum gradient of 8% and 6 km being over 6% gradient;

(c) three bridges, including one private overpass (State highway over); and

(d) approximately 6.1 million cubic metres of cut and 4.7 million cubic metres of fill required.

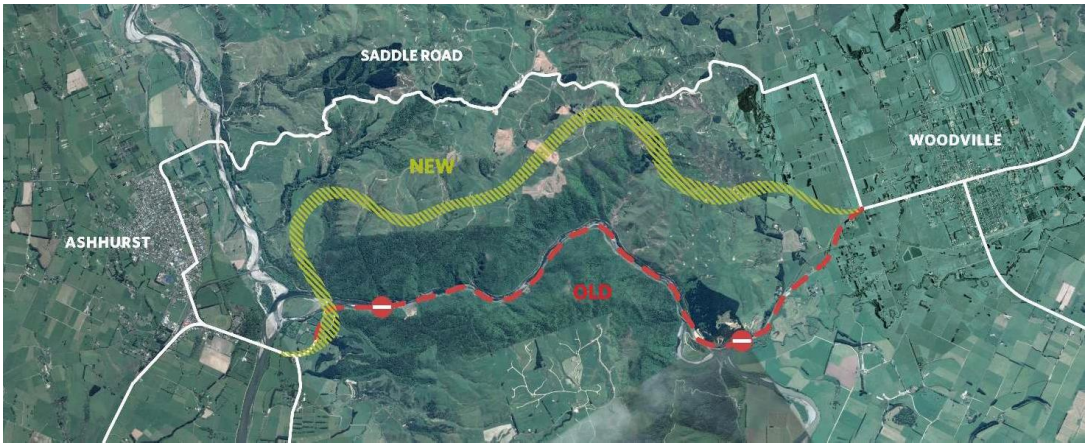


Figure 3 – DBC Recommended Option

39. The DBC recommended option was refined from the alignment of Short List Option 3, particularly in the eastern end. An adjustment to the corridor was made to reduce the need for significant embankments on soft soils and to minimise property impacts. This reduced the cost estimate and produced a more implementable option. To achieve this, a length of approximately 1.8km was shifted north of the Short List Option 3 corridor.

Key design criteria

40. The recommended option is a two-lane highway (with 3.5m wide lanes) with a 2m wide shoulder with a design speed of 110 km/h. Crawler lanes will be provided in both directions (resulting in four lanes) where grades exceed 6% and between steep sections to provide a consistent corridor width (Figure 4). Where there are crawler lanes, a median and 1m wide nearside shoulders will be provided.

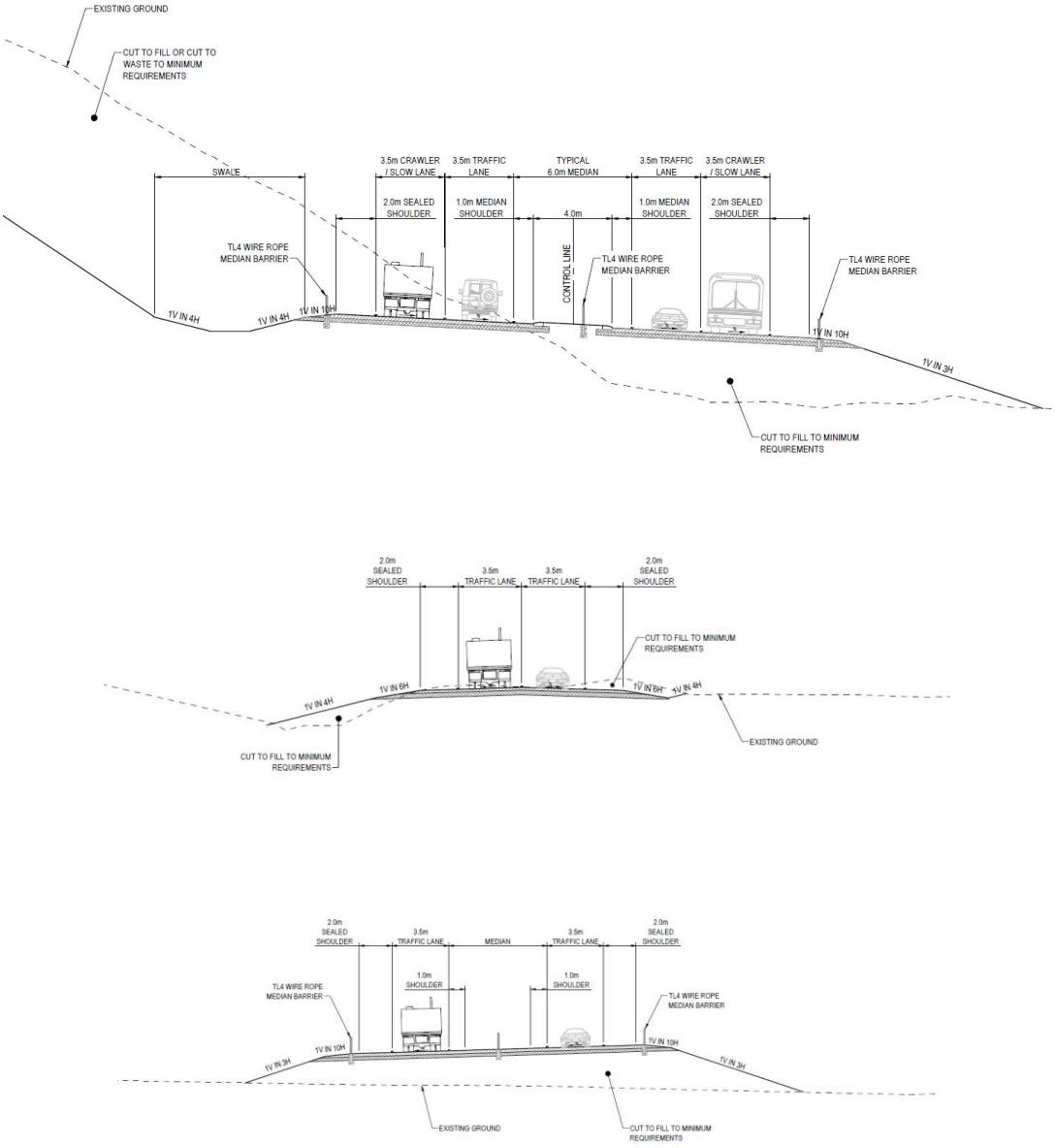


Figure 4 -Typical cross-sections of the DBC recommended option

41. The design for the new bridge across the Manawatū River (approximately 350 to 400m long) was yet to be confirmed, however three options were considered within the DBC and the Preliminary Structure Options Report (GHD, 2018). These were a composite box girder design, cable-stayed (main span) design, or Super-T girders design.

42. The operational stormwater system will include structures for stormwater collection and conveyance, treatment systems and devices and culverts and watercourse diversions. The design will include a range of water-sensitive design solutions including treatment swales and treatment wetlands to deliver stormwater hydrology (flows and volumes) and stormwater quality (treatment)

mitigation. These measures and associated discharges will be the subject of later resource consent processes.

43. Walking or cycling facilities are not specifically included along the main alignment, as explained in the evidence of **Ms Downs**, however there are wide shoulders provided for in the specification and shown in Figure 4 above. The Pahīatua Track was the national cycling route between the western and eastern ends of the Gorge prior to its closure. While there is no (or very low levels of) usage of Saddle Road by cyclists at present due to the volume of traffic and road configuration, Saddle Road will revert to a suitable cycling route once the new road is constructed. The Manawatū Gorge walking track between the western and eastern ends of the Gorge is expected to remain as the primary walking route.

44. The route traverses multiple watercourses and sub-catchments of the Manawatū River, requiring cross-drainage structures, including culverts (either pipes or box culverts) and bridges. Where required, provisions for the safe passage of fish will be made. Again, these matters will be the subject of later resource consent applications.

45. The recommended option includes rationalisation of the Te Āpiti Wind Farm access tracks, where required.

46. Due to the challenging terrain, multiple large cuts and embankments along the route will be required.

Future design processes

47. The above elements and factors have influenced the indicative design of the Project, which has in turn influenced the nature and extent of the designations sought. I summarise below some key environmental and other factors that have also influenced the design work to date.

48. As **Lonnie Dalzell** explains in his evidence, the detailed design of the Project is still to be undertaken. That work, the lodging of resource consent applications, and the preparation of outline plans of works (to be lodged with the territorial authorities) is expected to take place in the second half of 2019.

ENVIRONMENTAL AND OTHER FACTORS INFLUENCING DESIGN

Introduction

49. The proposed designations provide some space for anticipated measures required to address some of the adverse environmental effects of the Project, as summarised below. Specific assessments and design work carried out in

particularly constrained areas of the Project are summarised later in my evidence.

Natural environment – water quality, hydrology, and freshwater ecology

50. There is potential for there to be adverse affects on water quality during construction, with the likely release of sediment from earthwork areas into the receiving environment. These discharges are not activities enabled by the proposed designations, but will be the subject of later resource consent applications to the regional council, and further design development will need to ensure erosion and sedimentation effects are able to be controlled in accordance with relevant controls and guidelines. There is space within the proposed designations to accommodate erosion and sediment control measures (as I discuss further below, in response to the Section 42A materials).

51. Stormwater runoff from the new highway will be treated (via wetlands/sedimentation ponds/swales etc) prior to discharge to the receiving environment. The designation footprint allows for sufficient space to accommodate required treatment facilities within the highway corridor. It is anticipated these will primarily be vegetated systems rather than proprietary systems.

52. Likewise, the Project will have some hydrological effects, in terms of the need to traverse watercourses, divert some overland flows through culverts, and potentially detain stormwater. Again, these are matters to be considered further through the regional resource consent process, but works are able to be accommodated within the proposed designations.

53. There will also be adverse effects on freshwater ecosystems, including stream environments and wetlands. Avoidance of substantial reaches of waterway effects through detailed design may be possible as many of these waterways run at right angles to the alignment. In any event, these effects will be assessed in detail, and mitigation measures proposed, in the context of the regional resource consenting process.

Natural environment – terrestrial ecology

54. The effects on terrestrial ecology of the Project are discussed in the evidence of **Dr Adam Forbes** and **Andrew Blayney**.

55. The adverse effects on terrestrial ecosystems will be managed in a variety of ways, including as required by through the proposed designation conditions

presented by **Ainsley McLeod**. Detailed design of the alignment will be incentivised by those conditions to minimise the affected footprint and provide mitigation/offset/compensation planting resulting from any affected footprint. As tracts of indigenous vegetation are substantially continuous as they cross the proposed corridor, there are limited opportunities to avoid indigenous vegetation altogether. The corridor proposed and constrained has been select to minimised the potential area of disturbance of high-value vegetation as identified and refined during the detailed assessments. This is discussed further later in my evidence.

Cultural heritage

56. The Project option avoids specific cultural sites that have been made known to the Transport Agency (and all recorded archaeological sites, as discussed in the evidence of **Dr Rod Clough**), but I understand that the entire Ranges and the Manawatū River are significant to Māori, and that there are several important sites within the vicinity of the proposed designations.

57. The Project's crossing of the Manawatū River has been constrained to the west to ensure it does not traverse Parahaki Island, which I understand is culturally significant Māori land. The alignment is similarly constrained to the east on the northern river bank in order to avoid the Manawatū Gorge Scenic Reserve.

Landscape, visual effects, and natural character

58. The Project's effects on landscape, views, and natural character are discussed in the evidence of **Boyden Evans**.

59. These matters have influenced design in a similar way to ecological issues, as discussed above. The importance of appropriate landscape and environmental design to be developed in future design stages is addressed in the Cultural and Environmental Design Framework ("**CEDF**"), as discussed by **Mr Evans** and in the evidence of **Chris Bentley**.

Existing infrastructure

60. The proposed designations traverse the Te Āpiti Wind Farm on an alignment that maximises the prospects of avoiding individual turbines. There remains a high likelihood of requiring the removal of at least one turbine to accommodate the Project works. As discussed in the evidence of **Lonnie Dalzell**, compensation under the Public Works Act 1981 will be payable for those and other effects on the wind farm.

61. The indicative alignment, which has helped inform the boundaries of the proposed designations, also crosses/severs several buried power and communication lines which will require replacement as part of the Project.

62. Existing street lighting (Flag Lighting) at the intersection of SH3/SH57 and the intersection of SH3/Woodlands Road/Troup Road will be replaced and upgraded as part of the Project, with there being substantial upgrade of these intersections.

63. Existing overhead electrical reticulation on Woodlands Road/Troup Road and SH3 belonging to PowerCo and Transpower will require either protection or modification. The specific works will be determined through detailed design, with all modifications to be contained within the proposed corridor. Conditions are proposed to address this issue, as discussed in the evidence of **Ms McLeod**.

64. It is expected that some on-farm infrastructure, such as stock water ponds, troughs, and reticulation, will be affected, and accommodation works will have to be agreed with individual landowners.

65. The corridor traverses a site utilised for long-term research on the AgResearch property. As discussed further below, the proposed designation corridor has been constrained at this location to provide increased surety of the final footprint through this property.

Operational noise

66. The Project's operational noise effects (among other matters) are addressed in the evidence of **Dr Stephen Chiles**.

Contaminated land

67. The proposed designation corridor traverses seven potential Hazardous Activity and Industries List ("**HAIL**") sites.

68. One of the HAIL sites is a historic landfill bordered by Saddle Road and Morgan Road. The indicative alignment used to determine the proposed corridor is expected to miss the landfill itself, although it traverses the tagged property. Further investigation and detailed design will need to consider the potential for excavation of buried waste, its stability if within cut and the potential for leachate seepage effects on stormwater.

69. The six other HAIL sites identified are either stockyards, transport depots or buildings which may contain asbestos. These pose a moderate risk as

contaminated soil may need to be removed and procedures put in place to protect site workers.

70. Given the historic agricultural and industrial (ie wind farm) use of land within the proposed designation corridor, there is potential for previously unrecorded sites to be identified during the project.

INDICATIVE CONSTRUCTION METHODOLOGY

Overview

71. In addition to the operational requirements of the Project, considerations relating to the Project's construction have been factored into determining the boundaries of the proposed designations. For example, the designation includes an access track connecting the Project site to Saddle Road.

72. An assessment of the indicative construction methodology, prepared by Grant Higgins and Justin Smith (of Higho Consultants), has been summarised in section 10 of the AEE (in volume 2 of the NoRs). My evidence below draws on this assessment.

73. Construction of the Project will be influenced by many factors, including:

    (a) the detailed design of the Project (following the confirmation of the designations);

    (b) measures to mitigate possible risks, such as those set out below;

    (c) the conditions of the designations (and the resource consents, to be sought as part of detailed design); and

    (d) the timing and target completion date for the Project.

74. The Transport Agency seeks a degree of flexibility in allowable construction methods to accommodate these factors and to provide further opportunities to reduce the impacts and duration of any adverse effects of construction.

75. Once the contract for the detailed design and construction of the Project has been awarded, the detailed design will be developed, taking into account the constructor's preferred methodology and within a management plan framework and consistent with the conditions of the designations. The conditions framework is explained in **Ms McLeod**'s evidence, but it is intended to address environmental effects appropriately while allowing the constructor sufficient flexibility in their construction methodology to allow for

the Project to be delivered efficiently (while remaining compliant with the conditions of the designations).

76. If the contractor wishes to undertake construction via a methodology that would be not within the scope of the designations, or future consents, additional authorisations would need to be obtained at that time.

Construction sequence

77. The likely construction sequence has been assessed as follows:

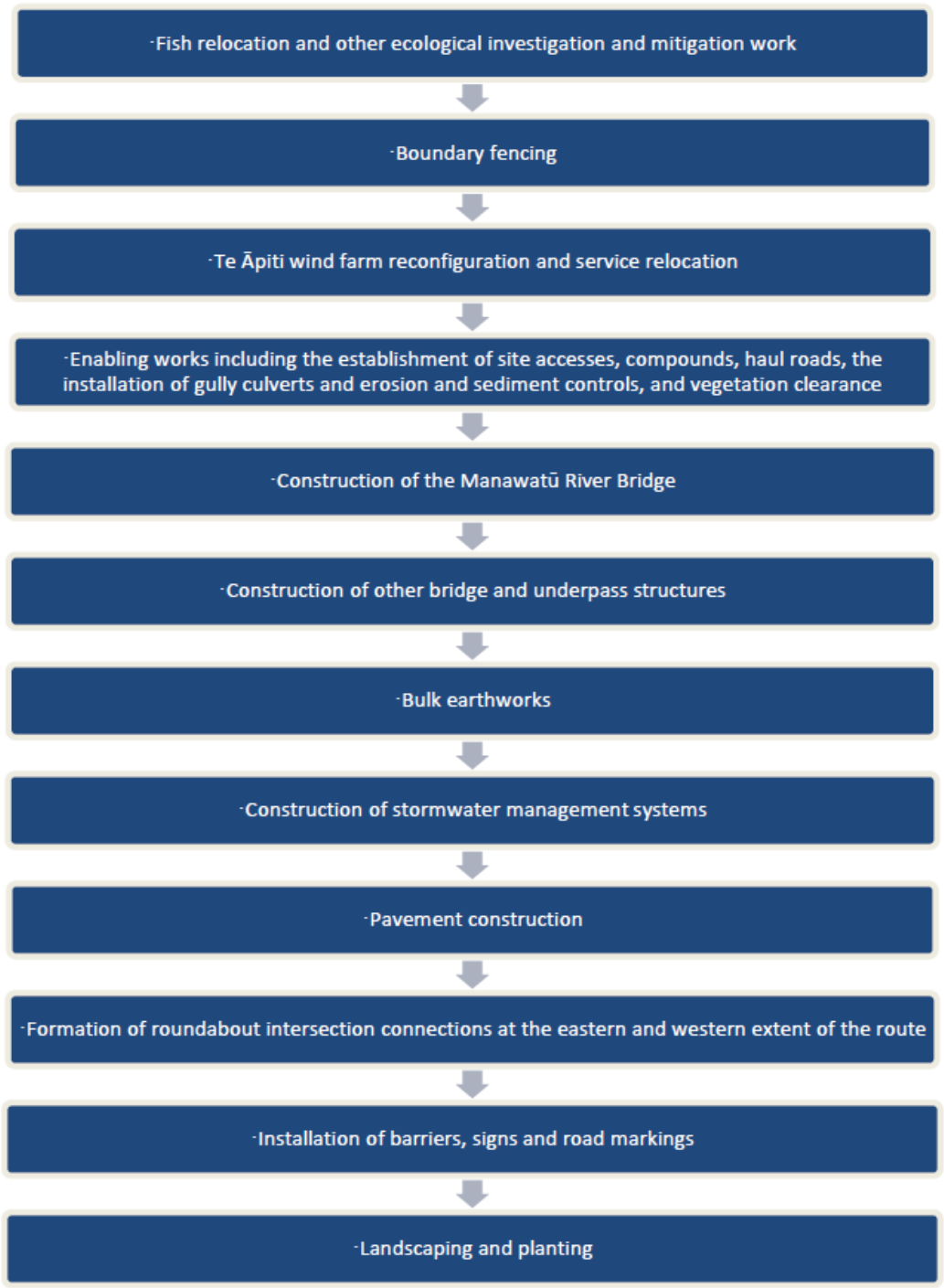


Figure 5 - Possible Construction Sequence

78. The key sequence for construction activities involves the establishment of the required site environmental management measures and controls, and the establishment of safe access, prior to the commencement any physical works within a specific area. It is likely, given the linear nature of the Project (which is able to be separated into several distinct and discrete zones), that the establishment activities could be spread over the construction period to allow areas to remain undisturbed until necessary.

79. Where advantageous to the project programme or to minimise delay risk, there may be enabling works, carried out in advance of the main construction activities, such as utilities diversions and/or protection (e.g. wind farm electrical and communication reticulation, Transpower lines), property accommodation works, fencing, temporary access construction, and so on.

80. Initial construction will likely focus on establishing access to critical locations in order to complete works that enable construction traffic, as much as is practicable, to be diverted from sensitive areas (such as through Ashhurst). This includes, for example, the completion of the main Manawatū Bridge and the bridge at the Woodville end of the Project to enable to corridor to be utilised for importation of road aggregates etc.

SPECIFIC INDICATIVE DESIGN ELEMENTS

Project western extent – SH3/SH57 roundabout

81. The Project's western extent is at a new four-leg roundabout intersection for the SH3/SH57 intersection east of the existing tee intersection. The western leg of the roundabout ties in to the SH3 prior to the existing SH3 Manawatū River bridge at Ashhurst. The southern leg of the roundabout ties in to the existing SH57. The northern leg ties into the currently closed SH3 providing direct linkage to the Gorge carpark and access to properties either side of SH3. The eastern leg of the roundabout is the approach from the new highway.

82. The intersection proposed initially within the DBC was for the retention of the existing 'T' intersection for SH3/SH57, with a new 'T' intersection immediately to the east connecting the new corridor to the old SH3 in order to maintain access to the Gorge carpark. This form of intersection was subsequently changed to a roundabout following concerns raised during the Stage 1 RSA about safe stopping distances and conflicting turning movements.

83. The position of the roundabout has been determined from required approach geometry to control entry speeds and on recommendations from **Dr Chiles** with respect to noise considerations (separation) for adjacent properties.

Project eastern extent – Woodland Road/Troup Road/Napier Road/SH3 roundabout

84. The Project's eastern extent is a new five-leg roundabout intersection connecting Woodland Road, SH3 to Woodville, Troup Road, Napier Road (old section of SH3) and the new highway. The roundabout replaces, and is to the west of, the existing Woodland Road/Troup Road/SH3 priority intersection. The roundabout is positioned west of the existing intersection at a location that optimises the approach geometry from all five legs, and in particular the linkage to Napier Road.

85. The intersections proposed initially within the DBC involved the retention of the existing Woodland Road/Troup Road/SH3 intersection and a new intersection connecting the old Napier road to the new corridor.

86. This form of intersection was subsequently changed to a roundabout following concerns raised during the Stage 1 RSA about safe stopping distances and conflicting turning movements between the intersections and the merging of the eastbound crawler lanes.

General alignment

87. The corridor from the western roundabout heads east then north on a gradual incline as it approaches a new proposed crossing of the Manawatū River at the mouth of Manawatū Gorge.

88. The highway crosses the Manawatū River over a new large span bridge, with its southern abutment being from the terrace south of the Gorge carpark, spanning to the north over the Gorge carpark, river and rail line to the north of the river. The bridge's northern abutment is on a natural spur immediately north of the rail line.

89. The highway progresses on a north-westerly direction over a bridge spanning an area containing a wetland and swamp maire, among other significant vegetation, described in further detail by **Dr Forbes**.

90. The highway progresses up the range initially in a northwest direction before turning to the right to head north at the point it crosses a two-branched QEII covenant area. The QEII covenant area is covered in more detailed in the evidence of **Dr Forbes**.

91. Indicatively, the highway crosses the western branch of the QEII covenant area on a single-span bridge leaving the gully floor undisturbed, then through a relatively small cut prior to crossing the second branch of the covenant area with an embankment with the watercourse culverted.

92. The alignment then traverses the Ruahine Range through the Te Āpiti Wind Farm, following a low point in the terrain, substantially avoiding the Wind Farm's above-ground infrastructure until it reaches the ridgeline immediately prior to the descent to Woodville.

93. From the ridgeline, the alignment follows highpoints and spurs in the terrain where possible in order to minimise the need to construct embankments through gullies, the majority of which have medium to high ecological value (as described by **Dr Forbes**).

94. The descent traverses in a south-easterly direction before turning to the east across the plain towards Woodville where it connects at the new roundabout.

Potential structures

95. There are currently 7 main structures proposed along the alignment as follows:

    (a) three overpass structures (highway over the structure) where large box structures are proposed to provide connectivity to land either side of the highway or to maintain private access, including for Meridian Energy Limited ("**Meridian**");

    (b) one large-span structure across the Manawatū River; and

    (c) three standard highway bridges (Super T or hollowcore) across high-value ecological areas or watercourses.

96. The development of concept structural arrangements has been completed by Phil Gaby and Rob Presland of Holmes Consulting. The concepts were developed to inform design development and to assist in the assessment of environmental effects by the various technical specialists.

97. The advice provided confirms it is technically feasible to design and construct the long-span bridge across the Manawatū River, within the proposed corridor, with no more than 1 pier within the watercourse.

98. The remaining six structures are able to be of a type common throughout the highway network, with their design and construction considered standard practice.

Spoil sites

99. Within the proposed designation corridor there are multiple sites identified as potential spoil sites. The largest of these are located adjacent to the inclines at either end of the Project, with several sites indicated across top of the Range through the wind farm.

100. The largest cuts on the Project are at the top of each incline and are likely to be the source of the majority of surplus spoil, with the total earthwork volume split evenly to each end of the corridor.

101. It is advantageous having the largest surplus generated from the cuts at the top of each incline as the laden earthworks plant travels down to the spoil sites, and returns uphill empty.

102. The indicative spoil sites at either end of the Project have been checked for capacity, assuming:

    (a) filling is completed to the toe of adjacent embankments only; and

    (b) filling is completed to a higher level adjacent to the embankments, effectively forming a buttress fill.

103. In the first case, with the spoil sites filled to the base of the adjacent embankment levels, there is sufficient storage volume to accommodate the expected surplus spoil without the need for additional spoil site use.

104. In the second case, with the spoil sites filled against the embankments as a buttress fill, the capacity of the spoil sites is 2-3 times the total anticipated spoil volume.

105. Through the wind farm there are several smaller cuts and fills, which will generate either surplus or unsuitable (as engineered fill) material. While there is capacity in the spoil sites at either end it is anticipated the closest spoil sites to where the surplus is generated will be used to prevent the need to cart surplus over excessively large distances.

Earthworks

106. The earthworks on the Project, while large in scale, are able to be undertaken using established construction methodologies.

107. The earthwork materials comprise topsoil (to be stripped and stockpiled for reuse) underlain by mudstones and conglomerates, highly weathered close to the surface to un-weathered with depth. It is likely that material encountered, particularly in the deeper cuts, will comprise harder rock

material that will require ripping prior to excavation. Based on initial geotechnical investigations, it is anticipated all material will be able to be directly excavated or ripped and excavated.

108. Cut faces will be designed, either through eased slopes or engineered facings (retaining or similar), to have minimised residual risk of slippage or material impact on the safe and resilient operation of the new highway. The indicative alignment design has been based on a conservative slope assessment following the first round of geotechnical investigations. These slopes will be further refined during detailed design following completion of additional geotechnical investigations.

109. The inverts of gullies and naturally formed depressions are likely to contain softer materials unsuitable as foundations or engineered fill, which will require either treatment to remain *in situ* or excavation to the spoil sites as surplus.

110. It is expected that all earthworks are able to completed using traditional and industry-standard earthworks plant and methodology.

ALTERNATIVE DESIGNS INFLUENCING THE BOUNDARIES OF THE PROPOSED DESIGNATIONS

Introduction

111. Following completion of the DBC in March 2018, the Transport Agency and its technical specialist advisors have assessed the potential effects of the DBC preferred option in greater detail. An iterative process of design development entailing design, assessment, and re-design has resulted in the refinement of the indicative alignment and the proposed designation corridor.

112. The proposed designation corridor maintains sufficient width where this can be provided to accommodate design and construction innovation through the implementation phase of the Project.

113. I summarise below how the indicative alignment and designation design were developed, and the variations considered for specific sections of the corridor following the completion of the DBC. These matters are described in more detail in the DPR.

SH3 western extent to start of incline after crossing the Manawatū River

114. The DBC recommended option comprised a two-way single carriageway (ie with one lane in each direction) from the Project start, the eastern abutment of the existing SH3 Manawatū River Bridge, traversing east to a priority tee

intersection with SH57, comprising right-hand and left-hand turn lanes from SH3. The Project alignment then traversed east and north to cross a new bridge over the Manawatū River at the mouth of the Manawatū Gorge, after which crawler lanes in both directions were developed at the beginning of the western incline.

115. The RSA undertaken on the DBC recommended option raised concerns with respect to the combined impact on road safety that the location of the merge of the westbound crawler lane might have on the western slope decline and its interaction with the Manawatū River Bridge, the curve between the bridge and the SH3/SH57 intersection, and the form of the intersection itself. Specific concerns included safe merging of slow vehicles immediately before the bridge with no run-off area or on the subsequent sweeping bend and how it affected safe access/egress to the Manawatū Gorge carpark, plus the ability to make safe right-hand turns from SH3 into SH57.

116. In response to the concerns identified through the RSA (as set out above), the development of the indicative alignment of the Project for this section provides a roundabout for the intersection of SH3/SH57, with dual lanes for the SH3 through movements and single lane for the turning movements to/from SH57. The crawler lanes and central median from the western incline are extended to the roundabout, with the crawler lane westbound merged between the roundabout and the existing SH3 bridge. The eastbound crawler lane is developed at the roundabout to allow for heavy vehicles to increase speed from the roundabout without holding up light vehicles.

117. Access to the Manawatū Gorge carpark is provided via a 4th leg to the roundabout opposite SH57 and the old section of SH3. Access to properties either side of the new section of north and east of SH3 is provided from the 4th leg of the roundabout via the old SH3.

118. This configuration provides a merge, post-roundabout, at safe operating speeds and improved intersection safety for access/egress at SH57, improved safety for access/egress to the Manawatū Gorge carpark, and improved safety for access/egress to the properties either side of SH3.

119. Other options considered included alternative merge points for the westbound lanes, prior to the SH57 intersection and single lane roundabout options.

New Manawatū River Bridge – south abutment position

120. One of the considerations for the Project is not to negatively impact on accessibility to the Gorge and Gorge carpark. The indicative alignment of the Project positions the bridge abutment on the terrace to the south of the carpark allowing the new bridge and highway to span over the carpark, and thus not reduce its capacity.

121. Other options considered included extending the earthwork formation across the carpark with the abutment adjacent to the Manawatū River bank. This would necessitate the provision of replacement carparking and the engineering of access through or around the embankment in order to maintain connectivity to the Gorge.

New Manawatū River Bridge – north abutment to beyond forest and wetland

122. The designation across the river, and flexibility thereof, has been limited so as to avoid encroachment into the existing legal property boundary of Parahaki Island (to the west of the proposed bridge alignment) and the Manawatū Gorge Scenic Reserve (to the east of the proposed bridge alignment). This has limited the flexibility of the northern bridge abutment location and corridor alignment for the western incline.

123. The area immediately west of the Manawatū Gorge Scenic Reserve, north of the River, contains several different ecosystems. A wetland and stand of swamp maire (among other valued habitats) are on the east side of the corridor, a stand of mature old-growth forest is to the west of the corridor and a high value stream bisects them. These are described in the evidence of **Dr Forbes**.

124. The DBC recommended option traversed the approximate midpoint of the proposed corridor, with the northern bridge abutment immediately north of the rail line. Further technical assessment identified several concerns, including that the alignment did not differentiate between the differing ecological values of the multiple areas, and therefore may not have represented an appropriate balance of effects, and the alignment traversed the majority of the existing stream.

125. The indicative alignment of the Project positions the bridge and alignment as it crosses the northern river bank and rail line to the east of the proposed corridor, immediately west of the Manawatū Gorge Scenic Reserve. The northern abutment of the Manawatū River bridge is positioned on a knoll immediately north of the rail line and to the south of the swamp maire. The

highway then crosses the wetland and swamp maire via a second bridge, then onto an engineered embankment north of the wetland. It then runs parallel to the stand of old growth native forest and stream before crossing the stream as the alignment leaves the high value ecological areas.

126. The indicative alignment provides several advantages over the DBC options, and in particular increased separation of alignment from Parahaki Island, avoidance of the old-growth forest, avoidance of a significant length of the existing stream, with its eastern arm traversed at a large angle to the alignment (therefore shorter), retention of the majority of the existing wetland, an allowance for construction activity (access tracks and machinery) to be located on less sensitive eco-systems with effects on the raupō seepage wetland minimised, and retention of the existing swamp maire.

127. Other alignments considered included single bridge options with extended embankment (replacing the second bridge shown in the Project's indicative alignment) which resulted in increased areas of disturbed and/or removed vegetation and increased length of stream affected. The alignments considered include options to both the west and east of the alignment, however these had increased effects on the old growth native forest or the wetland and swamp maire respectively.

Western incline to western QEII covenant area

128. The alignment in this section progresses north, from the new Manawatū River bridge, climbing north while turning east and across the western QEII covenant area as the alignment enters the western extent of the Te Āpiti Wind Farm. Options considered through this section have been developed taking into account the position at its start (from the various alignments where it exits the forest and swamp areas to the south) and to assess potential extents of disturbance within the QEII covenant areas with alternative crossing points.

129. Where the alignment heads north, the eastern designation boundary has been positioned adjacent to the Manawatū Gorge Scenic Reserve and QEII covenant area, with the large area between the boundary and indicative alignment being a likely disposal area for unsuitable and surplus earthwork material. The western designation boundary has been positioned taking into account the likely extent required to accommodate an optimised alignment to be developed during detailed design.

130. Where the alignment turns and heads east into the Te Āpiti Wind Farm, the southern designation is on the Manawatū Gorge Scenic Reserve boundary. The northern designation boundary has been positioned taking into account the likely extent required to accommodate an optimised alignment to be developed during detailed design, bearing in mind the need to balance impact on the QEII covenant area versus earthworks extent, and impact of the alignment on the existing Te Āpiti Wind Farm.

131. The DBC phase concept design traversed the western QEII covenant area immediately north of the confluence of the western and eastern branches, with embankments constructed through both branches of the stream. It was acknowledged that there was potential for a bridge to be constructed over the western branch to minimise the extent of vegetation clearance and associated affects.

132. The current indicative alignment of the Project traverses the western QEII covenant area to the north of the DBC recommended option, in order to affect less of the QEII area on both branches. This alignment also proposes a bridge over the western branch.

133. Other options considered included an alignment south of the DBC alignment affecting the confluence of the two branches with a net increased footprint, bridging both branches, and an alignment significantly south of the confluence of the two branches, closer to the Manawatū Gorge Scenic Reserve.

134. This southern option was not developed further as it shortens the length between the new Manawatū River Bridge and the point it traverses the covenant area, requiring either a cut through the covenant area, diverting its water course, or significantly increased gradient to the highway.

Eastern QEII covenant area to midway through the Te Āpiti Wind Farm (adjacent to Cook Road)

135. The alignment progresses east through the Te Āpiti Wind Farm, following a meandering route typically through the lowest terrain, positioned to minimise impact on the wind farm itself. This includes crossing lines of turbines as close as possible to the end of turbine strings to minimise the likely impact on re-cabling or other associated accommodation works.

136. Where possible, the alignment has been positioned equidistant between pairs of turbine towers in order to reduce the likelihood of affecting the towers themselves. Where this has not been achieved, this is a result of other

design considerations, such as QEII covenant areas or significant earthwork implications. The southern designation boundary runs along the edge of the Manawatū Gorge Scenic Reserve, with the area between the southern boundary and the highway representing areas for potential disposal sites for surplus and unsuitable fill.

137. The northern designation boundary is positioned to accommodate the northern-most alignment considered potentially feasible, and offers flexibility to develop alternative alignment options to optimise the future operation of and/or to minimise effects on the Te Āpiti Wind Farm.

138. The DBC recommended option entered the Te Āpiti Wind Farm immediately west of the eastern QEII covenant area, bisecting the western-most turbine towers before crossing the eastern covenant area. The southern cut face between the turbine towers was in the vicinity of a tower base, requiring either protection of the tower's foundation or removal of the tower. The alignment then crossed the eastern covenant area across the confluence of the three stream branches in the covenant area before swinging south-east, then east so as to follow the terrain as much as practicable.

139. The earthworks extended to encapsulate the last turbine tower on the turbine string east of the covenant area, which would have required the removal of the turbine, tower and base. Progressing east, the alignment crossed several waterways and bisected two more turbine strings, without impacting towers, as well as bisecting areas of significant vegetation without major impact. The alignment approached the point adjacent to Cook Road to the north. A new wind farm access road was (and is) proposed adjacent to the highway alignment connecting severed infrastructure.

140. The indicative alignment of the Project enters the Te Āpiti Wind Farm immediately west of the eastern covenant area, bisecting the western-most turbine towers before crossing the eastern covenant area. The alignment bisects the turbines at a point where the earthworks daylight equidistant between the turbine towers, resulting in increased likelihood the southern tower will be unaffected. The alignment then crosses the eastern covenant area upstream of the confluence of the three stream branches before swinging south and largely following the alignment of the DBC recommended option.

141. A Northern option considered feasible is similar to the current indicative alignment, except that is has a straighter alignment, which bisects all pairs of wind farm turbine towers equidistant from each other, avoiding the need for

turbine removal. The alignment traverses the section where the terrain is higher than the current indicative alignment, resulting in a substantial increase in earthwork volumes (an increase of cut of more than 400,000m^3).

Midway through Te Āpiti wind farm (adjacent to Cook Road) across the Ruahine Ridgeline and onto the AgResearch property

142. The indicative alignment tracks through the eastern extent of the Te Āpiti Wind Farm, across the Ruahine ridgeline and into the AgResearch property. From the western end it traverses northeast, passing north of a string of turbines before swinging southeast as it crosses the Ruahine ridgeline, which is identified as an Outstanding Natural Landscape, and over the adjacent AgResearch property.

143. Options developed since completion of the DBC have focused on assessing the implications of options that avoid, to the extent possible, the AgResearch property or the areas understood to be particularly valuable within it. The northern designation boundary is positioned to accommodate the northern-most alignment that is considered potentially feasible, which is also the current indicative alignment of the Project. The southern designation boundary has been positioned to constrain works that would otherwise affect the AgResearch property.

144. Both the DBC recommended option and the current indicative alignment traverse the eastern end of the Te Āpiti Wind Farm to its eastern extent, which allows for the mimimising of earthworks while avoiding turbine towers. As set out above, the alignment then tracks northeast, passing north of a string of turbines before swinging to the southeast as it crosses the Ruahine ridgeline in a large cutting where it bisects the top of the AgResearch property, before heading off in a southeasterly direction.

AgResearch property

145. The DBC and current indicative alignments traverse the AgResearch property from a localised low point in the ridgeline before heading in a south-easterly direction.

146. Various alignments to the south have been considered. All of these result in increased earthworks, because of the ridgeline (an Outstanding Natural Landscape) being higher at the crossing point. Further, moving the alignment south shortens the incline length, resulting in deeper cut or steeper gradients.

147. South of the AgResearch property there is a large valley which is understood to contain medium- to high-value vegetation, as referred to in the evidence of **Dr Forbes**. Traversing this valley would require either a substantial embankment with the culverting of the watercourse (up to 600m in length), or the bridging of the valley with a structure up to 450m in length with an indicative height of around 100m or greater.

148. The designation boundary across the AgResearch property has been tightened to closer to the indicative alignment to reduce the potential footprint of the works. The evidence of **Jeff Morton** and **Dave Horne** discusses the implications of this for the property. Previously indicated stormwater treatment ponds and spoil disposal areas have also been removed from the AgResearch property, in order to minimise effects.

Eastern incline to Woodville

149. The incline traverses typically in a southeast direction, from where it leaves the AgResearch property down the eastern slopes of the Ruahine Ranges before swinging east towards Woodville. The highway ties back into the existing highway network at the new five-leg roundabout. The southern designation boundary runs south of the southern-most option considered post-completion of the DBC. The northern designation boundary is positioned to accommodate the current indicative alignment of the Project, which is south of the DBC recommended option.

150. The DBC recommended option descended the Ruahine Range eastern slopes in a long cutting in a south-easterly direction. Where it exited cut and descended, the final extent of the incline was on an embankment across a large valley and out onto the plain towards Woodville. The large embankment covered an area of regenerating broadleaf forest and high value stream in a meandering incised gully, before extending across the plain to beyond a major stream (bridged) running parallel to the ranges. Once at grade, the crawler lanes merged to a single lane two-way road with the wire rope and median terminating at the end of the merge/diverge. The existing SH3 joined the alignment to form a new ‘T’ intersection, with the new highway joining at the existing intersection of SH3, Woodlands Road and Troup Road.

151. Road safety concerns associated with the DBC option include:

    (a) the change of environment from a four-lane carriageway (two lanes with crawler lanes) to the two-lane carriageway without appropriate threshold or environment change;

(b) potential for unsafe U-turn movements beyond the end of the wire rope median;

(c) insufficient separation between the crawler lane merge and the development of right turn lanes to new SH3 T Intersection;

(d) potential safety issues with the low volume side road (tee intersection) and the high volume SH3, potential safety issues with the low volume side roads (Woodlands Road and Troup Road) and the high volume SH3; and

(e) the lack of threshold type change of environment from rural State highway to peri-urban and urban SH3 within Woodville.

152. The option also required removal of large area of regenerating broadleaf forest and culverting or similar of large length of existing high-value stream within broadleaf forest.

153. Technical assessment and design development since the DBC completion has eliminated the DBC design without amendment as an acceptable alignment to be taken forward. It has therefore not been considered as an influencer on the proposed designation boundary.

154. The current indicative alignment of the Project descends the Ruahine Range eastern slopes in a long cutting in a south-easterly direction, following a ridgeline before heading south and then southeast again. It exits cut (substantially as per the DBC design) and descends the final extent on an embankment adjacent to and partially over a large valley and out on to the plain towards Woodville. The embankment is located to the south of, and thus substantially avoids, the area of regenerating broadleaf forest and gully, containing the high value stream, before extending across the plain to beyond a major stream (bridged) running parallel to the ranges. The downstream end of the stream coming out of the Ranges traverses pasture affected by the highway alignment and will require diversion.

155. The indicative alignment then extends towards Woodville, linking at the five-leg roundabout. The median and wire rope extend to the roundabout, beyond the extent of the east-bound merge. The arrangement addresses the issues identified within the RSA.

156. A southern option has also been considered which descends the Ruahine Range eastern slopes in the same way as set out above for both the DBC and current indicative designs, where it exits cut (substantially as per the

DBC recommended option). It descends the final extent on an embankment on a straight alignment south of the regenerating broadleaf forest and out on to the plain towards Woodville. The embankment substantially avoids the area of regenerating broadleaf forest and gully containing the high value stream before extending across the plain to beyond a major stream (bridged) running parallel to the ranges. The embankment across the plain avoids the downstream end of the stream coming off the Ranges where it traverses pasture.

157. This alignment has been used for determining the southern designation boundary.

158. In summary, setting the boundary of the proposed designations has been an involved process entailing considerable evaluation of multiple indicative options, input from environmental specialists, and consideration of effects on landowners.

COMMENTS ON SUBMISSIONS

Submissions regarding effects on Ballantrae Farm

159. There are several submissions associated with the effects of the Project on the fertiliser trial site at AgResearch's Ballantrae farm. Submissions query the practicality of avoiding the site and raise concerns regarding construction and operational effects, such as the effects of dust and sediment generation on the trial.[1]

160. The designation corridor as proposed through the Ballantrae site has been influenced by multiple factors, including minimising the extent of the trial site affected, minimising the effects on various medium- to high-value ecological areas, traversing the ridgeline at a location with lower scale and height of cuts, other design implications to achieve acceptable vertical (grade) and horizontal (radii) geometry for the incline from Woodville, and considerations regarding the approach from the west, including potential effects on wind turbines in the Te Āpiti Wind Farm.

161. During the development of the long list of options, the area to the south of the Ballantrae site was discounted as being appropriate to place the highway due to the unfavourable terrain which would result in considerable earthworks and/or structures.

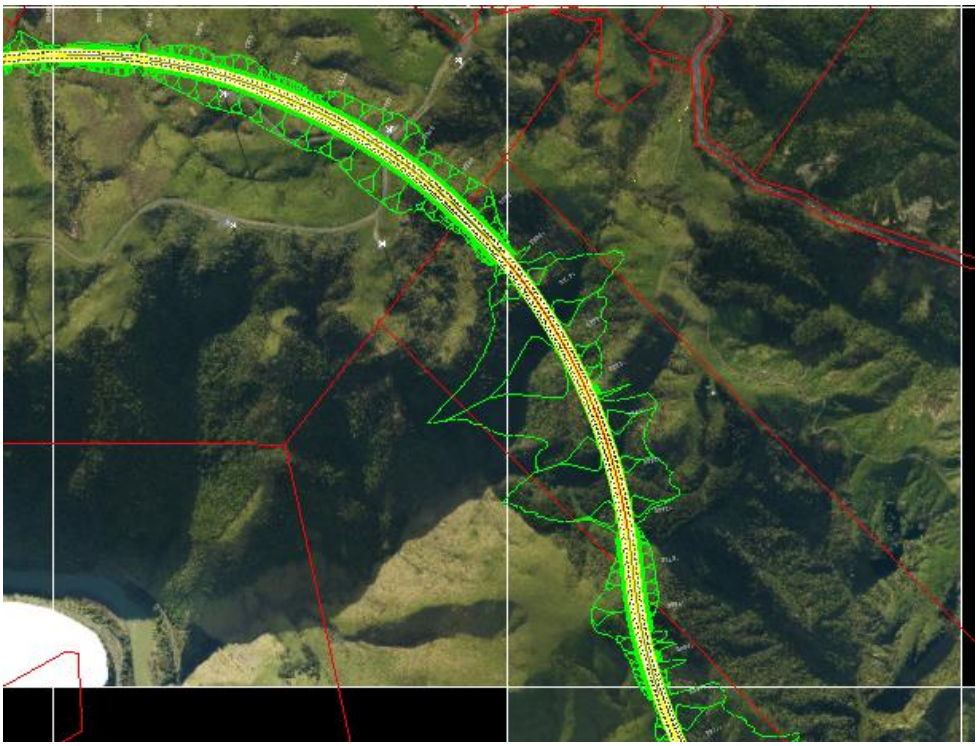
[1] The relevant submitters are AgResearch (submitter 312); Cory Matthew (submitter 372); the Fertiliser Association of New Zealand Incorporated (submitter 361); Beef and Lamb NZ Limited (submitter 364); Ballance Agri-Nutrients Limited (submitter 359); and Louis Schipper (submitter 171).

162. During refinement of shortlist Option 3, moving the corridor to the north was discounted due to its effects on Saddle Road during construction, and potential severing of Saddle Road in the long-term.

163. During engagement since the lodging of submissions, one submitter, Mr Cory Matthew, has provided a sketch of a suggested alignment to test as to whether something similar had been considered and whether it was feasible.

164. As noted above, this and similar alignments were discounted during the long-list stage, due to the terrain. In order to illustrate why and to respond to Mr Matthew's submission, two variations of alignments similar to this sketch have been modelled, as explained below.

165. An option approximately half-way between the Mr Matthew's suggested position and the proposed corridor is shown below.



166. Key features of this alignment (as compared to the proposed corridor) are as follows:

(a) total cut volumes would be consistent with those of the indicative alignment within the proposed corridor;

(b) there would be a significant increase in required fill/embankment quantities, resulting in a need to import a large volume (around 2 million m^3 or more of bulk fill).

(c) culverting the invert of the valley would be required, affecting an approximate length of 430m of stream habitat;

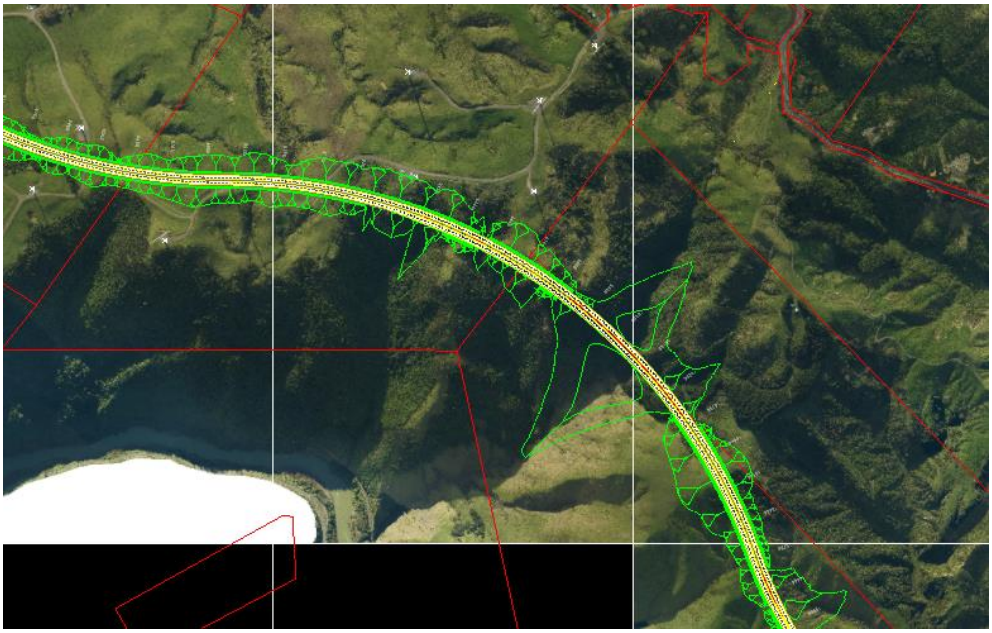
(d) the alignment would require the likely removal of two of the Te Āpiti Wind Farm turbines that are not affected by the proposed designation;

(e) the alignment would require the removal of additional regenerating broadleaf forest;

(f) an alternative to the large fill over the valley would be a bridging solution, involving a bridge of over 100m in height and with a total length of approximately 440m. This option would save the need to import approximately 1.4 million m^3 of bulk fill, leaving a net import of

approximately 0.6 million m^3. However, the bridge would be in the vicinity of a known fault.

167. An option at the approximate location of Mr Matthew's suggested alignment is shown below.



168. Key features of this alignment (as compared to the proposed designation corridor) are as follows:

(a) total cut volumes would increase by 2 million m^3;

(b) there would be a significant increase in required fill/embankment quantities, albeit within the increased cut volume;

(c) culverting the invert of the valley would affect stream habitat with an approximate length of 680m;

(d) the alignment would require the likely removal of at least two Te Āpiti Wind Farm turbines that are not affected by the proposed designations;

(e) the alignment would require the removal of additional regenerating broadleaf forest;

(f) an alternative to the fill over the valley would be a bridging solution of over 125m height with a total length of approximately 450m. This option would save approximately 1.6M m^3 of bulk fill, but a disposal area for this saved volume would be required. This bridge would be in the vicinity of a known fault.

169. With respect to concerns raised by submitters regarding adverse effects on the Ballantrae site during the construction phase, in my view there would not likely be any significant effects, because the majority of the works within the area will be confined within a cut which would substantially limit the potential for dust, water runoff and erosion onto the trial site. The site Construction Environmental Management Plan ("**CEMP**"), together with standard regional consent conditions, would address requirements for control of dust, runoff and erosion.

Meridian Energy Limited (submitter 363)

170. Meridian's submission raises a concern regarding access to turbines during construction of the Project. I do not consider it likely that construction will materially affect access to turbines during construction. Rather, I expect that the alternative access provisions, to design standards agreed with Meridian, will be constructed as enabling works, substantially separating daily wind farm operations from highway construction operations.

171. Regarding cabling works, addressing potential conflict where existing infrastructure is crossed by the Project will again be undertaken as enabling works or, as a minimum, in advance of substantial works in the area of the cables. The re-cabling will follow a different route than the existing infrastructure, with disruption being limited to 'crossing over' to the new infrastructure and testing. I consider that with close liaison with Meridian this is able to be efficiently managed, and would only affect a small number of turbines at any one time.

172. Meridian has expressed a requirement that the highway and works associated with it are set back a minimum of 160m from individual turbines. From an engineering perspective, this is not required to protect the existing turbines; rather, it is proposed that where physical works are within three foundation diameters (as previously expressed by Meridian), individual turbines would need to be assessed to confirm whether they can operate unaffected, require protection, or require removal. In my view, the 160m setback is not driven by engineering considerations relating to the existing turbines.

173. **Mr Dalzell** discusses the Public Works Act 1981 compensation that would be payable to Meridian for any adverse effects of the Project on the wind farm's operation, during construction and on an ongoing basis, and for constraints on the development potential of the site.

Barbara Cooke (submitter 105)

174. Ms Cooke's submission has queried the need for the roundabout at the Woodville end of the Project. As explained above, this is predominantly driven through the need to provide a safe intersection catering for all traffic movements, and has been recommended following concerns raised in the RSA of the DBC design (which contained variants on the existing priority intersection).

175. The provision of a roundabout also has the benefit of providing a positive transition of environment from a modern standard of highway back to the existing SH3.

176. With respect to construction effects, and particularly dust, the site CEMP would address requirements for control of dust. I do not consider it likely that construction at this location will have adverse effects differing from any other road construction activity.

Nicholas Shoebridge (submitter 103)

177. Mr Shoebridge's submission has also queried the need for the roundabout at the Woodville end of the Project. I have addressed this point in response to Ms Cooke's submission above.

178. Mr Shoebridge has also expressed concern about an increased risk of flooding to his property as a result of the Project. I do not consider that the provision of the highway or roundabout is likely to contribute to the risk of flooding. Stormwater management will be a matter considered further during the detailed design process, and will require conformation through the regional resource consenting processes.

Janette McHugh (submitter 238)

179. Ms McHugh's submission has also queried the need for the roundabout at the Woodville end of the Project. I have addressed this above.

180. With respect to the practicality of a 'ring road' around or for Woodville, the evidence of **Sarah Downs** for the Transport Agency explains that this is outside the Project scope and objectives. From a design perspective, however, I note that the provision of the Project does not preclude a future ring road should one be proposed at a later date.

Manawatū-Whanganui Regional Council ("Horizons")

181. Horizons' submission has queried the vulnerability of the proposed new Manawatū River Bridge to liquefaction. The Transport Agency's Bridge Manual 2013, being the standard against which the bridge will be designed, requires consideration of liquefaction risk to be undertaken as the structure is designed and, where the risk is unacceptable, for it to be addressed. While this is not my area of expertise, I understand that common methods for addressing this risk include larger/deeper piles and/or ground improvements. If required, solutions to address potential liquefaction risk will be completed by specialists during detailed design.

182. The current geotechnical programme is targeted to enable assessment of the potential for liquefaction, including the undertaking of a site-specific seismic assessment.

Department of Conservation ("DOC", submitter 369)

183. DOC's submission raises several issues regarding potential adverse effects of the Project on the Manawatū Gorge Scenic Reserve. My response pertains specifically to the carpark at the mouth of the Gorge and its operation during construction.

184. It is proposed that the construction contract is required to maintain during construction the same level of service with respect to parking provision (numbers) and access for all users, both public and DOC. This would involve provision of temporary carparks and/or access should the existing provision be affected. In her evidence, **Ms McLeod** describes proposed designation conditions to the same effect.

Manawatū River Source to Sea (submitter 360)

185. The submitter has enquired with respect to the practicalities of avoiding the QEII covenant area and the area containing the swamp maire and wetland immediately north of the Manawatū River.

186. For the recommended option, it is not practical to avoid the QEII covenant area:

    (a) To move to the alignment north results in greater cut depth as the terrain increases in height at a greater rate than the road, and if moved a distance sufficiently great to avoid the QEII area, would impact the significantly incised gully, which also contains large tracts of mature vegetation (and, I understand, may be of significant cultural value). The

alignment as the route crosses into the Te Āpiti Wind Farm would also increase the likelihood of removal of at least one additional turbine.

(b) To move the alignment south to avoid the QEII area would impact the Manawatū Gorge Scenic Reserve, requiring a significantly greater cut through the reserve, an overall increase in bulk earthworks and reduction in fill, resulting in a significant increase in surplus volumes.

187. For the current indicative alignment, while it is possible to avoid the swamp maire and wetland, this would result in the alignment moving to the west and impacting the adjacent stream and mature forest as discussed in the evidence of **Dr Forbes**. The alignment as currently indicated has been developed through an iterative process of Dr Forbes assessing various options in order to set an appropriate envelope of effects.

Tararua District Road Safety Group (submitter 376)

188. The Tararua District Road Safety Group has expressed a desire for access to the Wind Farm viewing area to be provided off the new highway utilising what they have described as the construction access road. I have assumed the Group is referring to the reconfigured Meridian Wind Farm access roads that will be utilised during construction, and in some cases upgraded where required.

189. It is not the intention to facilitate routine access off the new highway for any users. Access is discouraged off dual carriageways wherever possible for reasons of road safety.

190. Where the indicative design indicates direct access off the highway currently this is to service non-routine access requirements for over-dimension vehicles requiring access to the Wind Farm which will not be able to access via the proposed underpass. This would be, for example, transporters establishing the 300t + crane required to service the wind turbines.

191. Maintaining access to the Wind Farm viewing area maintains the existing situation, which is potentially improved on opening of the new highway with the predicted reduction in Saddle Road traffic.

Te Āpiti Governance Group (submitter 374)

192. The Te Āpiti Governance Group has submitted in support of the Project, and the proposed intention to continued provision of access and enhanced access to the Te Āpiti / Manawatū Gorge facilities (tracks etc) during and

after construction including measures to ensure visitor experience is enhanced and not impacted during and post the construction of the Road.

193. Predominately the submission reinforces the desire for the Group to be included in appropriate conditions and management plan processes.

194. With respect to achievability, through design, of the provision of access during and after construction, including enhancement of the visitor experience, I confirm there is sufficient scope and space within the proposed designation for this to be achieved, and I understand that the interim and final form of the Gorge access will be subject to further discussions with stakeholders.

John Bent (submitter 243)

195. Mr Bent has raised concern about a lack of consideration with respect to construction effects (in the short term) and the long-term effects of run-off from sealed and unsealed surfaces.

196. I confirm that construction effects have been considered to the extent required to provide a designation footprint that would enable appropriate mitigation measures (such as storm water attenuation and treatment facilities (in the long term) and Erosion and Sediment Control measures during construction.

197. Specific measures and designs will be subject to the proposed subsequent RMA consent applications.

RESPONSES TO QUESTIONS FROM THE HEARING PANEL

Alternative alignment avoiding the Ballantrae Hill Country Research Station fertiliser trial sites

When the designation corridor was being confirmed, were any options assessed that would avoid the Ballantrae Hill Country Research Station fertiliser trial sites?

198. Yes, various options to avoid the AgResearch land were considered during the refinement of the four shortlisted options, and subsequently in the design refinement to determine the designation corridor for Short List Option 3. Alternative alignments both north and south of the proposed corridor were considered and discounted, as discussed in my evidence above.

199. Even earlier in the process than that, additional alignments to the south, similar in position to that suggested by the submitter, Mr Cory Matthew (discussed above), were discounted for inclusion in the long list due to the

significant terrain challenges and reduced length of incline resulting in increased gradients.

Ashhurst and Woodville roundabouts

Please outline why the Ashhurst roundabout is required to have two circulating lanes yet the Woodville roundabout only has one.

200. The introduction of the roundabout with two circulating lanes at Ashhurst is as a result of the need to terminate safely the dual westbound lanes down the western slope of the Ruahine Ranges. The original design, prior to the Stage 1 RSA, terminated these lanes prior to the main bridge over the Manawatū River with a highway of a single lane each direction in the 'bridge to bridge' section. This was deemed to be an inappropriate location for termination of the dual lanes, with a recommended merge to be located further west.

201. As the 'bridge to bridge' section contains a relatively sharp right-hand curve (westbound) it is also inappropriate to terminate the dual lanes on the curve. The introduction of the roundabout introduces the opportunity to merge the lanes in a positively controlled environment, being the westbound exit from the roundabout. The dual lanes therefore extend to and through the roundabout.

202. The eastbound dual lanes commence on the eastern approach to the roundabout, with the full two-lane eastbound provision being provided from that point. The rationale behind this is to separate slow-moving eastbound heavy commercial vehicles exiting the roundabout (having entered from either SH57 or SH3) from the majority of traffic to enable vehicles to get up to operating speed prior to the significant incline. It should be noted the dual lanes on the roundabout are provided only on the SH3 through movement, with a single lane only provided for the right turning movements associated with SH57.

203. The Woodville roundabout does not have the equivalent safety issues associated with the dual lane merge, because it is substantially prior to the roundabout on a significantly straighter section of highway. It is therefore able to remain single-lane.

Central median width

Why does the central median need to be between 4.0 and 6.0 metres wide?

204. The width of the central median is substantially determined by the forward safe stopping distance, being the distance from which a driver can see an object on the road, within their lane. Where the road is curved, the driver must see past the median safety barrier which ultimately determines the median width. Similarly, should a barrier be struck by an errant vehicle it deflects, with the intention being the extent of deflection does not impose on the opposing traffic lane. As the majority of alignment is curved, the required median width is likely to exceed 4.0m.

Is it feasible to reduce the width of the central median in order to facilitate the provision of a shared pedestrian/cyclist pathway along the route?

205. As the majority of the route is curved, which is determining the median width for reasons of safety (as explained above), I do not consider it feasible to reduce the width in order to facilitate the provision of a shared pedestrian/cyclist pathway.

Spoil areas

What are the implications of having spoil sites in areas where there are streams, particularly in terms of storm-water turn off, erosion control and filling over waterways?

206. I do not expect that the indicated spoil areas will be permitted, as a result of the resource consent process, to negatively affect streams with respect to storm-water run-off, erosion control and filling of waterways. The spoil areas proposed, if the total area is considered, are significantly greater than required to accommodate the predicted spoil volume, providing the constructor sufficient flexibility in the design of spoil areas to avoid and provide protection to waterways.

207. The process of obtaining the necessary resource consents, for example, to discharge sediment to water, will require the approval of an Erosion and Sediment Control Plan and its implication prior to physical works as standard practice.

What methods of control and mitigation are proposed?

208. These methods are still to be determined by the alliance that will design and construct the Project. However I expect that measures, to be confirmed in the Erosion and Sediment Control Plan, will include the likes of shape control

(spoil surfaces sloping away from watercourses), settling ponds, silt fences, and other devices.

Please clarify whether any consideration has been given to the suitability of site materials for reuse within construction and what effects would arise, and their extent, if the material is unsuitable.

209. It is intended that all re-usable material will be incorporated within the works, including all stripped topsoil and engineered fill (from cuts). I expect there will be a surplus of material suitable as engineered fill, which will either be placed as buttress fill to the embankments or disposed of in the spoil areas. Cleared vegetation, if suitable, is expected to be mulched for later re-use. Existing fencing and other agricultural materials are not expected to be sufficient standard for re-use and are expected to be disposed of off-site. There is not anticipated to be any significant waste arising beyond this.

Within the spoil sites, what consideration has been given to future landform to minimise effects on the Te Āpiti windfarm and by what mechanism will this be controlled?

210. I understand this is the subject of ongoing discussions with Meridian. There is sufficient capacity in the spoil areas beyond the Wind Farm to not require the use of the Te Āpiti Wind Farm spoil areas, although this would incur additional cost associated with increased haulage distances.

Queen Elizabeth II National Trust land

Given the ecological value of the Queen Elizabeth II National Trust land and the fact that the southern alignment option has not been discounted, please provide a broad assessment of cost and geometric design effects this option might present.

211. The southern alignment option has not been presented as the indicative alignment as it would impact a greater footprint of the QEII area. It eliminates the ability to bridge the western branch, requiring an embankment crossing both and the associated increase in culverted waterway and removed vegetation.

212. There is minimal effect in the geometric design for this alignment, noting it is a small shift only, although the resultant cut depths east of the QEII area increase as a result of the slight reduction in incline length. That said, I expect that through detailed design this could be minimised.

213. From a cost perspective, it is not expected to have a significant implication, with the savings arising from the bridge being off-set by additional earthworks

and significant lengths of large diameter culvert plus likely increases in offset mitigation and landscaping works.

214. While the option has not been discounted, it is considered it would be difficult to satisfy the 'effects envelope' described by **Dr Forbes** with the significantly increased footprint.

Transport – Palmerston North Ring Road Route

It is stated that the Palmerston North Ring Road Route may lead to changes in active mode travel patterns accessing Manawatū Gorge. If this is expected to increase accessibility, and in general terms increased pedestrian and cyclists demand is anticipated anyway, please explain the rationale behind making no provision within the existing SH3 bridge for these modes. Please also explain how this may change the need for a cycle/walking track, how might a combined cycle, walking and equestrian track be incorporated within the NOR, what would be the cost implications and the design constraints and opportunities and what might a typical cross section look like.

215. The question relating to the existing SH3 bridge and whether this may change the demand for a cycle/walking track is addressed in the evidence of **Mr Dunlop**. My response pertains to how a combined walking and equestrian track could be incorporated within the NoRs.

216. Were a separated shared path provided, accommodating cycling, walking and equestrian measures, it would typically be of a minimum of 3m in width with appropriate setbacks from obstructions such as safety barriers. The surface of the path would need to be determined; I understand that road cyclists would likely have a preference for a smooth sealed surface, whereas equestrian users may not (given concerns about smooth surfaces and, in particular, the risk of horses slipping resulting in injuries to the horse and/or rider).

217. Assuming a separated walking/cycling shared path were sealed, with appropriate set-backs (which includes not being positioned within the verge barrier deflection zone), the overall formation width of the indicative alignment would increase by over 4m. The cross-section across the bridges would need to increase by the shared path width, resulting in a width increase in the order of 15% on all structures.

218. It is unlikely there would be significant reduction in shoulder width to offset the provision of a shared path as the shoulder width was originally

determined to safely accommodate broken down or stopped vehicles should this occur. This remains unchanged.

219. Without further developing the design, an indication only of the costs based on assumed rates is as follows:

(a)	Structures (base estimate $60M) *15%	≈ $9M
(b)	3m shared path *11km = 33000m^2 x $150/m^2	≈ $5M
(c)	Contractors' Preliminary and General 30% (of $14M)	≈ $4M
(d)	Subtotal	≈ $18M

220. This does not make allowance for other elements including additional earthworks, increased length of culverts, landscaping, fencing design, and amenity areas. I expect that additional costs of providing a separated facility would exceed $20M.

Wind farm access roads

Has any consideration been given to maintaining the wind farm access roads on their existing alignments and carrying them on accommodation bridges or underpasses?

221. This was considered during indicative alignment development and discounted on the basis of cost. The Wind Farm accesses are required to carry significant over-dimension loads (width and weight, ie cranes) and as such are not lightweight structures typically used, for example, as farm access bridges. The structures would therefore be of a structural standard, and unit cost, not dissimilar to a highway bridge on an overweight route.

222. Additionally, the crossings at either end of the Wind Farm exceed 100m in length and would be substantial. They were therefore not consider a practical alternative to the presented indicative solution.

Please demonstrate why the 2km access road is necessary if alternative solutions are available.

223. It follows from my comments above that I do not consider a practical alternative to be feasible. Alternative access from the new road would present a road safety issue, even if such an access did satisfy Meridian's requirements.

Avoiding the QEII covenanted land

What would be the design implications of relocating the road corridor to the north to avoid the QEII covenanted land?

224. I have addressed this question in my evidence above.

In your view, are the effects of the large cut to accommodate the [Meridian turbine] access road through gully systems sufficiently significant to suggest an alternative solution to access be adopted?

225. The alignment, both horizontal and vertical, of the Meridian access road is indicative and to be developed further through subsequent design phases in accordance with the design principles in the CEDF and the designation conditions, taking into account Meridian's operational requirements. One such design development may be to place the access road where possible immediately adjacent to the highway boundary over the eastern QEII area which would reduce the affected foot print than shown in the indicative design.

Avoiding the Ballantrae Hill Country Research Station fertiliser trials

What would be the design implications of moving the road to avoid the Ballantrae Hill Country Research Station fertiliser trials, particularly in light of concerns raised by submitters including AgResearch, Fertiliser NZ, Ballance, Beef and Lamb and various individuals?

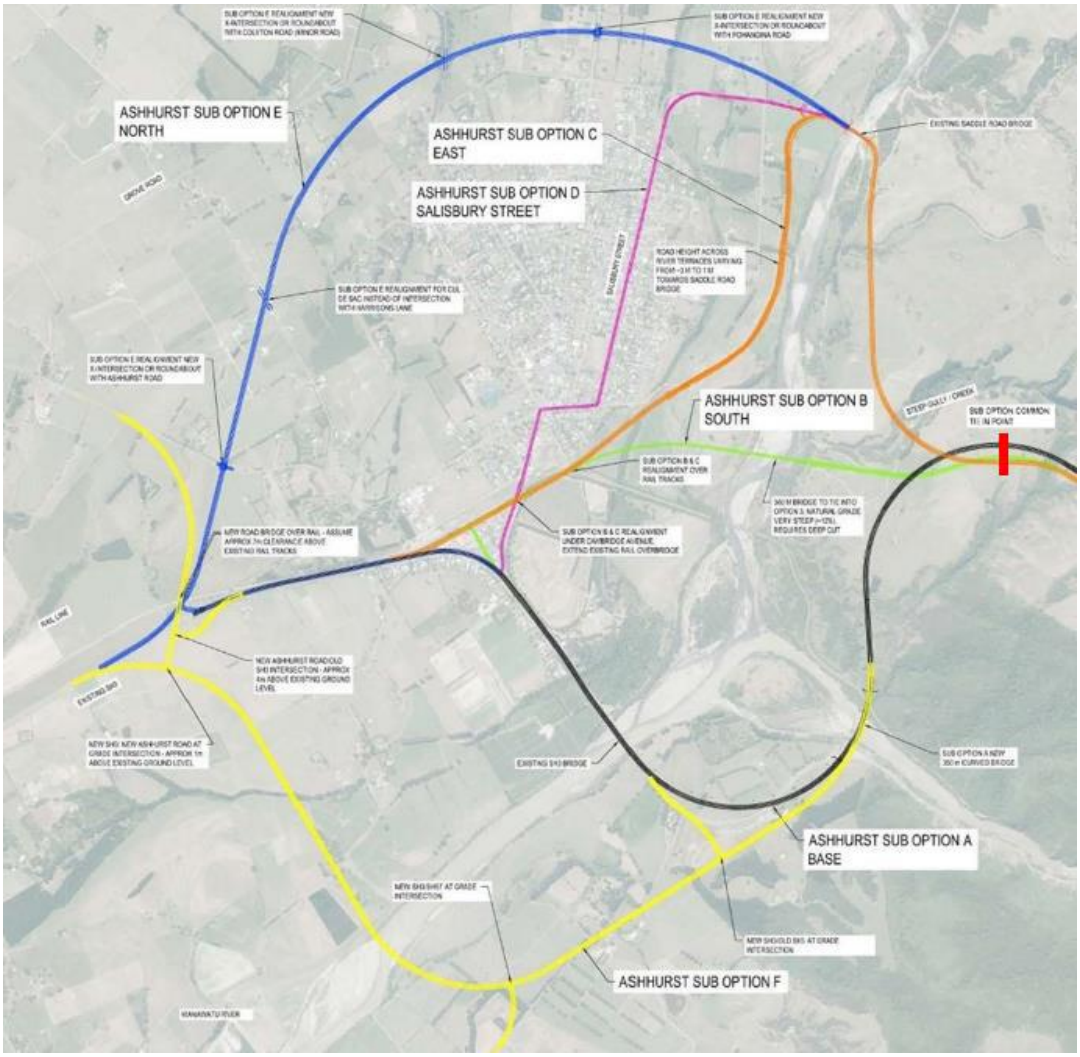
226. I have responded to this question in my evidence above.

Ashhurst sub-options A-F

In relation to the sub-options A-F for the western end of the NOR considered in the DBC, please provide an assessment of traffic and engineering design effects of these options.

227. I understand that **Scott Wickman** is annexing the standalone Ashhurst sub-options report that was prepared as part of the DBC to his evidence.

228. Ashhurst sub-options A to F were developed to a level of detail consistent to that of the Long List options in order to support technical assessment to inform the MCA process undertaken. The outcome of that MCA process was that sub-option A was preferred, with sub-option A being the included in the indicative design.



229. I can provide further information on these matters if they would assist the Hearing Panel, but at a high level the key engineering design aspects of each option were as follows:

(a) **Sub-option A** (black) – a new bridge across the Manawatū River at the mouth of the Gorge, traversing north across areas identified as being of high ecological value before entering the Te Āpiti Wind Farm – this option formed the basis of the Project's current indicative design.

(b) **Sub-option B** (green) – from SH3, prior to the right-hand bend in Ashhurst, the new highway headed in a north-east direction, parallel to the rail line through the southern end of Ashhurst, requiring new intersections within Ashhurst to retain connectivity before extending across the north-western edge of the Ashhurst Domain (a gazetted reserve) and bridging the existing rail before turning west, dropping down a terrace into the Pohangina River flood plain, and crossing the Pohangina River on a structure with a minimum length of 350m before climbing up the range. The incline length was substantially less than

that for sub-option A, resulting in significant gradient (>10%) for its length.

(c) **Sub-option C** (orange) – the sub-option followed the alignment of sub-option B through Ashhurst to the point it crossed the rail line, at which point it dropped down a terrace and ran north on the flood plain to the existing Saddle Road bridge. The alignment was similar to an alignment that had been proposed as a temporary Ashhurst Bypass. Once over the Saddle Road bridge, the alignment swung south before turning east as it crossed the previously mentioned significant gully dominated by native/undisturbed vegetation (which is the gully that would be impacted if the indicative design were pushed north to avoid the western QEII area). The alignment would have required a new tee intersection with Saddle Road. The sub-option had one fewer crossing of the Pohangina and Manawatū Rivers than sub-options A, B, and F.

(d) **Sub-option D** (pink) retained the existing route through Ashhurst to immediately after the crossing of the Pohangina River. Once over the Saddle Road bridge, the alignment swung south before turning east as it crossed the same significant gully dominated by native/undisturbed vegetation. The alignment would have required a new tee intersection with Saddle Road. The sub-option had one fewer crossing of the Pohangina and Manawatū Rivers than sub-options A, B, and F.

(e) **Sub-option E** was a western alignment around Ashhurst commencing on SH3 before crossing (via grade separation) the rail line before traversing north than east to where it crosses the Pohangina River. The alignment then follows that for sub-options C and D

(f) **Sub-option F** is a variant of option A considered to test the feasibility of taking SH3 out of Ashhurst completely (ie the existing stretch of SH3 to the existing bridge). This required the provision of a new bridge across the Manawatū River prior to swinging north along the approximate alignment of SH57 before linking with sub-option A prior to the river crossing at the mouth of the Gorge.

Blasting

Where within the designation is blasting to occur?

230. Geotechnical investigations to date have not identified rock sufficiently hard to justify blasting. Should further investigations or physical works encounter harder rock, it is most likely to be lower down in the deepest cuts.

Imported fill

Do you know whether or not the bulk of imported fill will pass through Ashhurst or not?

231. There are unlikely to be significant quantities of imported fill, with the majority of earthworks being a 'cut to fill' operation. The exception to this will be engineered aggregates for drainage and pavements which will be imported. It is expected that once the Manawatū River Bridge is complete, pavement aggregates will not pass through Ashhurst. However, until such time as the bridge is built, via Ashhurst would be the route for materials from the west of the ranges.

Outstanding Natural Landscapes

Is there an alternative route choice for the western end of the NOR that could avoid crossing the ONL and have lesser effects on landscape and natural character? If so, where would this route lie?

232. Numerous alternative routes have been considered at the western end of the Project, as part of the Ashhurst sub-options process (discussed above) and through the further development of the proposed NoR boundaries. I understand that there is a relatively small 'gap' between the areas identified as Outstanding Natural Landscapes ("**ONL**"), which is on the Pohangina River just upstream of the confluence with the Manawatū River.

233. In the Ashhurst sub-options process, from an ONL perspective, all six sub-options crossed the ONL, however there were differing levels of visual intrusion of each. For example, Option B was the closest option to the 'gap' between the ONLs, and performed least favourably as it was most visible from Ashhurst, plus had other disbenefits of being the most expensive option, directly affecting the floodplain upstream of the rail bridge, and impacting on the Ashhurst Domain, a gazetted recreational reserve. The alignment taken forward was the preferred alignment following the completion of the MCA.

234. Other options assessed in developing the preferred option have involved exploring moving the river crossing west of the now-proposed designation, which would affect Parahaki Island and all involve a shortened length of the incline, which would require either steepening grades or deepening cuts, and would (I understand) still have significantly adverse environmental effects.

COMMENTS ON COUNCIL SECTION 42A REPORTS

Consideration of alternatives

235. The Section 42A report and associated evidence for the Councils raised a number of issues relating to the consideration of alternative alignment options, at the western end of the Project (including the northern abutment of the proposed Manawatū River Bridge and the QEII areas) and across the AgResearch site. I have addressed these points in my evidence above, including in response to questions from the Hearing Panel.

Traffic/transport matters

236. The report authors discuss the proposed shoulder width and query whether the Transport Agency is providing shoulders consistent with best practice for cycle provision.

237. There is an important distinction to be made in responding to this point, namely that the Transport Agency is providing highway shoulders which cyclists who choose to use the route are likely to utilise. The Transport Agency is not specifically providing cyclist facilities and, as such, the indicative design does not incorporate a space designed specifically for cyclists to use.

238. The indicative design shoulder width has been determined primarily to provide safe space for broken down vehicles or similar as opposed to a cycle facility. The indicative shoulder width for this purpose has been indicated as 2m. The shoulder cross-section across the bridges will be consistent with that of the approaching carriageway.

239. The ultimately designed shoulder will be subject to Stage 2 RSA (preliminary design) and Stage 3 RSA (detailed design) as discussed earlier in my evidence. These RSAs will take into account the safety of vulnerable users.

Construction and earthworks – evidence of Gregor McLean

Designation boundary

240. Paragraph 40 to 41 and paragraphs 58 to 60 of Mr McLean's report question whether the designation boundary has considered the required space for ESC work.

241. I can confirm that the designation boundaries have been set considering the need for ESC works, albeit noting in some locations that the designation has been tightened or conditions proposed (as identified by Mr Mclean), such as in the QEII areas and on the AgResearch land, to encourage a minimised affected footprint from the constructor. I understand that ESC measures need not sit within the designation, although the constructor will be encouraged to do so.

Conditions regarding ESC works and spoil sites

242. Paragraph 29 of Mr McLean's report recommends that an ESCP be provided as part of the NoR process, in part to address issues that he considers may arise with the management of effects associated with enabling works.

243. I do not consider this to be necessary, because with an ESCP and associated works will be central to the subsequent RMA consenting processes that will be based on a more developed design. I note too that any enabling works not permitted activities will need to be covered by these, or separate, RMA consents against which an ESCP will be proposed as appropriate.

244. Paragraph 30 of Mr McLean's report queries what standards will apply in the determination of appropriate ESC measures and references the *Erosion and Sediment Control Guidelines for the Wellington Region* ("**Wellington Guidelines**") referred to in the One Plan.

245. Mr McLean is correct in his subsequent commentary that in certain situations, such as involving sensitive receiving environments or difficult to control areas, higher measures than outlined in the Wellington Guidelines will be required. Ultimately the ESCP, irrespective of the standard or guideline used, will need to satisfy the requirements of RMA consent process and subsequent conditions. It is, however, anticipated that the ESCP will largely follow the Wellington Guidelines as these are those most familiar to the local industry and authority (and mandated in the One Plan).

Design implementation

246. Paragraph 54 to 57 of Mr McLean's report raises the potential for design development in response to emerging risks (in the example provided, geotechnical considerations) to override the requirements of the CEDF.

247. This is considered unlikely as the indicative design which has both informed, and been informed by, the CEDF has been based on initial geotechnical investigations that I consider to be conservative. For example, the use of shotcrete is unlikely as the indicative design, and ultimately the proposed designations, have been based on developing cut slopes that are stable/resilient without mechanical stabilisation.

Resilience

248. Paragraphs 17-19 of Mr McLean's report emphasise the complex geological conditions along the route.

249. These statements summarise the information used in the selection of Option 3 through the long and short list MCA processes, the conclusion of which was that the preferred Option 3 was the most favourable with respect to resilience. The statements pertain primarily to the wider geological environment including faulting, as opposed to specific elevated geotechnical risk with Option 3.

Andrew Whaley

8 March 2019