Before the Expert Consenting Panel

under: the Fast-track Approvals Act 2024 (*FTAA*)

in the matter of: notices of requirement and applications for resource consents, wildlife approvals and archaeological authorities by the NZ Transport Agency Waka Kotahi to develop the Brynderwyn Hills section of the Alternative to the Brynderwyn Hills Project, a state highway from the intersection of State Highway 1 and Baldrock Road in the south, through the Brynderwyn Hills to Waipū in the north.

applicant: **NZ Transport Agency**

Requiring Authority and Applicant

Statement of Evidence of Tom Ireland for NZ Transport Agency Waka Kotahi

Dated: 28 October 2026

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STATEMENT OF EVIDENCE OF TOM IRELAND

INTRODUCTION

1 My full name is Thomas John Ireland.

2 I am a Major Projects Director at Aurecon New Zealand Limited.

3 I have over 30 years' experience in large-scale infrastructure developments, including roads, railways and wastewater infrastructure. I have a Masters degree in civil engineering specialising in geotechnical and structural engineering, and a Bachelors in both Engineering, and Science.

4 I am a chartered professional engineer and a member of the Institute of Civil Engineers, UK (MICE) and the Institution of Engineers Australia (IEAUST), with membership of the civil and structural college.

5 I have held leadership roles on several large engineering projects over the last 15 years including Western Ring Route ($2.4B), City Rail Link ($5.5B), Transmission Gully ($1.4B) and Puhoi to Warkworth ($1B). During these projects I have worked on site as well as with the contractors from the procurement stage through to project completion. This experience, along with over 30 years of design and construction delivery, has given me insight into construction and delivery-related matters of large roading infrastructure projects.

6 My evidence has been prepared to support NZ Transport Agency Waka Kotahi *(NZTA)* as part of the response to comments on the notices of requirement and applications for resource consents, wildlife approvals and archaeological authorities (together, the *Application*) to develop the Brynderwyn Hills section of the Alternative to the Brynderwyn Hills (*Project*), a state highway from the intersection of SH1 and Baldrock Road in the south, through the Brynderwyn Hills to Waipū in the north.

7 I have been involved with this Project since 2024. I am part of the leadership team for the Technical Advisor to NZTA responsible for the development of the Indicative Design that supports the technical assessments and the Application.

CODE OF CONDUCT

8 Although this matter is not before the Environment Court, I confirm that I have read the Environment Court's Code of Conduct for Expert Witnesses in its Environment Court Practice Note 2023. I agree to comply with that Code. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I have not omitted to

consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

9 My evidence has been prepared to:

9.1 Provide context to the Panel in relation to construction and delivery of large-scale infrastructure; and

9.2 Respond to comments.

10 In particular, my evidence addresses:

10.1 Construction and delivery constraints faced by large-scale infrastructure;

10.2 My involvement in the consideration of alternative routes and alignments for the Project, as it related to construction and delivery;

10.3 How construction and delivery-related considerations have informed development of the Project's construction methodology, including:

(a) Geological and geotechnical considerations;

(b) Avoidance of constraints in the broader landscape;

(c) Movement and placement of spoil; and

(d) Large-scale structures (including bridges, viaducts and tunnels).

10.4 How the Project's design has responded to these construction and delivery-related considerations, including:

(a) Embankment of the Piroa Stream; and

(b) Not tunnelling through the Brynderwyn Hills.

10.5 Responses to comments from:

(a) The Director General of Conservation on behalf of the Department of Conservation (*DOC*);

(b) Te Pouwhenua o Tiakiriri Kūkupa Trust on behalf of Te Parawhau hapū (*Te Parawhau*);

(c) Kōwhai Te Awhina Hapū o Te Parawhau Hapū Incorporation (*Te Parawhau Inc*); and

(d) Patuharakeke Te Iwi Trust Board (*Patuharakeke*).

CONSTRUCTION AND DELIVERY CONSTRAINTS

11 Major roading projects typically involve earthworks, drainage, pavements, barriers and structures. All of these components present construction constraints and can create substantial cost and delay in delivery, if not managed appropriately.

12 For construction of projects in rural areas, the earthworks are generally a major component of the critical path of the delivery programme.

13 The volume of earthworks required for a project depends on the topography traversed. For this Project, the corridor has a large volume of earthworks per km due to the steepness of the terrain. The horizontal curvature of the road alignment will be limited by the operational requirements of the road (e.g. speed and safety), which has a larger impact on the volume of earthworks than the existing SH1 road though the Project area.

14 From an efficiency perspective, road construction requires, where possible, a balanced cut-to-fill of earthworks in order to avoid either excessive importation of fill from outside the site or excessive spoiling of fill within the site (both of which add cost and time to the construction process).

15 Not all earth materials have the required engineering properties to be used in highway fill embankments and therefore some materials need to be cut-to-spoil. Typically, softer soils weathered from the rock below require disposal as spoil.

16 For this Project, the road geometry will be designed to provide a balanced cut-to-fill and to minimise spoil where possible. However, there are a number of constraints related to the specific topography and the operational requirements of the road which drive the earthworks outcomes.

17 For example, at Ch 19300-19900 the Indicative Alignment includes a large cut (the *Brynderwyns Cut*) at the ridgeline that generates a large volume of cut material. This cut cannot be reduced because, for safety reasons, the grade of the final road alignment cannot be more than approximately 9%. Accordingly, the generation of a large volume of cut material will be unavoidable and will either need to be placed in road embankments or within spoil sites.

18 Similarly, the steep nature of the terrain on the southern slopes of the Brynderwyn Hills within the Proposed Designation means a large fill embankment or a long, high viaduct will be required to raise the gradient of the road so as to minimise the depth and volume of cut at the crest of the ridgeline. The Indicative Alignment manages this

constraint by placing the cut from the ridgeline crest within a road embankment in the vicinity of the Piroa Stream.

19 The northern portion of the Indicative Alignment towards Waipu, passes through flat flood plains, which means a fill embankment is required for this section of road to stay above the 100 year flood level. The Indicative Alignment proposes to use the fill from the Brynderwyns Cut for this embankment.

20 Importation of material or removal of material from a construction site, particularly to a site outside of land owned by the infrastructure provider, has a very significant cost compared to undertaking such activities within the vicinity of the road and with land owned by the infrastructure provider. This cost is due to the smaller size and capacity of trucks that can be used on public roads compared to the larger trucks that can be used within a construction site, necessitating more trucks and truck movements to move the fill material, and the significant increases in haul distances. Cost is also increased by the use of quarried material and off-site disposal.

21 Earthworks are therefore designed to use site-won material and to minimise haul distances for both cut-to-fill and cut-to-spoil. The cost and programme of such earthworks is directly proportional to the haul distances that must be covered.

22 Spoil sites for unsuitable and excess material need to be selected carefully by a contractor to help reduce cost and to ensure sediment run-off is appropriately managed. Gullies are typically used as spoil sites to maximise the amount of material that is able to be placed within each site. Additionally, locations at the top of catchments allow better management of water during construction, thereby minimising sediment runoff.

23 Long structures such as viaducts impose significant project constraints (e.g. programme constraints), particularly if cut-to-fill earthworks are required across the structure or if the structure is required for site access. Further detail on this constraint is covered in paragraphs 50-55 below.

24 The time required to undertake major utility relocations (such as High-Voltage lines or gas mains) that are needed before construction of a state highway can commence, is a significant constraint as earthworks cannot commence in the area until the major utility is relocated. They also provide a practical limitation on where spoil can be placed due to the required clearance zones.

INVOLVEMENT IN THE ALTERNATIVES PROCESS

25 I have been involved in the evaluation of alternative corridors that was carried out for the Investment Case process for the Project, providing input from a construction and delivery perspective. As part of that process, we considered multiple corridors.

26 I was also involved in the process of considering alternative alignment options during the development of the Indicative Alignment.

27 From a constructability perspective, the Proposed Designation (the preferred corridor) traverses predominantly stable greywacke terrain and avoids much of the geotechnical uncertainty, active land movement and poor ground conditions affecting the western corridor options. Consequently, the Proposed Designation provides more predictable ground conditions, lower geotechnical risk and a reduced requirement for extensive stabilisation and remediation works. The instability issues associated with the existing SH1 (which is in close proximity to the Proposed Designation and shares similar terrain) relate to the design of the existing road.

28 In particular, the existing road was constructed in the 1930's when civil engineering was not as developed. The existing road cuttings in the slopes of the Brynderwyn Hills were in the weak residual soils weathered from the greywacke, rather than into the stable greywacke beneath. In contrast, the design of the Project will resolve these instability issues with much flatter cut slopes in the weaker material, with steeper slopes only used for the more stable unweathered greywacke below.

29 The Proposed Designation also avoids several material cost and delivery risks associated with the alternative corridors, including the extensive earthworks that would have been required for any of the western alignments (because of the additional length and flatter cut slopes required for the weaker material) and the major structural and utility-relocation requirements that would have been needed for the eastern alignments. In particular, the Proposed Designation avoids the need for a more than 1 km long viaduct over the Atlas quarry on Artillery Road, significant service-road construction and relocation of Transpower infrastructure, all of which as outlined above, have substantial programme, cost and constructability risks.

30 On balance, the Proposed Designation was assessed through the alternatives process as the lowest cost option due to its shorter route length, favourable cut-fill balance, lower geological risk and reduced infrastructure relocation requirements. These factors, combined with strong operational and resilience benefits, supported its selection as the preferred corridor.

HOW CONSTRUCTION AND DELIVERY HAS INFORMED THE CONSTRUCTION METHODOLOGY

31 This section addresses how construction and delivery-related considerations have informed the Project's construction methodology. In particular, as it relates to decisions regarding avoidance of constraints in the broader landscape, the movement and placement of spoil, and construction of large-scale structures.

Geological and geotechnical considerations

32 The Project corridor traverses a geologically complex setting comprising basement rocks, allochthonous thrust sheets, sedimentary units and volcanic rocks. This geological history has resulted in substantial lithological and structural variability, with ground conditions, rock mass characteristics and groundwater conditions potentially changing over relatively short distances. The Geological Assessment indicates major geological contacts, faults, sheared zones and mélange are therefore important features in developing an understanding of the engineering geological conditions along the corridor.

33 This geological complexity is also reflected in the prevalence of landslides and slope instability within Northland. The Northland Allochthon is particularly susceptible to instability, especially within mélange and sheared mudstone units where deformation associated with emplacement has resulted in reduced material strength. These materials may also contain pre-existing shear surfaces which can influence both the location and mechanism of slope movement. This is present in the corridor south of the Brynderwyn Hills. This type of ground is typical for Northland and is one of the reasons why infrastructure costs for this Project are higher than elsewhere in the country, NZTA is therefore looking for construction efficiencies to make this Project affordable.

34 The interaction between geological structure and groundwater is also important. In areas of complex stratigraphy, stronger geological units may overlie weaker and less permeable materials. Groundwater can become concentrated at or near these contacts, resulting in locally elevated pore water pressures. Where these conditions coincide with unfavourable geological structure and topography, they can contribute to shallow instability or larger, deep-seated landslides.

35 Existing landslide features may also be sensitive to modification of the natural slope. Cut excavation, placement of fill, changes in loading and alterations to surface or groundwater drainage can disturb existing stability conditions and potentially reactivate previous landslide movement.

36 The existing SH1 through the Brynderwyn Hills provides a relevant example. On the southern side of the Brynderwyn Hills, instability is associated with thick weathering profiles and over-steepened cut and fill batters. On the northern slopes, instability is considered likely to include the reactivation of older, deep-seated landslides associated with the contact between the Waipapa Greywacke and the overlying Ruarangi Formation. This illustrates the relationship between geological conditions, slope modification and the development or reactivation of instability within the corridor.

37 These geological and landslide conditions are therefore fundamental to the Project's design. In particular, they inform the assessment of

slope stability, excavation behaviour, foundation conditions and groundwater, and the identification of areas where earthworks may require specific stabilisation, drainage or foundation measures. They were also relevant to the development of the Indicative Alignment and will be important for the development of the detailed design, particularly where substantial earthworks are proposed in steep terrain or across weak geological units, geological contacts or existing landslide features.

Avoidance of constraints in the broader landscape

38 The development of the Proposed Designation and Indicative Alignment involved balancing a range of competing environmental, engineering, construction and operational considerations across the wider Project corridor. The alignment was not developed by optimising a single outcome, rather NZTA identified an alignment that balanced multiple and, in some cases, competing constraints. These constraints included:

38.1 avoiding or reducing effects on streams and ecological habitats;

38.2 limiting encroachment into the Brynderwyn Hills Outstanding Natural Landscape;

38.3 the steep terrain;

38.4 minimising earthworks volumes and spoil generation;

38.5 managing geotechnical and slope stability risks;

38.6 maintaining efficient mass-haul operations;

38.7 reducing structural complexity;

38.8 a gas main requiring relocation; and

38.9 providing a design that could be constructed safely and delivered within reasonable programme and cost parameters.

39 In the vicinity of the Gully near Ch20000 on the Indicative Alignment (see Figure 1 below), competing constraints are particularly evident. The Indicative Alignment was intentionally developed to remain centred on the ridgeline and positioned as high as practicable within the catchment. This approach was adopted to minimise encroachment into adjacent streams, reduce disturbance within the ONL, and limit the extent of construction activity within sensitive areas. Steep engineered cut and fill batters were also adopted as a deliberate footprint minimisation measure to reduce the overall extent of earthworks and associated disturbance.

40 The resulting alignment therefore reflects a process of balancing competing considerations across the Project as a whole rather than

maximising any single objective. The constraints in the vicinity of Ch20000 (Figure 1) have also resulted in one of the narrowest points of the Proposed Designation which acts to constrain future design in this location.

41 In my opinion, these design responses demonstrate NZTA's attempt to balance ecological, landscape and earthworks effects by avoiding some key environmental features whilst maintaining a corridor that remains practically constructable and capable of supporting efficient project delivery.

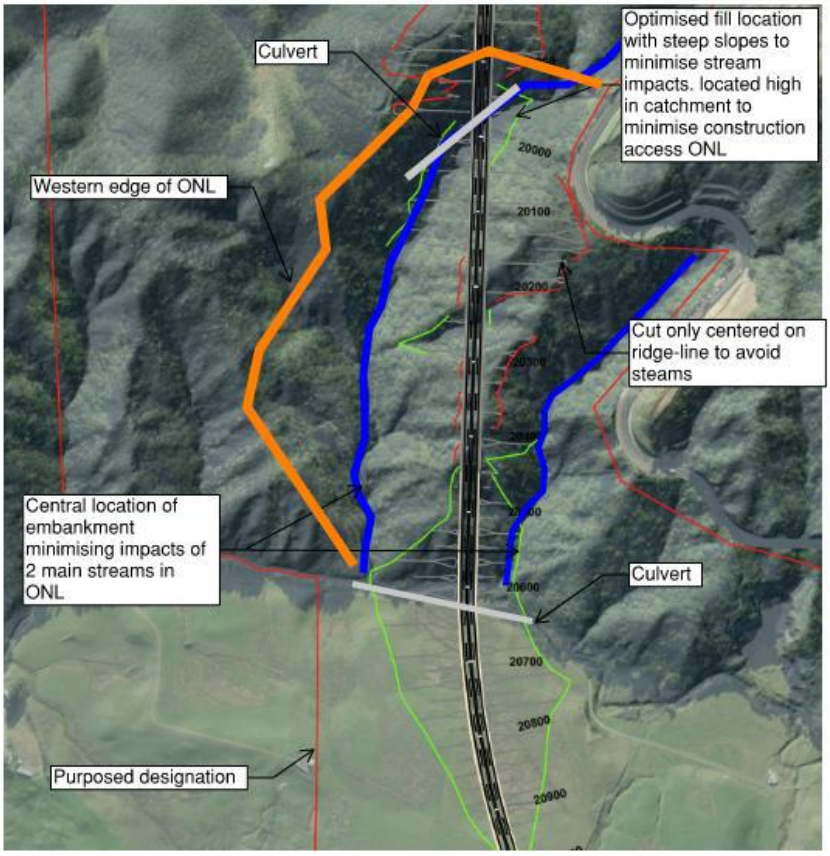

Figure 1: Consent Design and Key Design Considerations

42 In my opinion, the Project represents NZTA's attempt to appropriately "thread the needle" between competing ecological, landscape, geotechnical, construction and delivery considerations and provides the most balanced outcome of the options assessed.

Movement and placement of spoil

43 A key consideration in the development of the Project has been the management, movement and placement of spoil and structural fill arising from the significant earthworks that are required for the Project.

44 The Project is being developed on a balanced cut-to-fill philosophy, with the objective being maximised reuse of site-won material, minimised imported fill requirements, reduced haul distances and

avoidance of unnecessary off-site spoil disposal wherever practicable. The mass-haul strategy will be specifically optimised to minimise haulage distances (and therefore cost).

45 The earthworks strategy for the Project seeks to keep the movement of material as local as practicable. Suitable material will be preferentially reused in nearby fills within the same construction zone, with cross-zone haulage undertaken only where necessary to achieve mass balance or to satisfy engineering requirements. Similarly, unsuitable material will generally be spoiled within the zone in which it is generated rather than being transported to remote disposal locations. In my opinion, this approach reduces haul distances, minimises material rehandling, limits construction traffic and improves overall construction efficiency.

46 The Indicative Alignment has also been designed to facilitate the efficient internal movement of earthworks materials. For instance, certain structures and embankments, e.g. the SH1 Brynderwyn Overbridge and the Piroa embankment, would be critical early works, establishing the principal haul routes between construction areas.

47 In my opinion, the spoil management and mass-haul strategy proposed for the Project is a critical factor for the overall constructability of the scheme.

48 Without the ability to adopt a spoil management and mass-haul strategy as discussed above, a greater proportion of Project spoil would need to be transported to remote disposal locations. While such an approach may reduce the extent of spoil placement within the designation footprint, it would require the establishment and operation of additional external spoil disposal sites. It would also require additional loading, transportation, unloading and return-haul activities for significant material volumes, which would increase the number of haulage vehicles, fuel consumption, traffic movements and logistics requirements. It would also increase reliance on the public road network and create additional programme risks associated with traffic management, haulage availability and disposal site access.

49 By maximising on-site reuse of material, locating spoil areas close to their source, and maintaining efficient internal haul connections, the Project will have less haulage requirements, thereby avoiding the additional cost, programme impacts and environmental effects that would arise from transporting significant spoil volumes to more remote disposal locations.

Construction of large-scale structures

50 The principal constructability implications of introducing large scale bridge, viaduct or tunnel structures arise from their effects on construction access, earthworks sequencing and material haulage, rather than from the structure itself. This is due to the steepness of

the topography and limited access opportunities around the location of any structure for earthworks mass-haul. While a bridge, viaduct or tunnel reduces direct permanent impacts, it introduces a major structure within steep terrain that requires specialised construction methodologies, dedicated access arrangements and significant temporary works.

51 A key consideration for design or construction of a bridge or viaduct structure is the impact of that structure on the Project's mass-haul strategy. The Indicative Alignment enables progressive placement of fill within road embankments as earthworks advance, maintaining efficient cut-to-fill operations and continuity of haulage routes. By comparison, a bridge option would introduce a physical constraint within the haul corridor, reducing earthworks productivity and necessitating an additional temporary haul road (including temporary bridges across watercourses) to maintain material movements through the site.

52 Construction of bridges through the Brynderwyn Hills would require construction of a temporary haul road through the ONL to maintain connectivity between earthworks areas during bridge construction. This haul road would traverse steep terrain and would require additional excavation, filling, temporary slope stabilisation and ongoing management. Sections of the route would operate in a constrained one-way configuration, reducing haulage efficiency and increasing programme complexity. The haul road would also introduce temporary ecological, landscape and construction effects that are avoided under the Indicative Alignment.

53 Any bridge option would also require additional access tracks, working platforms, crane operations and structural staging activities that are not required for embankment alternatives. While bridges reduce direct operational effects at a location, there are often significant construction effects, as well as additional construction complexity, wider project-delivery constraints and higher costs.

54 A fundamental consideration during development of the Indicative Alignment was therefore the interaction between proposed structures and the Project's mass-haul strategy. Large-scale earthworks projects rely on the efficient movement of material between cuts, fills and spoil locations. Where a bridge, viaduct or tunnel occupies a critical section of the corridor, earthworks movements can be constrained until the structure is sufficiently advanced or alternative haul routes are established. This can result in material rehandling, stockpiling, longer haul distances and reduced construction productivity.

55 In steep terrain, opportunities to bypass major structures with temporary haul roads are often limited. Additional haul roads may require substantial excavation and filling; temporary retaining or stabilisation works and can introduce further environmental and constructability effects. The feasibility, cost and environmental

consequences of such bypass routes were therefore important considerations when assessing structural solutions and refining the Indicative Alignment.

SPECIFIC ELEMENTS OF THE PROJECT DESIGN

56 This section addresses how the design of the Indicative Alignment has responded to construction and delivery-related concerns, including the embankment through the Piroa stream, NZTA's decision not to include a tunnel and the design through gullies where Hochstetter's frogs have been identified.

Embankment of the Piroa Stream

57 In developing the Indicative Alignment, NZTA considered a range of alternatives for crossing the Piroa Stream, including two long-span bridge options and a fill embankment with a culverted stream. While the bridge options avoided culverting of the Piroa Stream, the assessment determined that the fill embankment provided superior outcomes when considered in the context of the wider Brynderwyn Hills section and the overall construction methodology for the Project.

58 Key considerations in assessing the options were ecological effects, spoil management and earthworks integration. The bridge options effectively created a barrier between northern and southern earthworks areas, limiting the ability to move material along the corridor and resulting in a substantially greater requirement for spoil disposal sites throughout the Brynderwyn Hills. By contrast, the fill embankment connected the earthworks areas and enabled surplus cut material generated elsewhere along the alignment to be reused beneficially within the Piroa embankment. This approach significantly reduced spoil disposal requirements and improved the overall efficiency of the earthworks strategy.

59 The broader environmental implications of spoil management were also an important factor. Bridge options would require substantially larger spoil disposal areas within the Brynderwyn Hills (or further away, which, as discussed above was discounted due to efficiencies and cost), resulting in materially greater vegetation clearance and stream disturbance across the wider landscape. Although the embankment involves a larger earthworks footprint at the crossing itself, it reduces the overall extent of vegetation clearance and stream impacts associated with spoil disposal activities elsewhere in the Brynderwyn Hills.

60 Constructability of a bridge was another important consideration. The bridge options required complex top-down excavation, large piled foundations, temporary access works, stream diversions, extensive slope stabilisation measures and the construction of piers up to approximately 45 metres high within difficult terrain and geological conditions. In comparison, an embankment could be constructed using conventional earthworks techniques and available

site-won material, avoiding many of the programme, geotechnical and construction risks associated with major bridge structures. The embankment would be considerably simpler and quicker to construct.

61 Also, the southern base of the Brynderwyn Hills Range exhibits a geological transition from uplifted greywacke to Northland Allochthon near the Piroa Stream. The greywacke has been tectonically uplifted, forming steep slopes at approximately 1H:1V, and is highly weathered and prone to shallow instability. The contact between the greywacke and the allochthon is faulted, and local geomorphology is influenced by active stream incision, resulting in undercutting near the transition zone and a shallow layer of alluvial deposits adjacent to the stream bed. This setting creates a high potential for slope instability and differential ground conditions across the alignment which would add significantly to the cost and risk of a bridge structure. See Figure 2 below.

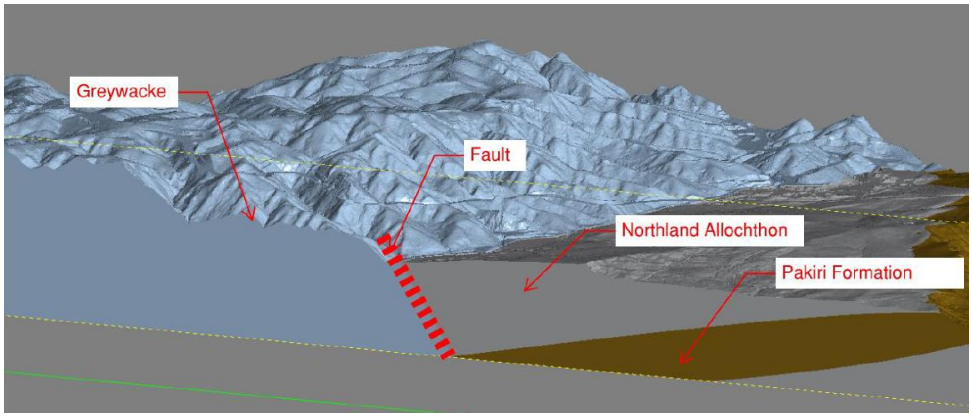

Figure 2: Fault zone at the location of the Piroa Embankment

62 The cost of bridge construction is also a key factor. The estimated construction cost of the longer-span bridge alternative is over $200M.

63 Based on the above, the fill embankment is preferred as it enables more efficient reuse of surplus earthworks material, significantly reduces spoil disposal requirements and their associated environmental effects, improves construction logistics and programme certainty, reduces geotechnical and construction risk, and achieves these outcomes at materially lower cost than either bridge alternative.

64 The fault zone has less impact on the embankment as it is less sensitive to differential settlement and seismic impacts. The pier foundations are also more complex than embankment foundation treatments.

Not tunnelling through the Brynderwyn Hills

65 NZTA considered tunnelling through the Brynderwyn Hills during the early optioneering phases of the Project. Once the preferred

corridor was selected and refined, both a long tunnel beneath the Brynderwyn Hills range and a shorter tunnel beneath the ridgeline were considered.

66 Tunnelling was not preferred because the area's steep topography and deeply weathered, fractured greywacke geology would result in significant construction complexity, extensive ground-support requirements and substantially higher geotechnical risk than a surface earthworks solution.

67 In addition to the construction challenges, both tunnel options would introduce ongoing operational requirements, including ventilation, lighting and life-safety requirements, and higher whole-of-life costs.

68 Restrictions on hazardous goods vehicles within the tunnel would require the existing route to be maintained and would impact the resilience of the fuel supply from Port Marsden. There would also be reduced network flexibility during maintenance or incidents.

69 While tunnelling could reduce some surface environmental effects, NZTA's assessment concluded that these benefits would be outweighed by the increased cost, construction complexity, long-term operational requirements, network performance and whole-of-life risk. On balance, tunnelling was not considered a preferred solution.

Approach to Avoid Areas

70 NZTA's indigenous vegetation expert, Mr Nick Singers, has identified some potential further vegetation-based 'avoid' areas that are impacted by the Indicative Alignment.

71 Kahikatea, pukatea, pūriri forest (V1_144) of very high ecological value (as shown on Figure 4 of Mr Singers evidence) has been identified. This area is in the middle of the Proposed Designation and is located on a long sweeping curve that leads up to the Waipū Interchange. The geometry of this curve is sensitive to change and an avoid area is this location would substantially limit flexibility to accommodate changes and may impact the Waipu interchange which has been designed to avoid the Kahikatea stand in that location.

72 Kohekohe, taraire, podocarp, broadleaf forest (V2_3, 4 & 7) of high to very high ecological value is located on the Brynderwyn Hills just south of the SH1 crossing (as shown on Figure 5 of Mr Singer's evidence). This area is impacted by the 40m high large Brynderwyn fill embankment. Structures would be required to avoid this area. This is discussed further in paragraph 85 below but would have a significant programme and cost implication.

RESPONSE TO COMMENTS

73 The following section responds to design and construction matters raised in comments.

Consideration of structures and restrictions on spoil sites

74 The following paragraphs consider matters raised in Table 4 of Dr Burns' evidence[1] to show the balancing that is required on a major infrastructure project. I consider specific areas to illustrate the considerations and balancing that will need to occur through the detailed design process.

75 I have addressed the three highest priority recommendations from Table 4 of Dr Rhys Burns evidence below. I note that both Te Parawhau[2] and Patuharakeke[3] have each separately sought that structures be installed in certain locations as part of their comments. While the bridges referenced in those locations are not specifically addressed here, my responses remains relevant to their commentary.

Structures and spoil sites

76 Dr Burns has requested 9 additional bridges and the relocation of 16 spoil sites[4]. As noted above, additional structures make the earthworks unworkable and due to the constraints imposed by the terrain, also result in around 900,000 m^3 of cut material going to spoil sites. The 9 additional bridges would increase the construction duration by 1-2 years which represents a 30% increase to programme (from 6 years to 8 years).

77 In relation to the relocation of 16 spoil sites (totalling 33 hectares), I note that the figures provided with the evidence represent all of the spoil sites located within the Brynderwyn Hills, which have been designed to contain around 1.3M m^3 of spoil. As noted above, for efficiency, spoil sites need to be located near the main alignment in order to minimise haul distances and the area disturbed by the earthworks. The Project cannot be constructed efficiently without spoil sites close to the work front. Every linear infrastructure project I have been involved in has had spoil sites available within the designation.

78 The cumulative effects of relocating 16 spoil sites away from the alignment, along with a very significant increase in the spoil

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1 Table 4, Appendix C - Burns - s53 Frogs, lizards, avifauna update, dated 20 October 2026, pages 43-44

2 Te Parawhau – comments on resource consent conditions (RC32 and RC37). Specifically, bridging the Waihoihoi unless not possible, and in all locations where permanent culverts are proposed unless a bridge cannot be used.

3 Patuharakeke – comments on resource consent conditions (RC32). Specifically, a request to bridge the Waihoihoi main stem, Piroa main stem, Mayflower tributary main stem, Wairau north tributary and Pine north main tributary.

4 Table 4, Appendix C - Burns - s53 Frogs, lizards, avifauna update, dated 20 October 2026, pages 43-44

volumes from the replacement of road embankment with bridges, means that around 2.2M m^3 of additional spoil sites would need to be found away from the main alignment, making the scheme far less efficient, resulting in a significant increase in time and cost.

79 It is not clear whether there are sufficient additional/alternative spoil sites available within the Proposed Designation. As noted in my evidence above, removing the spoil from site would result in a large increase in cost and programme delays.

Gully at CH20000 (Area E)

80 The indicative design of the crossing at Gully CH20000 was influenced by a range of competing environmental, engineering and construction constraints (shown on **Figure 3** below). These included reducing effects on the Hochstetter's frog habitat and adjacent streams, minimising disturbance within the ONL, limiting earthworks volumes and spoil generation, maintaining efficient mass-haul operations, avoiding additional temporary access requirements, and achieving a solution that remained practical to construct and deliver. The Indicative Alignment was developed to remain on the ridgeline and as high as practicable within the catchment to balance these competing considerations.

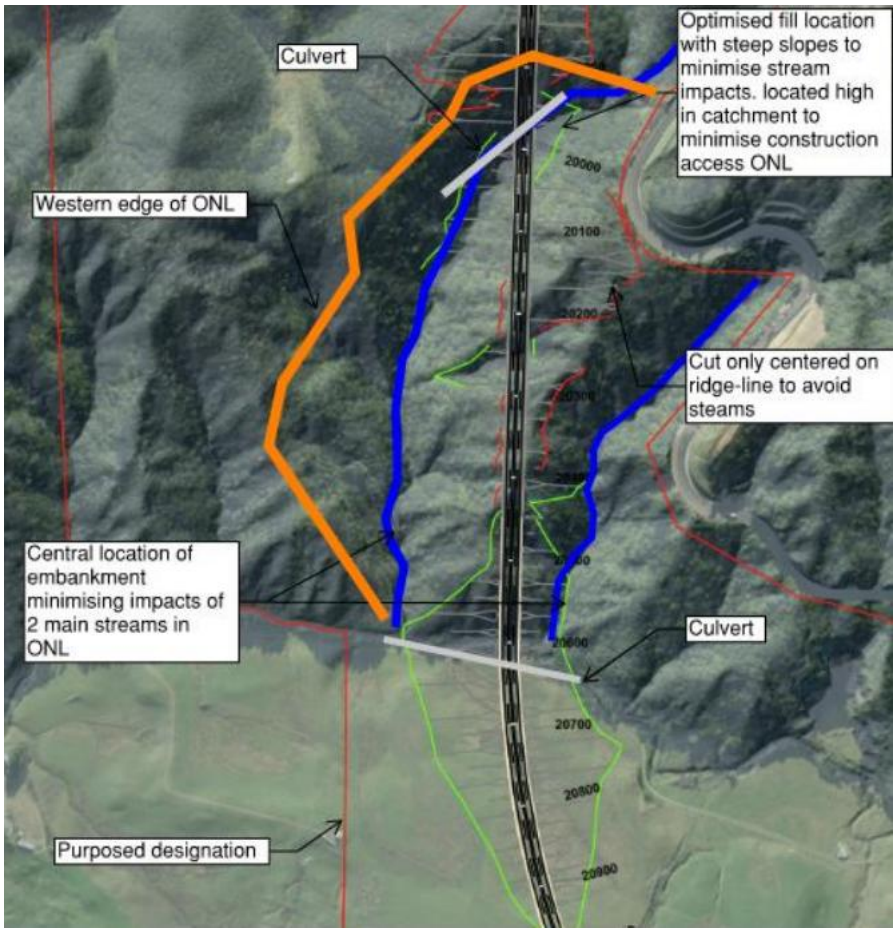

Figure 3: Constraints at Gully at CH20000

81 NZTA assessed alternative crossing options to reduce the extent of culverting and improve ecological connectivity through the gully. These options included a reduced culvert with retaining walls (Option 1), an arch culvert (Option 2), and a bridge crossing (Option 3). While each option reduced direct impacts within the gully, all options required trade-offs elsewhere in the Project.

82 Options 1 and 2 required lowering of the road profile to shorten the culvert length. This resulted in approximately 1.5 million m³ of additional spoil, increased retaining wall construction and a substantially larger earthworks footprint. Both options were assessed as increasing project cost and extending the construction programme by approximately 12 months relative to the consent design.

83 Option 3 replaced the embankment crossing with a bridge. While this option provided the greatest reduction in direct effects within the gully, it introduced a major structure within a critical earthworks corridor, required a temporary haul road through the ONL, reduced earthworks productivity and increased construction complexity. This option is shown in Figure 4 below.

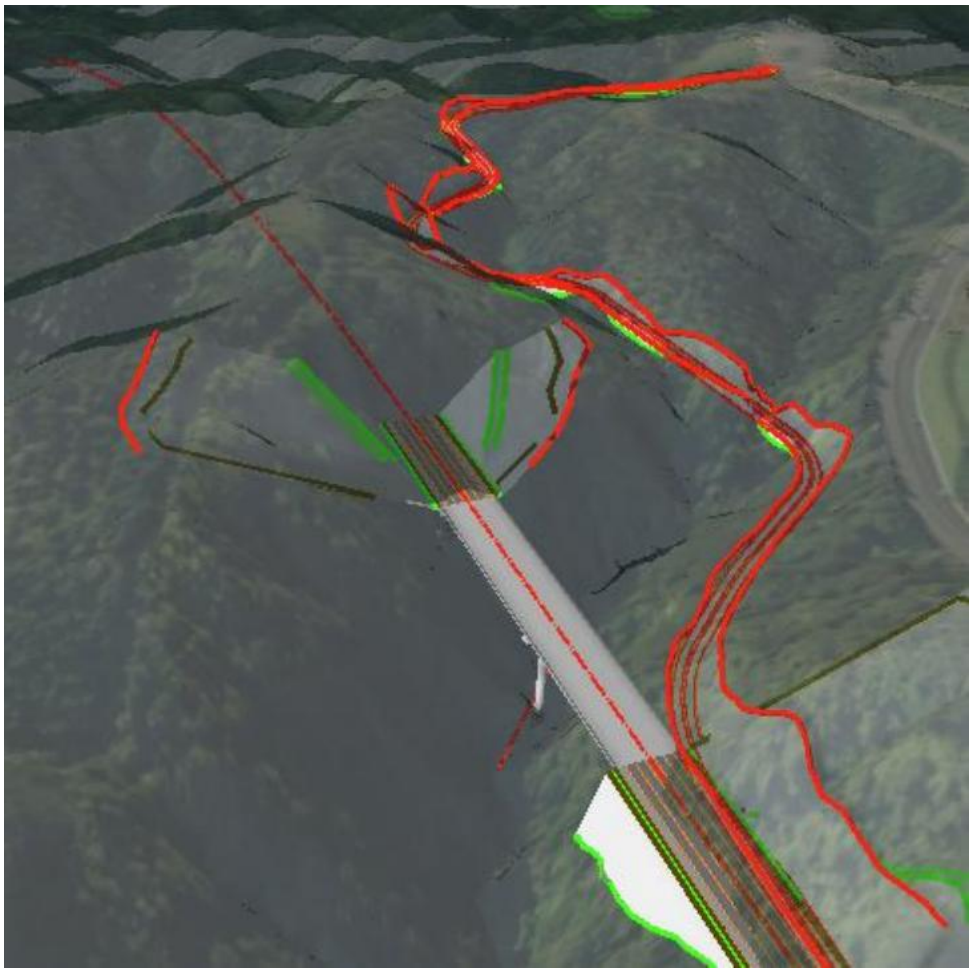

Figure 4: Bridge alternative and associated haul road at CH20000

84 My assessment is that these additional components would extend the overall construction programme for the Project by approximately 12 months and would increase project costs by approximately $135-150 million relative to the Indicative Alignment.

85 In my opinion, consideration of alternative designs for this area demonstrates that reducing effects at the gully crossing would likely result in consequential increases in earthworks, spoil generation, temporary works, construction complexity, programme duration and cost elsewhere within the Project.

Gully at CH18000 (Area M)

86 In order to bridge the embankment at CH18000 of the Indicative Alignment, a 5-span bridge approximately 220m in length would be required. The embankment is 40m high, so a substantial structure is required. The fill that would otherwise be placed in this embankment would need to be placed in spoil sites somewhere else in the designation or more remote. The cost of such a structure would be around $90-100M. Access roads to construct concrete piers would be required and in order to maintain the earthworks mass haul a temporary bridge would be required so the impact on the existing frog habitat would be significant.

Gully at CH20300 (Area C)

87 In order to bridge the embankment at CH20300 of the Indicative Alignment, a 3-span bridge approximately 60m long would be required. This bridge would cost around $20-25M. This gully is at the top of the catchment and is a complicated intersection of multiple ridges. The majority of the upstream section of the ephemeral stream would need to be earthworked and therefore would be fully disturbed. The Indicative Design does not have a culvert at this location so it unlikely that the existing frog habitat would be maintained irrespective of the bridge construction.

Implications of construction-related delays

88 The comments from Te Parawhau (and Patuharakeke) request some restrictions on working hours, and third party approvals of management plans.

89 From a construction and delivery perspective, I do not consider these additional restrictions as being appropriate as they will risk unduly restricting (or completely stalling) the construction programme. At a general level, any further restrictions placed on timely and efficient construction reduces productivity, increases construction impacts and increases the cost of delivery unnecessarily. In relation to the specific examples I note:

89.1 The works are generally offline and in areas located well away from large populations and therefore working hour restrictions, in my opinion, are not necessary; and

89.2 Management plan timeframes proposed are standard practise and efficient delivery is most important at the outset of the project to ensure momentum is created.

Comments on geotechnical hazards

90 I have considered the geotechnical matters raised by Te Parawhau Inc. These matters do not identify any new geotechnical hazard, fatal flaw or previously unidentified risk. The landslides, slumps, earthflows, seepage, groundwater conditions and natural instability referred to are known conditions that informed route selection, development of the Proposed Designation and the Indicative Alignment.

91 The Project has undertaken an extensive programme of geotechnical investigation and assessment, reflecting the known instability risks along the corridor. This work has identified the principal geotechnical hazards and constraints and enabled them to be taken into account in route selection, designation development and the Indicative Alignment.

92 Further geotechnical investigation and refinement will appropriately occur through detailed design. In my view, that does not indicate an insufficient understanding of the ground conditions at this stage. In my opinion, the investigations undertaken to date are sufficient to support the current phase of the Project and that deferred investigations will not materially alter the understanding of corridor-wide conditions.

93 The Proposed Designation has been developed having regard to the identified geotechnical hazards, anticipated mitigation requirements and the need for future design refinement. I understand that no locations have been identified where permanent geotechnical mitigation outside the Proposed Designation is anticipated, or where additional designation width is required to manage identified geotechnical risks.

94 Accordingly, the matters raised by Te Parawhau Inc do not alter my conclusions regarding the suitability of the Indicative Alignment or the adequacy of the Proposed Designation to accommodate the further development of the Project.

Request for restoration and landscaping on steep slopes

95 Patuharakeke has requested that all cut slopes be restored and landscaped. The following section outlines why we have steeper cut slopes that require natural regeneration, rather than topsoiling and planting.

96 The principal cut slopes occur in two different geological environments. At the Brynderwyn Summit, the Waipapa Group materials generally comprise residual soils and weathered greywacke transitioning to rock at depth. In the Volcanic Saddle area, the dacite materials typically comprise sandy silts that are

highly erodible when exposed. The fill slopes will generally comprise rock fill, without landscaping fill, at inclinations ranging from approximately 1V:1H to 1V:2H.

97 These batter geometries have been adopted to minimise the Project footprint and associated ecological impact, and also to minimise earthworks quantities while maintaining acceptable geotechnical performance. The resulting batters will, however, be steep and high and will be situated in a high-rainfall environment.

98 For these steep batter inclinations and local climatic conditions, widespread long-term retention of imported topsoil, growing media or engineered planting substrates on these batters would not be practicable. Erosion, rilling and downslope migration of placed material would be expected before a stable, densely vegetated surface could become established. Hydroseeding, hydraulic mulch and similar treatments may be used to assist temporary erosion control and initiate natural regeneration, but they should not be relied on to establish or maintain dense vegetation cover over those batters in the long term.

99 Vegetation is expected to establish progressively through natural weathering, colonisation and ecological succession. Consequently, exposed rock, clay and weathered soil faces are likely to remain visible for an extended period following construction, with fuller vegetation cover developing over decades rather than immediately after construction.

100 In my opinion, I think that the cut slopes are appropriate given the topography and geotechnical conditions.

CONCLUSIONS

101 In my opinion, the Proposed Designation and Indicative Alignment represent a practical, constructable and efficient solution to delivering a state highway through the Brynderwyn Hills. The design has been developed having regard to the significant topographical, geotechnical, cultural, environmental and construction constraints present across the Project corridor. I consider the Project appropriately balances these competing factors and represents a reasonable and proportionate response to the relevant constraints.

102 The Project has been developed through an iterative process that considered alternative corridors, alignments, structures and construction methodologies. Construction risk, programme, spoil management, earthworks efficiency and cost were important considerations in that process. The Proposed Designation and Indicative Alignment were assessed as providing the most appropriate overall outcome when these factors were considered collectively.

103 Efficient management of earthworks, spoil and material haulage has been a fundamental driver of the Project's development. The Indicative Alignment illustrates an option that enables the beneficial reuse of site-won material, minimises haul distances, reduces reliance on off-site spoil disposal and supports an efficient construction methodology. The constructability assessment identifies the importance of maintaining internal haul connectivity and delivering key enabling works to support this approach.

104 While a number of alternative design responses have been considered for the Project, including additional structures, alternative spoil management approaches and tunnel options, these alternatives generally result in increased construction complexity, greater temporary works requirements, longer construction durations, higher costs and increased delivery risk. In my opinion, they do not provide a superior overall project outcome.

105 Accordingly, I consider the embankment crossing at Piroa Stream, the decision not to adopt a tunnel through the Brynderwyn Hills, and the consent design at Gully Ch20000 represent appropriate responses to the Project's constraints and provide the best overall balance between environmental, cultural, engineering, constructability, programme and cost considerations.

106 For these reasons, I consider the Proposed Designation and Indicative Alignment to be an appropriate and deliverable solution for the Project.

Tom Ireland
28 October 2026