

**IN THE MATTER OF**

The Resource Management Act 1991

**AND**

**IN THE MATTER OF**

applications for resource consents in relation to  
Te Ahu a Turanga; Manawatū Tararua Highway  
Project

**BY**

**NEW ZEALAND TRANSPORT AGENCY**  
Applicant

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**TE AHU A TURANGA: TECHNICAL ASSESSMENT I**

**NATURAL CHARACTER**

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## INTRODUCTION

1. My name is **Boyden Henry Evans**.

### Qualifications and experience

2. I am a New Zealand Institute of Landscape Architects' ("**NZILA**") Registered Landscape Architect and a Partner at Boffa Miskell Limited ("**Boffa Miskell**"), a New Zealand-owned environmental planning and design consultancy.
3. I have a Bachelor of Science in botany and pedology from Victoria University of Wellington and a post-graduate Diploma in Landscape Architecture from Lincoln University. I am a Fellow of the NZILA.
4. I have been a landscape consultant with Boffa Miskell since 1986 and have worked on a range of projects for corporate and private clients and for territorial authorities and government agencies in various parts of New Zealand. This work includes district and regional landscape assessments and resource studies, and landscape and visual effects assessments for many types of development projects, including assessments of natural character. These include infrastructure projects, such as new roads, wind farms, quarries, transmission lines, and rural lifestyle and residential subdivisions. I have also been involved in many site rehabilitation and revegetation projects and have prepared master plans and management plans for reserves and other areas.
5. Key projects and processes in which I have been involved in over the past 10 years include:
  - (a) Mackays to Peka Peka Expressway;
  - (b) Wellington International Airport Runway Extension;
  - (c) Wellington City Landscape Evaluation Assessment (as part of the district plan process);
  - (d) Hutt City Landscape Evaluation Assessment (as part of the district plan process);
  - (e) Wairarapa Landscape Evaluation Assessment (as part of the district plan process);
  - (f) Wellington and Hutt Coastal Natural Character Assessment (as part of the district plan process);

- (g) Porirua Coastal Natural Character Assessment (as part of the district plan process);
  - (h) Te Awa Kairangi/Hutt River Environmental Strategy Action Plan (as part of the Greater Wellington Regional Council Te Awa Kairangi/Hutt River Floodplain Management Plan);
  - (i) Otaika Quarry Overburden Disposal Area and Rehabilitation, Whangarei (as part of the AEE for the resource consent application);  
and
  - (j) Belmont Quarry Overburden Disposal Area and Rehabilitation, Hutt City (as part of the AEE for the resource consent application).
6. These projects have involved a combination of landscape and visual effects assessments, identification of outstanding natural features and landscapes, assessment of natural character and subsequently preparing and presenting expert witness evidence.
7. I also prepared landscape and visual effects assessments and evidence for the Te Āpiti Wind Farm as part of the consenting process in 2003 and stage 3 of the Tararua Wind Farm as part of the consenting process in 2007. Through this work, and my earlier work on Te Ahu a Turanga; Manawatū Tararua Highway (the "**Project**") as detailed below, I am familiar with the Manawatū Tararua area generally, and the Project area in particular.

#### **Code of Conduct**

8. I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2014. This assessment has been prepared in compliance with that Code, as if it were evidence being given in Environment Court proceedings. Unless I state otherwise, this assessment 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.

#### **Background to this assessment**

9. An assessment of the natural character of the waterways within the Project area was carried out as part of the Assessment of Effects on the Environment ("**AEE**") in support of the Notices of Requirement ("**NoRs**") for

the Project<sup>1</sup> ("**NoRs Assessment**"). The NoRs Assessment formed an appendix (Appendix 4A) to Technical Assessment #4: Landscape, Natural Character and Visual Effects, which I authored and which in turn formed part of the AEE in support of the NoRs. I also presented evidence on landscape, natural character and visual effects at the hearing on the NoRs in April 2019.

10. Following the hearing on the NoRs, the Transport Agency appointed an Alliance to deliver the design, resource consents and construction of the Project.
11. The Te Ahu a Turanga Alliance ("**Alliance**") developed an alignment for the Project, which has introduced changes from the alignment considered as part of the NoRs for designation ("the **Northern Alignment**"). The Northern Alignment will have implications in relation to some of the waterbodies that will be potentially affected by the Project. In developing the Northern Alignment, the Alliance team has carried out detailed site investigations which have fed into this natural character assessment.
12. In October 2019, I was asked by the Alliance to work with members of the Alliance team to prepare this natural character assessment in support of the AEE for the regional consent applications for the Project. This was because of my involvement in the NoRs assessment and familiarity with the topic area and subject matter.

### **Purpose and scope of assessment**

13. This natural character assessment was carried out by a team of technical specialists from the Alliance (which was also the approach used for the NoRs Assessment). The team that carried out this assessment comprises:
  - (a) Dr Jack McConchie (hydrology and geomorphology);
  - (b) Alex James & Keith Hamill (water quality);
  - (c) Justine Quinn (freshwater ecology);
  - (d) Josh Markham (terrestrial ecology);
  - (e) David Hughes (stormwater); and
  - (f) Myself (experiential).

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<sup>1</sup> Appendix 4A, Technical Assessment 4 of the NoR documentation suite, lodged 2 November 2018 and available at <https://www.nzta.govt.nz/projects/sh3-manawatu/rma-consenting/>

14. The approach and methodology that was used for the NoRs Assessment has also been used for this assessment but with some amendments, as discussed in paragraphs 57-58. The following sections explain the assessment approach and methodology used and the findings and conclusions deriving from that assessment.

### **Assumptions and exclusions in this assessment**

15. This assessment did not explicitly consider proposed mitigation measures; therefore, the post-development ratings are all "pre-mitigation". However, as noted later in this report, the mitigation measures recommended by the various experts who contributed to this natural character assessment will all help to mitigate adverse effects on natural character.
16. This assessment considers the permanent changes to the natural character of the relevant waterbodies that would occur as a result of the Project. The attribute ratings ascribed by the experts, together with the overall ratings for each of the catchments and crossing points assessed did not consider construction effects on natural character. However, based on my previous experience in carrying out natural character assessments and the findings regarding the permanent effects on natural character of this Project, I provide a general summary of anticipated construction effects on natural character at paragraphs 226-232.

### **EXECUTIVE SUMMARY**

17. Natural character of rivers, streams, wetlands and their margins is about condition. It concerns the level of naturalness and the degree of modification. An assessment of natural character of the rivers, streams and wetlands and their margins traversed by the Project was carried out by a team of experts to inform the AEE that was prepared in support of the NoRs (referred to in this assessment as the NoRs Assessment). As part of preparing the application for regional consents, another natural character assessment of the waterbodies has been carried out in relation to Project as modified to provide for the Northern Alignment, and this assessment is described in this report.
18. The team who carried out this natural character assessment is a mostly new team of experts (as compared to the team who carried out the NoRs Assessment). As part of preparing this assessment, the new team reviewed

all aspects of the original NoRs Assessment<sup>2</sup> in relation to natural character (i.e. methodology, assessment matrix and criteria, rating scale, etc) and made various refinements and modifications. However, in general terms, the methodology, assessment matrix and criteria, description of attributes and rating scale applied by the new team was the same as in the NoRs Assessment.

19. The new team also confirmed that in terms of “areas” of natural character, as set out in Objective 6-2 of the One Plan, a catchment-scale approach was appropriate when assessing the overall natural character of streams and wetlands, but that in determining this, an assessment of natural character at selected crossing points would also be carried out in order to inform the overall catchment rating of natural character.
20. The team also decided, however, that a whole of *river* catchment-scale assessment of the Manawatū River was inappropriate. Instead, the team decided that the Manawatū River Bridge crossing point should be considered an "area" of natural character in its own right. This was because of its size, scale, prominence, visibility, accessibility and location at the mouth of the Gorge. Therefore, a separate natural character assessment of the Manawatū River Bridge crossing point was carried out without any broader Manawatū River catchment assessment. This is consistent with the NoRs Assessment, where the Manawatū River crossing point was assessed but a broader "catchment" scale of assessment was not undertaken for the River or a certain reach of it.
21. The team decided that the assessment process would be run as a series of workshops enabling robust discussion of the methodology, description of attributes and ratings, both in terms of individual attributes and the overall ratings for both catchments and crossing points.
22. The Project traverses nine stream catchments (which all ultimately feed into the Manawatū River) and during the first two workshops each team member considered the various attribute(s) of these catchments (and selected crossing points) relevant to their own area of expertise and assigned ratings to those attributes. Based on these individual ratings, the team then agreed an overall rating of the existing natural character of these catchments, and the selected crossing points.

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<sup>2</sup> Including Technical Report #4 in support of the AEE for the NoRs; and my evidence presented to the Independent Hearings Panel: Statement of evidence of Boyden Evans, dated 8 March 2019.

23. Following this, the team assessed the post-development natural character. Again, each team member considered the various attribute(s) relevant to their own area of expertise and assigned ratings to those attributes in the different catchments and selected crossing points. In the third and final team workshop, the team discussed and agreed the overall post-development ratings of the catchments and selected crossing points. In reaching these overall post-development ratings the team did not consider any mitigation (i.e. the overall ratings were agreed to be pre-mitigation).
24. The outcomes of this natural character assessment of the waterways and their margins potentially affected by the Project are summarised below:
- (a) There are no areas of existing outstanding natural character within the areas potentially affected by the Project.
  - (b) Of the nine catchments traversed by the Project, only one (catchment 9) has an overall high existing natural character rating.
  - (c) The overall existing natural character ratings for the other eight catchments range from low to moderate high.
  - (d) Post-development, there is a reduced level of overall natural character in catchments 2, 3, 4, 5 and 7; in catchments 1, 6, 8 and 9 there is no change.
  - (e) In terms of the crossing points that were assessed,<sup>3</sup> there will be a reduced level of natural character at all of these locations post-development. In three of the crossing points, there will be significant diminishment in natural character from an existing level of high natural character: crossing point 5A will reduce from high to low; crossing point 7A will reduce from high to low; and the Raupō Wetland crossing point will reduce from high to moderate.
  - (f) While the level of natural character will be significantly diminished post-development at these three crossing points, when these are considered in terms of their respective catchments, the reduction in natural character is attenuated, as much of the catchment above and below the crossing point will be unaffected by the Project.

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<sup>3</sup> Eleven crossing points in seven of the catchments (2, 3, 4, 5, 6, 7 and 9) were assessed separately; no crossing points were assessed in catchments 1 or 8, where the existing natural character is rated as low.



- (g) The proposed Manawatū River Bridge crossing point was assessed separately with the existing level of natural character rated as moderate high and the post-development level rated as moderate.
25. Objective 6-2(b) in the One Plan focuses on potential adverse effects to natural character in those areas with outstanding natural character and high natural character.
26. There are no areas with outstanding natural character, therefore One Plan Objective 6-2(b)(i) does not apply. One catchment was assessed as having high existing natural character, but the effects of the Project in this catchment were assessed as not significantly diminishing this area's natural character. None of the other catchments affected by the Project were considered to have existing high levels of natural character. It is therefore considered that the Project does not offend Objective 6-2(b)(ii). **Table I.1** below summarises the assessed levels of natural character for each of the catchments, both existing and post-development.

**Table I.1: Natural Character Catchment Assessment Summary**

| Catchment | Existing Natural Character | Post-Development Natural Character |
|-----------|----------------------------|------------------------------------|
| 1         | Low                        | Low                                |
| 2         | Moderate                   | Moderate Low                       |
| 3         | Moderate High              | Moderate                           |
| 4         | Moderate Low               | Low                                |
| 5         | Moderate High              | Moderate Low                       |
| 6         | Moderate High              | Moderate High                      |
| 7         | Moderate High              | Moderate                           |
| 8         | Low                        | Low                                |
| 9         | High                       | High                               |

## PROJECT DESCRIPTION

27. The Project comprises the construction, operation and maintenance of approximately 11.5km of State highway connecting Ashhurst and Woodville via a route over the Ruahine Ranges. The purpose of the Project is to replace the indefinitely closed existing State Highway 3 ("**SH3**") through the Manawatū Gorge.
28. The Project comprises a median separated carriageway that includes two lanes in each direction over the majority of the route and will connect with

State Highway 57 ("**SH57**") east of Ashhurst and SH3 west of Woodville (via proposed roundabouts). A shared use path for cyclists and pedestrian users is proposed as well as a number of new bridge structures including a bridge crossing over the Manawatū River.

29. The design and detail of each of the elements of the Project are described in:
  - (a) Section 3 of the Assessment of Environmental Effects (contained in **Volume I**);
  - (b) the Design and Construction Report ("**DCR**") (contained in **Volume II**); and
  - (c) the Drawing Set (contained in **Volume III**).
30. The works that are the subject of this assessment are those that relate to the natural character of the rivers, streams and wetlands and their margins.

## **STATUTORY FRAMEWORK**

### **Resource Management Act 1991**

31. Natural character in a Resource Management Act 1991 ("**RMA**") (section 6(a)) context relates only to waterbodies and their margins, rather than the landscape overall (which is addressed through section 6(b) of the RMA). The Project crosses the Manawatū River and several stream catchments, and it is the natural character of these waterbodies that is relevant to this assessment.

### **One Plan**

32. Provisions in the Regional Policy Statement ("**RPS**") section of the Horizons' One Plan provide guidance for natural character assessment. However, "natural character" is not defined in the One Plan and a regional natural character assessment has not been carried out by Horizons as part of preparing the One Plan or subsequent to the One Plan being adopted.
33. The relevant objectives and policies from the One Plan are set out in **Volume 1, Appendix C (Relevant Statutory Provisions)**. The Introduction to the natural features, landscapes and natural character chapter of the RPS (Chapter 6.1.3) sets out a range of factors that are associated with the natural character of the coastal environment, rivers, lakes, wetlands and their margins, noting that:

*“It is important that preservation of the natural character of rivers, lakes and their margins, **where this is reasonable**, is considered when making decisions on relevant activities.” (my emphasis)*

34. Objective 6-2(b) addresses adverse effects on natural character as follows:

*“(b) Adverse effects, including cumulative adverse effects, on the natural character of the coastal environment, wetlands, rivers and lakes and their margins, are:*

*(i) avoided in areas with outstanding natural character, and*

*(ii) avoided where they would significantly diminish the attributes and qualities of areas that have high natural character, and*

*(iii) avoided, remedied or mitigated in other areas.”*

35. Objective 6-3(c) further provides:

*“(c) Promote the rehabilitation or restoration of the natural character of the coastal environment, wetlands, rivers and lakes and their margins.”*

36. Policy 6-8(a) is for the natural character of the coastal environment, wetlands rivers and lakes and their margins to be preserved and for these areas to be protected from inappropriate subdivision, use and development. Policy 6-8(b) is for the natural character of these areas to be restored and rehabilitated where this is appropriate and practicable.

37. In considering natural character, Policy 6-8(c) notes that the natural character of these areas may include such attributes and characteristics as:

*“(i) Natural elements, processes and patterns,*

*(ii) Biophysical, ecological, geological, geomorphological and morphological aspects,*

*(iii) Natural landforms such as headlands, peninsulas, cliffs, dunes, wetlands, reefs, freshwater springs and surf breaks,*

*(iv) The natural movement of water and sediment including hydrological and fluvial processes,*

- (v) *The natural darkness of the night sky,*
- (vi) *Places or areas that are wild and scenic,*
- (vii) *A range of natural character from pristine to modified,  
and*
- (viii) *Experiential attributes, including the sounds and smell of  
the sea; and their content or setting.”*

38. These relevant provisions have been considered in developing the framework for this natural character assessment and undertaking that assessment.

### **NATURAL CHARACTER**

39. Under section 6(a) of the RMA, natural character is concerned with the natural character of the coastal environment, wetlands, lakes and rivers and their margins. In the context of this Project, it is the natural character of rivers (including streams and wetlands) and their margins which is relevant.

40. Natural character is essentially concerned with the condition of waterbodies and their margins and how they are experienced. It is a term used to describe the "naturalness" of river/stream environments. The degree or level of natural character within an environment depends on:

- (a) the extent to which natural elements, patterns and processes occur;  
and
- (b) the nature and extent of modifications to the ecosystems and  
landscape/riverscape.

### **Natural elements, patterns and processes**

41. Natural elements incorporate all key river elements, such as the water, bed and banks, as well as particular attributes occurring within the river environment, such as geological formations, indigenous vegetation and fauna.

42. Natural patterns take the channel and the riparian edge into account, and those patterns created by humans on adjacent land, such as earthworks, shelterbelts, fences, etc.

43. Natural processes include river/lake dynamics, flows and currents, erosion, floods, and regeneration processes of riparian vegetation and ecological health.

### **Modifications**

44. In respect of modifications, the following factors are relevant:
  - (a) the highest degree of natural character (greatest naturalness) occurs where there is least modification; and
  - (b) the effect of different types of modification upon the natural character of an area varies with the context and may be perceived differently by different parts of the community.
45. The attributes and qualities that need to be considered in order to assess the naturalness of rivers and other waterbodies relate to the degree of intactness of the natural elements, patterns and processes, including the extent of any physical modifications to landforms or presence of built structures. It also includes the perceptual or experiential component of naturalness.

### **Components of the natural character assessment**

46. The natural character assessment of rivers, streams and their margins are comprised of three spatial components: context, margin, and active bed. These are illustrated in **Figure I.1** below.

#### *Context*

47. Context refers to the wider landscape context of the catchment adjacent to the river/stream and considers the land use, landform and vegetation cover that contributes to the overall character of the river/stream and its margins. The quality of the wider area surrounding a river/stream corridor contributes to the overall level of natural character of the river/stream and its margins.

#### *Margin*

48. Margin refers to the area between the active bed and the wider landscape context. The margin is based on physiographic features and so varies in its actual width along the length of a waterbody (rather than remaining a set or consistent width). River processes, patterns and influences will be evident in the margin, such as occasional flooding, former banks and channel patterns, and river gorge wind flow. From locations within a river/stream margin, the active bed should be a dominant feature. The margin is typically narrow and

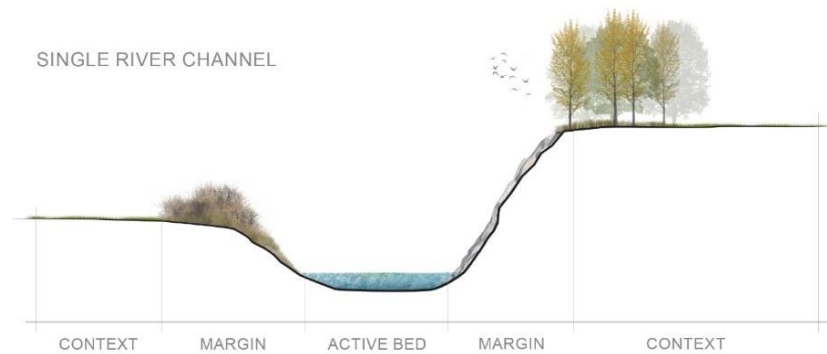
may incorporate terraces, banks, stop banks, abandoned river bed, small floodplains, river and stream estuaries. Generally, topographic features define the extent of the margin such as the top of banks and the base of terraces. Vegetation boundaries can also define the margin extent such as where shrubland or forest adjoins grazed pasture.

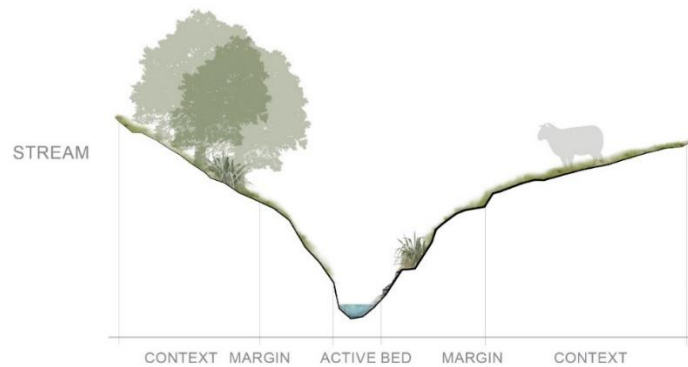
49. Infrastructure such as roads, tracks fences and structures are often situated on the margins.

*Active bed*

50. For single stream incised rivers, the active bed comprises the actual river channel. For wider river beds and those with a braided character, the active river bed includes wetted areas/channels and may include dry margins, islands, banks, abandoned channels and bars of a braid plain that form part of the river's natural migration across the river bed, as well as flood channels and side channels.

**Figure I.1: River Components**





## METHODOLOGY

### Background

51. As noted above, the Transport Agency has separately given NoRs for three designations for the Project, and these NoRs are currently under appeal. I understand that the Transport Agency has asked the Environment Court, as part of those appeals, to modify the NoRs to provide for the Northern Alignment on which the Alliance's concept design is based.
52. As noted in my Introduction, I am the author of the NoRs Assessment of landscape, natural character and visual effects. I am also familiar with the Transport Agency's proposed conditions for the designations ("**Designation Conditions**"), which include the following conditions relevant to natural character:
  - (a) Condition 3: Ecological Management Plan Certification Process;
  - (b) Condition 9: Outline Plans (Construction Works);

- (c) Condition 16: Cultural and Environmental Design Framework;
  - (d) Condition 17: Landscape Management Plan;
  - (e) Condition 18: Planting Management Plan; and
  - (f) Condition 24: Ecological Management Plan.
53. When I come to consider mitigation for the Project, I have considered how the mitigation recommended by the various experts who contributed to the natural character assessment builds on the mitigation proposed to date and confirmed through the Designation Conditions. I explain this further below at paragraph 242.

### **Assessment approach and scope**

54. Assessing the level of natural character involves an understanding of the many systems and attributes that contribute to a waterbody, including abiotic, biotic and experiential factors. Consequently, this requires input from a range of technical disciplines such as river hydrology and morphology, aquatic and terrestrial ecology, water quality, and experiential. This natural character assessment was undertaken by a team of experienced practitioners working within the Alliance and myself as outlined above at paragraph 13.
55. The methodology used in this natural character assessment is based on current best practice which has its foundations in the widely accepted methodology for natural character assessment in coastal environments. It is based on several previous South Island natural character river assessments, which were carried out to assess the existing natural character of six rivers/river reaches.
56. The assessment involved the following broad steps:
- (a) reviewing and confirming as a team the methodology and assessment matrix criteria used for the NoRs Assessment – in this regard, the same methodology and assessment matrix criteria was applied, with some minor amendments as detailed in paragraphs 57-58);
  - (b) reviewing and confirming the waterbodies crossed by the Project and their contributing catchments;



- (c) assessing the current condition of natural character associated with these waterbodies, including identifying any areas of high or outstanding natural character; and
  - (d) assessing the anticipated change to natural character resulting from the Project and the significance of that change (i.e. the scale of effect on existing natural character).
57. As noted above, the methodology for this assessment was adapted from that used for the NoRs Assessment. Given that the Project has moved from a designation corridor to a specific highway design (which was not the case with the NoRs), and that there is an almost entirely new team involved in carrying out this assessment, the methodology from the NoRs Assessment was reviewed by the new team and some refinements and modifications were made throughout the process as follows:
- (a) Some of the descriptors in the assessment criteria matrix were amended to provide greater clarity and precision to some of the criteria and terms used (the updated Natural Character Assessment Matrix is attached as **Appendix I.2**).
  - (b) The factors that each expert considered when determining the change to natural character rating for each attribute as a result of the Project (i.e. post-development) were described. This is explained further below at paragraphs 111-123.
  - (c) Context (as shown above in **Figure I.1**) is relevant when assessing the experiential attribute of natural character. However, it was considered that "context" is a much broader concept that contributes to the overall setting of the rivers, streams and wetlands. Given the focus of a natural character assessment is to understand the condition of rivers, wetlands and their margins, the extent to which "context" influences overall natural character ratings diminishes as one moves beyond the river/stream corridor. Accordingly, experiential ratings have only considered the natural attributes and qualities of the active bed and margins of the waterbodies, as well as the immediate area beyond the margins (refer **Table I.2**).
  - (d) The rating scale in the assessment criteria matrix was calibrated by selecting examples of waterbodies within the region to provide

benchmarking and guidance to the team when applying overall natural character ratings.

- (e) Tables with bullet point descriptors for the existing and post-development condition of both the catchment and selected crossing points were prepared (refer **Appendices I.3** and **I.4**).

58. In addition, the team discussed and confirmed the following:

- (a) That the overall natural character of the waterbodies in this Project should be considered at a catchment scale, rather than a reach or site-specific scale.
- (b) That a seven-point rating scale (as used in the NoRs Assessment) (i.e. very high / high / moderate-high / moderate / moderate-low / low / very low) should be used as this provides the ability to recognise small incremental changes to ratings where a full shift from high to moderate for example would be disproportionate to the actual or potential effects being considered in the pre- and post-development scenarios.<sup>4</sup>
- (c) Given the focus on waterbodies with outstanding or high natural character, that a reduction in natural character from outstanding to very high; very high to high; or high to moderate should be considered a significant change.
- (d) That, in terms of agreeing an overall rating for natural character (either pre- or post-development):
  - (i) no weightings would be applied to the attributes;
  - (ii) the median attribute ratings would not determine the overall rating; and
  - (iii) instead, the team would 'workshop' to determine the overall ratings for the existing and post-development natural character of an area. In this respect, the individual attribute ratings would provide the team with a framework for the team to review and consider the ratings together and then together to assign an overall natural character rating.

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<sup>4</sup> This is discussed further at paragraph 86.

59. Three workshops were held with the natural character assessment team in order to assess the natural character effects of the Project.
60. First, on 6 November 2019, a workshop was held to review and confirm the assessment methodology and matrix, as described further below.
61. Second, two further assessment workshops were held on 20 November 2019 and 16 January 2020 for experts to present their findings in respect of particular attributes and the team to agree an overall rating for natural character for each crossing point and catchment.
62. The assessment was an iterative process with experts completing their assessments for each of 'their' particular attributes prior to the workshops and at the workshops sharing those ratings with the other experts so that the team could review the assessment tables and assign overall natural character ratings for each of the catchments and selected crossing points in both the existing and post-development scenarios.
63. Further details on the assessment process and methodology are set out below.

#### **Assessment framework and matrix**

- 64.

65. Table **I.2** below sets out the assessment framework and the natural character attributes and qualities assessed. The assessment framework recognises that each of the three components of the river/stream (active bed, margin and all river corridor) have different attributes and qualities to be considered. The attributes that comprise natural character of a river/stream can also be clustered into three attribute groups: abiotic, biotic and experiential. Experiential aspects apply to the active bed, margin and the river/stream corridor (i.e. the immediate context).
66. The attributes and qualities assessed are set out below. These include, but are not limited to, the attributes and characteristics, relevant to freshwater environments, as listed in Horizons' One Plan Policy 6-8(c).

**Table I.2: Natural Character Assessment Framework**

| Attribute Group                                                                  | Natural Character Attributes                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Active Bed (includes streams and wetlands)</b>                                |                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Abiotic</b>                                                                   | <p><b>Flow Regime</b> – how natural/modified are the flows.</p> <p><b>Active bed/morphology</b>, including, sedimentation and presence or absence of human modifications within the active bed (e.g. weir, dam, etc)</p> <p><b>Water Quality</b> –level of water clarity, sedimentation, nutrient and bacterial levels</p>                                               |
| <b>Biotic</b>                                                                    | <p><b>Indigenous taxa assemblages</b> – presence of species forming aquatic communities and the level in representing unmodified habitat potentials</p> <p><b>Ecosystem functioning</b> – intactness of ecosystems</p> <p>Presence / absence of <b>exotic aquatic flora and fauna</b> (i.e. presence of exotic flora/fauna potentially diminishes natural character)</p> |
| <b>Margin (includes streams and wetlands)</b>                                    |                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Abiotic</b>                                                                   | Presence/absence of <b>structures and human modifications</b> on the banks/edge of a waterway                                                                                                                                                                                                                                                                            |
| <b>Biotic</b>                                                                    | <b>Terrestrial ecology</b> – presence of expected species, communities and habitats                                                                                                                                                                                                                                                                                      |
| <b>River/Stream Corridor (includes active bed, margin and immediate context)</b> |                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Experiential</b>                                                              | Human perception of how natural a place appears, underpinned by the biotic and abiotic attributes (above). It includes the remote/untamed experience a place may provide and experiential attributes such as sounds, smells and transient values.                                                                                                                        |

67. From this assessment framework, an assessment matrix was developed, which sets out indicators of the quality of particular attributes across the rating scale from very high to very low (see **Appendix I.2**).
68. The initial development of the matrix was grounded in natural character assessments carried out by Boffa Miskell for coastal environments and rivers for various regional and district councils around New Zealand.
69. This matrix was used by the experts in their assessments. As described above, a similar assessment matrix was used by the team who carried out the NoRs Assessment, but some changes were made to the matrix at the start of the process (refer paragraphs 57-58).
70. The assessment matrix ensured that a consistent rating scale was applied for each waterway and attribute by the assessment team while the calibration process (described further below) was also applied regularly to ensure consistency was achieved.

## **Assessment of the wider context**

71. For the NoRs Assessment, given that a regional natural character assessment had not been carried out by Horizons in relation to the provisions set out in the One Plan, the team decided to carry out a broadscale assessment to provide an understanding of the baseline level of natural character beyond the designation corridor. This assessment considered an area encompassing reaches of both the Manawatū and Pohangina Rivers in the general vicinity of the proposed designation corridor (**Appendix I.1**).
72. Within this area, there is a wide variety of river environments with quite contrasting attributes and qualities within a relatively small geographic area. These environments range from the very distinctive Manawatū River Gorge to the picturesque Pohangina River valley, to the highly modified reaches of the Manawatū River downstream of the SH3 (Ashhurst) bridge. This work provided a useful context for the NoRs Assessment and it is also a suitable starting point for this natural character assessment.

## **Catchment scale of assessment**

73. As noted above, the team agreed that understanding the overall level of natural character of each river and stream at a catchment scale was appropriate in assessing the natural character of the "areas" potentially affected by the Project. The reasons for this decision are further explained below.
74. Rivers and streams reflect the dynamic interaction and integration of both physical and biological systems. Consequently, they need to be considered as interconnected environments and ecosystems. Catchments are therefore an appropriate unit to consider natural character.
75. A catchment scale assessment is consistent with the direction in section 6(a) of the RMA to preserve the natural character of "rivers and their margins" and the focus in Policy 6-8 on "areas" of natural character (rather than, for example, "sites" or "locations" of natural character).
76. A catchment is an area of land over which rainfall is collected by the land and directed towards a particular river or stream. Excess rainfall (i.e. that not lost to evapotranspiration), can either flow above the ground as surface runoff or percolate through the soil as groundwater feeding rivers, lakes and wetlands. In New Zealand, the catchment has become the basic management unit

when considering a range of processes, impacts and responses in the landscape.

77. Historically, catchment management policy was developed to mitigate the effects of flooding and erosion, with water allocation and water quality becoming a focus more recently. Catchment management was a key focus of the Soil Conservation and Rivers Control Act 1941 which also saw the establishment of Catchment Boards throughout New Zealand. Integrated Catchment Management Plans are now a key tool for identifying, managing and mitigating a wide range of environmental effects throughout New Zealand.
78. This assessment uses the term "catchment" as a spatial unit to identify and group the various streams and tributaries potentially impacted by the Project. As this is a natural character assessment, it is the **waterbodies and their margins** which are being assessed, rather than the total land area within each catchment. Therefore, the word catchment in this assessment refers only to the streams and their margins which lie within the wider physical catchment.
79. In this assessment of natural character effects, the assessment team has placed emphasis on understanding the nature and condition of the various stream catchments with the potential to interact with the Project. The Project potentially affects nine catchments, which vary in size and scale (Refer to **Drawings 1 and 2 (TAT-3\_DG-E-4100/4101)** in **Appendix I.6**. The streams that drain into these catchments have variable attributes and characteristics, influenced largely by the type of land use and condition of the land through which they flow. Representative photographs of each catchment are also included in **Appendix I.5**. Each stream catchment is made up of several of its own sub-catchments or tributaries, which are named according to the identifier of their overall stream catchment number (e.g. the sub-catchments of catchment 7 are catchment 7A, 7B etc.)
80. Any potential effects on a river or stream need to be considered in broader terms than at a single point. This is because, while impacts may be site specific, the effects will be moderated and attenuated downstream. Furthermore, while adverse impacts may occur at one point on a stream, the potential effects are influenced by the stream conditions both upstream and downstream. Similarly, if a particular reach of a stream or river is considered

as having outstanding or high natural character, this does not mean that the entire stream/river is outstanding or high.

### **Crossing point assessment**

81. In addition to the catchment-based assessment, it was also important to understand the situation along the actual route. The team therefore assessed natural character at selected places where the Alignment crosses waterbodies (i.e. crossing points). This was considered important because it assisted in informing the level of effect at the catchment scale.
82. Crossing points occur where a stream/wetland (identified by the sub-catchment identifier) lies under the potential construction footprint. The potential construction footprint has been prepared by applying generalised construction buffers across the Project to estimate the quantum of effects. (particularly in regard to ecological effects). The crossing points are shown on **Drawings 3 to 8 (TAT-3-DG-E-4121 – 4126)** in **Appendix I.6** and are referred to by reference to the identifier of the tributary that they cross (e.g. the crossing point on sub-catchment 7A is referred to as crossing point 7A).
83. The Project crosses the Manawatū River just beyond the mouth of the Gorge and also crosses streams at various points along the proposed Alignment. In addition to the Alignment crossing points, there are also areas where culverts, spoil sites, and the shared use path cross particular waterbodies (these also form part of the 'crossing points' that were assessed by the team).
84. The team selected particular crossing points for detailed assessment, which had potential to have higher levels of natural character. In this regard, the team reviewed all of the places where the Project crosses a waterbody and selected those locations which have high measures of ecological health or where there were high attribute ratings for crossing place assessment. The results of the crossing point assessment are set out in **Appendix I.4**. These crossing point assessments were considered by the team in determining the overall level of natural character effects for each of the catchments.
85. The team also decided, however, that a whole of *river* catchment-scale assessment of the Manawatū River was inappropriate. Instead, the team decided that the Manawatū River Bridge crossing point should be considered an "area" of natural character in its own right. This was because of its size, scale, prominence, visibility, accessibility and location at the mouth of the



Gorge. Therefore, a separate natural character assessment of the Manawatū River Bridge crossing point was carried out separately from any broader Manawatū River catchment assessment. This is consistent with the NoRs Assessment, where the Manawatū River crossing point was assessed but a broader "catchment" scale of assessment was not undertaken for the River or a certain reach of it.

### **Level of natural character**

86. The methodology adopted to assess the level of natural character involves a two-step process. In step one, natural character is assessed in relation to a seven-point scale as set out in **Figure I.2** below. Step two involves a re-assessment of those areas assessed as having high or very high natural character to determine whether they qualify as having outstanding natural character. In allocating ratings, the team was informed by the calibration process, which is detailed further in the following section.
87. A seven-point rating scale was also used in the NoRs Assessment. For this assessment, the team initially considered using a five-point rating scale (i.e. a scale without the "moderate high" and "moderate low" ratings). However, during the assessment process, it became clear that a five-point scale was too coarse and could not show small incremental changes to ratings where a full shift from high to moderate for example would be disproportionate to the actual or potential effects being considered in the pre- and post-development scenarios. It was also considered that adopting a seven-point rating scale would provide consistency with the methodology used in the NORs Assessment.
88. A seven-point rating scale is widely used in landscape and other similar assessments. The NZILA Best Practice Note 10.1<sup>5</sup> includes a seven-point scale and many coastal natural character assessments that have been completed throughout New Zealand for district and regional councils also use a seven-point rating scale.
89. In most assessments, places/objects that sit at the top and bottom ends of the rating scale are generally very obvious, however, it is the middle range of the scale where a greater range of definition is required (i.e. as in a bell-shaped curve). Three and five-point scales are generally considered to be

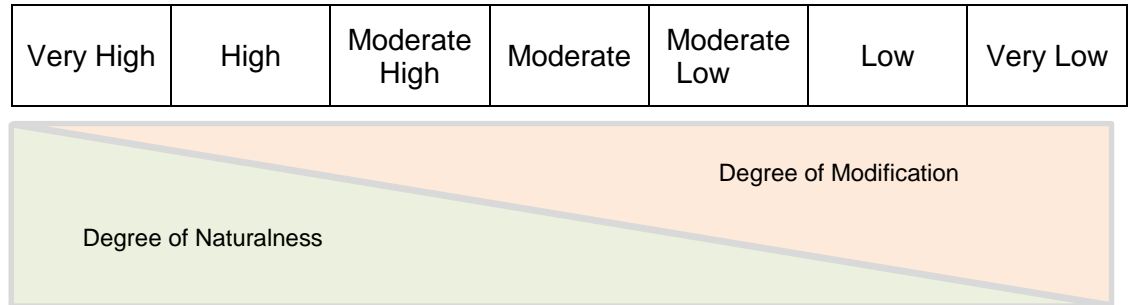
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<sup>5</sup> *Best Practice Note: Landscape Assessment and Sustainable Management 10.1*, NZILA Education Foundation, November 2010.

too coarse as they lack the subtlety in the mid-range that a seven-point scale provides.

90. **Figure I.2** below also illustrates the relationship between the degree of naturalness and degree of modification. A high level of natural character means the waterbody is less modified and vice versa.

**Figure I.2: Degrees of Natural Character**



91. To understand the natural character of an area, it is helpful to tease apart and analyse the individual components and then to draw the findings together. To do this, each expert assesses the particular attributes and qualities of each area and assigns a rating for that particular attribute (i.e. very high to very low). These individual attribute ratings provide a framework for the team of experts, using their professional judgement, to review and consider the ratings together and then together to assign an overall natural character rating for that area. As noted earlier, no weightings are applied to any of the attributes.

*Outstanding natural character*

92. A river or stream reach with outstanding natural character should “*Exhibit a combination of natural elements patterns and processes that are exceptional in their extent, intactness, integrity and lack of built structures and other modifications in the context of the district or region*”<sup>6</sup>. An area of outstanding natural character should encompass the entire width of the river corridor, rather than simply applying to an individual component of a reach to ensure that intact interrelated sequences of ecological systems and natural processes are included.
93. To determine areas of outstanding natural character, any river reach where all three components are identified as having high or very high natural

<sup>6</sup> Boffa Miskell derived definition. (Outstanding natural character has not been defined in the Horizons' RPS or elsewhere).

character will be considered in order to determine if any part of that reach or area qualifies as being 'outstanding'.

94. The NoRs Assessment determined that there were no areas of outstanding natural character and this was not disputed or challenged by the s42A team nor in any submissions received. There were, however, several areas with high natural character and the focus of the detailed assessment was on these areas.
95. The team who carried out this assessment reviewed and discussed the findings of the NoRs Assessment and agreed that there were no areas within the Project area with outstanding natural character, due to the level of modification of both the Manawatū River and the streams within the Project area.

### **Calibration**

96. Calibrating the attribute matrix (that is, identifying examples of rivers and streams and where they would sit in the matrix in relation to the listed criteria) is an important process when assessing natural character. A calibrated matrix provides a benchmark for both the contributing specialists in their individual assessment of attributes and for the team in agreeing an overall natural character rating. Calibration is a recognised and commonly used method for ensuring a consistent natural character assessment.<sup>7</sup>
97. While attributes and characteristics are factors to be addressed in an assessment of natural character, the scale of the waterway and its context are important aspects to consider when it comes to calibration.
98. For this Project, the team identified rivers and streams within the Horizons' Region that would sit towards either end of the rating scale in the assessment matrix.<sup>8</sup> **Figure I.3** below illustrates where each of the examples would sit in the calibration scale.
99. Sitting at the very high end of the natural character scale would be the Manganui a te Ao River, with some reaches of the river likely to be outstanding.

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<sup>7</sup> Calibration examples have been used in three separate coastal natural character assessments carried out for Wellington City and Hutt City (2016), Porirua City (2019), and Masterton, Carterton and South Wairarapa District Councils (2020).

<sup>8</sup> In *the Introduction to the Natural features, Landscapes and Natural Character Chapter of the One Plan (Chapter 6.1.3)*, the Plan states: "Natural character is a sliding scale and varies from a low degree of natural character, such as urban environments, to a high degree of natural character (for example, Tongariro National Park)."

100. The Manganui a te Ao River is 32 km long, drains the western slopes of Mount Ruapehu, and flows southwest through rugged hill country covered in native forest, to its confluence with the Whanganui River; 10km north of Pipiriki. It is the only river draining the Central Plateau that has not been modified by the Tongariro Power Development. A National Water Conservation Order for the Manganui o te Ao was granted in 1989 to protect the endangered whio (blue duck), which prefers clean, fast-flowing streams. The river is also highly regarded as an outstanding recreational fishery.
101. The headwaters of the Mangahao River in the Tararua Range, a tributary of the Manawatū River, would also fall in the very high category. While the headwaters and flow regime of the upper catchment are entirely natural, there are two dams further downstream and flow is diverted to Arapeti Stream, and then to Mangaore Stream. The Whitewater Park below the Mangahao Power Station is very popular amongst kayakers during flow releases twice a year.
102. At the other end of the scale (low / very low) is the Kawau Stream in Palmerston North. This catchment is nearly 100% urban with much of the headwaters piped, and the lower reaches straightened, channelised, and enclosed between stopbanks. Kawau Stream is a tributary of the Mangaone Stream, which itself is a tributary of the Manawatū River.
103. A waterway that has a moderate level of natural character is the Turitea Stream. Turitea Stream has its headwaters in the Tararua Range and joins the Manawatū River downstream of Massey University opposite Ahimate Reserve (formerly Waitoetoe Park). Its catchment has undergone various human modifications, including the construction of two water supply dams in the upper catchment, extensive clearance of original native vegetation cover, and the installation of road and foot bridges. Numerous examples of ad hoc bank erosion and scour protection can be found along its length. The catchment retains around 50% native vegetation cover (mostly in the upper catchment upstream of the water supply dams), with around 38% of the catchment being agricultural land use. It has a fairly diverse native fish fauna and is known to be an important stream for lamprey. The Horizons' monitoring site near the confluence with the Manawatū River had a 5-year median MCI (Macroinvertebrate Community Index) of 102, which is indicative of 'good' conditions.

104. The moderation and attenuation of flows by the dams, and the extraction of water for supply purposes, modify the flow regime in the lower valley. Despite this, Turitea Stream above Ngahere Park maintains the natural flow characteristics typical of a small hill country catchment. The catchment also continues to support a viable and healthy aquatic ecosystem that is comparable to reaches above the dams.

# Figure I.3: Calibration Diagram

## Natural Character



Manganui o te Ao River



Manganui o te Ao River  
1:100,000



Turitea Stream



Turitea Stream  
1:40,000



Kawau Stream



Kawau Stream  
1:20,000



## Effects on natural character

105. An assessment of an activity's effects on natural character requires a comparison of the existing state of natural character of an area with the state of natural character that will exist once the activity is carried out; and then an assessment of the significance of the change, if any. Change can be negative or positive.

**Figure I.4: Changes in Natural Character**



106. The natural character effects assessment therefore involves the following steps:

- (a) assessing the existing level of natural character;
- (b) assessing the level of natural character anticipated when the Project is implemented; and
- (c) considering the significance of the change, if any.

107. Horizons' One Plan Objective 6-2(b)(ii) requires interpretation of the phrase "*significantly diminish the attributes and qualities of areas that have high natural character...*"

108. Given that there are no areas within the Project area that are considered to have outstanding natural character, the primary focus of the assessment has been on areas with high natural character. Areas with high natural character are more sensitive to change that could adversely impact on the attributes and qualities that contribute to their high natural character, than those areas that have a moderate or low level of natural character. A reduction from high to moderate was considered by the assessment team to be a significant reduction.<sup>9</sup> However, a change from high to moderate high was acknowledged to be a reduction in natural character, but not a significant one; and was not considered to "*significantly diminish the attributes and qualities of areas.*"

<sup>9</sup> The team who carried out the NoRs Assessment also agreed that a change from high to moderate should be considered a significant change.

109. The interrelated nature of the attributes means that modification of a waterbody will typically affect several attributes or qualities. In **Appendices I.3** and **I.4**, the ratings for each attribute are tabulated, together with commentary on the reasons for the particular ratings. It is the collective ratings of attributes and qualities for any one location/area that were considered by the team together to describe and rate the overall natural character of that area both pre- and post-development. In making this assessment, the team agreed that a reduction in overall natural character from high to moderate (or less than moderate) should be considered to constitute a significant reduction in the level of natural character of an area.

#### **Process for assessing existing natural character**

110. In the second workshop (on 20 November 2019), the initial focus was on assessing the level of **existing** natural character in each of the nine catchments and for the selected crossing points.
111. Each expert compiled a list of key points for each catchment and crossing point to describe the condition and quality of that particular attribute and also assigned an existing natural character rating in terms of that attribute. The team then discussed the ratings and agreed and assigned an overall existing natural character rating for each catchment and crossing point. This was followed by a process of calibration (where appropriate). These ratings are set out in **Appendices I.3** and **I.4**. Representative photographs of each catchment are also included in **Appendix I.5**.

#### **Process for assessing post-development natural character**

112. The material from the 20 November 2018 workshop was collated and circulated to the team for review. Prior to the third workshop (on 16 January 2020), each expert completed their post-development descriptions and attribute ratings for both the catchments and selected crossing points.
113. At the third workshop, the post-development descriptions and ratings were reviewed by the team and confirmed, and then overall ratings agreed for each catchment and crossing point.
114. The post-development assessment involved consideration of the effects of the Project's earthworks, installation of culverts, stream diversions, embankments, spoil disposal sites and the existence of the road itself.



115. In determining the level of natural character post-development, it was important to clearly describe and agree on the factors that each expert considered to determine the changes to level of naturalness and extent of modification; these are set out below.

#### *Flow regime*

116. In assessing effects on this attribute, the expert (Dr McConchie), considered the effect of any development on runoff, including all runoff processes operating upstream and not just local or site-specific runoff. This is because, given the scale of the proposed works, any local runoff will be negligible. Consequently, the potential effects of any development were considered with respect to their effects on the existing runoff regime past the proposed development. This included any effects on the volume and timing of runoff, and the separation between baseflow and stormflow.

#### *Morphology*

117. In assessing effects on this attribute, the expert (Dr McConchie), considered any effects of the proposed development with respect to the actual geomorphic character and processes operating within the specific site. While the runoff processes were considered in context, the morphology was treated in a site-specific manner. Changes in morphology included the naturalness of the channel, channel form and character, and channel processes.

#### *Water quality*

118. Given catchment water quality is predominantly dictated by overall catchment land use, in order to estimate post-development water quality, the water quality experts (Alex James and Keith Hamill), considered how the Project will alter overall land use (e.g. in a few instances it will result in retirement of relatively large areas of farmland) as well as proposed discharges of treated stormwater from the completed road. For most catchments, the Project has a relatively small footprint and does not result in gross changes to land use that could alter existing water quality.

#### *Exotic aquatic flora and fauna (freshwater)*

119. In assessing this attribute, the expert (Justine Quinn), considered the post-development state of the natural channel, whether there would be a constructed channel post-development, and what proportion of the natural channel this would constitute. Where the natural channel would be lost, it was considered that this may create conditions more favourable to exotic

aquatic flora and fauna and therefore led to a diminishment in the level of this quality.

*Indigenous taxa assemblages (freshwater)*

120. In assessing this attribute, the expert (Justine Quinn), considered the post-development state of the natural channel, whether there would be a constructed channel post-development, and what proportion of the natural channel this would constitute. Post-development conditions that may be less favourable for indigenous species were also considered in relation to this factor.

*Ecosystem functioning (freshwater)*

121. In assessing this attribute, the expert (Justine Quinn), considered the post-development state of the natural channel and whether there would be a constructed channel post-development, but this was recognised more so as a modification to the natural ecosystem functioning. The contribution of this channel to provide ecosystem functioning at a catchment scale was also considered.

*Structures and human modifications*

122. In considering the presence or absence of structures and human modifications, the experts (Dr McConchie and David Hughes), considered only physical works and wider catchment effects such as land use change were not. This involved consideration of engineered elements to both convey water (e.g. culverts and bridges), and to impound water (e.g. ponds and wetlands). It also included consideration of channel realignment, infilling of existing water courses, and construction of artificial drainage paths.

*Terrestrial ecology*

123. In assessing the post-development character of the terrestrial ecology (riparian margin), the expert (Josh Markham), considered the riparian margins of constructed channels (if present), the relative proportion of riparian margin post-development, connectivity to the constructed channel, the composition of the margin in relation to the 'naturalness' criteria and its ability to establish in light of planting into 'engineered' materials.

*Experiential*

124. I was the expert who considered the experiential effects of the Project. Experiential aspects concern the remote/untamed nature of a waterway,

sounds and smells and the relationship between these aspects. Post-development, the level of intactness and remoteness is the one aspect that will be most affected (i.e. the introduction of a large infrastructure element into a river/stream environment). In many places, the sounds and smells will be affected less as the waterway will still exist and function as such and the sounds and smells will in many instances, be similar, albeit altered.

## **PROJECT SHAPING AND AVOIDING AND MINIMISING EFFECTS**

125. Shifting the Alignment northwards as proposed in the Northern Alignment has overall beneficial effects on natural character, especially at the western end of the Project in relation to catchments 6 and 7, both of which mostly exist in an environment with significant areas of indigenous vegetation, including that in the two QEII open space covenants.
126. In terms of catchment 7, the Eco-Bridge (BR03) that links to the Manawatū River Bridge (BR02) provides a more environmentally responsive solution to that anticipated in the original NoRs alignment. It avoids an embankment on the northern side of the River, crosses over the perched raupō wetland and avoids significant vegetation, including the stand of swamp maire and old growth forest in the lower section of catchment 7.
127. In terms of catchment 6, the Project crosses at the upper headwaters and avoids traversing through the middle of the QEII (east) open space covenant as was proposed in the original NoRs alignment.
128. Most of the other waterways are located in highly modified grazed pasture farming environments where indigenous riparian vegetation is mostly absent or restricted to fragments. The Northern Alignment encroaches (minimally) into the top of catchment 9 but the only a very small part of this catchment is affected.
129. In catchment 8, the Northern Alignment enables development of a range of recreation facilities and experiences, including visitor facilities on the southern bank, pedestrian access and viewing area on the new bridge across the river (BR02) and public access and environmental enhancements on the north bank associated with the Eco-Bridge (BR03).
130. The Northern Alignment has, however, 'flow on' effects on natural character in relation to catchment 5, where the existing overall natural character of the catchment is moderate high. At the points where the Project crosses stream 5A and stream 5B, the effects on natural character would be significant with

all attributes being reduced post-development, some more than others. At a catchment scale, natural character would also be reduced.

131. Despite the adverse natural character effects that the Northern Alignment has on catchment 5, the benefits that the Northern Alignment achieves in catchments 6 and 7 are significant given the relatively small size of these two catchments and the reduction in natural character effects on the waterways in the two QEII open space covenants.
132. The Northern Alignment provides significant improvements to natural character when compared with the original NoRs alignment.

## **ASSESSMENT OF EFFECTS**

### **General summary of post-development effects**

133. The Alignment generally crosses the land perpendicular to the drainage pattern of the land. It is therefore inevitable that multiple streams need to be crossed and/or diverted by the Project.
134. Given the scale of the works associated with construction and operation of the Project, the natural character of the waterbodies it interacts with will be affected in some way. Generally, these effects will be detrimental, typically because of physical loss or modification of the abiotic attributes of the waterbodies which in turn may affect the biotic systems. These physical changes, together with the introduction of the new road and traffic activity, will also impact on the experiential qualities of the waterbodies and their catchments.
135. Many of the activities only create effects at the location where they physically occur (such as loss of the natural bed and bank under a culvert) whereas other activities can potentially affect longer sections of the waterbodies (such as through sedimentation and water quality effects), particularly where biotic/ecological systems are modified.
136. Assessment of the crossing points clearly indicated significant diminishment of some attributes and qualities, which is not unexpected given the scale of the works proposed. Some attributes will however be unaffected (e.g. the flow regime) or affected only in minor ways, and in places attributes such as water quality are likely to slightly improve as a result of removal of stock and fencing that will be required in order to construct and operate the highway.

137. The large-scale physical works of the Project at the crossing points will have the greatest impact on the morphology of the active bed and margins, the aquatic taxa and ecosystem functioning of the active bed, the terrestrial ecology of the margins, and the experiential qualities. The water quality is generally not affected.
138. The greatest impact of the Project relates to the scale and location of the works footprint at the crossing points in the active bed and margins of the streams. At the local scale, the filling of the stream gullies with earth embankments/spoil sites will result in loss of vegetation and the loss or modification of significant lengths of active bed and margin.
139. Experientially, the introduction of large-scale earthworks and road activity will dominate the natural environment and tranquil aspects of small stream gullies, several of which are deeply incised.
140. However, as noted previously, given the interconnected nature of waterways, a catchment-scale of assessment of natural character is appropriate. For example, abiotic factors such as flow regime and water quality (which are attributes that are considered in relation to the active bed), are often, understandably, the least affected at a catchment level. Similarly, in relation to terrestrial ecology, where vegetation growing on the margins of a water body also extend way beyond it and can often have an effect at a catchment scale.
141. Therefore, while there will be significant changes to some attributes at a crossing point scale, these need to be considered in context. Given that streams are interconnected ecosystems and effects need to be considered in a catchment context, the team considered the significance of these changes at a catchment scale. While adverse effects may occur at a crossing point on a stream, the effects on the catchment are influenced by both the upstream and downstream conditions. In summary, the team did not find any catchments that would be significantly diminished at the catchment scale.
142. Some Project activities that are an integral part of the operation and maintenance aspects of the new state highway may have consequential benefits to natural character, such as permanent fencing of the road corridor or part thereof. Fencing and exclusion of stock from waterways has multiple and interrelated benefits including: the restoration of riparian vegetation; avoidance of physical bank and bed damage; reduced sedimentation and benefits to water quality and biodiversity. In some places because of the

topography and/or the design of the highway, there will be some fairly large tracts of land where stock grazing will be removed and the area permanently fenced, which is likely to have positive effects on waterways, and thereby on natural character (for example, catchment 7).

143. By way of example, **Table I.3** below summarises the key Project activities and their potential effects on various natural character attributes and qualities.

Table I.3: Project Activity and Potential Effects

| PROJECT ACTIVITY                                          | ACTIVE BED                                                                                  |               |                                                     |                                                                                                                  |                                                                                                                  |                                                                                                        | MARGIN                                                                                                     |                                                                                        | EXPERIENTIAL |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|--------------|
|                                                           | Flow Regime                                                                                 | Water quality | Bed morphology                                      | Indigenous Taxa                                                                                                  | Ecosystem function                                                                                               | Exotic flora Fauna presence/ absence                                                                   | Terrestrial Ecology                                                                                        | Structures and human modification                                                      |              |
| <b>Vegetation removal</b>                                 | Negative; increases flows and likelihood of bigger more frequent moderate size flood events | Negative      | Neutral but possible increase in siltation          | Negative; increases sedimentation & water temperature                                                            | Negative; increases sedimentation & water temperature                                                            | Neutral; increased temp and sediment, could result in conditions more favourable to exotic flora/fauna | Negative; results in loss of habitat and biodiversity (if vegetation native; if exotic, could be positive) | Negative; increases risk of erosion.                                                   | Negative     |
| <b>Retiring land/excluding stock</b>                      | Positive                                                                                    | Positive      | Positive                                            | Positive                                                                                                         | Positive                                                                                                         | Positive                                                                                               | Positive                                                                                                   | Positive                                                                               | Positive     |
| <b>Culverts</b>                                           | Neutral; does not change volume or velocity                                                 | Neutral       | Negative; results in loss of natural bed            | Negative; results in loss and fragmentation of habitat, and creates physical barrier (darkness of long culverts) | Negative; results in loss and fragmentation of habitat, and creates physical barrier (darkness of long culverts) | Neutral                                                                                                | Negative; results in loss of riparian habitat                                                              | Negative; results in loss of margin.                                                   | Negative     |
| <b>Reinforced beds and margins/riprap</b>                 | Neutral                                                                                     | Neutral       | Negative; results in loss of natural bed substrate. | Negative; results in loss of natural bed habitat                                                                 | Negative; results in loss of natural bed habitat                                                                 | Neutral                                                                                                | Negative; results in loss of the stream margin and its ability to support riparian vegetation.             | Negative; results in loss of natural margin, although this could naturalise over time. | Negative     |
| <b>Stream diversions</b>                                  | Neutral                                                                                     | Neutral       | Negative; results in loss of natural bed substrate. | Negative; results in loss of natural bed habitat (quality and quantity).                                         | Negative; results in loss of natural bed habitat (quality and quantity).                                         | Negative; may alter the type of habitat which could influence presence of exotic flora and/or fauna.   | Negative; results in loss of the stream margin and its ability to support riparian vegetation.             | Negative; results in loss of natural margin, although this could naturalise over time. | Negative     |
| <b>Stormwater management changing size of catchments.</b> | Neutral                                                                                     | Neutral       | Neutral                                             | Negative; change to volume can affect fauna                                                                      | Negative; change to volume and velocity of                                                                       | Negative; change to velocity/volume can change                                                         | Negative; results in loss of riparian habitat associated with                                              | Neutral                                                                                | Negative     |

| PROJECT ACTIVITY                                                   | ACTIVE BED  |                                                                                                                                                                      |                                                    |                                                              |                                                               |                                                                                                | MARGIN                                                                                                     |                                                                                   | EXPERIENTIAL |
|--------------------------------------------------------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------|------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------|
|                                                                    | Flow Regime | Water quality                                                                                                                                                        | Bed morphology                                     | Indigenous Taxa                                              | Ecosystem function                                            | Exotic flora Fauna presence/ absence                                                           | Terrestrial Ecology                                                                                        | Structures and human modification                                                 |              |
|                                                                    |             |                                                                                                                                                                      |                                                    |                                                              | water entering stream                                         | instream conditions.                                                                           | construction of stormwater management device                                                               |                                                                                   |              |
| <b>Stormwater discharges from treatment wetlands, swales, etc.</b> | Neutral     | Positive: full treatment of all stormwater discharge from the project including treatment of existing roads (ie SH3 Napier Road) that currently discharge untreated. | Neutral                                            | Negative; potential toxicity or temperature effects          | Neutral                                                       | Negative; potential toxicity or temperature effects which can make more favourable for exotics | Negative; results in loss of riparian habitat associated with construction of stormwater management device | Neutral.                                                                          | Negative     |
| <b>Spoil sites</b>                                                 | Neutral     | Neutral                                                                                                                                                              | Negative; results in loss of natural bed substrate | Negative; loss of natural bed habitat (quality and quantity) | Negative; loss of natural bed habitat. (quality and quantity) | Negative; may alter the type of habitat which could influence presence of exotic.              | Negative; loss of the stream margin and inability to support riparian vegetation                           | Neutral; removal of existing Structures and human modification for spoil disposal | Negative     |



## Summary tables

144. The existing and post-development natural character ratings for all catchments and the selected crossing points are summarised in **Tables I.4** to **I.7** below.
145. **Table I.4** is a summary of the overall ratings for the existing and post-development natural character in each catchment;<sup>10</sup> **Table I.5** is a summary of the existing and post-development attribute ratings for each catchment. **Appendix I.3** contains the full tables for the catchments.
146. **Table I.6** is a summary of the existing and post-development natural character for each of the selected crossing points and **Table I.7** is a summary of the existing and post-development attribute ratings for those crossing points. **Appendix I.4** contains the full tables for the crossing points. As explained earlier, the crossing point assessments were considered at a finer scale than the overall catchment but informed the overall catchment “area” ratings.
147. Further explanation of the ratings, at a catchment level, are given in the following sections.

### *Catchment summary*

**Table I.4: Catchments Summary: Existing and Post-Development Natural Character**

| Catchment | Existing Natural Character | Post-Development Natural Character |
|-----------|----------------------------|------------------------------------|
| 1         | Low                        | Low                                |
| 2         | Moderate                   | Moderate Low                       |
| 3         | Moderate High              | Moderate                           |
| 4         | Moderate Low               | Low                                |
| 5         | Moderate High              | Moderate Low                       |
| 6         | Moderate High              | Moderate High                      |
| 7         | Moderate High              | Moderate                           |
| 8         | Low                        | Low                                |
| 9         | High                       | High                               |

<sup>10</sup> Note Table I.4 is identical to Table I.1 which is set out earlier in this report.

**Table I.5: Catchment Attribute Summary**

| CATCHMENT      |                                    | 1    |      | 2    |      | 3    |      | 4    |      | 5    |      | 6    |      | 7    |      | 8    |      | 9    |      |
|----------------|------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|                |                                    | Extg | Post | Extg | Post | Extg | Post | Extg | Post | Extg | Post | Extg | Post | Extg | Post | Extg | Post | Extg | Post |
| Active Bed     | Flow Regime                        | VL   | VL   | L    | L    | M    | M    | ML   | L    | M    | M    | M    | M    | M    | ML   | L    | L    | H    | H    |
|                | Morphology                         | VL   | VL   | ML   | ML   | M    | M    | ML   | L    | M    | ML   | M    | M    | M    | ML   | L    | L    | H    | H    |
|                | Water Quality                      | L    | L    | L    | L    | M    | M    | L    | L    | ML   | ML   | MH   | MH   | M    | MH   | L    | L    | MH   | MH   |
|                | Exotic Flora and Fauna             | L    | L    | M    | M    | M    | M    | M    | M    | H    | M    | H    | H    | H    | MH   | L    | L    | H    | H    |
|                | Indigenous Taxa Assemblages        | L    | L    | H    | H    | H    | H    | M    | ML   | H    | M    | H    | H    | H    | MH   | L    | L    | H    | H    |
|                | Ecosystem Functionality            | L    | VL   | M    | M    | M    | ML   | M    | L    | H    | M    | H    | H    | H    | M    | L    | L    | H    | H    |
| Margin         | Structures and Human Modifications | L    | L    | ML   | ML   | MH   | M    | ML   | L    | M    | ML   | M    | ML   | M    | L    | L    | L    | MH   | M    |
|                | Terrestrial Ecology                | VL   | L    | L    | L    | MH   | M    | M    | ML   | H    | MH   | H    | H    | H    | M    | L    | L    | H    | H    |
| Experiential   |                                    | L    | L    | M    | ML   | M    | ML   | ML   | L    | MH   | ML   | H    | M    | H    | L    | L    | L    | H    | H    |
| Overall Rating |                                    | L    | L    | M    | ML   | MH   | M    | ML   | L    | MH   | ML   | MH   | MH   | MH   | M    | L    | L    | H    | H    |

*Crossing point summary*

**Table I.6: Crossing Point Summary: Existing and Post-Development Natural Character**

| <b>Crossing Point</b>         | <b>Existing Natural Character</b> | <b>Post-Development Natural Character</b> |
|-------------------------------|-----------------------------------|-------------------------------------------|
| 2C                            | Moderate High                     | Low                                       |
| 3A                            | Moderate                          | Moderate Low                              |
| 3B                            | Moderate High                     | Moderate Low                              |
| 4D                            | Moderate Low                      | Low                                       |
| 5A                            | High                              | Low                                       |
| 5B                            | Moderate High                     | Low                                       |
| 6A                            | Moderate                          | Very Low                                  |
| 7A                            | High                              | Low                                       |
| 7B                            | Moderate Low                      | Low                                       |
| 7B Eco-bridge (Raupō wetland) | High                              | Moderate                                  |
| 9                             | Moderate Low                      | Low                                       |
| Manawatū River                | Moderate High                     | Moderate                                  |

Table I.7: Crossing Points Attribute Summary

| CROSSING POINTS |                                    | 2C   |      | 3A   |      | 3B   |      | 4D   |      | 5A   |      | 5B   |      | 6A   |     | 7A   |      | 7B   |      | Eco-bridge<br>(Raupō wetland) |      | 9    |      | Manawatū<br>River<br>Bridge |      |
|-----------------|------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|------|------|------|------|-------------------------------|------|------|------|-----------------------------|------|
|                 |                                    | Extg | Post | Extg | Post | Extg | Post | Extg | Post | Extg | Post | Extg | Post | Extg | Pos | Extg | Post | Extg | Post | Extg                          | Post | Extg | Post | Ex                          | post |
| Active Bed      | Flow Regime                        | M    | M    | ML   | ML   | M    | M    | M    | ML   | ML   | L    | M    | L    | ML   | L   | M    | M    | M    | L    | H                             | M    | MH   | M    | MH                          | M    |
|                 | Morphology                         | M    | L    | ML   | ML   | M    | M    | ML   | L    | M    | L    | M    | L    | ML   | L   | MH   | L    | M    | L    | H                             | MH   | M    | L    | H                           | H    |
|                 | Water Quality                      | M    | M    | M    | M    | M    | M    | L    | L    | ML   | ML   | ML   | ML   | M    | M   | M    | M    | L    | ML   | M                             | M    | L    | L    | M                           | M    |
|                 | Exotic Flora and Fauna             | H    | L    | M    | M    | H    | L    | M    | L    | H    | ML   | H    | L    | M    | VL  | H    | VL   | M    | L    | H                             | H    | L    | L    | H                           | H    |
|                 | Indigenous Taxa                    | H    | L    | M    | L    | M    | VL   | M    | L    | H    | L    | H    | VL   | M    | VL  | H    | VL   | M    | L    | H                             | H    | L    | L    | H                           | H    |
|                 | Ecosystem Functionality            | H    | VL   | H    | M    | M    | VL   | M    | VL   | H    | L    | MH   | VL   | M    | VL  | H    | VL   | M    | VL   | H                             | H    | VL   | VL   | H                           | H    |
| Margin          | Structures and Human Modifications | H    | L    | M    | ML   | MH   | M    | M    | L    | H    | L    | MH   | L    | M    | L   | MH   | L    | M    | L    | H                             | L    | H    | M    | M                           | L    |
|                 | Terrestrial Ecology                | M    | L    | H    | M    | M    | L    | M    | L    | H    | L    | M    | L    | H    | VL  | VH   | VL   | L    | L    | H                             | M    | L    | L    | MH                          | L    |
| Experiential    |                                    | M    | L    | ML   | L    | ML   | L    | ML   | VL   | M    | VL   | M    | VL   | M    | L   | H    | L    | L    | VL   | H                             | L    | M    | ML   | MH                          | L    |
| Overall Rating  |                                    | MH   | L    | M    | ML   | MH   | ML   | ML   | L    | H    | L    | MH   | L    | M    | VL  | H    | L    | ML   | L    | H                             | M    | ML   | L    | MH                          | M    |

## High-level summary of existing and post-development natural character

148. The Manawatū River has a large catchment with its headwaters northwest of Norsewood on the eastern slopes of the Ruahine Range. It flows initially eastward before turning south-west near Ormondville and flowing 40 km before turning north-west near Woodville and then entering the Manawatū Gorge. Beyond the Gorge, it joins the Pohangina River and meanders over the Manawatū Plains, finally discharging into the sea at Foxton Beach.
149. The Manawatū River is 235km long and drains a catchment area of approximately 5,890km<sup>2</sup>. The catchment has several large tributaries including the Oroua, Mangatainoka, Mangahao, Pohangina and Tiraumea. Within the Manawatū catchment, the landscape context ranges from almost 'totally natural' (in the upper reaches of the Mangahao and some other major tributaries) through 'largely natural' (such as in the Manawatū River Gorge, which is affected by infrastructure), to 'artificial / totally modified' (such as at the Moutoa Flood Diversion Channel).
150. The nine sub-catchments of the Manawatū River potentially affected by the Project are shown on **Drawings 1 and 2 (TAT-3\_DG-E-4100 and 4101)**; for the purposes of this assessment, the sub-catchments are referred to as catchments 1 to 9. Detailed drawings of the catchments, crossing points and other Project details are shown on **Drawings 3 to 8 (TAT-3-DG-E-4121 – 4126)**.
151. Photographs of the streams in each catchment are included in **Appendix I.5** and these illustrate the nature and character of the waterbodies traversed by the Project. Most of these waterways are located in highly modified grazed pasture farming environments where indigenous riparian vegetation is mostly absent or restricted to fragments. In addition, stock access to the waterways has resulted in bank erosion and fouling. In places, willows and poplars have been planted to stabilise stream banks and contain erosion. Catchments 6 and 7 are exceptions, largely because the streams in these catchments mostly exist in an indigenous forest environment within the two QEII open space covenants. In catchment 9, there are considerable areas of mature and regenerating indigenous vegetation and the Project affects only a very small part of the catchment (i.e. the catchment area will decrease by only 1.4%).
152. Catchments 4, 5 and 6 discharge into the Manawatū River via the Manawatū Gorge Scenic Reserve, which forms the lower part of these catchments and

which comprises largely unmodified dense indigenous vegetation. The flatter topography across the top of the Project corridor, specifically within catchment 4 is most modified as a result of farming activity and the Te Āpiti Wind Farm. The gentler topography has enabled more intensive farming practices, including cultivation and smaller paddocks compared to the steeper adjoining hill country.

153. Together, the catchments have a combined area of approximately 34km<sup>2</sup>, and more than half of this area is upstream of any potential works in the Mangamanaia catchment (catchment 2). This is a maximum of about 0.6% of the area of the Manawatū River catchment, or 0.3% if the upper Mangamanaia catchment is excluded. Only a very small percentage of these catchments will actually be affected by the Project.
154. Apart from the Mangamanaia, the stream catchments are small, with most being less than about 2km<sup>2</sup>. The catchments, their existing land use and physical characteristics provide the context when assessing existing natural character and the potential effects of the Project on this character.
155. Of the nine catchments, only catchment 9 (Mangakino Stream), has an overall high level of existing natural character. However, only a very small proportion of this catchment will be affected as a result of the proposed Northern Alignment where the Alignment skirts along and just over the ridgeline dividing catchment 9 from catchments 6 and 7. The existing flow regime will remain the same and there will be no change to the channel morphology or characteristics. There is likely to be a reduction in sediment yield following improved treatment and water quality will remain the same. Given that only a very small proportion of the catchment is affected, there is unlikely to be any change in the ecosystem functioning or to the flora and fauna. Experiential aspects of the catchment will also be unaffected. Therefore, the overall rating at the catchment scale will remain high post-development.
156. The proposed Northern Alignment, together with more detailed site investigations and refinements to the overall design, has had a positive effect on the natural character outcomes for catchments 6 and 7, when compared to the findings of the NoRs Assessment.
157. While the proposed Northern Alignment will have overall less adverse natural character effects in catchment 7 compared to the original NoRs alignment, there will be a significant reduction in natural character at crossing point 7A.

The scale of the physical modifications as a result of the Project in this location will significantly affect most of the attributes; and the presence of the highway, together with the traffic activity, will significantly diminish the experiential aspects. The Raupō Wetland, which is also part of catchment 7, will also be adversely affected, especially in relation to terrestrial ecology and experiential effects. However, as noted previously, at the catchment scale, catchment 7 is overall less affected by the Northern Alignment than it was by the original Alignment. This results in an overall reduction in natural character which is not significant at a catchment scale (the change being from moderate high to moderate).

158. The proposed Northern Alignment has 'flow on' effects further east in relation to catchment 5, particularly in relation to crossing point 5A where both the ecological functioning and the experiential values will be significantly diminished. At the catchment scale, catchment 5 is expected to diminish from moderate high to moderate/low levels of natural character.

#### **Assessment by catchment**

159. Set out in the next sections are:

- (a) a summary of how each catchment is affected by the Project;
- (b) a table summarising various Project details in relation to each catchment;
- (c) a table setting out the existing and post-development ratings of natural character for each attribute and an overall rating for each catchment and assessed crossing point;
- (d) an overall assessment of the effects of the Project on the existing natural character of each catchment; and
- (e) an assessment of the Manawatū River Bridge crossing point.

160. As noted previously, the Manawatū River Bridge crossing point was considered as an "area" in its own right, and there is no broader "catchment" scale assessment of the River or a particular reach of it.

161. The full assessment tables for each catchment and crossing point (including descriptors in relation to each attribute) can be found in **Appendix I.3** and **Appendix I.4** respectively.

## Catchment 1

162. Refer **Drawing 8 (TAT-3-DG-E-4126)** in **Appendix I.6** and catchment photos in **Appendix I.5**.
163. Catchment 1 is at the eastern end of the Project with the headwaters of two tributaries lying under the proposed Woodville roundabout.
164. This catchment largely drains a flat, low-lying floodplain, with significant lengths of artificial drains and modified channels. The catchment is entirely under pasture and being on a low-lying floodplain, the drainage density is slightly lower than the average. It is highly modified, dominated by pastoral farming that includes numerous drainage channels.
165. The Project crosses the upper extent of two tributaries, which are currently crossed by SH3 and includes the construction of culverts and diversions.

### *Project details:*

|                                                                                                                 |        |
|-----------------------------------------------------------------------------------------------------------------|--------|
| Total catchment area                                                                                            | 126 Ha |
| Total catchment (1A, 1B)                                                                                        | 126 Ha |
| Total length of stream sitting under the project footprint + buffer (total Construction area) <sup>11</sup> (m) | 923 m  |
| Culvert length (incl. riprap where detail has been provided) (m)                                                | 310 m  |
| Number of culverts                                                                                              | 3      |
| Combined length of diversions (types 1, 2, 3) (m)                                                               | 1116 m |

**Table I.8: Catchment 1 Effects on Natural Character**

| <b>Catchment 1</b>                          | <b>Existing Natural Character</b> | <b>Post-development Natural Character</b> |
|---------------------------------------------|-----------------------------------|-------------------------------------------|
| <b>Flow Regime</b>                          | Very Low                          | Very Low                                  |
| <b>Morphology</b>                           | Very Low                          | Very Low                                  |
| <b>Water Quality</b>                        | Low                               | Low                                       |
| <b>Exotic Flora and Fauna</b>               | Low                               | Low                                       |
| <b>Indigenous Taxa Assemblages</b>          | Low                               | Low                                       |
| <b>Ecosystem Functioning</b>                | Low                               | Very Low                                  |
| <b>Structures &amp; Human Modifications</b> | Low                               | Low                                       |
| <b>Terrestrial Ecology</b>                  | Very Low                          | Low                                       |
| <b>Experiential</b>                         | Low                               | Low                                       |
| <b>Overall Rating</b>                       | <b>Low</b>                        | <b>Low</b>                                |

<sup>11</sup> The "construction area" is shown on the natural character drawings contained in **Appendix I.6** as the "construction footprint".



### *Assessment*

166. The existing level of natural character (low) is not expected to change as a result of the Project. This is due to the already highly modified nature of the waterbodies located in intensively developed farmland and the interaction with SH3. The ecosystem function is expected to reduce due to the modification of several channels and introduction of additional culverts. However, it is possible that the terrestrial ecology may see some improvement as a result of planting of riparian margins along the stream diversions.

### **Catchment 2**

167. Refer **Drawings 7 and 8 (TAT-3-DG-E-4125-4126)** in **Appendix I.6** and catchment photographs in **Appendix I.5**.
168. Catchment 2 (Mangamanaia Stream) is the largest catchment traversed by the Project. It is located on the hills and flats at the eastern end of the Project. Most of the catchment lies to the north and upstream of the Project. The streams drain to the base of the hill country and eventually into the Manawatū River across the river flats. This catchment has two distinct physiographic units, the steeper dissected hill country to the west and north, and the generally flat low-lying floodplain to the east. The drainage density is one of the lowest in the Project area (4.24km<sup>2</sup>). Approximately 85% of the catchment is under pasture with only a small area of broadleaved indigenous hardwoods (5%) and manuka and kanuka (6%).
169. The Project intercepts streams at the lower end of the catchment, in the hill country and the flood plain, and includes the construction of culverts, diversions and the Mangamanaia Stream Bridge (BR07), which crosses the Mangamanaia Stream.
170. The area where the Project crosses stream 2C has been assessed as a crossing point given its high SEV rating and that there is secondary broadleaf forest and scrubland in the headwaters (Refer **Appendix I.4**). In this location, a section of stream in the steep hill country is located under the Alignment and will be replaced by a diversion.

*Project details:*

|                                                                                                                                    |                 |
|------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Total catchment area                                                                                                               | 2055 Ha         |
| Total catchment (2A, 2B, 2C, 2E)                                                                                                   | 272 Ha          |
| Total length of stream sitting under the Project footprint + buffer (total Construction area) (m)                                  | 2890 m          |
| Culvert length (incl. rip-rap where detail has been provided) (m)                                                                  | 198 m           |
| Number of culverts                                                                                                                 | 1 + Bridge BR07 |
| Combined length of diversions (types 1, 2, 3) (m)                                                                                  | 1115 m          |
| Crossing 2C - loss of 1220m of stream under the road replaced by diversions and culvert CU17 and CU17A (135m long) and BR07 bridge |                 |

**Table I.9: Catchment 2 Effects on Natural Character**

| <b>Catchment 2</b>                          | <b>Existing Natural Character</b> | <b>Post-development Natural Character</b> |
|---------------------------------------------|-----------------------------------|-------------------------------------------|
| <b>Flow Regime</b>                          | Low                               | Low                                       |
| <b>Morphology</b>                           | Moderate Low                      | Moderate Low                              |
| <b>Water Quality</b>                        | Low                               | Low                                       |
| <b>Exotic Flora and Fauna</b>               | Moderate                          | Moderate                                  |
| <b>Indigenous Taxa Assemblages</b>          | High                              | High                                      |
| <b>Ecosystem Functioning</b>                | Moderate                          | Moderate                                  |
| <b>Structures &amp; Human Modifications</b> | Moderate Low                      | Moderate Low                              |
| <b>Terrestrial Ecology</b>                  | Low                               | Low                                       |
| <b>Experiential</b>                         | Moderate                          | Moderate Low                              |
| <b>Overall Rating</b>                       | <b>Moderate</b>                   | <b>Moderate Low</b>                       |
| <b>Crossing point 2C</b>                    | <b>Moderate High</b>              | <b>Low</b>                                |

*Assessment*

171. The Project intercepts a small portion at the lower end of this large catchment. Overall, the level of natural character is expected to lessen slightly (from moderate to moderate low) at the catchment level due largely to reduction in the experiential qualities with the introduction of the road and associated traffic activity.
172. Crossing point 2C was assessed as having a reduction in natural character from moderate high to low with all attribute ratings except flow regime and

water quality expected to decrease. A 1220m section of the upper part of the tributary will be lost under the road necessitating diversions and a culvert. While the diversions will provide some opportunity for freshwater habitat, the natural ecosystem functioning will be lost, as will the natural stream channel and bed (albeit already modified through farming activity prior to works). However, these effects at the crossing point scale will attenuate at the catchment scale, meaning that the overall diminishment of natural character at the catchment scale is not significant.

### **Catchment 3**

173. Refer **Drawings 6 and 7 (TAT-3-DG-E-4124-4125)** in **Appendix I.6** and catchment photographs in **Appendix I.5**.
174. This is a small hill country catchment on the steep scarp of the Manawatū Gorge near the eastern end. Pastoral farming dominates the slopes with broadleaf indigenous forest in gullies. A small proportion of this catchment is above the Gorge scarp. There is stock access to upper reaches (mostly sheep in the Ballantrae Research Station land) and a limited amount of cattle access in the mid and lower parts of the catchment, where there is indigenous vegetation cover.
175. The Project crosses streams via five culverts at the very upper end of the catchment in gullies dominated by grazed pasture and exotic woodlots.
176. Two streams (3A and 3B) comprise the catchment and have been assessed as crossing points. While the SEV rating of tributary 3A at the crossing point is indicative of a moderate to low ecosystem functioning, there is a wetland assessed as having moderate value and the riparian margin of this stem is fairly intact. Stem 3B has an SEV score indicative of moderate ecological value and function and there are areas of secondary broadleaf forest and scrubland (Refer **Appendix I.4**).

*Project details:*

|                                                                                                   |        |
|---------------------------------------------------------------------------------------------------|--------|
| Total catchment area                                                                              | 123 Ha |
| Total catchment (3A, 3B)                                                                          | 38 Ha  |
| Total length of stream sitting under the Project footprint + buffer (total Construction area) (m) | 725 m  |
| Culvert length (incl. rip-rap where detail has been provided) (m)                                 | 381 m  |
| Number of culverts                                                                                | 5      |
| Combined length of diversions (types 1, 2, 3) (m)                                                 | 111 m  |
| Crossing 3A - 127m culvert replacing the stream under the main Alignment footprint.               |        |
| Crossing 3B – 85m culvert under the main Alignment and 211m of stream diversions                  |        |

**Table I.10: Catchment 3 Effects on Natural Character**

| <b>Catchment 3</b>               | <b>Existing Natural Character</b> | <b>Post-development Natural Character</b> |
|----------------------------------|-----------------------------------|-------------------------------------------|
| Flow Regime                      | Moderate                          | Moderate                                  |
| Morphology                       | Moderate                          | Moderate                                  |
| Water Quality                    | Moderate                          | Moderate                                  |
| Exotic Flora and Fauna           | Moderate                          | Moderate                                  |
| Indigenous Taxa Assemblages      | High                              | High                                      |
| Ecosystem Functioning            | Moderate                          | Moderate Low                              |
| Structures & Human Modifications | Moderate High                     | Moderate                                  |
| Terrestrial Ecology              | Moderate High                     | Moderate                                  |
| Experiential                     | Moderate                          | Moderate Low                              |
| <b>Overall Rating</b>            | <b>Moderate High</b>              | <b>Moderate</b>                           |
| <b>Crossing point 3A</b>         | <b>Moderate</b>                   | <b>Moderate Low</b>                       |
| <b>Crossing point 3B</b>         | <b>Moderate High</b>              | <b>Moderate Low</b>                       |

*Assessment*

177. Overall, the natural character of the catchment will reduce slightly from moderate high to moderate. Instream ecosystem functioning will reduce with the loss of some channels/wetlands. The culverts will change the character of the physical stream margins and the loss of riparian margins will result in discernible change to the terrestrial ecology of the catchment. A new road will reduce the experiential quality at the top of the catchment near the road, lower down the catchment this effect would diminish.

178. Two sections of streams will be lost under the Project footprint into culverts. The natural character for both crossing points 3A and 3B is impacted largely due to reduced quality of aquatic and terrestrial ecology through the partial loss of natural stream systems and habitats in the culverts and diversions. However, these crossing points are at the upper end of the catchment and constitute a small proportion of the total stream length in the catchment, most of which will remain unchanged.

#### **Catchment 4**

179. Refer **Drawings 5 and 6 (TAT-3-DG-E-4123-4124)** in **Appendix I.6** and catchment photographs in **Appendix I.5**.

180. Catchment 4 is located in the central part of the Project area on the elevated flatter hilltop topography and includes the eastern end of the Te Āpiti windfarm. The drainage pattern of the catchment comprises a series of streams draining from east to west and discharging into the Manawatū River via the Scenic Reserve.

181. A large proportion of the catchment is above the Gorge scarp on more gentle terrain and is predominantly high producing pasture. The flatter topography has enabled more intensive land use along this part of the hill country with the ability to cultivate/crop. Grazed farmland dominates the land use, together with the turbines of the Te Āpiti Wind Farm and associated access tracks. Saddle Road passes through its northern end. The streams in the upper and middle parts of the catchment, are unfenced from stock, resulting in bank collapse and erosion in places. The lower part of the catchment within the Scenic Reserve is dense indigenous forest. Two QEII open space covenants are located in this catchment.

182. The Project traverses the middle reaches of the catchment between the steeper hill country to the north and the top of the Gorge scarp. The Project crosses six streams. Stream 4D has been assessed as a crossing point. It is a natural channel with a hard bottom and good instream habitat and a moderate SEV value. It lies under a spoil site and is culverted under the Alignment (Refer **Appendix I.4**).

*Project details:*

|                                                                                                   |        |
|---------------------------------------------------------------------------------------------------|--------|
| Total catchment area                                                                              | 438 Ha |
| Total catchment (4A, 4B, 4C, 4D, 4E, 4F)                                                          | 423Ha  |
| Total length of stream sitting under the Project footprint + buffer (total Construction area) (m) | 3166 m |
| Culvert length (incl. rip-rap where detail has been provided) (m)                                 | 692 m  |
| Number of stream culverts (8, 8A, 9, 10, 11, 12, 13 and ACU 05, ACU05A, ACU06)                    | 10     |
| Combined length of diversions (types 1, 2, 3) (m)                                                 | 1900 m |
| Fill site 28 overlays most of catchment 4D                                                        |        |
| Crossing 4D - 98m culvert under the road and spoil site 28 over 450m of stream                    |        |

**Table I.11: Catchment 4 Effects on Natural Character**

| <b>Catchment 4</b>                          | <b>Existing Natural Character</b> | <b>Post-development Natural Character</b> |
|---------------------------------------------|-----------------------------------|-------------------------------------------|
| <b>Flow Regime</b>                          | Moderate Low                      | Low                                       |
| <b>Morphology</b>                           | Moderate Low                      | Low                                       |
| <b>Water Quality</b>                        | Low                               | Low                                       |
| <b>Exotic Flora and Fauna</b>               | Moderate                          | Moderate                                  |
| <b>Indigenous Taxa Assemblages</b>          | Moderate                          | Moderate Low                              |
| <b>Ecosystem Functioning</b>                | Moderate                          | Low                                       |
| <b>Structures &amp; Human Modifications</b> | Moderate Low                      | Low                                       |
| <b>Terrestrial Ecology</b>                  | Moderate                          | Moderate Low                              |
| <b>Experiential</b>                         | Moderate Low                      | Low                                       |
| <b>Overall Rating</b>                       | <b>Moderate Low</b>               | <b>Low</b>                                |
| <b>Crossing point 4D</b>                    | <b>Moderate Low</b>               | <b>Low</b>                                |

*Assessment*

183. The natural character of the streams in the middle and flatter parts of the catchment is already highly modified by existing development (farming and wind farm activities) with an overall moderate low rating for the catchment. The Project will result in a slight diminishment to the level of natural character for the catchment (to low) due to the combined impacts on the streams, with eight culverts required to replace streams under the main Alignment, various diversions and a spoil disposal site affecting most of stream 4D. The water quality and intact indigenous forest in the lower reaches within the Scenic Reserve and the QEII open space covenants will, however, remain

unchanged. The experiential qualities of the catchment, while already moderate low, will further reduce to low with the introduction of the new infrastructure and traffic activity in the middle reaches of the catchment.

184. The modification to the waterways through the middle of the catchment will be substantial given there are eight stream culverts and a spoil site. However, these modifications are concentrated in the already most modified part of the catchment. The less modified waterways in the upper and lower parts of the catchment will remain unchanged by the Project.
185. Crossing point 4D at the upper end of the catchment constitutes a small proportion of the stream length in the overall catchment, most of which will remain unchanged. However, the proposed spoil site will occupy much of stream 4D with the loss of the stream to be replaced by a diversion channel on the fill resulting in a reduction of naturalness for all but the water quality attribute. In addition, stream length will be lost under the footprint of the road and replaced by culverts and diversions. While the diversions will be able to provide limited in-stream habitat, the physical form of the natural stream will be replaced with a more engineered form. This crossing point will decrease from moderate low to low, which is the same as the overall rating for the catchment.

### **Catchment 5**

186. Refer **Drawing 5 (TAT-3-DG-E-4123)** in **Appendix I.6** and catchment photographs in **Appendix I.5**.
187. Catchment 5 is located toward the western end of the Project and drains directly into the Manawatū River via the steep forested Manawatū Gorge scarp.
188. The catchment comprises hill country dissected by partly vegetated stream gullies (scrub and regenerating indigenous vegetation). Wind turbines, access roads and farm activities are a dominant feature of the upper two thirds of the catchment with the lower third in indigenous forest on the steep scarp slopes of the Manawatū Gorge Scenic Reserve. The Project crosses the middle part of this catchment and includes new wind farm access roads, culverts, diversions and a spoil site.
189. Two streams comprise this catchment (5A and 5B), which have each been assessed as crossing points. The SEV of stream 5A has a higher SEV than stream 5B, which is moderate. The riparian margins of 5A are more intact

than 5B but there is manuka/kanuka shrublands and fragmented areas of old growth forest in both streams and consequently both streams warranted detailed assessment (Refer **Appendix I.4**).

*Project details:*

|                                                                                                                                                                                                   |        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Total catchment area                                                                                                                                                                              | 120 Ha |
| Total catchment (5A, 5B)                                                                                                                                                                          | 71 Ha  |
| Total length of stream sitting under the Project footprint + buffer (total Construction area) (m)                                                                                                 | 3311 m |
| Culvert length (incl. rip-rap where detail has been provided)                                                                                                                                     | 646 m  |
| Number of culverts (4, 5, 6, 7 under main Alignment and ACU 03 & 04)                                                                                                                              | 6      |
| Combined length of diversions (types 1, 2, 3) (m)                                                                                                                                                 | 1333 m |
| Spoil site 25 (stream length incl. above)                                                                                                                                                         |        |
| Crossing 5A- 175m culvert replacing stream under the main Alignment and access road.                                                                                                              |        |
| Crossing 5B – 5 culverts replacing stream under main Alignment and access roads (433m). Main Alignment road and spoil site over intermittent and permanent streams replaced by stream diversions. |        |

**Table I.12: Catchment 5 Effects on Natural Character**

| Catchment 5                      | Existing Natural Character | Post-development Natural Character |
|----------------------------------|----------------------------|------------------------------------|
| Flow Regime                      | Moderate                   | Moderate                           |
| Morphology                       | Moderate                   | Moderate Low                       |
| Water Quality                    | Moderate Low               | Moderate Low                       |
| Exotic Flora and Fauna           | High                       | Moderate                           |
| Indigenous Taxa Assemblages      | High                       | Moderate                           |
| Ecosystem Functioning            | High                       | Moderate                           |
| Structures & Human Modifications | Moderate                   | Moderate Low                       |
| Terrestrial Ecology              | High                       | Moderate High                      |
| Experiential                     | Moderate High              | Moderate Low                       |
| Overall Rating                   | <b>Moderate High</b>       | <b>Moderate Low</b>                |

|                   |                      |            |
|-------------------|----------------------|------------|
| Crossing point 5A | <b>High</b>          | <b>Low</b> |
| Crossing point 5B | <b>Moderate High</b> | <b>Low</b> |

*Assessment*

190. Overall, the natural character of the catchment would reduce from moderate high to moderate low. The relatively large Project footprint occurs in the



more modified 5B stream gullies while the more natural 5A stream is less modified by the Project. The upper parts of the 5A stream and lower third of the catchment, in the forested Manawatū Gorge Scenic Reserve, will not be physically affected by the Project. The new road infrastructure and traffic activity passing through the middle of the catchment will reduce the experiential quality of the upper half of the catchment with this effect decreasing lower down the catchment in the Manawatū Gorge Scenic Reserve.

191. The natural character of both crossing points 5A and 5B reduce to low post-development. All of the natural character attribute ratings apart from water quality will decrease at both crossing points. Much of the stream in the upper part of tributary 5B, north of the proposed road, will be under the proposed spoil site with the loss of the natural gully landform and stream, which will be replaced with a diversion. The physical loss of the stream channels, margins and natural stream systems will reduce the ecological function and indigenous habitat of the catchment under the Project and the new road activity will reduce the experiential quality at the crossing points. However, at the catchment level, these adverse effects are attenuated, and the diminishment in natural character is less pronounced.

## **Catchment 6**

192. Refer **Drawing 4 (TAT-3-DG-E-4122)** in **Appendix I.6** and catchment photographs in **Appendix I.5**.
193. Catchment 6 is located near the western end of the Project and drains directly into the Manawatū River via the steep forested Manawatū Gorge scarp. It comprises dissected and steep hill country. Grazed farmland and the Te Āpiti Wind Farm dominate the upper half of the catchment with the lower half in indigenous forest as part of the Manawatū Gorge Scenic Reserve. A QEII open space covenant incorporates all of streams 6A and 6B upstream of the Scenic Reserve.
194. The Project footprint intercepts a small portion at the very top of the catchment where there are large cuts at the top of the catchment. A short section of stream 6A is intercepted by the Project at its upper extent and has been assessed as a crossing point for this reason (refer **Appendix I.4**). Stream 6B is not crossed by the Project.

*Project details:*

|                                                                                                   |       |
|---------------------------------------------------------------------------------------------------|-------|
| Total catchment area                                                                              | 95 Ha |
| Total catchment area (6A, 6B)                                                                     | 19 Ha |
| Total length of stream sitting under the Project footprint + buffer (total Construction area) (m) | 127 m |
| Culvert length (incl. rip-rap where detail has been provided) (m)                                 | 0 m   |
| Number of culverts                                                                                | 0     |
| Combined length of diversions (types 1, 2, 3) (m)                                                 | 0     |
| Crossing 6A- 127 stream bed loss at upper extent of stream                                        |       |

**Table I.13: Catchment 6 Effects on Natural Character**

| <b>Catchment 6</b>               | <b>Existing Natural Character</b> | <b>Post-development Natural Character</b> |
|----------------------------------|-----------------------------------|-------------------------------------------|
| Flow Regime                      | Moderate                          | Moderate                                  |
| Morphology                       | Moderate                          | Moderate                                  |
| Water Quality                    | Moderate High                     | Moderate High                             |
| Exotic Flora and Fauna           | High                              | High                                      |
| Indigenous Taxa Assemblages      | High                              | High                                      |
| Ecosystem Functioning            | High                              | High                                      |
| Structures & Human Modifications | Moderate                          | Moderate Low                              |
| Terrestrial Ecology              | High                              | High                                      |
| Experiential                     | High                              | Moderate                                  |
| <b>Overall Rating</b>            | <b>Moderate High</b>              | <b>Moderate High</b>                      |

|                          |                 |                 |
|--------------------------|-----------------|-----------------|
| <b>Crossing point 6A</b> | <b>Moderate</b> | <b>Very Low</b> |
|--------------------------|-----------------|-----------------|

*Assessment*

195. The Project crosses tributary 6A, which will be impacted (changing from moderate to very low). The indigenous vegetation in this area is somewhat fragmented with areas of pasture which extend to the north of the crossing point. Consequently, the existing natural character at this crossing point is rated as moderate. This is different to south of the crossing point where the covenanted vegetation is continuous and similar to that in the lower section of the catchment in the Scenic Reserve. Consequently, the rating for the overall catchment is higher (moderate high).

196. At the catchment level, while there is 127m of stream bed loss, there are no culverts and there is no stormwater discharged from the road. There may be some small changes to the timing and volume of stormwater runoff, but this

effect will dissipate downstream. There will be a minor reduction in the access by stock to the stream channel in the upper limit of the catchment.

197. The physical presence of the road, together with traffic activity, will reduce the experiential qualities primarily in the upper part of the catchment near the crossing point. Further down the catchment and within the Scenic Reserve, these effects will be much less, especially given the road will be contained within a large cut reducing the effects of traffic noise.
198. Most of the stream will remain unaffected given the small footprint of the Project is at the very top of the catchment and the rest of the catchment is within either QEII open space covenant or Scenic Reserve. Therefore, overall, this catchment will retain moderate high levels of natural character.

### **Catchment 7**

199. Refer **Drawings 3 and 4 (TAT-3-DG-E-4121-4122)** in **Appendix I.6** and catchment photographs in **Appendix I.5**.
200. The western end of the Project where the road ascends/descends between the hill country and the Manawatū River lies in catchment 7. The catchment is typical of the area where the steep-sided gullies are covered in regenerating indigenous forest and scrub and the hill tops and flatter areas with improved pasture. Farming activities and infrastructure (turbines fences, and access tracks) are present throughout the catchment and extend down to the Manawatū River. Stock have access to the lower part of the catchment, including the areas of regenerating and old growth forest and in the vicinity of the perched Raupō Wetland. A QEII open space covenant includes the upper end of tributary 7A.
201. The Project crosses a small portion of the very upper end of the catchment (stream 7A) and overlays the full length of stream 7B. Stream 7C is not crossed by the Project. The proposed Eco-Bridge (BR 03) will cross the Raupō Wetland.
202. Given the combination of elements and activities that the Project will introduce to this catchment and the high SEV values, intact riparian margins, tracts of high value forest, the presence of the QEII open space covenant, and the adjoining Manawatū Gorge Scenic Reserve, streams 7A and 7B and the Raupō Wetland have each been assessed as crossing points (refer **Appendix I.4**).

*Project details:*

|                                                                                                   |         |
|---------------------------------------------------------------------------------------------------|---------|
| Total catchment area                                                                              | 110 Ha  |
| Total catchment area (7A, 7B, 7C, Raupō Wetland)                                                  | 98.6 Ha |
| Total length of stream sitting under the Project footprint + buffer (total construction area) (m) | 1195 m  |
| Culvert length (incl. rip-rap where detail has been provided) (m)                                 | 76 m    |
| Number of culverts                                                                                | 1       |
| Combined length of diversions (types 1, 2, 3) (m)                                                 | 1146 m  |
| Crossing 7A – 414m stream loss                                                                    |         |
| Crossing 7B - 804m stream loss under spoil/road embankment replaced with diversions               |         |
| Crossing Raupō Wetland - 3 Eco-Bridge piers and access tracks, stock will be excluded.            |         |

**Table I.14: Catchment 7 Effects on Natural Character**

| <b>Catchment 7</b>               | <b>Existing Natural Character</b> | <b>Post-development Natural Character</b> |
|----------------------------------|-----------------------------------|-------------------------------------------|
| Flow Regime                      | Moderate                          | Moderate Low                              |
| Morphology                       | Moderate                          | Moderate Low                              |
| Water Quality                    | Moderate                          | Moderate High                             |
| Exotic Flora and Fauna           | High                              | Moderate High                             |
| Indigenous Taxa Assemblages      | High                              | Moderate High                             |
| Ecosystem Functioning            | High                              | Moderate                                  |
| Structures & Human Modifications | Moderate                          | Low                                       |
| Terrestrial Ecology              | High                              | Moderate                                  |
| Experiential                     | High                              | Low                                       |
| <b>Overall Rating</b>            | <b>Moderate High</b>              | <b>Moderate</b>                           |

|                                     |                     |                 |
|-------------------------------------|---------------------|-----------------|
| <b>Crossing point 7A</b>            | <b>High</b>         | <b>Low</b>      |
| <b>Crossing point 7B</b>            | <b>Moderate Low</b> | <b>Low</b>      |
| <b>Crossing point Raupō Wetland</b> | <b>High</b>         | <b>Moderate</b> |

*Assessment*

203. Crossing point 7A will be most affected with ratings for almost all attributes affected, resulting in a significant diminishment of overall natural character from high to low. At this crossing point, 127m of the stream will be lost under the Project footprint and the ecological functioning of this section of stream will be significantly affected. However, this is a relatively short section of the stem at the very top of the catchment.

204. Crossing point 7B will also be adversely affected (replaced with a diversion) but its existing natural character rating is lower than 7A (i.e moderate low compared to high). Terrestrial vegetation in 7B is of low value, apart from in the lower section of the stream. All of stream 7B will be replaced by a diversion.
205. The natural character of the Raupō Wetland will also be impacted (from high to moderate) primarily because of the three piers that will be located in the wetland.
206. In summary, the Project reduces the natural character at three crossing points in this catchment. However, the reduction in natural character for each of the crossing points is greater than the overall reduction in natural character for the catchment. This difference can be explained because much of the catchment will be unaffected. In particular, all but the very upper end of stream 7A remains intact from the headwaters to the Manawatū River, including the well vegetated margins and the old growth forest at the lower end. In addition, stock will be excluded from the lower part of the catchment, including the Raupō Wetland. While all of 7B will be replaced by a diversion, its existing condition is moderate low.
207. The composition of indigenous terrestrial fauna within the overall catchment is unlikely to change.
208. Given the physical changes resulting from the Project, together with the traffic activity, the experiential effects will however, be significantly reduced (from high to low).
209. Water quality, however, is anticipated to improve as a result of removal of stock, which currently have unhindered access to this area, and this, together with permanent fencing to exclude stock as part of the ongoing operations and maintenance of the highway (including fencing of the lower part of the catchment and the Raupō Wetland), will be beneficial.
210. Therefore, at a catchment level, the natural character values will diminish only slightly from moderate high to moderate.

### **Catchment 8**

211. Refer **Drawing 3 (TAT-3-DG-E-4121)** in **Appendix I.6** and catchment photographs in **Appendix I.5**.

212. Catchment 8 is on the south side of the Manawatū River, and south of SH3. It is different to the other catchments in that it drains to the Manawatū River downstream of the confluence with the Pohangina River. Most of this catchment is under pasture with a significant proportion in exotic woodlots. The drainage density is the highest of all the catchments but likely reflects the artificial drains installed across the floodplain to support existing land use.

*Project details:*

|                                                                                                   |        |
|---------------------------------------------------------------------------------------------------|--------|
| Total catchment area                                                                              | 438 Ha |
| Total catchment area (8A)                                                                         | 438 Ha |
| Total length of stream sitting under the Project footprint + buffer (total Construction area) (m) | 1052 m |
| Culvert length (incl. rip-rap where detail has been provided) (m)                                 | 159 m  |
| Number of culverts                                                                                | 3      |
| Combined length of diversions (types 1, 2, 3) (m)                                                 | 1251 m |

**Table I.15: Catchment 8 Effects on Natural Character**

| <b>Catchment 8</b>               | <b>Existing Natural Character</b> | <b>Post-development Natural Character</b> |
|----------------------------------|-----------------------------------|-------------------------------------------|
| Flow Regime                      | Low                               | Low                                       |
| Morphology                       | Low                               | Low                                       |
| Water Quality                    | Low                               | Low                                       |
| Exotic Flora and Fauna           | Low                               | Low                                       |
| Indigenous Taxa Assemblages      | Low                               | Low                                       |
| Ecosystem Functioning            | Low                               | Low                                       |
| Structures & Human Modifications | Low                               | Low                                       |
| Terrestrial Ecology              | Low                               | Low                                       |
| Experiential                     | Low                               | Low                                       |
| <b>Overall Rating</b>            | <b>Low</b>                        | <b>Low</b>                                |

*Assessment*

213. Given the existing high level of modification of catchment 8, there are unlikely to be any adverse changes to this area, post-development (i.e. the levels of natural character will remain low). While the Project will introduce an overall increase in impervious surfaces and channel diversions, a stormwater treatment wetland is proposed which may have positive effects although will not necessarily result in an overall improvement in water quality. The proposed culverts will be low profile and small and similar to those existing.

214. The road environment in this area is dominant and while the Project will increase the overall scale of built elements, the experiential quality will remain low.

### Catchment 9

215. Refer **Drawing 4 (TAT-3-DG-E-4122)** in **Appendix I.6** and catchment photographs in **Appendix I.5**.

216. Catchment 9 lies north of the proposed Alignment and drains east-west into the Pohangina River. Known as the Mangakino Stream, there is about 40% indigenous forest cover and about 60% pasture.

217. The proposed road embankment overlays small parts of the catchment at the top of two small gullies.

#### *Project details:*

|                                                                                                   |        |
|---------------------------------------------------------------------------------------------------|--------|
| Total catchment area (Ha)                                                                         | 220 Ha |
| Total catchment area (9A)                                                                         | 220 Ha |
| Total length of stream sitting under the Project footprint + buffer (total Construction area) (m) | 59 m   |

**Table I.16: Catchment 9 Effects on Natural Character**

| Catchment 9                      | Existing Natural Character | Post-development Natural Character |
|----------------------------------|----------------------------|------------------------------------|
| Flow Regime                      | High                       | High                               |
| Morphology                       | High                       | High                               |
| Water Quality                    | Moderate High              | Moderate High                      |
| Exotic Flora and Fauna           | High                       | High                               |
| Indigenous Taxa Assemblages      | High                       | High                               |
| Ecosystem Functioning            | High                       | High                               |
| Structures & Human Modifications | Moderate High              | Moderate                           |
| Terrestrial Ecology              | High                       | High                               |
| Experiential                     | High                       | High                               |
| Overall Rating                   | <b>High</b>                | <b>High</b>                        |

|                  |                     |            |
|------------------|---------------------|------------|
| Crossing point 9 | <b>Moderate Low</b> | <b>Low</b> |
|------------------|---------------------|------------|

#### *Assessment*

218. The attributes in this catchment were rated as mostly high given that, although it is not pristine, there are large continuous areas of mature

indigenous vegetation, mostly associated with the deeply incised gully system. The Project will introduce changes to only a very small part of the catchment and so in terms of both individual attributes and the overall rating, natural character will remain high.

### **Manawatū River Bridge crossing point**

219. Refer **Drawing 3 (TAT-3-DG-E-4121)** in **Appendix I.6** and catchment photographs in **Appendix I.5**.
220. The Project crosses the Manawatū River at one point just beyond the western end of the Gorge and the Manawatū Gorge Scenic Reserve and upstream of Parahaki Island. The scale of the Bridge crossing sets it apart from the stream crossings in terms of the scale of works, the scale of the waterway being affected, and the prominence of its location between the mouth of the Gorge and the confluence of the Manawatū River with the Pohangina River and also the presence of Parahaki Island. The Project's other crossing points are over streams and waterways of a much smaller scale and prominence in all respects. The Manawatū River Bridge (BR02) and the Eco-Bridge (BR03) that adjoins it to the north are the largest structures in the Project. The assessment for the Manawatū River Bridge (BR02) crossing point in is included in **Appendix I.4**.
221. The proposed Manawatū River Bridge (BR02) will be located approximately 600m upstream of the confluence of the Manawatū and Pohangina Rivers. It will cross over the existing DoC carpark on the southern side of the Manawatū River, then sweep across the River and over the railway line on the northern side, where it will join with the proposed 305m long Eco-Bridge (BR03).
222. The Manawatū River Bridge (BR02) will have four traffic lanes, median, shoulders and a 2.5m wide shared use path. A 9.0m long, 1.5m wide viewing platform will be located on the eastern side of the Bridge. The bridge structure comprises a 4-span superstructure supported by three reinforced concrete piers - one pier within the river channel and two piers on the river banks. Rock rip-rap protecting the piers on the banks will be visible above the water while the rip-rap for the central pier will sit below a layer of natural river bed material. The variable depth superstructure will be elevated approximately 25m-30m above the river channel. MSE abutment walls will have a retention height up to 7m. The abutments will be sloped from the



bridge footing to the river and be clad with precast concrete modular facing blocks.

*Project details:*

|                                            |          |
|--------------------------------------------|----------|
| Total bridge length                        | 300 m    |
| Bridge width                               | 26.4 m   |
| Viewing platform                           | 9m x1.5m |
| Width of river at crossing (approximately) | 150m     |

**Table I.17: Manawatū River Bridge Crossing Point Effects on Natural Character**

| <b>Manawatū River Bridge Crossing</b> | <b>Existing Natural Character</b> | <b>Post-development Natural Character</b> |
|---------------------------------------|-----------------------------------|-------------------------------------------|
| Flow Regime                           | Moderate High                     | Moderate                                  |
| Morphology                            | High                              | High                                      |
| Water Quality                         | Moderate                          | Moderate                                  |
| Exotic Flora and Fauna                | High                              | High                                      |
| Indigenous Taxa Assemblages           | High                              | High                                      |
| Ecosystem Functioning                 | High                              | High                                      |
| Structures & Human Modifications      | Moderate                          | Low                                       |
| Terrestrial Ecology                   | Moderate High                     | Low                                       |
| Experiential                          | Moderate High                     | Low                                       |
| <b>Overall Rating</b>                 | <b>Moderate High</b>              | <b>Moderate</b>                           |

*Assessment*

223. The margin on the south bank of the River at the crossing point is dominated by the existing DoC carpark, toilets, interpretation facilities and the former SH3 road environment. Below the carpark, the embankment has been planted on either side of the track that leads down to the river edge. On the north bank there is a large fill embankment supporting the railway and also a large box culvert. The margins are subjected to frequent disturbance due to flooding and in places willows and other exotic vegetation have colonised the margin, together with other species that are adapted to high frequency disturbance. There is also active erosion of largely fluvial deposits on the northern (true right) bank and flood flows continuously shape the gravel bed and the margins of Parahaki Island. The exposed gravel beach and wetted margin provide seasonal habitat for birds, such as banded dotterel.

224. The flow regime is largely natural, and the water quality is moderately degraded with stormwater contaminants such as copper and zinc likely to be elevated because of run-off from the land use activities on both sides of the river.
225. The overall existing level of natural character is moderate high due to the factors described above. Post-development natural character will be reduced to moderate. Many attributes will remain unchanged or will be modified only slightly but the Bridge will result in significant adverse changes to the experiential aspects, introducing a prominent structure into the river environment. While the Project will treat all stormwater prior to discharge and represents a slight improvement, the water quality will not be altered to an extent that would result in an overall positive change.
226. The Bridge will span the River approximately 30m above the active channel and there will be no change to the wider river channel form with modifications only in the immediate vicinity of the Bridge. The pier within the River will introduce a built element into the open river channel. Construction of the Bridge will, however, require clearing of the river banks and stabilisation with rip-rap visible on both banks of the river.

## **CONSTRUCTION EFFECTS**

227. This assessment considered the long-term (permanent) effects of the Project. Construction activities will also create adverse effects on the natural character of the waterbodies, but these effects will be temporary and short term when compared to the permanent effects of the new highway. The construction phase is estimated to take three to four years.
228. It is assumed that best practice construction methodologies, including stormwater management, and erosion and sediment control measures will be implemented during construction to avoid or minimise construction effects, as set out in the Project Conditions. Notwithstanding this, the disturbance and modification of parts of the catchments during construction will be substantial given the scale of the Project. Construction activities include:
- (a) vegetation removal;
  - (b) earthworks, including topsoil stripping, bulk earthworks, undercutting and placement of engineered fill/spoil sites and re-placement of topsoil and grass on the batters/fill areas. Where possible, a progressive approach to stabilisation of earthworks surfaces will be undertaken with

surfaces being covered with erosion resistant materials as soon as practicable;

- (c) construction of access roads, bridges, culverts, stream diversions, wetlands and other storm water management structures; and
- (d) permanent fencing and revegetation or re-grassing of finished works.

#### **General construction effects on natural character of streams and wetlands**

229. The scale of the proposed works required to construct the Project are substantial, particularly in relation to the small scale of the streams and wetlands crossed by the Project. Consequently, at the crossing points, the construction effects will be high. Not only is the works footprint likely to be larger than the operational footprint, the ongoing earthworks will be disruptive with culvert installation, stream diversions, formation of spoil sites, installation of construction temporary erosion and sediment control structures, and heavy vehicle activity.
230. However, following construction, effects will lessen once the rehabilitation and revegetation measures are in place.

#### **Effects on natural character of constructing the Manawatū River Bridge (BR02)**

231. The process of constructing this Bridge requires substantial temporary works to provide access to each of the piers and abutments, together with access to support the superstructure construction. A temporary access into the river bed for small excavators and vehicles will also be constructed. Temporary staging will consist of a series of 600mm hollow circular steel piles installed at 9m intervals into the river bed. A temporary sheet pile coffer dam is also required for the central pier (approximately 16m by 16m). Work on the river banks will involve excavation, installation of structural fill and construction of the MSE walls.
232. The physical impacts of the staging piles and coffer dam will directly interact with the river channel. While this will not change the flow rates, it may temporarily disrupt the flow patterns downstream of the site. The natural sediment movement of bed material will re-deposit river gravels on the disturbed areas of the bed. The river margins will be physically modified through vegetation removal and construction of temporary access tracks, crane pads, piers and the abutments. On completion, the disturbed areas

beyond the permanent bridge footprint will be reinstated and planted. Experientially, the substantial structures and activity will turn the area into a busy construction site. This will totally change the naturalness of the river corridor during the construction period, but once construction and rehabilitation have been completed, the level of naturalness will significantly improve.

233. The construction of this large Bridge will inevitably and significantly reduce the level of natural character of this part of the River throughout the construction period. This is typical of any large infrastructure Project in relation to its interaction with the receiving environment.

### **SUMMARY RATING OF EFFECTS**

234. The outcomes of the natural character assessment of the waterways and their margins potentially affected by the Project are summarised below:
- (a) There are no areas of existing outstanding natural character within the areas potentially affected by the Project.
  - (b) Of the nine catchments traversed by the Project, only one (catchment 9) has an overall high existing natural character rating.
  - (c) The overall existing natural character ratings for the other eight catchments range from low to moderate high.
  - (d) Post-development, there is a reduced level of overall natural character in catchments 2, 3, 4, 5 and 7; in catchments 1, 6, 8 and 9 there is no change.
  - (e) In terms of the crossing points that were assessed,<sup>12</sup> there will be a reduced level of natural character at all of these locations post-development. In three of the crossing points, there will be significant diminishment in natural character from an existing level of high natural character: crossing point 5A will reduce from high to low; crossing point 7A will reduce from high to low; and the Raupō Wetland crossing point will reduce from high to moderate.
  - (f) While the level of natural character will be significantly diminished post-development at these three crossing points, when these are considered in terms of their respective catchments, the reduction in natural

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<sup>12</sup> Eleven crossing points in seven of the catchments (2, 3, 4, 5, 6, 7 and 9) were assessed separately; no crossing points were assessed in catchments 1 or 8, where the existing natural character is rated as low.

character is attenuated, as much of the catchment above and below the crossing point will be unaffected by the Project.

- (g) The proposed Manawatū River Bridge crossing point was assessed separately with the existing level of natural character rated as moderate high and the post-development level rated as moderate.

235. Objective 6-2(b) in the One Plan focuses on potential adverse effects to natural character in those areas with outstanding natural character and high natural character.
236. There are no areas with outstanding natural character, therefore One Plan Objective 6-2(b)(i) does not apply. One catchment (catchment 9), was assessed as having high existing natural character, but the effects of the Project in this catchment were assessed as not significantly diminishing this area's natural character. None of the other catchments affected by the Project were considered to have existing high levels of natural character. It is therefore considered that the Project does not offend Objective 6-2(b)(ii). **Tables I.1** and **I.4** above (which are identical) summarise the assessed levels of natural character for each of the catchments, both existing and post-development.

## **CUMULATIVE EFFECTS ON NATURAL CHARACTER**

237. The Project will change the context of the landscape through which it traverses. This tract of land between Saddle Road and the Manawatū Gorge accommodates a range of activities within what is a working rural landscape, which supports rivers and streams of varying levels of natural character. While most of the area through which the Alignment passes are pasture and farmed, the Te Āpiti Wind Farm, the indigenous forests of the Manawatū Gorge Scenic Reserve and the QEII open space covenants all form part of this context as do the existing transport corridors (which include Saddle Road, the railway line and the former road through the Gorge). The addition of the new road will add further to the developed and modified nature of the parts of the catchments that it traverses.
238. In assessing the effects on natural character at a catchment level, this assessment inherently considers the cumulative natural character effects of the Project on the affected catchments.
239. The natural character assessment has considered the changes to existing natural character on a catchment basis and assessed the key locations

where the Project crosses waterbodies. Cumulatively, the nine catchments comprise only a small proportion of the overall Manawatū River catchment area. 13.36 km of stream length within the nine catchments is potentially impacted by the Project and while the widths of streams across the Project varies, the total area of associated stream bed impacted is 0.830 ha.

240. **Drawing 2 (TAT-3-DG-E-4101)** in **Appendix I.6** indicates the relative extent of the Project footprint, the lengths of waterways crossed, and the portions of the catchments not affected. From this perspective, it would be expected that the effects of the Project on the overall natural character of the waterbodies would be relatively small, and this conclusion is supported by the detailed assessment of crossing points and catchments.

### **MEASURES TO REMEDY OR MITIGATE ACTUAL OR POTENTIAL ADVERSE EFFECTS ON NATURAL CHARACTER**

241. As noted previously, in assigning post-development ratings to natural character, the team did not consider possible mitigation measures; therefore, the ratings given are all pre-mitigation ratings. While the team did not specifically consider mitigation for natural character effects, the cumulation of many of the mitigation measures provided to address the environmental effects of the Project will contribute to mitigating adverse effects on natural character. The detail on the measures taken to avoid, remedy and mitigate the adverse effects of the Project are set out in the relevant technical reports.

#### **Mitigation provided through the Designation Conditions**

242. As noted earlier in paragraph 52, several of the Designation Conditions relate to effects on natural character:
- (a) Condition 3: Ecological Management Plan Certification Process;
  - (b) Condition 9: Outline Plans (Construction Works);
  - (c) Condition 16: Cultural and Environmental Design Framework;
  - (d) Condition 17: Landscape Management Plan;
  - (e) Condition 18: Planting Management Plan;
  - (f) Condition 24: Ecological Management Plan.

243. The mitigation measures provided through these Designation Conditions are further developed by the mitigation measures referred to above in paragraph 240, and together these will reduce the adverse effects on natural character.

## **CONCLUSION AND RECOMMENDATIONS**

244. As expected, given the scale of the Project, there will be effects on the natural character of the river, streams and wetlands along the Alignment. The significance of these effects will vary along the Alignment – the natural character attributes in catchments 5, 6 and 7 will be the most adversely affected by the Project, particularly at the crossing points assessed for catchments 5 and 7. However, at the catchment scale, there will be no "areas" of natural character that will significantly diminish in natural character. **Tables I.1** and **I.4** above (which are identical) summarise the assessed levels of natural character for each of the catchments, both existing and post-development.
245. Similarly, at the Manawatū River Bridge crossing point, which has been assessed as an "area" of natural character in its own right, there will not be a significant diminishment in natural character (refer **Table I.17** above).
246. Objective 6-2(b) in the One Plan focuses on potential adverse effects to natural character in those areas with outstanding natural character and high natural character. There are no areas with outstanding natural character, therefore One Plan Objective 6-2(b)(i) does not apply. One catchment was assessed as having high existing natural character, but the effects of the Project in this catchment were assessed as not significantly diminishing this area's natural character. None of the other catchments affected by the Project were considered to have existing high levels of natural character. It is therefore considered that the Project does not offend Objective 6-2(b)(ii).
247. The proposed mitigation measures, together with the proposed consent conditions, will have a beneficial effect on several attributes and on the effects on the natural character of the catchments overall. In addition, following construction, the operations and maintenance measures for the highway such as removing stock and fencing the Alignment will also likely result in benefits to natural character.
248. Any permanent measures that can further protect the waterbodies and their margins from ongoing modification will assist to restore the natural character of these waterbodies. Exclusion of stock by fencing will help prevent physical

damage to water bodies, prevent fouling and thus improve water quality,  
reduce sedimentation and allow vegetation to regenerate on the margins.

**Boyden Evans**



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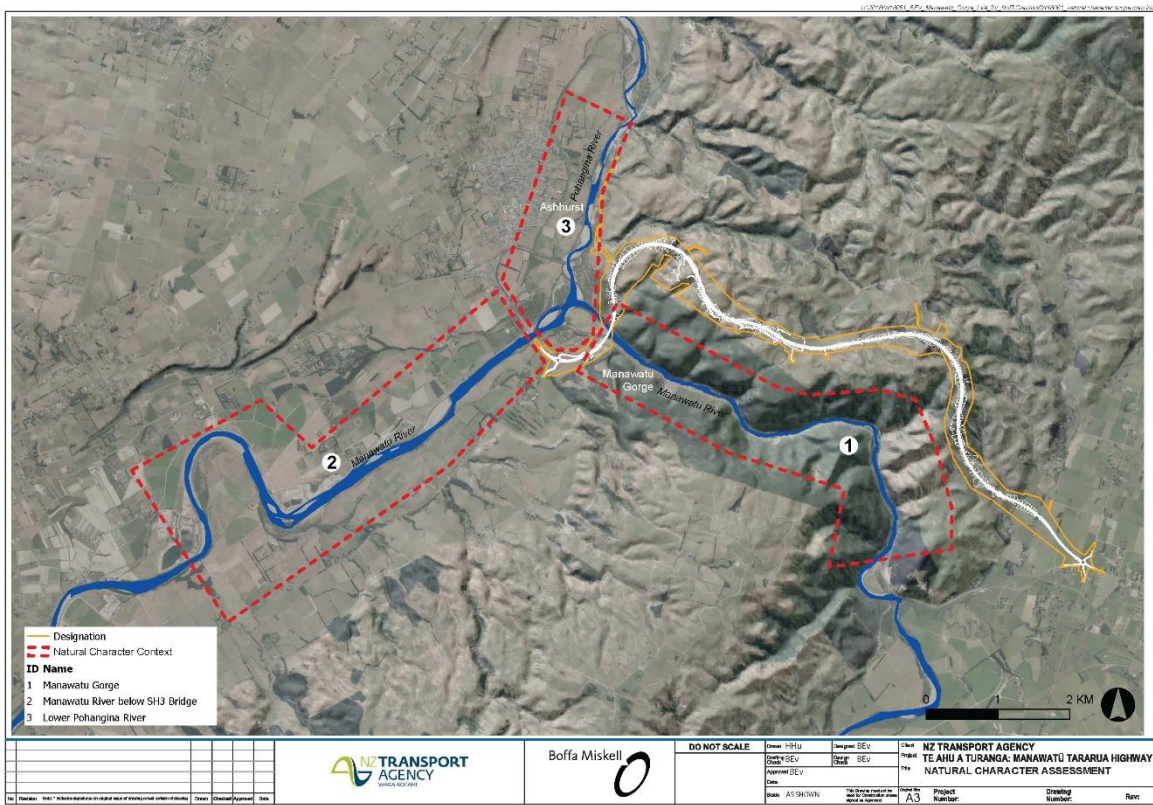
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# Appendix I.1: Natural Character Context

It is important to understand the relationship of the Project with its broader context of the Manawatū and Pohangina Rivers environment. Within this area, there is a wide variety of river environments often with quite contrasting attributes and qualities within a relatively small geographic area. These environments range from the very distinctive Manawatū River Gorge to the picturesque Pohangina River valley, to the highly modified reaches of the Manawatū River downstream of the SH3 (Ashhurst) bridge (**Figure 1**). The descriptions below assist to understand the waterbodies in the wider context for the Project.

**Figure 1**



## **Manawatū River Gorge**

The Manawatū River Gorge runs east west through the Tararua and Ruahine Ranges and is unique in New Zealand for being the only river to flow through an uplifting mountain range. Approximately 1.5 million years ago, uplift began to occur along a series of NE-SE trending active faults (i.e. the Wellington, Ruahine and Mohaka faults), initiating the formation of the central ranges. This regional scale movement led to the diversion of many smaller water courses into the Manawatū River. Consequently, the Manawatū River gained the drainage from the entire eastern side of the uplifting range. Where the Manawatū River crossed the low point of the uplifting ranges, it eroded down through the marine sediments, and then eventually cut through the basement rock, keeping pace with the rate of uplift. Smaller, abandoned stream valleys were uplifted within the ranges.

This process has led to the present-day approximately 1km wide and 6km long Manawatū River Gorge. The geomorphological nature of the Gorge can be defined into three distinct zones; the river, the gorge scarp and the broad flat-topped range crest.

The River is bound on both sides by slopes which rise 250-300m and are generally steep (35°-45°) to very steep (>45°). There are localised zones of near vertical bluffs.

The steep gorge slopes (scarp) are differentiated from the top of the Ruahine Range by a distinct change in slope angle. A profile of a tributary on the northern side of the Gorge indicates the relatively gentle slope along the flat-topped ridge crest, which then steeply changes at the slope break of the Gorge.

Above the steeply inclined gorge slopes, the top of the Ruahine Range is characterised by broad, smooth surfaces. These represent an ancient erosional surface upon which marine and alluvial deposits are preserved. Much of Project will be constructed on the crest of the Ruahine Range.

The Manawatū Gorge Scenic Reserve extends on either side of the Manawatū River. On the northern side of the River, the area between the River and the Scenic Reserve is designated for rail purposes and on the southern side the area between the River and Scenic Reserve is designated for road purposes. The Manawatū Gorge, from Ballance Bridge to the confluence of the Pohangina and Manawatū Rivers, including the adjacent Scenic Reserve, are identified in Schedule G of the Horizons One Plan as an Outstanding Natural Landscape.

The catchment land use includes intensive production farmland on the floodplains and flatter land, and farmed hill country, undeveloped land, exotic and indigenous forest and conservation areas.

The narrow Gorge largely confines the River to a single channel with minor braiding occurring in places, especially during low flows. The active channel remains natural and largely unmodified with man-made structures other than the Ballance Bridge piers.

Water quality and clarity in the Gorge is moderately degraded by relatively intensive land uses in the catchments. However, aquatic ecology condition remains high, and aquatic ecosystem functioning is relatively unmodified.

The margins of the River comprise the steep vegetated banks up to and including the SH3 and rail formations. These combine to modify the margins significantly, with cut platforms, associated buildings, bridges, culverts, signals, signs, bank stabilisation and retaining structures.

The wider context (upper slopes) are unmodified being predominantly covered in indigenous forest of differing statures, compositions, and stages of succession. The terrestrial vegetation species and habitats present are of high conservation value as recognised by the DoC Scenic Reserve status.

The dramatic nature and significant scale of the Gorge with its steep vegetated slopes and swift River have high experiential values.

### **Manawatū River Reach below SH3 (Ashhurst) Bridge**

This reach extends approximately 9km downstream of the SH3 (Ashhurst) Bridge. The river catchment combines the Pohangina River and upper Manawatū catchments and flows through high production farmland. The reach includes several gravel extraction operations which occupy old river terraces.

The alignment of the River is highly modified by removal of several meanders and side channels and a general narrowing of the river bed. The water quality is moderately degraded by catchment land uses.

The river margins have been modified by river protection works, willow planting, stopbanks and gravel extraction activities, as well as oxidation ponds and stormwater outfalls. The exposed gravel beaches and wetted margin habitats provide seasonal habitat for birds.

However, the disturbance regime is too high for the persistence of other significant terrestrial fauna (lizards) and terrestrial invertebrate communities typical of these river systems.

High production pasture and horticulture are the dominant land uses of the old floodplains adjacent to the River, which was historically lowland forest. Indigenous vegetation communities are restricted to a sparse indigenous tree-lands and small areas of regenerating shrub-hardwood species.

## **Lower Pohangina River Reach**

This 3km reach extends from the Saddle Road Bridge to the SH3 Bridge and includes the confluence with the Manawatū River. The true left bank<sup>1</sup> of the River is contained by the natural banks at the toe of the hills. The land on the true right is farmland overlying old braid plains and river terraces and includes the Ashhurst Domain. The Pohangina catchment is a 55,000ha sub-catchment of the Manawatū River with predominant land uses of grazed farmland and exotic and indigenous forest.

The River has been physically constrained and straightened over time to manage floods and to protect the rail and SH3 (Ashhurst) bridges. Within the constrained bed, the River retains its braided characteristics with meandering channels, exposed sand/gravel islands and margins. Frequent flood events move the river channels across the bed and at the confluence of the two Rivers.

Aquatic health of the River is good with ecological function being relatively unmodified and likely to be similar to what was occurring historically.

The river margins include Parahaki Island and other areas outside the active river bed (such as the island near the Ashhurst Domain). Parahaki Island is low-lying and the main stem of the Manawatū River flows around the north side and a secondary channel along the south. The shape and form of the island clearly show that it is a fluvial landform. Vegetation on the island is dominated by exotic species (rank grass, pampas, willow, tree lucerne).

The river margins are largely physically unmodified except for flood protection works and structures associated with the abutments of the bridges. The riparian margins are a mix of indigenous and exotic species. The most valuable habitat for fauna is the indigenous forest remnant at Ashhurst Domain.

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<sup>1</sup> The left bank when looking downstream

# **APPENDIX I.2: NATURAL CHARACTER ASSESSMENT MATRIX**

Appendix I.2: Natural Character Assessment Matrix

| Active Bed/Channel/Wetland Body |                                                                                                                                                                                                                                                                                                                                                                                                              | Very High                                                                                                                                           | High                                                                                                                                                                                                       | Moderate                                                                                                                                                                                                                                                                                                                                                                                                       | Low                                                                                                                                                                                                                                                                                                                                       | Very Low                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Abiotic</b>                  | <p><b>Flow Regime</b></p> <p>The flow regime characteristics of a river with a given catchment size and location.</p> <p>Change to critical flow statistics relative to naturalised flow. Inflow/outflow controlled</p> <p>Occurrence of impoundments or large diversions of flows including flood harvesting. Proportion of flows diverted or impounded. Proportion of available allocation abstracted.</p> | <p>Natural flow regime with no measurable modifications to flow statistics. No changes to land cover or land use.</p>                               | <p>Natural flow regime with minor modifications to the flow statistics. Minor changes to land cover and land use.</p> <p>Only minor changes to the timing of flows not the total inflows and outflows.</p> | <p>Still largely natural flow regime but with significant changes to the flow statistics. Moderate changes to land cover and land use. Some changes to the timing of flows and minor changes to the inflows and outflows.</p> <p>Presence of small-scale impounding structures e.g. farm dams. Some minor permitted water takes. Some water harvesting at higher flows. Low flow regime largely unchanged.</p> | <p>Moderate changes to the natural flow regime and the flow statistics. Large changes to land cover and land use but some natural processes remaining. Moderate changes to the timing of flows and the inflows and outflows. Some water permits. Low flow regime modified to a moderate degree. Occasional larger scale impoundments.</p> | <p>Highly modified flow regime. Major changes to the flow statistics. Broad scale changes to land cover and land use. Major changes to the timing of flows and the inflows and outflows. Few natural processes remain unaffected. Significant number of water permits. Low flow regime modified to a high degree. Large number or large-scale impoundments.</p> |
|                                 | <p>Physical change and dynamics of river and water movement resulting from natural seasonal floods and flows- movement of alluvial loads, sediments, flushing of algae and weeds.</p>                                                                                                                                                                                                                        | <p>Natural dynamic processes intact</p> <p>Wetland surface or groundwater intact. Natural wetland extent. Secure from dryland species invasions</p> | <p>Natural dynamic processes largely intact</p> <p>Wetland surface or groundwater hydrology intact. Wetland extent natural. Low levels of dryland species invasions</p>                                    | <p>Most natural dynamic processes generally intact but with minor modifications</p> <p>Wetland surface or groundwater hydrology may be modified but wetland extent represents close to natural extent. Invasions of dryland species localised and naturally contained</p>                                                                                                                                      | <p>Natural processes modified to a moderate level.</p> <p>Wetland surface or groundwater hydrology modified, wetland extent reduced and dryland species invaded</p>                                                                                                                                                                       | <p>Natural processes modified and masked by anthropogenic effects</p> <p>Wetland surface and groundwater hydrology very highly modified, wetland extent largely reduced, overwhelming invasion by dryland species</p>                                                                                                                                           |

| Active Bed/Channel/Wetland Body |                                                                                                                                                                                                                                                                                                                                                                                                                                  | Very High                                                                                                                    | High                                                                                                                                             | Moderate                                                                                                                                                                                           | Low                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Very Low                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Abiotic</b>                  | <p><b>Active bed/morphology-</b> including, sedimentation and presence or absence of human modifications within the active bed</p> <p>Includes, groynes, diversions, gravel extractions, irrigation infrastructure, roads, bridges, transmission lines or boat ramps.</p> <p>Extent of change to active bed or water surface profile.</p> <p>'Training of braided rivers through straightening and narrowing of braid plain.</p> | <p>Overwhelmingly natural channel with no evidence of human interference. Natural channel affected by natural processes.</p> | <p>Highly natural channel with isolated evidence of human intervention normal to the channel. Natural channel affected by natural processes.</p> | <p>Generally natural channel with occasional 'sections' with human modifications both parallel to and normal to the channel. Channel formed by and interacting with largely natural processes.</p> | <p>Moderately modified channel but still with some largely natural reaches. Multiple human modifications both parallel to and normal to the channel. Channel interacting with human modifications. Significant reaches have been affected or modified by human intervention (i.e. suburban/intensive agriculture/horticultural land use/gravel extraction/channel diversions and reshaping/narrowing and straightening of braid plain). Long stretches of flood protection structures (stopbanks, groynes, riprap).</p> | <p>Highly modified channel interacting with human interventions rather than natural processes. Majority of the reach has been affected by human interventions and modifications. Extensive channel modification and management, including gravel extraction, channel diversions and reshaping, narrowing and straightening of braid plain. Long stretches of flood protection structures (stopbanks, groynes, riprap).</p> |
|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>No impacts on wetland by reclamation or hard structures</p>                                                               | <p>Only localised areas of wetland reclamation or modification by hard structures</p>                                                            | <p>Few areas of wetland reclamation or modification by hard structures</p>                                                                                                                         | <p>Large areas of wetland reclamation or surface modification</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <p>Wetlands extensively reclaimed or modified by hard structures</p>                                                                                                                                                                                                                                                                                                                                                       |



| Active Bed/Channel/Wetland Body |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Very High                                                                                                                                                                                                                                                                                                                                                              | High                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Moderate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Low                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Very Low                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Abiotic</b>                  | <p><b>Water Quality</b></p> <p>Water quality and aquatic habitat quality; visual water clarity, sedimentation of streambed, nutrient concentrations, and faecal bacteria levels, periphyton and macrophyte growth, stormwater discharges, etc. This should account for both the main channels of the river/the wetland body as well as lateral aquatic habitats if any.</p> <p>Adverse water quality and habitat changes may result from elevated rates of fine sediment deposition, nuisance growths of macrophytes and periphyton, draining/change in flow regime, trampling by stock, discharges, etc.</p> | <p>Highly natural water and lateral habitat quality. Displaying no human induced changes.</p> <p><u>Informed by:</u><br/>Native vegetation cover of catchment / riparian zone &gt;85%. No intensive land use impacting WQ.</p> <p>Median contaminant concentrations are at or below the median reference conditions set out in McDowell et al. (2013).<sup>1</sup></p> | <p>Water displaying relatively high levels of water quality with small or rare amounts of impurities caused further upstream (e.g. by occasional stock crossing or forest harvesting); Lateral habitats in good condition despite occasional stock ingress or exotic vegetation. Lateral habitats subject to active channel migration and flooding/flushing</p> <p><u>Informed by:</u><br/>Native vegetation cover of catchment / riparian zone 60% to 85%.</p> <p>Median contaminant concentrations exceed the median reference conditions set out in McDowell et al. (2013) but are below the trigger value thresholds.<sup>2</sup></p> | <p>Water displaying reasonable levels of naturalness although contains occasional high-moderate levels of human induced changes to part of the waterway or at infrequent times; Some impact to habitat quality but lateral habitats generally intact and subject to active surface migration and flooding/flushing,</p> <p><u>Informed by:</u><br/>Native vegetation cover of catchment / riparian zone 35% to 60%.</p> <p>Median contaminant concentrations are within the 95% confidence intervals (CIs) of the trigger values set out in McDowell et al. (2013) but exceed the trigger value thresholds.</p> | <p>Water usually displaying high levels of contamination mainly from adjacent diffuse sources from land use activities (agricultural leaching etc); Lateral streams and wetlands are diminished in area, unnaturally silted and/or choked with exotic weeds. Lateral channels not exposed to lateral migration of flooding/flushing by surface flows</p> <p><u>Informed by:</u><br/>Native vegetation cover of catchment / riparian zone &lt;35%</p> <p>Median contaminant concentrations exceed the 95% confidence intervals (CIs) of the trigger values set out in McDowell et al. (2013).</p> | <p>Very highly contaminated or permanently discoloured water displaying very high levels of human induced changes to the water quality with limited life supporting capacity (e.g. within polluted urban/industrialised areas or intensive farming); Lateral habitats drained, removed or separated from the active channel or wetland body. May have reduced flushing flows.</p> <p><u>Informed by:</u><br/>Native vegetation cover of catchment / riparian zone is very low (&lt;15%) and /or intensive land use or discharges impacting water quality.</p> <p>Contaminant concentrations do not meet NPS-FM 2014 bottom lines, are causing national bottom lines for periphyton to be breached or exceed ANZECC 2000 80% protection guidelines.</p> |

<sup>1</sup> Reference conditions are defined as the chemical, physical or biological conditions that can be expected in streams and rivers with minimal or no anthropogenic influence: McDowell, R.W., Snelder, T.H., Cox, N. 2013. Establishment of reference conditions and trigger values for of chemical, physical and micro-biological indicators in New Zealand streams and rivers. AgResearch Client Report. Prepared for the Ministry for the Environment.

<sup>2</sup> Trigger values indicate that there is a 'potential risk' of adverse effects at a site. Note that the trigger values established by McDowell et al (2013) are based on national datasets and need to be interpreted in the context of site-specific information when available. For this Project, the trigger values were compared with site specific data and modelled data.

| Active Bed/Channel/Wetland Body |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Very High                                                                                  | High                                                                                                                                                                                                                        | Moderate                                                                                                                    | Low                                                                                                               | Very Low                                                                                   |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>Biotic</b>                   | <p><b>Exotic Aquatic Flora and Fauna</b></p> <p>Presence of exotic aquatic flora and fauna within the river channel/wetland body or lateral habitats (including waterweeds, exotic fish, and invasive alga e.g. didymo) can reduce the natural character of the river/wetland. This does not include vegetation on 'islands' within the river channel. This is contained under 'braid plain vegetation'. Algal blooms may be evident in some rivers due to seasonal low flows. Expert ecological judgement will be required to assess extent and may have a bearing on the degree of naturalness of this primary attribute.</p> | No evidence of introduced flora or fauna within the river channel/wetland body             | Small, often isolated pockets of introduced flora and fauna evident (less than 20% of total river/wetland). However, river/wetland displaying very high levels of naturalness. Fish communities dominated by native species | Occasional stretches (some quite long) of introduced flora and fauna evident within waterway (approx. 50% of river/wetland) | Large areas of introduced flora and fauna (including exotic fish) evident (in approximately 75% of river/wetland) | System "choked" with exotic aquatic flora and fish communities dominated by exotic species |
|                                 | <p><b>Indigenous taxa assemblages</b></p> <p>The presence of species forming aquatic communities and the level that they are in terms of representing unmodified habitat potentials.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                        | Virtually all expected species present and their population structure virtually unmodified | Virtually all expected species present but population structure is modified                                                                                                                                                 | Some expected species absent with moderate modification to population structure                                             | Most expected species absent with remnant population structure highly modified                                    | Expected species largely absent                                                            |
|                                 | <p><b>Ecosystem functioning</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | All ecosystem functions virtually intact                                                   | Almost all ecosystem functions intact                                                                                                                                                                                       | Some ecosystem functions varying outside natural range                                                                      | Most ecosystem functions varying well outside natural range                                                       | Original ecosystem functions rare or absent                                                |

| Margin         |                                                                                                                                                                                                                                                                                                                                                                 | Very High                                                                                                                                                                                                                                           | High                                                                                                                                                                                                                                                                                                                                                                             | Moderate                                                                                                                                                                                                                                                                                             | Low                                                                                                                                                                                                                                                                           | Very Low                                                                                                                                                                                         |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Abiotic</b> | <b>Structures and human modifications</b><br><br>Includes, dams, groynes, stop banks, diversions, gravel extractions, irrigation infrastructure, roads, bridges, transmission lines or boat ramps, 4WD tracks, recreational facilities- carparks, toilets,                                                                                                      | Overwhelmingly natural with no/ very limited evidence of human interference                                                                                                                                                                         | Limited human intervention (i.e. occasional bridge abutments/ power pole within the river channel)                                                                                                                                                                                                                                                                               | Occasional 'reaches' with human modifications (i.e. a settled rural landscape with bridge/ aqueduct supports, pylon footings across river corridor). Occasional localised water takes and pump stations. Informal occasional 4 WD track or walking trails on banks. Boat ramps on lake edge          | Significant parts of the margins have been affected or encroached upon by human intervention (i.e. suburban/highly managed agricultural land, including: gravel workings, part channelisation). Roads or railway lines immediately adjacent to the banks requiring protection | Completely modified or artificial (i.e. by a dam, weir or flood defence structure such as extensive stop banks or groynes)                                                                       |
|                | <b>Terrestrial Ecology</b><br><br>Vegetation – Indigenous/exotic vegetation, ecological value, quality habitat. Natural patterns and processes.<br><br>Fauna - including birds, lizards, pest animals (River and lake margins provide habitat for resident and migratory bird populations. Larger river margins and riverbeds potentially provide more habitat) | Overwhelmingly indigenous vegetation, of predominantly mature ecosystem elements, with no or few introduced species and resembling reference levels of natural pattern and process.<br><br>Contains species and habitats of high conservation value | Indigenous vegetation present in a fragmented mosaic of native and exotic communities. Several successional stages with mature ecosystem components present. Resembling high levels of natural pattern and process.<br><br>All expected species present with slight modification to population structure. Very likely to contain species and habitats of high conservation value | Includes some indigenous species (i.e. indigenous understorey regeneration or seral assemblages) but exotic vegetation (i.e. willows/ gorse) predominates and contributes most to natural pattern and process<br><br>Some expected species absent with moderate modification to population structure | Sporadic vegetation or predominance of managed exotic vegetation such as plantations/woodlots, pest plant species with few of native species and limited pattern and process<br><br>Most/many expected species absent with remnant population structure highly modified       | Absence of vegetation due to human induced changes or limited presence (in pockets) of managed exotic vegetation. Natural patterns and processes absent<br><br>Expected species virtually absent |

| Experiential                                                       | Very High                                                                 | High                                                            | Moderate                                                    | Low                                                         | Very Low                                                         |
|--------------------------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------------|
| <b>Views, sounds and smells</b><br>Sense of untamed and remoteness | Overwhelming sense of wildness and remoteness<br><br>Rare human influence | Predominantly wild and remote<br><br>Limited human interference | Regular opportunities to experience wildness and remoteness | Limited sense of wildness and remoteness for long stretches | No or rare sense of wildness or remoteness<br><br>Dominant human |

|  |  |  |                                          |                                            |  |
|--|--|--|------------------------------------------|--------------------------------------------|--|
|  |  |  | Human obvious but not dominant influence | Strong human influences for long stretches |  |
|--|--|--|------------------------------------------|--------------------------------------------|--|

|                                             |                               |             |                       |            |                     |
|---------------------------------------------|-------------------------------|-------------|-----------------------|------------|---------------------|
| <b>Calibration</b>                          | <b>Very High</b>              | <b>High</b> | <b>Moderate</b>       | <b>Low</b> | <b>Very Low</b>     |
| <b>Example Waterbodies in Horizons area</b> | <b>Manganui o te Ao River</b> |             | <b>Turitea Stream</b> |            | <b>Kawau Stream</b> |

## **APPENDIX I.3: CATCHMENT ASSESSMENT TABLES**

The nine sub-catchments of the Manawatū River potentially affected by the Project are shown on **Drawings 1 and 2 (TAT-3\_DG-E-4100 and 4101 in Appendix I.6)**. For the purposes of this assessment, the sub-catchments are referred to as Catchments 1 to 9.

| CATCHMENT 1                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                               |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Attribute                                                                                                                                           | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                    | RATING   | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | RATING   |
| <b>Active Bed</b> <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                               |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |
| <b>Abiotic</b>                                                                                                                                      | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Broad-scale modifications to land cover and land use, and therefore changes to the flow regime; particularly the low flow regime</li> <li>Major modification to the drainage network, which has highly modified flow regime;</li> <li>Few natural processes remain unaffected and any natural processes now largely modified and masked by human effects</li> </ul> | Very Low | <ul style="list-style-type: none"> <li>The interchange has been designed to be hydraulically neutral</li> <li>There will be no quantifiable change to the existing flow regime apart from a very minor loss of 'flood storage' during large events</li> <li>The catchment area will be reduced by &lt;1% but this will have no quantifiable effect on the flow regime</li> <li>Only one permanent stream impacted</li> <li>No natural processes will be affected</li> <li>Proposed changes will have no effect on existing character or processes</li> </ul> | Very Low |
|                                                                                                                                                     | <b>Morphology</b> <ul style="list-style-type: none"> <li>Cobbled bed, highly modified bed interacting with human interventions rather than natural processes;</li> <li>90 degree turns causing erosion/sedimentation – silt clogging cobbles;</li> <li>Extensive channel modification, including straightening and artificial drainage lines;</li> <li>Large number of culverts and bridges</li> </ul>                        | Very Low | <ul style="list-style-type: none"> <li>No changes to the bed morphology or characteristics are anticipated apart from some culverting although most of these will be replacements</li> <li>Existing hydraulic capacity will be maintained</li> <li>No hydraulic structures are planned that do not already exist within the area</li> <li>Channel already extensively modified</li> <li>Proposed changes will have no effect on existing character or processes</li> </ul>                                                                                   | Very Low |

| CATCHMENT 1 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Attribute   | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | RATING | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | RATING   |
| Active Bed  | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                 |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |
| Abiotic     | <b>Water Quality</b> <ul style="list-style-type: none"> <li>Heavily modified channels in agricultural land, sections straightened</li> <li>Heavy macrophyte growth</li> <li>Stock access, likely to have nutrient enrichment – likely to have elevated <i>E. coli</i> concentrations</li> <li>Modelling indicates low water quality</li> <li>Receives untreated road runoff</li> <li>0% of catchment with natural pre-human land use according to LCDB4</li> </ul>                                                | Low    | <ul style="list-style-type: none"> <li>The Project involves overall increase in impervious surfaces, channel diversions and installation of stormwater treatment wetland in catchment.</li> <li>Contaminant load model (CLM) predicts overall reduction in TSS, Zn, Cu, and TPH compared to current situation due to less cars on Saddle Road and linking roads and all Te Ahu a Turanga stormwater being treated prior to discharge.</li> <li>However, the overall catchment remains predominantly pastoral land use, which will be the main driver of overall water quality so no change to rating anticipated.</li> </ul> | Low      |
|             | <b>Exotic aquatic flora and fauna</b> <ul style="list-style-type: none"> <li>Exotic macrophytes present within the streams, thick cover.</li> <li>No exotic fish recorded in surveys.</li> </ul>                                                                                                                                                                                                                                                                                                                  | Low    | <ul style="list-style-type: none"> <li>Modification of catchment, no real change to exotic flora/fauna</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Low      |
|             | <b>Indigenous taxa assemblages</b> <ul style="list-style-type: none"> <li>Shortfin eels recorded, very poor Index of Biological Integrity (IBI) (24). Lowland, but may be artificial barriers to passage and habitat is of low quality.</li> <li>Macroinvertebrate indices indicative of poor water and habitat quality. MCIsb 63 and SQMCIsb 3.24. Typical of agricultural waterways and dominated by Diptera, <i>Potamopyrgus</i> and amphipods.</li> </ul>                                                     | Low    | <ul style="list-style-type: none"> <li>Modification of catchment, may be minor shift in suitability of habitat for fauna but limited current quality so unlikely to shift.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                        | Low      |
| Biotic      | <b>Ecosystem functioning</b> <ul style="list-style-type: none"> <li>Stream system highly modified through straightening and agricultural land use.</li> <li>Riparian margins are effectively absent with little to no shade. Streams are therefore subject to thermal influence and do not provide habitat for aquatic macroinvertebrates.</li> <li>SEV values (n=2, 0.34, 0.36) indicative of low ecological value and functioning.</li> <li>Instream habitat heterogeneity and availability limited.</li> </ul> | Low    | <ul style="list-style-type: none"> <li>Modification of several channels, introduction of culverts, small catchment so change discernible.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Very Low |

| CATCHMENT 1                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                               |            |                                                                                                                                                                                                                                                                                                                                                                                                          |            |
|--------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Attribute                                                                                                                      | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                    | RATING     | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                         | RATING     |
| <b>Margin</b> <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                |                                                                                                                                                                                                                                                                                                                                                               |            |                                                                                                                                                                                                                                                                                                                                                                                                          |            |
| <b>Abiotic</b>                                                                                                                 | <b>Structures and human modifications:</b> <ul style="list-style-type: none"> <li>Local culvert structures across road and farm tracks</li> <li>Engineered (man-made) drainage channels</li> </ul>                                                                                                                                                            | Low        | <ul style="list-style-type: none"> <li>The proposed interchange will be a significant change, but the effects are related to the setting rather than hydrology</li> <li>Three additional culverts but these will be hydraulically neutral and are consistent with existing drainage structures in the area</li> <li>Culverts will be embedded to ensure maintenance of bed form and character</li> </ul> | Low        |
| <b>Biotic</b>                                                                                                                  | <b>Terrestrial Ecology:</b> <ul style="list-style-type: none"> <li>Agricultural land use, predominantly pastoral, low value for fauna (pipits present)</li> <li>No vegetation in the riparian margin</li> <li>Shelterbelts throughout and limited bird habitat; some transient bird species</li> <li>Lizards – unlikely</li> <li>Pest animals high</li> </ul> | Very Low   | <ul style="list-style-type: none"> <li>May see some improvement in the riparian margins as diversions are planted. Minor improvement only, given modification of landscape, proximity to road, anthropogenic planting of 'easy maintenance' species rather than diverse representative of natural ecosystems.</li> </ul>                                                                                 | Low        |
| <b>Experiential</b> <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i> |                                                                                                                                                                                                                                                                                                                                                               |            |                                                                                                                                                                                                                                                                                                                                                                                                          |            |
|                                                                                                                                | <ul style="list-style-type: none"> <li>Limited sense of wildness and remoteness along these streams due to farm activity and modifications.</li> <li>Riparian vegetation and natural stream meanders are still evident in some areas but not in others.</li> </ul>                                                                                            | Low        | <ul style="list-style-type: none"> <li>Remains low overall. The Project crosses the upper extent of 2 tributaries.</li> <li>SH 3 road environment already exists in this catchment</li> </ul>                                                                                                                                                                                                            | Low        |
| <b>OVERALL RATING</b>                                                                                                          |                                                                                                                                                                                                                                                                                                                                                               | <b>LOW</b> |                                                                                                                                                                                                                                                                                                                                                                                                          | <b>LOW</b> |



| CATCHMENT 2                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Attribute                                                                                                                                           | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | RATING       | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | RATING       |
| <b>Active Bed</b> <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |              |
| <b>Abiotic</b>                                                                                                                                      | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Broad-scale modification to land cover and land use, and therefore changes to the flow regime, particularly the low flow regime (Mangamanaia flood control channel);</li> <li>Forest and scrub on some upper slopes;</li> <li>Major modification to the drainage network on the eastern and southern side of the catchment;</li> <li>Some impoundments but generally small scale;</li> <li>Few natural processes remain unaffected;</li> <li>Most natural processes now modified but still apparent in various parts of the catchment.</li> </ul>                                                                                            | Low          | <ul style="list-style-type: none"> <li>Bridge will span the channel and has been designed to be hydraulically neutral</li> <li>The bridge has a low profile, so any effects will be localised</li> <li>The catchment area will reduce by about 0.2% so any effects on the flow regime will be less than minor</li> <li>Therefore, there will be no change to the existing flow regime apart from a very minor loss of 'flood storage' to the proposed constructed wetland during large events</li> <li>All natural processes will persist</li> <li>Some very minor changes to the runoff response in the upper tributaries affected by the Project (2C &amp; 2D) but these effects will attenuate and moderate rapidly downstream</li> <li>No measurable effects once tributaries discharge to the main stem of Mangamanaia Stream</li> <li>Proposed changes will have no effect on existing character or processes</li> </ul> | Low          |
|                                                                                                                                                     | <b>Morphology</b> <ul style="list-style-type: none"> <li>Much of the channel length has natural form and is affected by natural processes;</li> <li>In the southern and eastern portions of the catchment, highly modified bed interacting with human interventions rather than natural processes;</li> <li>Extensive channel modification including straightening and artificial drainage lines on the floodplain to the east and south;</li> <li>Large number of culverts and bridges</li> <li>In the lower catchment channel form and bed character highly modified</li> <li>High percentage of deposited sediment cover on gravel bed, completely covered with fine sediments in places</li> </ul> | Moderate Low | <ul style="list-style-type: none"> <li>Only changes to the natural channel form will be in the immediate vicinity of the bridge</li> <li>While the changes will be locally significant, they will be extremely localised and of limited extent</li> <li>Rip rap in the channel will be below the level of the active bed</li> <li>Bed and channel are unstable under the current regime with bank collapse common</li> <li>Some stabilisation of the bed and banks in the immediate vicinity of the bridge from provision of scour protection</li> <li>Proposed changes will have a localised effect on existing bed and bank form and character</li> </ul>                                                                                                                                                                                                                                                                    | Moderate Low |

| CATCHMENT 2                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |
|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Attribute                                                                                                                                    | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | RATING   | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | RATING   |
| Active Bed <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |
| Abiotic                                                                                                                                      | <b>Water Quality</b> <ul style="list-style-type: none"> <li>Very high deposited sediment cover of stream bed</li> <li>Receives untreated stormwater from Saddle Road (road contaminants and exposed cut slope sediments), old SH3, and local roads.</li> <li>Intermittent stock access to main stem (2A)</li> <li>12% of sub-catchment with natural pre-human land use according to LCDB4</li> <li>Modelling indicates low water quality</li> <li>Measured water clarity good to fair during dry weather; low turbidity &amp; TSS during dry weather</li> <li>Very low clarity measured during rain events (lowest readings across all catchments); highest turbidity &amp; TSS during rain events of three wet event monitored catchments</li> <li>High soluble inorganic nitrogen (SIN) – mostly nitrate (NO<sub>3</sub>-N) measured</li> <li>Measured <i>E.coli</i> concentrations can be elevated at times</li> <li>Riffles were dry in February 2019 at downstream-most baseline water quality monitoring site indicating periodic lack of continuous surface flow.</li> </ul> | Low      | <ul style="list-style-type: none"> <li>The Project involves overall increase in impervious surfaces, loss of some tributary streams, channel diversions and installation of stormwater treatment wetlands in catchment.</li> <li>Contaminant load model (CLM) predicts overall reduction in TSS, Zn, Cu, and TPH compared to current situation due to less cars on Saddle Road and all Te Ahu a Turanga stormwater being treated prior to discharge.</li> <li>Overall catchment remains predominantly pastoral land use and has large area upstream of the Project area. Hence the Project is not anticipated to result in any significant change to overall water quality and the rating remains unchanged.</li> </ul> | Low      |
|                                                                                                                                              | <b>Exotic aquatic flora and fauna</b> <ul style="list-style-type: none"> <li>Survey data is limited to the immediate investigation area and the headwaters adjacent to the Ruahine Ranges.</li> <li>Typically, hard bottom stream system, aquatic macrophytes absent in steep headwater sections and where riparian margins are re-establishing. In areas of wetland typology and in the modified streams to the east of the Mangamanaia catchment, macrophytes expected to be present.</li> <li>Non-native fish (brown trout) recorded within the Manawatū catchment that could be present within the Mangamanaia lowland catchment.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                    | Moderate | <ul style="list-style-type: none"> <li>Loss of a tributary branch and placement of a bridge but not a fundamental shift to the way the catchment functions at a catchment level.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Moderate |

| CATCHMENT 2 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |                                                                                                                                                                                             |          |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Attribute   | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | RATING   | POST DEVELOPMENT                                                                                                                                                                            | RATING   |
|             | <ul style="list-style-type: none"> <li>On balance, over half of catchment is headwater system, hardbottom and without exotic flora and fauna.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |                                                                                                                                                                                             |          |
|             | <p><b>Indigenous taxa assemblages</b></p> <ul style="list-style-type: none"> <li>Seven macroinvertebrate sites assessed, range of hard bottom and soft bottom habitats. MCI from 60 up to 110 indicative of poor to good water and habitat quality. SQMCI 2.69 – 6.29. Sensitive EPT taxa percent abundance ranges from 2 to 42%. Taxa richness high, between 9 and 20.</li> <li>Koura present within Mangamanaia and headwater reaches.</li> <li>Excellent fish IBI (70) based on whole catchment, due to presence of longfin eel and inanga (both At Risk – Declining), shortfin eel, common bully and redfin bully. Steepness of tributaries restricts access to many species, but shortfin recorded in headwaters.</li> <li>Headwater catchments higher value for macroinvertebrates, main stem higher value for fish.</li> </ul> | High     | <ul style="list-style-type: none"> <li>Loss of a tributary branch and placement of a bridge but not a fundamental shift to the way the catchment functions at a catchment level.</li> </ul> | High     |
|             | <p><b>Ecosystem functioning</b></p> <ul style="list-style-type: none"> <li>Headwater systems to west of Managamanaia catchment relatively unmodified (in-stream), with some stock access. Areas within AgResearch being revegetated. Habitat heterogeneity good, with riparian margins contributing ecosystem function. Some areas agricultural activities to margin with modified channels.</li> <li>SEV scores in lower catchment (near alignment) indicative of moderate to very high value. Range from 0.29 (agricultural land use) to 0.85 (protected in headwaters).</li> <li>Additional SEV in upper catchment (adjacent to Ruahines) 0.42 to 0.62, excellent in-stream habitat heterogeneity. Reduced overall score due to lack of riparian margins.</li> </ul>                                                               | Moderate | <ul style="list-style-type: none"> <li>Loss of a tributary branch and placement of a bridge but not a fundamental shift to the way the catchment functions at a catchment level.</li> </ul> | Moderate |

| CATCHMENT 2                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |
|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Attribute                                                                                                                      | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | RATING          | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                          | RATING              |
| <b>Margin</b> <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |
| <b>Abiotic</b>                                                                                                                 | <b>Structures and human modifications</b> <ul style="list-style-type: none"> <li>Settled rural landscape</li> <li>Culverts, bridges and manmade drains</li> <li>Artificial lined channels due to farm operations and local road construction</li> </ul>                                                                                                                                                                                                                                                                                                   | Moderate Low    | <ul style="list-style-type: none"> <li>A new bridge that will be hydraulically neutral</li> <li>Some rip rap scour protection but much below the active bed</li> <li>Some additional culverts but these will be hydraulically neutral and are consistent with existing drainage structures</li> <li>Road 'embankment' across the floodplain</li> <li>Some modifications towards the interfluvium of sub-catchments 2C &amp; 2D</li> </ul> | Moderate Low        |
| <b>Biotic</b>                                                                                                                  | <b>Terrestrial Ecology</b> <ul style="list-style-type: none"> <li>Catchment is modified by agricultural land use</li> <li>Regenerating vegetation in gully systems, pockets of secondary broadleaf forest</li> <li>Isolated pockets of pine forest potential for possible lizard habitat, and forest birds</li> </ul>                                                                                                                                                                                                                                     | Low             | <ul style="list-style-type: none"> <li>Loss of a tributary branch and placement of a bridge. Riparian margins at a catchment level will not be fundamentally changed.</li> </ul>                                                                                                                                                                                                                                                          | Low                 |
| <b>Experiential</b> <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |
|                                                                                                                                | <ul style="list-style-type: none"> <li>Rural working hill country dissected by the steep stream gullies, some of which support indigenous vegetation.</li> <li>The experience of naturalness varies greatly from high in the deep and densely vegetated gullies to low in the upper parts of the stream gullies dominated by pasture.</li> <li>The flat and intensively farmed part of the catchment near Woodville is highly modified with channelised streams with little or no riparian vegetation and has very low experiential qualities.</li> </ul> | Moderate        | <ul style="list-style-type: none"> <li>New road activity in the hill country and physical modifications to the waterbodies will reduce the experiential quality of this less modified end of the catchment.</li> </ul>                                                                                                                                                                                                                    | Moderate Low        |
| <b>OVERALL RATING</b>                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>MODERATE</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>MODERATE LOW</b> |

| CATCHMENT 3 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Attribute   | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | RATING   | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | RATING   |
| Active Bed  | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |
| Abiotic     | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Smaller catchment – less scope for modification. Doesn't have upper pastoral catchment</li> <li>Land cover and land use has changed over about half of the catchment, and therefore changes to the flow regime; particularly the low flow regime;</li> <li>Some natural processes remain unaffected; and</li> <li>Most natural processes now modified but still apparent in various parts of the catchment.</li> <li>Variable flows, highly responsive for rainfall events</li> <li>Minor changes to the drainage network and these changes are restricted to the interfluvium;</li> <li>Some small-scale impoundments;</li> <li>Considerable forest and scrub on some upper catchment slopes;</li> </ul> | Moderate | <ul style="list-style-type: none"> <li>The Project has the potential to interact only with intermittent streams</li> <li>The effective catchment area will increase by 0.2%</li> <li>There will be no change to the existing flow regime apart from potentially some change to the timing and volume of immediate storm runoff but only in the upper reaches of 3B &amp; 3A where flow is already intermittent</li> <li>Only a very small proportion of the catchment affected</li> <li>Natural processes largely unaffected as works towards the interfluvium and in intermittent channels</li> <li>Some very minor changes to the runoff response in the upper tributaries affected by the Project but these effects will attenuate and moderate rapidly</li> <li>No measurable effects once headwater tributaries discharge to the permanent stream channel</li> <li>Proposed changes will have little effect on existing flow regime</li> </ul> | Moderate |
|             | <b>Morphology</b> <ul style="list-style-type: none"> <li>Channel form and cobbled bed character reasonably natural</li> <li>Much of the channel length has natural form and affected by natural processes;</li> <li>Highly modified bed on the upper slopes interacting with human interventions rather than natural processes;</li> <li>Some short reaches on the upper slopes affected by human interventions and modifications;</li> </ul>                                                                                                                                                                                                                                                                                                                       | Moderate | <ul style="list-style-type: none"> <li>Only changes to the natural channel form will be in the immediate vicinity of the Project and towards the interfluvium</li> <li>Channel in this area already modified by human activities</li> <li>Predominantly intermittent channels will be affected</li> <li>Bed and channel adjusted to the current flow regime that will not change</li> <li>Proposed changes will have minor effect on existing channel character or processes</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Moderate |

| CATCHMENT 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                             |
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| Attribute                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | RATING                                                                                                                                                                                                                                                                                                                                       | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | RATING                                                                                                                                                                                                                                                                                      |
| Active Bed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                             |
| Abiotic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Water Quality</b> <ul style="list-style-type: none"> <li>Moderate-high deposited sediment cover of stream bed</li> <li>Already receives some untreated road stormwater from a short section of Saddle Road.</li> <li>Stock access to upper reaches – mostly sheep and limited cattle access in mid to lower parts of catchment</li> <li>46% of sub-catchment with natural pre-human land use according to LCDB4</li> <li>Modelling indicates moderate water quality</li> <li>Measured water clarity fair during dry weather</li> <li>Measured turbidity and TSS low during dry weather</li> <li>Fairly high deposited sediment cover measured</li> </ul> | Moderate                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>The Project involves overall increase in impervious surfaces, loss of some headwater stream length, channel diversions and installation of stormwater treatment wetland in catchment.</li> <li>Contaminant load model (CLM) predicts overall increase in TSS, Zn, Cu, and TPH compared to current situation due to input of treated road stormwater.</li> <li>The Project will also result in reduced stock density in upper catchment compared to current situation (mostly sheep).</li> <li>The best parts of the catchment with regenerating bush remains unchanged.</li> <li>On balance the Project is unlikely to have a great effect on overall water quality that would result in a change in rating.</li> </ul> | Moderate                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Biotic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Exotic aquatic flora and fauna</b> <ul style="list-style-type: none"> <li>Constructed ponds at headwaters and online structures influenced the in-stream hydrology. As such, macrophytes present in upper reaches and where no riparian margin present.</li> <li>Indigenous (moderate value) wetland in uppermost reach of 3A.</li> </ul> | Moderate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>Some modification at top of catchment. Modification more extensive than current and complete loss of some channels/wetlands.</li> <li>Overall the change will not significantly alter the assemblage of flora and fauna in the catchment.</li> </ul> |
| <b>Indigenous taxa assemblages</b> <ul style="list-style-type: none"> <li>Steep, good riparian margins through upper to mid reaches</li> <li>Macroinvertebrate data (67 and 89) in the upper reaches are indicative of poor to fair water and habitat quality. Likely influenced by the agricultural land use. Good taxa richness (n = 14, 19). Mid reaches under forest cover higher MCI.</li> <li>Key taxa within the vegetated areas – Talitridae amphipods, <i>Zephlebia</i> mayflies, <i>Potamopyrgus</i> snails, <i>Archichauliodes</i> dobsonfly larvae, <i>Hydropsyche</i> (<i>Orthopsyche</i>) caddis larvae. Lower value species in the headwaters.</li> <li>Longfin eel (At Risk – Declining) shortfin eel and koura recorded within the catchment. IBI 52, indicative of</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | High                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>Some modification at top of catchment. Modification more extensive than current and complete loss of some channels/wetlands.</li> <li>Overall the change will not significantly alter the assemblage of flora and fauna in the catchment.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | High                                                                                                                                                                                                                                                                                        |

| CATCHMENT 3                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |                                                                                                                                                                                                                                                                                                                                             |              |
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| Attribute                                                                                | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | RATING        | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                            | RATING       |
|                                                                                          | <p>moderate. Fish survey limited but presence of threatened longfin indicates habitat values.</p> <ul style="list-style-type: none"> <li>The low diversity of fish present in the upper catchment likely to be influenced by natural barriers in the lower reaches and also existing barriers at the gorge road.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                            |               |                                                                                                                                                                                                                                                                                                                                             |              |
|                                                                                          | <p><b>Ecosystem functioning</b></p> <ul style="list-style-type: none"> <li>Very upper reaches have been modified including online ponds and damming structures. Some stock access.</li> <li>Mid to upper catchment riparian margins are wide and intact, providing shade to the stream. These reaches unlikely to be modified and representative of relatively natural system.</li> <li>Lower reaches riparian margins absent and so likely to have thermal influence, but channel appears unmodified and expect relatively natural functioning.</li> <li>SEV at two locations in uppermost catchment, 0.38 and 0.66. Indicative of moderate value and expected to be indicative of the agricultural land use. Mid catchment reaches would have higher SEV.</li> </ul> | Moderate      | <ul style="list-style-type: none"> <li>Some modification at top of catchment. Modification more extensive than current and complete loss of some channels/wetlands.</li> <li>Overall the change will not significantly alter the ecological function of the catchment, on the basis that the proportion being affected is small.</li> </ul> | Moderate Low |
| <b>Margin Indicators (vegetation, patterns/type, structures and human modifications)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |                                                                                                                                                                                                                                                                                                                                             |              |
| <b>Abiotic</b>                                                                           | <p><b>Structures and human modifications:</b></p> <ul style="list-style-type: none"> <li>Minimal structures / modifications within existing catchment</li> <li>Modification at top end</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Moderate-High | <ul style="list-style-type: none"> <li>Five culverts proposed but low profile and scale</li> <li>Culverts will be embedded so that the existing bed can reform</li> <li>Proposed changes will affect the existing character but limited extent</li> </ul>                                                                                   | Moderate     |

| CATCHMENT 3                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                      |                      |                                                                                                                                                                                                                                                                               |                 |
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| Attribute                                                                                                               | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                           | RATING               | POST DEVELOPMENT                                                                                                                                                                                                                                                              | RATING          |
| Margin <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                |                                                                                                                                                                                                                                                                                                                                                                      |                      |                                                                                                                                                                                                                                                                               |                 |
| <b>Biotic</b>                                                                                                           | <b>Terrestrial Ecology</b> <ul style="list-style-type: none"> <li>Regenerating indigenous vegetation in gullies, multiple successional stages, possibly secondary broadleaf forest,</li> <li>Extends down to Manawatū Gorge Scenic Reserve<br/>Relatively good intactness for forest birds; wetland birds also present</li> <li>Potential lizard habitat.</li> </ul> | Moderate-High        | <ul style="list-style-type: none"> <li>Some modification at top of catchment. Modification more extensive than current and complete loss of existing areas of riparian margin. In the context of the riparian margin in the catchment, it is a discernible change.</li> </ul> | Moderate        |
| Experiential <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i> |                                                                                                                                                                                                                                                                                                                                                                      |                      |                                                                                                                                                                                                                                                                               |                 |
|                                                                                                                         | <ul style="list-style-type: none"> <li>A combination of predominantly indigenous forest/scrub cover dissected by the steep stream gullies and areas of grazed slopes.</li> <li>The experience of naturalness varies greatly from high in the deep and densely vegetated gullies to low in the parts of the stream gullies dominated by pasture.</li> </ul>           | Moderate             | <ul style="list-style-type: none"> <li>The Project impacts the upper extent of this catchment, but overall remains moderate as the majority of the catchment is unaffected, in particular the forested scarp.</li> </ul>                                                      | Moderate Low    |
| <b>OVERALL RATING</b>                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                      | <b>MODERATE HIGH</b> |                                                                                                                                                                                                                                                                               | <b>MODERATE</b> |



| CATCHMENT 4 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |
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| Attribute   | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | RATING       | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | RATING |
| Active Bed  | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |
| Abiotic     | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Land cover and land use has been modified over about 85% of the catchment, and therefore changes to the flow regime; particularly the low flow regime;</li> <li>Limited forest and scrub on some upper catchment slopes;</li> <li>Forest remaining on the slopes of the gorge scarp;</li> <li>Some modification to the drainage network but these changes are restricted to the upper slopes and interfluvium (farm dams);</li> <li>Several small to moderate-scale impoundments;</li> <li>Some natural processes remain unaffected but generally in the lower catchment</li> <li>Most natural processes now modified but still apparent in various parts of the catchment.</li> </ul> | Moderate Low | <ul style="list-style-type: none"> <li>Area potentially impacted by the Project already affected by human activities</li> <li>There will be a slight increase in catchment area 0.3%</li> <li>Majority of streams affected are intermittent</li> <li>Flow regime has already adjusted to changes in land use and land cover</li> <li>Possibly a slight change to the timing and volume of storm runoff</li> <li>Majority of effects are to those tributaries on the 'south side' of the main stem</li> <li>Any effects will be attenuated and moderated by the large tributary to the north, which has a greater area than those potentially affected and the catchment downstream of the Project area</li> <li>Will be some small 'diversions' from adjacent catchments but any effects will be so small they will be immeasurable</li> <li>Proposed changes will have only a small effect on existing runoff character or processes</li> <li>Downstream at the indigenous forest boundary any changes resulting from the Project will not be measurable</li> </ul> | Low    |
|             | <b>Morphology</b> <ul style="list-style-type: none"> <li>Much of the channel length has natural form and affected by natural processes;</li> <li>Channel form and bed character reasonably natural</li> <li>Highly modified bed on the upper slopes interacting with human interventions rather than natural processes;</li> <li>Some short reaches on the upper slopes affected by human interventions and modifications;</li> <li>Few farm tracks and culverts;</li> <li>Couple of culverts. Quite modified in upper catchment, lower quite natural</li> </ul>                                                                                                                                                                                 | Moderate-Low | <ul style="list-style-type: none"> <li>Only changes to the natural channel form will be in the immediate vicinity of the Project</li> <li>Changes will generally be to intermittent channels</li> <li>Channel in this area already modified by human activities</li> <li>Bed and channel adjusted to the current flow regime that will not change</li> <li>Some changes to the channel caused by realignment and installation of culverts etc.</li> <li>Potentially a reduction in silt and attenuation of low flows</li> <li>Proposed changes will have limited effect on existing character or processes</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                | Low    |

| CATCHMENT 4 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |        |
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| Attribute   | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | RATING | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | RATING |
| Active Bed  | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |        |
|             | <p><b>Water Quality</b></p> <ul style="list-style-type: none"> <li>• Very high deposited sediment cover of stream bed was measured</li> <li>• Appears mostly unfenced from stock (sheep and cattle) with numerous areas of active bank collapse and erosion observed.</li> <li>• Receives some untreated road stormwater from Saddle Road (possible contaminants)</li> <li>• 19% of sub-catchment with natural pre-human land use according to LCDB4 – mostly the lower section within the Manawatū Gorge Scenic Reserve</li> <li>• Modelling indicates low water quality</li> <li>• Unlined former Woodville Landfill occupies the headwaters of one tributary (likely leachate)</li> <li>• Measured water clarity was fair during dry weather, except for downstream most site which was very poor. Second-most turbid of monitored catchments during dry weather</li> <li>• All sites have very poor clarity measured during rain events.</li> <li>• Most downstream site in Reserve has highest turbidity and TSS measured of all baseline monitoring sites.</li> <li>• Measured <i>E. coli</i> concentrations are elevated at times</li> <li>• Measured dissolved reactive phosphorus (DRP) elevated at times</li> <li>• Likely has high water temperatures during summer due to limited shading of channel</li> <li>• Artificial pond at Bolton property-Reserve boundary is chronically turbid and has resulted in an armoured bed downstream in Scenic Reserve with very high sediment cover downstream, even in faster flowing sections.</li> </ul> | Low    | <ul style="list-style-type: none"> <li>• The Project involves overall increase in impervious surfaces, the piping, diversion and loss of some stream length, and installation of stormwater treatment sediment basins and wetland swales.</li> <li>• Contaminant load model (CLM) predicts overall reduction in TSS, Zn, Cu, and TPH compared to current situation due to less cars on Saddle Road and all Te Ahu a Turanga stormwater being treated prior to discharge.</li> <li>• The Project will result in some reduction of stock densities and reduce the length of stream where stock have access.</li> <li>• Overall catchment land use will remain predominantly agricultural, including a large area upstream of the Project, and be the main driver of water quality. In the absence of any widespread riparian fencing and planting in the greater catchment, the Project is not expected to alter water quality to any great extent and the rating remains unchanged.</li> <li>• Additionally, the large artificial pond just upstream of the Manawatū Gorge Scenic Reserve boundary will remain as is and continue to result in the high suspended and deposited fine sediments measured downstream.</li> </ul> | Low    |

| CATCHMENT 4 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |              |
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| Attribute   | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | RATING   | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                              | RATING       |
| Active Bed  | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |              |
| Biotic      | <b>Exotic aquatic flora and fauna</b> <ul style="list-style-type: none"> <li>Macrophytes present throughout, not always dominant but there are thick macrophyte beds in places.</li> <li>Exotic and native wetlands present, low value.</li> <li>Areas of vegetated QEII and lower DoC reserve unlikely to have macrophytes. These areas form a small proportion of the catchment.</li> <li>Native fish recorded within the catchment.</li> </ul>                                                                                                                                                                                                        | Moderate | <ul style="list-style-type: none"> <li>Modification of several parts of catchment, including infilling of gullies and wetlands, diversion of flows to newly created channels (therefore impacting downstream reaches).</li> <li>Overall at catchment scale unlikely to change the composition of exotic flora/fauna.</li> </ul>                                                                                                                               | Moderate     |
|             | <b>Indigenous taxa assemblages</b> <ul style="list-style-type: none"> <li>Six macroinvertebrates samples. MCI range from 64-88, indicative of poor to fair quality water and habitat quality.</li> <li>Few EPT taxa (key taxa - <i>Potamopyrgus</i> snails, Talitridae amphipods, oligochaete worms)</li> <li>Koura recorded in the catchment.</li> <li>Fish IBI (34) very poor. Upland bully, unidentified bully (common or Cran's) and shortfin eel observed. Longfin eel (At Risk – Declining) present. Driven by presence of barriers downstream.</li> </ul>                                                                                         | Moderate | <ul style="list-style-type: none"> <li>Modification of several parts of catchment, including infilling of gullies and wetlands, diversion of flows to newly created channels (therefore impacting downstream reaches).</li> <li>Loss of some areas of habitat but unlikely to substantially influence indigenous taxa at a catchment scale as areas being impacted are of lower quality within the catchment.</li> </ul>                                      | Moderate-Low |
|             | <b>Ecosystem functioning</b> <ul style="list-style-type: none"> <li>Six SEV, all at moderate range (0.40 to 0.56).</li> <li>Modification of catchment with culverts, online ponds, stock access.</li> <li>Stock access to much of the catchment, resulting in damage to stream banks and wetland habitats.</li> <li>Online pond upstream of DoC reserve likely to be impacting fauna assemblages and ecosystem function in the lower reaches.</li> <li>Some fish non-migratory so habitat values should be recognised.</li> <li>Riparian margins and quality in the DoC reserve likely to positively influence the ecosystem functioning at a</li> </ul> | Moderate | <ul style="list-style-type: none"> <li>Modification of several parts of catchment, including infilling of gullies and wetlands, diversion of flows to newly created channels (therefore impacting downstream reaches).</li> <li>Loss of some gully systems and modification of flow regime, input from stormwater devices, installation of structures online of channels, anticipate some reduction in ecosystem functioning at a catchment scale.</li> </ul> | Low          |

| CATCHMENT 4                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |              |                                                                                                                                                                                                                                                                                                                                                                                                                                    |              |
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| Attribute                                                                                | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | RATING       | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                   | RATING       |
|                                                                                          | catchment scale, although this is only a portion of the catchment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |              |                                                                                                                                                                                                                                                                                                                                                                                                                                    |              |
| Margin <i>Indicators (vegetation, patterns/type, structures and human modifications)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |              |                                                                                                                                                                                                                                                                                                                                                                                                                                    |              |
| <b>Abiotic</b>                                                                           | <b>Structures and human modifications</b> <ul style="list-style-type: none"> <li>Culverts and farm dams (two significant dams present and culverts in several locations)</li> <li>A number of farm tracks, which cross natural watercourses</li> <li>DoC Reserve is a small portion of catchment with limited human intervention</li> <li>Some modification to natural watercourses from farm operations (farm track and Meridian access culverts)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Moderate Low | <ul style="list-style-type: none"> <li>Ten culverts proposed but low profile and generally small scale and on intermittent streams</li> <li>Some realignment and construction of artificial channels</li> <li>Some reaches of existing channel will be completely lost</li> <li>Proposed changes will have a significant effect on the existing character, but this should dissipate over time and certainly downstream</li> </ul> | Low          |
| <b>Biotic</b>                                                                            | <b>Terrestrial Ecology</b> <ul style="list-style-type: none"> <li>Mix of terrestrial vegetation – divaricating shrublands, forest in DoC Reserve, wetlands, heavily grazed pasture, pines</li> <li>High proportion of exotic wetlands, divaricating shrublands and raupō – heavily grazed</li> <li>Heavy grazing has resulted in divaricating shrublands in gullies at head of wetlands creating a unique environment.</li> <li>In lower half of catchment with divaricating shrubland.</li> <li>QEII covenant on northern boundary</li> <li>Short section of riparian margin, pine present, wetland birds likely, forest birds and lizards unlikely. Pipit (pasture bird) likely to be present. Connects into DoC reserve (high value). Incomplete vegetation, resulting in edge effects. Minimal core habitat outside of the DoC area.</li> <li>Forest birds unlikely due to habitat type and age; wetland birds present</li> <li>Pipits and lizards likely to be present in isolated areas</li> </ul> | Moderate     | <ul style="list-style-type: none"> <li>Modification of several parts of catchment, including infilling of gullies and wetlands and associated margins.</li> <li>Loss of notable area of exotic wetland and some divaricating shrubland areas.</li> <li>Fauna may be impacted by loss of exotic wetland.</li> </ul>                                                                                                                 | Moderate-Low |

| CATCHMENT 4           |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                                                                                                                                                                                                                                                     |            |
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| Attribute             | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                        | RATING              | POST DEVELOPMENT                                                                                                                                                                                                                                    | RATING     |
| Experiential          | <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i>                                                                                                                                                                                                                                                                                                                                        |                     |                                                                                                                                                                                                                                                     |            |
|                       | <ul style="list-style-type: none"> <li>Rural working landscape, wind farm and road activities dominate the catchment, only small sections of stream above the scarp/Manawatu Gorge Scenic Reserve support indigenous vegetation.</li> <li>The experience of naturalness varies greatly from high in the deep and densely vegetated lower gullies (which is a small proportion of the catchment) to low in the mid and upper catchment.</li> </ul> | Moderate Low        | <ul style="list-style-type: none"> <li>The Project intercepts several tributaries in the mid- section of this catchment, further reducing the experiential quality with introduction of traffic activity and modification of waterbodies</li> </ul> | Low        |
| <b>OVERALL RATING</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>MODERATE LOW</b> |                                                                                                                                                                                                                                                     | <b>LOW</b> |

| CATCHMENT 5 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |              |
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| Attribute   | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | RATING    | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | RATING       |
| Active Bed  | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |              |
| Abiotic     | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Land cover and land use has been modified over about 67% of the catchment, and therefore some changes to the flow regime; variable flow regime, particularly the low flow regime;</li> <li>Limited indigenous forest and scrub on some upper catchment slopes but considerable forest remaining on the slopes of the gorge scarp;</li> <li>Some modification to the drainage network but these changes are restricted to the upper slopes and interfluvium;</li> <li>Several small to moderate-scale impoundments;</li> <li>Some natural processes remain unaffected but generally in the lower catchment;</li> <li>Several natural processes now modified but still apparent in various parts of the catchment.</li> </ul> | Moderate  | <ul style="list-style-type: none"> <li>Area potentially impacted by the road already affected by human activities</li> <li>Channel realignments and flow diversions will reduce the effective catchment size by 4.5%</li> <li>Flow regime has already adjusted to changes in land use and land cover but change in area will reduce flows, but not to a measurable extent</li> <li>Project passes through the mid-upper catchment so greater potential effects</li> <li>Likely a slight change to the timing and volume of storm runoff</li> <li>Any effects will be attenuated and moderated by the catchment downstream which has a greater area than those potentially affected</li> <li>Will be some small 'diversions' to adjacent catchments but any effects will be so small they will be immeasurable</li> <li>Proposed changes will have a small effect on existing runoff character or processes</li> <li>Downstream at the 'indigenous forest boundary' any changes resulting from the Project will not be measurable</li> </ul> | Moderate     |
|             | <b>Morphology</b> <ul style="list-style-type: none"> <li>Channel form and bed character reasonably natural over the majority of the catchment;</li> <li>Modified bed on the upper slopes interacting with some human interventions rather than natural processes;</li> <li>Some short reaches on the upper slopes affected by human interventions and modifications;</li> <li>Some farm tracks and culverts.</li> </ul>                                                                                                                                                                                                                                                                                                                                                               | Moderate- | <ul style="list-style-type: none"> <li>A number of culverts and realignment of some channel reaches are proposed</li> <li>These changes to the natural channel form will be in the immediate vicinity of the Project</li> <li>Channels in this area have already modified by human activities</li> <li>Bed and channel adjusted to the current flow regime</li> <li>Potentially a reduction in silt and attenuation of low flows</li> <li>Proposed changes will have a relatively small effect on existing character or processes of the wider catchment</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Moderate-Low |

| CATCHMENT 5 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |              |
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| Attribute   | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | RATING       | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | RATING       |
| Active Bed  | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |              |
|             | <p><b>Water Quality</b></p> <ul style="list-style-type: none"> <li>Upper catchment mostly unfenced agriculture with stock (sheep and cattle) access. Lower catchment in forested Manawatū Gorge Scenic Reserve.</li> <li>34% of catchment with natural pre-human land use according to LCDB4 – all in the lower section within the Manawatū Gorge Scenic Reserve</li> <li>Modelling indicates moderate water quality overall</li> <li>Moderate-high deposited sediment cover measured in agricultural land, low in forested Reserve.</li> <li>Currently receives no road stormwater runoff except from Meridian access roads.</li> <li>Measured visual clarity poor during dry weather</li> <li>Highest measured dry weather turbidity and TSS of all catchments</li> <li>Measured <i>E. coli</i> concentrations very elevated at times</li> <li>DRP often elevated</li> <li>Dissolved copper above guidelines at times</li> <li>Upper catchment water temperatures likely high during summer due to lack of shading.</li> </ul> | Moderate-Low | <ul style="list-style-type: none"> <li>The Project involves overall increase in impervious surfaces, the piping, diversion and loss of some stream length.</li> <li>Stormwater from the Project is directed out of the catchment such that it will not receive any treated runoff.</li> <li>The Project will result in reduced access by stock to the channel but most of the upper catchment will remain as pasture.</li> <li>In the absence of any widespread riparian fencing and planting in the greater catchment, the Project is not expected to alter water quality to any great extent and the rating remains unchanged.</li> </ul> | Moderate-Low |
| Biotic      | <p><b>Exotic aquatic flora and fauna</b></p> <ul style="list-style-type: none"> <li>Majority of catchment cobble bottom and at least partially shaded, so minimal macrophytes. Macrophytes effectively absent from most stream channel.</li> <li>Exotic and native vegetation within wetlands in the headwaters.</li> <li>Native fish recorded. (longfin eel, At Risk Declining)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | High         | <ul style="list-style-type: none"> <li>Substantial portion of upper catchment impacted by Project resulting in reduction in available stream length and habitat for fauna. May result in habitat being more favourable for exotic flora.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                         | Moderate     |

| CATCHMENT 5 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |          |
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| Attribute   | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | RATING | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                   | RATING   |
| Active Bed  | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |          |
|             | <p><b>Indigenous taxa assemblages</b></p> <ul style="list-style-type: none"> <li>• Good to excellent MCI/QMCI, tended to be higher at site in Reserve. Highest MCI and QMCI scores over all 17 sites at the site in Reserve</li> <li>• MCI as an indicator fair to excellent</li> <li>• Macroinvertebrate scores generally indicative of good to excellent water and habitat quality, with one site indicative of poor (n=7, 88 up to 120). SQMCI also indicative of excellent, quality (3.32 to 7.40). Macroinvertebrates from open watercourses as well as within forested DoC reserve.</li> <li>• High EPT taxa and abundance (typically above 50%, with three sites above 80%). Mayflies abundant.</li> <li>• Koura present.</li> <li>• At Risk – Declining longfin eel recorded in catchment, moderate IBI (48).</li> <li>• Fish passage barrier downstream likely to influence the diversity of fish present.</li> </ul> | High   | <ul style="list-style-type: none"> <li>• Substantial portion of upper catchment impacted by Project.</li> <li>• Loss of habitat for indigenous taxa, but not complete loss within catchment</li> </ul>                                                                                                                                                                                                                                                             | Moderate |
|             | <p><b>Ecosystem functioning</b></p> <ul style="list-style-type: none"> <li>• SEV scores in upper catchment with limited riparian margins range between 0.52 and 0.76 (n=7) indicative of moderate to high ecological function.</li> <li>• Upper reaches modified by stock access and riparian margins absent in parts, but also areas of intact vegetation shading the stream.</li> <li>• Shade also provided by incised channels.</li> <li>• Cobbles and boulders in stream, with chutes, waterfalls and pools providing instream habitat and hydrologic heterogeneity. Downstream reaches within DoC Reserve, well vegetated with wide margins and natural channels. SEV scores are expected to be higher than upper catchment due to riparian margin integrity.</li> </ul>                                                                                                                                                  | High   | <ul style="list-style-type: none"> <li>• Substantial portion of upper catchment impacted by Project. At those locations, the channels will be filled in and culverted.</li> <li>• Consequently, a marked change in the proportion of catchment that is natural and a shift away from agricultural land use in those areas (which still enables some ecosystem functioning).</li> <li>• Proportion of catchment with functional aquatic habitat reduced.</li> </ul> | Moderate |



| CATCHMENT 5           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
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| Attribute             | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | RATING               | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                      | RATING              |
| Margin                | <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                      |                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
| <b>Abiotic</b>        | <b>Structures and human modifications</b> <ul style="list-style-type: none"> <li>Some modification to natural watercourses from farm operations (farm track and Meridian access culverts) but limited</li> </ul>                                                                                                                                                                                                                                                                                                                                                                               | Moderate             | <ul style="list-style-type: none"> <li>Six culverts proposed</li> <li>Some realignment and construction of artificial channels</li> <li>Proposed changes will have a significant effect on the existing character, but this should dissipate over time and certainly downstream</li> </ul>                                                                                                                            | Moderate-Low        |
| <b>Biotic</b>         | <b>Terrestrial Ecology</b> <ul style="list-style-type: none"> <li>Includes Manawatū Gorge Scenic Reserve and QEII covenant.</li> <li>Minimal core habitat outside of the DoC reserve; incomplete vegetation coverage resulting in edge effects</li> <li>Tributary 5A has less margin and more pasture and agricultural activities, than upper section of tributary of 5B</li> <li>Mosaic of vegetation - manuka scrub, secondary broadleaf forest, some exotic wetlands</li> <li>Forest birds, pipits,</li> <li>Likely lizards present</li> <li>Edge effects on riparian vegetation</li> </ul> | High                 | <ul style="list-style-type: none"> <li>Substantial portion of upper catchment impacted by Project but most of the impacted area has lower value margins. Some areas of exotic wetland and kanuka/manuka shrubland to be impacted.</li> <li>Post development will be a reduction as planting of margins on top of spoil site and along embankments will be height-restricted and into engineered materials.</li> </ul> | Moderate-High       |
| Experiential          | <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                      |                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
|                       | <ul style="list-style-type: none"> <li>Upper reaches in rural working landscape dissected by the steep stream gullies, some of which support indigenous vegetation.</li> <li>Lower reaches densely vegetated gullies in the Manawatū Gorge Scenic Reserve</li> </ul>                                                                                                                                                                                                                                                                                                                           | Moderate High        | <ul style="list-style-type: none"> <li>Physical modifications and also traffic activity will substantially reduce the experiential qualities. However, the lower parts of the catchment are unaffected.</li> </ul>                                                                                                                                                                                                    | Moderate Low        |
| <b>OVERALL RATING</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>MODERATE HIGH</b> |                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>MODERATE LOW</b> |

| CATCHMENT 6 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |
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| Attribute   | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | RATING   | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | RATING   |
| Active Bed  | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |
| Abiotic     | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Land cover and land use has been modified over around 47% of the catchment, and therefore some changes to the flow regime; particularly the low flow regime;</li> <li>Limited forest and scrub on some upper catchment slopes but significant areas of indigenous forest on the lower slopes and the gorge scarp;</li> <li>Some modifications to the drainage network but these changes are restricted to the upper slopes and interfluvium;</li> <li>Several small to moderate-scale impoundments;</li> <li>Some natural processes remain unaffected but generally these are in the lower catchment; and</li> <li>Several natural processes now modified but still apparent in various parts of the catchment.</li> </ul> | Moderate | <ul style="list-style-type: none"> <li>Area potentially impacted by the road already affected by human activities</li> <li>Channel realignments and flow diversions will reduce the effective catchment size by 3.3%</li> <li>Flow regime has already adjusted to changes in land use and land cover but change in area will reduce flows, but not to a measurable extent</li> <li>Project passes through the upper catchment so fewer potential effects</li> <li>Likely a slight change to the timing and volume of storm runoff</li> <li>Any effects will be attenuated and moderated by the catchment downstream which has a greater area than those potentially affected</li> <li>Will be some small 'diversions' to adjacent catchments but any effects will be so small they will be immeasurable</li> <li>Proposed changes will have a small effect on existing runoff character or processes</li> <li>Downstream at the indigenous forest boundary' any changes resulting from the Project will not be measurable</li> </ul> | Moderate |
|             | <b>Morphology</b> <ul style="list-style-type: none"> <li>Much of the channel length has natural form and affected by natural processes;</li> <li>Modified bed on the upper slopes interacting with some human interventions rather than natural processes;</li> <li>Some short reaches on the upper slopes affected by human interventions and modifications;</li> <li>Some farm tracks and culverts;</li> <li>Channel form and bed character reasonably natural over the majority of the catchment.</li> </ul>                                                                                                                                                                                                                                                                      | Moderate | <ul style="list-style-type: none"> <li>Only changes to the natural channel form will be in the immediate vicinity of the Project</li> <li>Channels in this area have already modified by human activities</li> <li>Bed and channel adjusted to the current flow regime that will not change significantly</li> <li>Some changes to the channel caused by culverts and realignment etc.</li> <li>Effects of culverts will be mitigated by embedding them below the active bed</li> <li>Potentially a reduction in silt and attenuation of low flows</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Moderate |

| CATCHMENT 6   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |
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| Attribute     | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | RATING        | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | RATING        |
|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               | <ul style="list-style-type: none"> <li>Proposed changes will have small effect on existing character or processes</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |
|               | <p><b>Water Quality</b></p> <ul style="list-style-type: none"> <li>Upper stream channel is in QEII area and fenced from stock and vegetation is regenerating. Occasionally cattle get in.</li> <li>54% of sub-catchment with natural, pre-human land use according to LCDB4 – mostly the lower section within the Manawatū Gorge Scenic Reserve</li> <li>Modelling indicates moderate water quality overall</li> <li>Currently receives no road stormwater runoff except from Meridian access roads.</li> <li>Moderate to low deposited fine sediment cover of stream bed. Lower at downstream sample site in Reserve.</li> <li>Fair water clarity during dry weather</li> <li>Moderate to low TSS &amp; turbidity measured during dry weather</li> <li>Measured <i>E. coli</i> concentrations sometimes elevated</li> <li>DRP elevated</li> </ul> | Moderate-High | <ul style="list-style-type: none"> <li>The Project involves overall increase in impervious surfaces, the piping, diversion and loss of some stream length.</li> <li>Stormwater from the Project is directed out of the catchment such that it will not receive any treated runoff.</li> <li>The Project will result in very minor reduced access by stock to the channel in the upper limit of the catchment but outside QEII area remain as pasture.</li> <li>The Project is not expected to alter water quality to any great extent and the rating remains unchanged.</li> </ul> | Moderate-High |
| <b>Biotic</b> | <p><b>Exotic aquatic flora and fauna</b></p> <ul style="list-style-type: none"> <li>Macrophytes absent within the reach and periphyton sparse outside of the DoC reserve.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | High          | <ul style="list-style-type: none"> <li>Some modification at very top of catchment.</li> <li>Modification more extensive than current and complete loss of some channels.</li> <li>Overall the change will not significantly alter the assemblage of flora and fauna in the catchment.</li> </ul>                                                                                                                                                                                                                                                                                   | High          |
|               | <p><b>Indigenous taxa assemblages</b></p> <ul style="list-style-type: none"> <li>MCI and SQMCI indicative of good and excellent water and habitat quality (115 and 7.55 respectively). 41% sensitive EPT taxa.</li> <li>Fish passage restrictions, but koura present. May also be longfin eels (similar to Catchment 5).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | High          | <ul style="list-style-type: none"> <li>Some modification at top of catchment.</li> <li>Modification more extensive than current and complete loss of some channels.</li> <li>Overall the change will not significantly alter indigenous taxa in the catchment</li> </ul>                                                                                                                                                                                                                                                                                                           | High          |
|               | <p><b>Ecosystem functioning</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | High          | <ul style="list-style-type: none"> <li>Some modification at top of catchment.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | High          |

| CATCHMENT 6                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                      |                                                                                                                                                                                                                                                                                                  |                     |
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| Attribute                                                                                                                      | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | RATING               | POST DEVELOPMENT                                                                                                                                                                                                                                                                                 | RATING              |
|                                                                                                                                | <ul style="list-style-type: none"> <li>Assessments in upper catchment not undertaken, but similar to 5A, in that riparian margins contiguous along the stream. Narrow, but providing shade.</li> <li>Lower part of catchment (DoC Reserve) SEV score of 0.86 indicating very high ecological function – this was the highest SEV score obtained at NOR stage. Upper catchment would be lower value.</li> <li>Hard bottom, cobbly stream with no evidence of stock access/pugging.</li> <li>Habitat and hydrologic heterogeneity good.</li> </ul> |                      | <ul style="list-style-type: none"> <li>Modification more extensive than current and complete loss of some channels.</li> <li>Overall the change will not significantly alter the ecological function of the catchment, on the basis that the proportion being affected is very small.</li> </ul> |                     |
| <b>Margin</b> <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                      |                                                                                                                                                                                                                                                                                                  |                     |
| <b>Abiotic</b>                                                                                                                 | <b>Structures and human modifications</b> <ul style="list-style-type: none"> <li>Some modification to natural watercourses from farm operations (ie farm track culverts / fords)</li> </ul>                                                                                                                                                                                                                                                                                                                                                      | Moderate             | <ul style="list-style-type: none"> <li>Some realignment and construction of channel drains.</li> <li>Proposed changes will have a significant effect on the existing character at the crossing point, but this should dissipate over time and certainly downstream</li> </ul>                    | Moderate Low        |
| <b>Biotic</b>                                                                                                                  | <b>Terrestrial Ecology</b> <ul style="list-style-type: none"> <li>Minimal core habitat outside of the DoC reserve area</li> <li>Reserve has secondary broadleaf forest similar to forest cover in QEII covenant, which provides good connectivity for lizards, forest birds.</li> <li>Incomplete vegetation cover results in edge effects</li> <li>Incomplete indigenous vegetation cover because of adjoining agricultural land results in edge effects</li> </ul>                                                                              | High                 | <ul style="list-style-type: none"> <li>Some modification at top of catchment.</li> <li>Area being impacted lacks an intact margin therefore no discernible change at a catchment scale.</li> </ul>                                                                                               | High                |
| <b>Experiential</b> <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                      |                                                                                                                                                                                                                                                                                                  |                     |
|                                                                                                                                | <ul style="list-style-type: none"> <li>Upper reaches in working rural landscape/wind farm has low experiential value. The steep stream gullies, some of which support indigenous vegetation including the QEII covenant.</li> <li>Lower reaches in the densely vegetated DoC reserve by contrast have high experiential values.</li> </ul>                                                                                                                                                                                                       | High                 | <ul style="list-style-type: none"> <li>Physical modifications and traffic activity reduce the experiential qualities at the crossing point at the very top of 6A only. However, most of the waterbody is unaffected so overall moderate level of experiential qualities are retained</li> </ul>  | Moderate            |
| <b>OVERALL RATING</b>                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>MODERATE HIGH</b> |                                                                                                                                                                                                                                                                                                  | <b>MODERATE HGH</b> |

| CATCHMENT 7 (including Raupō Wetland) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |              |
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| Attribute                             | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | RATING   | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | RATING       |
| Active Bed                            | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |              |
| Abiotic                               | <p><b>Flow Regime</b></p> <ul style="list-style-type: none"> <li>Land cover and land use has changed over about 62% of the catchment, and therefore some changes to the flow regime; particularly the low flow regime;</li> <li>Some forest and scrub (38%) remaining on some upper catchment slopes;</li> <li>Considerable forest remaining on the slopes of the gorge scarp;</li> <li>Some changes to the drainage network but these changes are restricted to the upper slopes and interfluvium; occasional culvert</li> <li>A few small to moderate-scale impoundments;</li> <li>Some natural processes remain unaffected but generally in the lower catchment;</li> <li>Several natural processes now modified but still apparent in various parts of the catchment.</li> </ul> | Moderate | <ul style="list-style-type: none"> <li>Area potentially impacted by the Project already affected by human activities, mostly land use change</li> <li>There will be an increase in catchment area ~9%</li> <li>Largest permanent stream only affected in extreme headwaters</li> <li>Much of the stream length affected has intermittent flow</li> <li>Flow regime has already adjusted to changes in land use and land cover</li> <li>Possibly a slight change to the timing and volume of storm runoff</li> <li>Majority of potential effects are to tributary 7B</li> <li>Any effects will be attenuated and moderated by the catchment downstream which has a greater area than that potentially affected</li> <li>Will be some small 'diversions' from adjacent catchments but any effects will be very small and likely only during and immediately following large rainfall events</li> <li>Proposed changes will have no effect on existing runoff character or processes apart from a slight potential increase in catchment yield</li> <li>By the confluence of the three streams any changes resulting from the Project will not be measurable</li> </ul> | Moderate-Low |

| CATCHMENT 7 (including Raupō Wetland) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |               |
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| Attribute                             | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | RATING   | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | RATING        |
| Active Bed                            | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |               |
|                                       | <p><b>Morphology</b></p> <ul style="list-style-type: none"> <li>• Much of the channel length has natural form and affected by natural processes;</li> <li>• Modified bed on the upper slopes interacting with some human interventions rather than natural processes;</li> <li>• Some short reaches on the upper slopes affected by human interventions and modifications;</li> <li>• Some farm tracks and culverts;</li> <li>• Channel form and bed character reasonably natural over the majority of the catchment.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Moderate | <ul style="list-style-type: none"> <li>• Changes to the natural channel form will be in the immediate vicinity of the Project</li> <li>• Changes will include culverts and channel realignment</li> <li>• Changes will be either to the headwater reaches or largely intermittent channels</li> <li>• Channel in this area already modified by human activities</li> <li>• Bed and channel adjusted to the current flow regime that will not change</li> <li>• Some changes to the wetland as a result of piers and access tracks</li> <li>• Potentially a reduction in silt and enhancement and attenuation of low flows</li> <li>• Proposed changes will have no significant effect on existing character or processes</li> </ul>                                                  | Moderate-Low  |
|                                       | <p><b>Water Quality</b></p> <ul style="list-style-type: none"> <li>• Upper catchment of main tributary (7A) is part of QEII covenant with native forest and fenced from stock (occasional access by cattle).</li> <li>• Lower catchment is remnant forest and wetland with some rough pasture – unfenced with sheep and cattle access.</li> <li>• Other tributaries are unfenced and drain agricultural land.</li> <li>• 33% of catchment with natural, pre-human land use according to LCDB4 – mostly the QEII area of main tributary (7A)</li> <li>• Modelling indicates moderate water quality overall</li> <li>• Currently receives no road stormwater runoff.</li> <li>• Measured water quality data come from main tributary (7A) only. Other tributaries (7B &amp; 7C) likely to have poorer water quality due to less canopy cover and full stock access.</li> <li>• Measured fine deposited sediment cover of stream bed the lowest of all monitored catchments</li> </ul> | Moderate | <ul style="list-style-type: none"> <li>• The Project involves overall increase in impervious surfaces, the piping, diversion and loss of some stream length, and inputs of treated stormwater.</li> <li>• Contaminant load model (CLM) predicts overall increase in TSS, Zn, Cu, and TPH compared to current situation due to input of treated road stormwater.</li> <li>• The Project will also result in a substantial reduction in stock access to the stream in the lower section of 7A and most of 7B (which is being filled in).</li> <li>• On balance, given the extent of stock exclusion compared to the current situation, the Project could lead to the improvement of overall water quality and hence increase the rating of this parameter to moderate high.</li> </ul> | Moderate-High |

| CATCHMENT 7 (including Raupō Wetland) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |
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| Attribute                             | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | RATING | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                      | RATING        |
|                                       | <ul style="list-style-type: none"> <li>Fair to good visual clarity measured during dry weather. Poor to very poor during rain events.</li> <li>Measured dry weather turbidity low compared to other catchments.</li> <li>Measured dry weather TSS moderate compared to other catchments – probably influenced by geology</li> <li>During wet weather measured turbidity and TSS at the upstream-most site was barely elevated.</li> <li>High SIN and DRP measured</li> <li>Measured <i>E. coli</i> concentrations were elevated at times</li> </ul> |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |
| <b>Biotic</b>                         | <p><b>Exotic aquatic flora and fauna</b></p> <ul style="list-style-type: none"> <li>Three main sub-catchments. Exotic macrophytes effectively absent from all of 7A and lower reaches of 7B and 7C.</li> <li>Main channel of 7B has online ponds and exotic wetlands, and some sections with exotic macrophytes, so some exotic flora present.</li> <li>Majority of 7C lacking exotic macrophytes.</li> <li>Lower reaches of catchment 7 has native wetlands, with dominant native flora.</li> <li>No exotic fish recorded.</li> </ul>              | High   | <ul style="list-style-type: none"> <li>Modification of three sub-catchments where channels and wetlands will be lost under road and culverts constructed.</li> <li>Also bridge in lower catchment.</li> <li>At a catchment scale, reduction in habitat available for exotic flora and fauna.</li> <li>Post development may have habitat conditions more favourable for exotic flora, unlikely to substantially change at a catchment scale</li> </ul> | Moderate High |

| CATCHMENT 7 (including Raupō Wetland) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |
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| Attribute                             | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | RATING | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | RATING        |
| Active Bed                            | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |
| Biotic                                | <b>Indigenous taxa assemblages</b> <ul style="list-style-type: none"> <li>• Good to excellent MCI/QMCI (tended to be lower at downstream sample site). Side tributary has lower MCI</li> <li>• Highest quality macroinvertebrates within 7A sub-catchment, indicative of good to excellent water and habitat quality (MCI 1101 to 120, QMCI 5.54 to 7.38). Remainder of catchment poor to fair macroinvertebrate indices.</li> <li>• Longfin eel (At risk – declining) and shortfin eels present. Fish IBI 54, indicative of ‘moderate’ biotic integrity.</li> <li>• Barriers to fish passage at confluence with Manawatū River, overall limit on what fish can reach the catchment</li> </ul> | High   | <ul style="list-style-type: none"> <li>• Modification of three sub-catchments where channels and wetlands will be lost under road and culverts constructed.</li> <li>• Also Eco-Bridge in lower catchment. At a catchment scale, reduction in habitat available for indigenous taxa.</li> <li>• Composition of the fauna unlikely to change within the channels that remain</li> <li>• Post development may have habitat conditions more favourable for exotic flora which could influence indigenous taxa</li> </ul> | Moderate High |
|                                       | <b>Ecosystem functioning</b> <ul style="list-style-type: none"> <li>• Seven SEVs from Catchment 7 range from 0.44 (catchment 7B) to 0.81 (upper 7A). Indicative of moderate to high ecological function.</li> <li>• Areas of natural functioning ecosystem within reaches of 7A and lower reaches upstream of confluence with Manawatū River.</li> <li>• Riparian margins intact within 7A, and either fragmented or absent in 7C and 7B – where present, stream channel benefits from shade.</li> <li>• Online structures within 7B modified channel functionality, but across catchment, instream habitat and hydrologic heterogeneity good.</li> </ul>                                      | High   | <ul style="list-style-type: none"> <li>• Modification of three sub-catchments where channels and wetlands will be lost under road and culverts constructed.</li> <li>• Also Eco-Bridge in lower catchment. At a catchment scale, modification of approx. one third of the catchment (sub-catchment 7B and top of 7A).</li> </ul>                                                                                                                                                                                      | Moderate      |



| CATCHMENT 7 (including Raupō Wetland)                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |          |
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| Attribute                                                                         | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | RATING   | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | RATING   |
| Margin Indicators (vegetation, patterns/type, structures and human modifications) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |          |
| <b>Abiotic</b>                                                                    | <p><b>Structures and human modifications</b></p> <ul style="list-style-type: none"> <li>Some modification to natural watercourses from farm operations (i.e. fences, farm tracks, culverts)</li> <li>Existing Kiwirail culvert and localised erosion immediately upstream.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Moderate | <ul style="list-style-type: none"> <li>One culvert proposed in the upper catchment</li> <li>Eco-Bridge traverses over stream; piers supporting Eco-Bridge with permanent track access; stormwater treatment wetland</li> <li>Some realignment and construction of artificial channels</li> <li>Proposed changes will have an effect on the existing character, but this should dissipate over time and certainly downstream</li> <li>Improved fish passage would be a significant environmental enhancement</li> </ul> | Low      |
| <b>Biotic</b>                                                                     | <p><b>Terrestrial Ecology</b></p> <ul style="list-style-type: none"> <li>Terrestrial vegetation in the lower catchment a mosaic of age classes of indigenous forest and scrub. Old-growth forest present with areas of younger, diverse broadleaved forests and scrub and raupō wetland.</li> <li>Although several successional stages are present, the canopy species present do not represent pre-human forest compositions.</li> <li>Ecological condition impaired due to past and current stock access.</li> <li>The surrounding pastoral land use would contribute a degree of edge effect on the regenerating forest.</li> <li>Limited bird species present but good potential bird habitat. Lizards unlikely</li> <li>High proportion of pest animals</li> <li>Good quality habitat for terrestrial invertebrates and connects with the Manawatū Gorge Scenic Reserve.</li> <li>Collectively, the vegetation and habitats in the lower catchment make an important contribution to pattern and process</li> </ul> | High     | <ul style="list-style-type: none"> <li>Modification of three sub-catchments where channels and wetlands will be lost under road and culverts constructed.</li> <li>Also Eco-Bridge in lower catchment over raupō wetland. At a catchment scale modification of ~1/3 of the catchment (sub-catchment 7B and top of 7A).</li> <li>Riparian margins along catchment 7B generally absent, but vegetation removal in lower catchment to enable works results in a reduction.</li> </ul>                                     | Moderate |

| CATCHMENT 7 (including Raupō Wetland) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                          |                                                                                                                                                                                                                                           |                 |
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| Attribute                             | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | RATING                   | POST DEVELOPMENT                                                                                                                                                                                                                          | RATING          |
| Experiential                          | <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i>                                                                                                                                                                                                                                                                                                                                                                                                                               |                          |                                                                                                                                                                                                                                           |                 |
|                                       | <ul style="list-style-type: none"> <li>Overall relatively high level of naturalness and remoteness due to the enclosed nature of the steep gullies and dense vegetation within the QEII covenant, adjoining Manawatū Gorge Scenic Reserve, and relatively well vegetated gully between QEII covenant to the Manawatū River.</li> <li>The lower end of the stream catchment has a high level of naturalness due mainly to the unmodified stream, wetland and lowland forest remnants in combination with the adjacent Reserve.</li> </ul> | High                     | <ul style="list-style-type: none"> <li>The overall scale and nature of the physical modifications together with traffic activity have a significant impact on the naturalness of the catchment and its experiential qualities.</li> </ul> | Low             |
| <b>OVERALL RATING</b>                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>MODERATE<br/>HIGH</b> |                                                                                                                                                                                                                                           | <b>MODERATE</b> |

| CATCHMENT 8 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |
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| Attribute   | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | RATING | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | RATING |
| Active Bed  | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |
| Abiotic     | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Broad-scale modifications to land cover and land use, and therefore changes to the flow regime; particularly the low flow regime;</li> <li>Some exotic and indigenous forest and scrub on some upper catchment slopes;</li> <li>Major modification to the drainage network at the western portion of the catchment;</li> <li>Some impoundments but generally small scale;</li> <li>Some artificial drainage lines;</li> <li>Few natural processes remain unaffected; and</li> <li>Most natural processes now modified but still apparent in various parts of the catchment</li> </ul> | Low    | <ul style="list-style-type: none"> <li>This catchment has a heavily modified flow regime</li> <li>All changes proposed will be hydraulically neutral which means the same flow regime will exist after construction</li> <li>There will be no change to catchment area and therefore water yield</li> <li>Consequently, there will be no change to the existing flow regime</li> <li>No natural processes will be affected</li> <li>Proposed changes will have no effect on existing character or processes</li> </ul>             | Low    |
|             | <b>Morphology</b> <ul style="list-style-type: none"> <li>Some of the channel length has natural form and affected by natural processes;</li> <li>Highly modified bed interacting with human interventions rather than natural processes in the lower catchment and the terrace adjacent to the Manawatū River;</li> <li>Some reaches affected by human interventions and modifications;</li> <li>Extensive channel modification including straightening and artificial drainage lines on the floodplain to the west;</li> <li>Some culverts and farm bridges</li> <li>Channel form and bed character highly modified</li> </ul>                 | Low    | <ul style="list-style-type: none"> <li>No changes to the bed morphology or characteristics are anticipated</li> <li>Existing hydraulic capacity will be maintained</li> <li>No hydraulic structures are planned that do not already exist within the area</li> <li>Channel already extensively modified</li> <li>Culverts will be embedded to preserve bed form and character</li> <li>Proposed changes will have no effect on existing character or processes</li> <li>Likely improved treatment of suspended sediment</li> </ul> | Low    |

| CATCHMENT 8 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |        |
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| Attribute   | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | RATING | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | RATING |
| Active Bed  | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |        |
| Abiotic     | <b>Water Quality</b> <ul style="list-style-type: none"> <li>Catchment land use is mostly pasture.</li> <li>8% of catchment with natural, pre-human land use according to LCDB4. Aerial photographs appear to show small part of upper catchment with regenerating indigenous forest</li> <li>Modelling indicates low water quality overall</li> <li>Some of channel is roadside drain</li> </ul>                                                                                                                                                                                     | Low    | <ul style="list-style-type: none"> <li>The Project involves overall increase in impervious surfaces, channel diversions and installation of stormwater treatment wetland in catchment.</li> <li>Contaminant load model (CLM) predicts overall reduction in TSS load and a minor increase in Zn, Cu, and TPH compared to current situation.</li> <li>However, the overall catchment remains predominantly pastoral land use, which will be the main driver of overall water quality so no change to rating anticipated.</li> </ul> | Low    |
|             | <b>Exotic aquatic flora and fauna</b> <ul style="list-style-type: none"> <li>Exotic macrophytes present within the streams, thick cover.</li> <li>No exotic fish recorded in surveys.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                     | Low    | <ul style="list-style-type: none"> <li>Modification of catchment, no real change to exotic flora/fauna</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                 | Low    |
|             | <b>Indigenous taxa assemblages:</b> <ul style="list-style-type: none"> <li>Shortfin eel and common bully recorded, IBI (42) indicative of poor diversity.</li> <li>Lowland, but may be artificial barriers to passage and habitat is of low quality.</li> <li>MCI and SQMCI values indicative of poor water and habitat quality</li> </ul>                                                                                                                                                                                                                                           | Low    | <ul style="list-style-type: none"> <li>Modification of catchment, may be minor shift in suitability of habitat for fauna but limited current quality so unlikely to shift.</li> </ul>                                                                                                                                                                                                                                                                                                                                             | Low    |
| Biotic      | <b>Ecosystem functioning</b> <ul style="list-style-type: none"> <li>Stream system highly modified through straightening and agricultural land use although parts of headwaters retain natural characteristics.</li> <li>Riparian margins are effectively absent with little to no shade. Streams are therefore subject to thermal influence and provide limited habitat for aquatic macroinvertebrates.</li> <li>SEV values (0.31) indicative of low ecological value and functioning in lower reaches.</li> <li>Instream habitat heterogeneity and availability limited.</li> </ul> | Low    | <ul style="list-style-type: none"> <li>Modification of several channels, introduction of culverts, catchments already modified by similar structures.</li> <li>No change at a catchment scale.</li> </ul>                                                                                                                                                                                                                                                                                                                         | Low    |

| CATCHMENT 8           |                                                                                                                                                                                                                                                                                                                                                                     |            |                                                                                                                                                                                                                                                                                                                           |            |
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| Attribute             | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                          | RATING     | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                          | RATING     |
| Margin                | <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                                                                                                                                                                                                                                                                   |            |                                                                                                                                                                                                                                                                                                                           |            |
| <b>Abiotic</b>        | <b>Structures and human modifications:</b> <ul style="list-style-type: none"> <li>Generally settled rural landscape, with some unmodified watercourses at the top of the catchment</li> <li>Culverts, bridges and manmade drains evident</li> <li>Artificial lined channels due to farm operations and local road construction</li> </ul>                           | Low        | <ul style="list-style-type: none"> <li>Three additional culverts proposed, many already exist</li> <li>Watercourses are intermittent</li> <li>Culverts will be low profile and small</li> </ul>                                                                                                                           | Low        |
| <b>Biotic</b>         | <b>Terrestrial Ecology</b> <ul style="list-style-type: none"> <li>Agricultural land use, minimal indigenous vegetation</li> <li>Low value for fauna</li> </ul>                                                                                                                                                                                                      | Low        | <ul style="list-style-type: none"> <li>May see small improvement in the riparian margins as diversions are planted. Minor improvement only, given modification of landscape, proximity to road, anthropogenic planting of 'easy maintenance' species rather than diverse representative of natural ecosystems.</li> </ul> | Low        |
| Experiential          | <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i>                                                                                                                                                                                                                                                          |            |                                                                                                                                                                                                                                                                                                                           |            |
|                       | <ul style="list-style-type: none"> <li>Apart from small area in upper part of catchment rest is in pasture and farmed with several mature exotic woodlots.</li> <li>Low level of naturalness due to working farm and level of modifications across most of the catchment apart from area of regenerating secondary indigenous in upper part of catchment</li> </ul> | Low        | <ul style="list-style-type: none"> <li>The road environment already exists and is a dominant element in this area. Further modifications and will reduce the experiential qualities at the crossings but overall the experiential quality will remain low.</li> </ul>                                                     | Low        |
| <b>OVERALL RATING</b> |                                                                                                                                                                                                                                                                                                                                                                     | <b>LOW</b> |                                                                                                                                                                                                                                                                                                                           | <b>LOW</b> |

| CATCHMENT 9 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |               |
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| Attribute   | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | RATING        | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | RATING        |
| Active Bed  | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |               |
| Abiotic     | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>About half the catchment has modifications to land cover and land use, and therefore some relatively minor changes to the flow regime; particularly the low flow regime;</li> <li>Considerable indigenous forest and scrub in the upper catchment;</li> <li>Very minor modifications to the drainage network;</li> <li>Some artificial drainage but restricted to the lower catchment adjacent to the Pohangina River; also water takes</li> <li>Most natural processes remain but with a range of effects, particularly in the lower catchment.</li> </ul> | High          | <ul style="list-style-type: none"> <li>Only a very small percentage of the catchment will be affected, and only to an extremely small degree</li> <li>Total catchment area will decrease by 1.4%</li> <li>Existing flow regime will be maintained with the same characteristics and flow distribution</li> <li>Proposed changes will have no effect on existing runoff character or processes</li> </ul>                                                                                                                                                                                                                                                      | High          |
|             | <b>Morphology</b> <ul style="list-style-type: none"> <li>Most of the channel length has natural form and affected by natural processes;</li> <li>Highly modified bed interacting with human interventions rather than natural processes in the lower catchment and the terrace adjacent to the Pohangina River;</li> <li>Some short reaches affected by human interventions and modifications;</li> <li>Some culverts, fords and farm bridges</li> <li>Channel form and bed character largely natural</li> </ul>                                                                                                      | High          | <ul style="list-style-type: none"> <li>Any changes will only occur at the interfluvium</li> <li>There will be no changes to channel morphology or characteristics</li> <li>Any effects will moderate and attenuate downstream</li> <li>Likely to be a reduction in sediment yield following improved treatment</li> </ul>                                                                                                                                                                                                                                                                                                                                     | High          |
|             | <b>Water Quality</b> <ul style="list-style-type: none"> <li>Fenced and well vegetated riparian zone</li> <li>52% of catchment with natural, pre-human land use according to LCDB4.</li> <li>Modelling indicates high water quality overall, but upper slopes are steep pasture land with stock</li> <li>High measured deposited sediment cover of stream bed at bottom end of catchment</li> </ul>                                                                                                                                                                                                                    | Moderate High | <ul style="list-style-type: none"> <li>The Project results in minimal disturbance to this catchment with only a minor discharge from a cut-off channel and no direct impact on the main channel.</li> <li>Contaminant load model (CLM) predicts overall reduction in TSS load, Zn, Cu, and TPH compared to current situation due to far less traffic on Saddle Rd, which currently discharge untreated stormwater to this catchment.</li> <li>The Project will reduce the already minor contaminant loading from Saddle Rd but overall the Project does not change the prevailing land use of the catchment so no change to rating is anticipated.</li> </ul> | Moderate High |

| CATCHMENT 9                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                                                                                                                                                                                                                               |          |
|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Attribute                                                                                | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | RATING           | POST DEVELOPMENT                                                                                                                                                                                                              | RATING   |
| Biotic                                                                                   | <b>Exotic aquatic flora and fauna</b> <ul style="list-style-type: none"> <li>Brown trout recorded in catchment</li> <li>Macrophytes effectively absent, hard bottom stream.</li> <li>Native fish recorded.</li> </ul>                                                                                                                                                                                                                                                                                                                          | High             | <ul style="list-style-type: none"> <li>Unlikely to be a change in the exotic flora/fauna as only a very small portion of catchment affected.</li> </ul>                                                                       | High     |
|                                                                                          | <b>Indigenous taxa assemblages</b> <ul style="list-style-type: none"> <li>Shortfin eels, common bullies</li> <li>Fish IBI indicative of 'moderate' fish diversity. Based on limited survey data, so may be higher.</li> <li>Expect that macroinvertebrate values would be similar to the vegetated sections of Catchment 5 and 7, indicative of good to excellent water and habitat quality.</li> </ul>                                                                                                                                        | High             | <ul style="list-style-type: none"> <li>Unlikely to be a change in the indigenous taxa as only a very small portion of catchment affected.</li> </ul>                                                                          | High     |
|                                                                                          | <b>Ecosystem functioning</b> <ul style="list-style-type: none"> <li>Open canopy at downstream end, cobble bottom. Based on review of aerials, appears to be predominantly vegetated margins and natural gully system. Expect to be shaded and suitable habitat for macroinvertebrates and fish species.</li> <li>Assume that instream habitat and hydrologic heterogeneity is good and provides for excellent ecosystem functioning.</li> </ul>                                                                                                | High             | <ul style="list-style-type: none"> <li>Unlikely to be a change in the function as only a very small portion of catchment affected.</li> </ul>                                                                                 | High     |
| Margin <i>Indicators (vegetation, patterns/type, structures and human modifications)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                                                                                                                                                                                                                               |          |
| Abiotic                                                                                  | <b>Structures and human modifications</b> <ul style="list-style-type: none"> <li>Number of structures – ford, concrete, culverts in lower reaches</li> <li>Artificial lined channels due to farm operations</li> <li>A water take (unconsented) from farmland present</li> <li>Local scour of some existing channels due to modified upstream catchment and vegetation removal</li> <li>Low lying flooded areas at bottom of the catchment due to farm tracks constructed across natural overland flow paths at bottom of catchment</li> </ul> | Moderate<br>High | <ul style="list-style-type: none"> <li>Several small 'structures' on the interfluvium</li> <li>One additional culvert</li> <li>These structures will not detract significantly from the existing natural character</li> </ul> | Moderate |

| CATCHMENT 9           |                                                                                                                                                                                                                                                   |             |                                                                                                                                                                                                                               |             |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| Attribute             | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                        | RATING      | POST DEVELOPMENT                                                                                                                                                                                                              | RATING      |
| <b>Biotic</b>         | <b>Terrestrial Ecology</b> <ul style="list-style-type: none"> <li>• Incised deep vegetated gully system</li> <li>• Not pristine, but there are areas of mature indigenous vegetation</li> </ul>                                                   | High        | <ul style="list-style-type: none"> <li>• Unlikely to be a change as only a very small portion of catchment affected and riparian margins in these areas effectively absent.</li> </ul>                                        | High        |
| <b>Experiential</b>   | <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i>                                                                                                                                        |             |                                                                                                                                                                                                                               |             |
|                       | <ul style="list-style-type: none"> <li>• Extensive area of mature and regenerating indigenous vegetation along stream margin and on adjoining lower slopes, which has been fenced for long period to create quality stream environment</li> </ul> | High        | <ul style="list-style-type: none"> <li>• The modification at this crossing point is a small change in terms of the whole catchment, most of which is unaffected. Overall the experiential quality will remain High</li> </ul> | High        |
| <b>OVERALL RATING</b> |                                                                                                                                                                                                                                                   | <b>HIGH</b> |                                                                                                                                                                                                                               | <b>HIGH</b> |



## **APPENDIX I.4: CROSSING POINT ASSESSMENT TABLES**

**CROSSING POINT 2C** - loss of 1220m of stream under road -diversions and culvert CU17

| Attribute         | EXISTING NATURAL CHARACTER                                                                                                                                    | RATING   | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | RATING   |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>Active Bed</b> | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                             |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |
| <b>Abiotic</b>    | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Largely natural process, minor change</li> </ul>                                                    | Moderate | <ul style="list-style-type: none"> <li>Proposed changes will have extremely small effect on existing runoff processes as adjacent to the interfluvium</li> <li>Some very minor effect on immediate runoff response during rainstorms but any effect will attenuate and moderate rapidly downstream</li> <li>Only a very small percentage of this small sub-catchment will be potentially affected</li> <li>No measurable effects downstream of first confluence</li> <li>Two stream diversions of 550m length proposed to maintain as much of the existing flow as possible.</li> </ul> | Moderate |
|                   | <b>Morphology</b> <ul style="list-style-type: none"> <li>Land cleared</li> <li>Largely natural processes but in higher sections of catchment</li> </ul>       | Moderate | <ul style="list-style-type: none"> <li>The existing stream morphology will be lost where the current stream is filled by the proposed state highway earthworks.</li> <li>Sediment supply and transport will be controlled so sediment yield downstream may decrease</li> <li>Proposed changes will have a moderate but localised effect on existing morphology</li> </ul>                                                                                                                                                                                                               | Low      |
|                   | <b>Water Quality</b> <ul style="list-style-type: none"> <li>Fenced at bottom</li> <li>Upper catchment vegetation</li> <li>Cattle and sheep present</li> </ul> | Moderate | <ul style="list-style-type: none"> <li>Crossing point involves diversion and piping of the existing stream as well as treated stormwater discharge.</li> <li>The new diversion channel will still receive runoff from pastoral land upstream of the channel diversions.</li> <li>Three sediment basins will promote settlement and treatment of sediment laden water runoff from slopes before discharging to the stream</li> <li>Will not result in any significant change to overall water quality so rating remains unchanged.</li> </ul>                                            | Moderate |

| CROSSING POINT 2C - loss of 1220m of stream under road -diversions and culvert CU17                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |                                                                                                                                                                                                                                                                                                                                                                               |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Attribute                                                                                                                                           | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | RATING | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                              | RATING   |
| <b>Active Bed</b> <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |                                                                                                                                                                                                                                                                                                                                                                               |          |
| <b>Biotic</b>                                                                                                                                       | <b>Exotic aquatic flora and fauna</b> <ul style="list-style-type: none"> <li>Macrophytes absent along majority of reach, where hard bottom substrate dominates in the upper reach. Lower reach has some stock access and macrophyte growth, but outside of crossing point area.</li> <li>No exotic fish recorded.</li> </ul>                                                                                                                                                                                                                                                                                              | High   | <ul style="list-style-type: none"> <li>Stream will be completely filled in through this section and road alignment will sit directly on top. Two new diversions will be constructed and a culvert. Constructed channels may provide some habitat and may have conditions favourable for exotic flora.</li> </ul>                                                              | Low      |
|                                                                                                                                                     | <b>Indigenous taxa assemblages</b> <ul style="list-style-type: none"> <li>Macroinvertebrates in upper reach at 104 (good water and habitat quality) and 67 and 80 where margins smaller and more nutrient runoff. 32% EPT abundance in headwaters and high taxa richness (20 species).</li> <li>Steepness of catchment reduces ability of fish to gain access. Shortfin eels and koura recorded just downstream of crossing point.</li> </ul>                                                                                                                                                                             | High   | <ul style="list-style-type: none"> <li>Stream will be completely filled in through this section and road alignment will sit directly on top.</li> <li>Two new diversions will be constructed and a culvert.</li> <li>Constructed channels may provide some habitat for indigenous taxa, but the conditions are likely to reduce the 'good' macroinvertebrate taxa.</li> </ul> | Low      |
|                                                                                                                                                     | <b>Ecosystem functioning</b> <ul style="list-style-type: none"> <li>Riparian margins narrow in mid reaches but dominated by regenerating native vegetation. Wider in upper catchment. Steep banks and vegetation provide shade to stream.</li> <li>Stream is predominantly hard bottom and habitat heterogeneity good. Some silt deposition in lower gradient reaches. Root mats present.</li> <li>Tributaries feeding the 2C reach are short, with stock access and little to no riparian vegetation.</li> <li>Three SEV within the 2C reach. 0.4 at the downstream end, up to 0.7 and 0.79 in upper reaches.</li> </ul> | High   | <ul style="list-style-type: none"> <li>Stream will be completely filled in through this section and road alignment will sit directly on top.</li> <li>Two new diversions will be constructed and a culvert to join the two.</li> <li>Natural ecosystem functioning will be lost.</li> </ul>                                                                                   | Very Low |
| <b>Margin</b> <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |                                                                                                                                                                                                                                                                                                                                                                               |          |
| <b>Abiotic</b>                                                                                                                                      | <b>Structures and human modifications</b> <ul style="list-style-type: none"> <li>None known</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | High   | <ul style="list-style-type: none"> <li>One culvert (CU-17) of 140m length proposed</li> <li>Approximately 620m of stream diversion.</li> <li>Proposed changes will have an effect on the existing character</li> </ul>                                                                                                                                                        | Low      |

| CROSSING POINT 2C - loss of 1220m of stream under road -diversions and culvert CU17                                            |                                                                                                                                                                                                                            |                      |                                                                                                                                                                                                                                                                   |            |
|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Attribute                                                                                                                      | EXISTING NATURAL CHARACTER                                                                                                                                                                                                 | RATING               | POST DEVELOPMENT                                                                                                                                                                                                                                                  | RATING     |
| <b>Margin</b> <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                |                                                                                                                                                                                                                            |                      |                                                                                                                                                                                                                                                                   |            |
| <b>Biotic</b>                                                                                                                  | <b>Terrestrial Ecology</b> <ul style="list-style-type: none"> <li>Headwaters of the crossing point are secondary broadleaf forest and scrubland</li> <li>Exotic vegetation on margins</li> <li>Areas of pasture</li> </ul> | Moderate             | <ul style="list-style-type: none"> <li>Stream will be completely filled in through this section and road alignment will directly on top</li> <li>Two new diversions will be constructed with riparian margins limited by the proximity to embankments.</li> </ul> | Low        |
| <b>Experiential</b> <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i> |                                                                                                                                                                                                                            |                      |                                                                                                                                                                                                                                                                   |            |
|                                                                                                                                | <ul style="list-style-type: none"> <li>Rural working hill country with steep gullies, similar to many other areas.</li> <li>Mix of regenerating indigenous vegetation and cleared farmland</li> </ul>                      | Moderate             | <ul style="list-style-type: none"> <li>New road activity and physical modifications will directly affect the experiential quality of this crossing point.</li> </ul>                                                                                              | Low        |
| <b>OVERALL RATING</b>                                                                                                          |                                                                                                                                                                                                                            | <b>MODERATE HIGH</b> |                                                                                                                                                                                                                                                                   | <b>LOW</b> |

| CROSSING POINT 3A Four Culverts 293 in length |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |              |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Attribute                                     | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                | RATING       | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | RATING       |
| Active Bed                                    | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |              |
| Abiotic                                       | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Significant change to land cover</li> </ul>                                                                                                                                                                                                                                                                                                                                                                     | Moderate-Low | <ul style="list-style-type: none"> <li>Area potentially impacted by the road already heavily modified by human activities</li> <li>Only intermittent channels will be affected</li> <li>Flow regime has already adjusted to changes in land use and land cover</li> <li>Possibly a slight change to the timing and volume of storm runoff but any effect will attenuate and moderate downstream</li> <li>Proposed changes will have no effect on existing runoff character or processes</li> </ul>                                     | Moderate-Low |
|                                               | <b>Morphology</b> <ul style="list-style-type: none"> <li>Natural channel largely but some human modification</li> <li>Farm dams in upper section</li> </ul>                                                                                                                                                                                                                                                                                                               | Moderate-Low | <ul style="list-style-type: none"> <li>Only changes to the natural channel form will be in the immediate vicinity of the Project</li> <li>Intermittent channel will be replaced by culvert</li> <li>Channel in this area already modified by human activities</li> <li>Bed and channel adjusted to the current flow regime that will not change</li> <li>Potentially a reduction in silt and attenuation of low flows</li> <li>Proposed changes will affect the existing character or processes, but this will be localised</li> </ul> | Moderate-Low |
|                                               | <b>Water Quality</b> <ul style="list-style-type: none"> <li>Headwaters vegetated</li> <li>Sheep present in waterways</li> <li>Modelling indicates moderate water quality</li> <li>Measured water clarity fair during dry weather</li> <li>Measured turbidity and TSS low during dry weather</li> <li>Fairly high deposited sediment cover measured</li> <li>Modelling indicates moderate water quality</li> <li>Measured water clarity fair during dry weather</li> </ul> | Moderate     | <ul style="list-style-type: none"> <li>Crossing point involves piping of the existing stream as well as treated stormwater discharge.</li> <li>Four sediment basins to treat stormwater runoff from sloped surfaces before discharging to the stream. The stream will still receive runoff from pastoral land upstream.</li> <li>Will not result in any significant change to overall water quality so rating remains unchanged.</li> </ul>                                                                                            | Moderate     |

| CROSSING POINT 3A Four Culverts 293 in length                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |                                                                                                                                                                                                                                                                                                                                       |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Attribute                                                                                                                                           | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | RATING   | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                      | RATING   |
|                                                                                                                                                     | <ul style="list-style-type: none"> <li>Measured turbidity and TSS low during dry weather</li> <li>Fairly high deposited sediment cover measured</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |          |                                                                                                                                                                                                                                                                                                                                       |          |
| <b>Active Bed</b> <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |                                                                                                                                                                                                                                                                                                                                       |          |
| <b>Biotic</b>                                                                                                                                       | <b>Exotic aquatic flora and fauna</b> <ul style="list-style-type: none"> <li>Indigenous and exotic wetlands, predominantly indigenous flora. Some areas of exotic vegetation within channels.</li> <li>Indigenous wetland just outside of footprint but may be indirectly impacted.</li> <li>Native fish recorded, no non-natives recorded. Longfin (At Risk – Declining).</li> </ul>                                                                                                                                                                                                                                                                                                                                    | Moderate | <ul style="list-style-type: none"> <li>Modification consists of loss of channels and installation of culverts.</li> <li>Exotic flora and fauna will remain absent, but the stream channel will be gone</li> </ul>                                                                                                                     | Moderate |
|                                                                                                                                                     | <b>Indigenous taxa assemblages</b> <ul style="list-style-type: none"> <li>MCI 67, SQMCI 2.15 indicative of poor water quality and habitat. Likely impacted by the presence of impounded water and lack of shade in the upper reaches</li> <li>Fish restricted access due to grade and location but At Risk – Declining longfin eel present. Also, koura and shortfin eel. IBI of 52 is indicative of moderate value.</li> <li>Some wetland areas dominated by native plant species.</li> </ul>                                                                                                                                                                                                                           | Moderate | <ul style="list-style-type: none"> <li>Culverts will not provide suitable habitat for the macroinvertebrates and fauna present.</li> <li>Some habitat remains.</li> </ul>                                                                                                                                                             | Low      |
|                                                                                                                                                     | <b>Ecosystem functioning</b> <ul style="list-style-type: none"> <li>Wetland functioning driven in part by damming of streams systems and modifications. Indigenous wetland in upper eastern side.</li> <li>SEV score at crossing point 0.38 indicative of moderate to low ecosystem function but really only representative of one part of the impact area.</li> <li>Tributary to the west of the main stem has riparian margins in the upper section and a series of wetlands and online ponds. Upper reaches likely to be higher value, compared to areas without riparian margins.</li> <li>Proportionately, the area of wetland and stream being impacted on the western arm increases the value to high.</li> </ul> | High     | <ul style="list-style-type: none"> <li>Multiple tributaries impacted and headwaters connectivity reduced by culverts.</li> <li>Isolation of certain areas and possible change of hydrology to indigenous wetland? Note indigenous wetland not specifically impacted.</li> <li>Some habitat and ecosystem function remains.</li> </ul> | Moderate |

| CROSSING POINT 3A Four Culverts 293 in length                                                                                  |                                                                                                                                                                                                                                                                                               |                 |                                                                                                                                                                                                                                                                     |                         |
|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| Attribute                                                                                                                      | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                    | RATING          | POST DEVELOPMENT                                                                                                                                                                                                                                                    | RATING                  |
| <b>Margin</b> <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                |                                                                                                                                                                                                                                                                                               |                 |                                                                                                                                                                                                                                                                     |                         |
| <b>Abiotic</b>                                                                                                                 | <b>Structures and human modifications</b> <ul style="list-style-type: none"> <li>Farm dams</li> </ul>                                                                                                                                                                                         | Moderate        | <ul style="list-style-type: none"> <li>Four culverts proposed but low profile and scale and on predominantly intermittent channels</li> <li>Proposed changes will have extremely small effect on the existing character which is already highly modified</li> </ul> | Moderate/Low            |
| <b>Biotic</b>                                                                                                                  | <b>Terrestrial Ecology</b> <ul style="list-style-type: none"> <li>Moderate value wetland – indigenous dominated seep wetland</li> <li>Riparian margin at bottom fairly intact as well as other vegetation at top of headwater</li> <li>Secondary broadleaf and manuka/kanuka shrub</li> </ul> | High            | <ul style="list-style-type: none"> <li>Multiple tributaries impacted and headwaters connectivity reduced by culverts.</li> <li>Majority of riparian margin to be retained but modification will occur where culverts are located.</li> </ul>                        | Moderate                |
| <b>Experiential</b> <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i> |                                                                                                                                                                                                                                                                                               |                 |                                                                                                                                                                                                                                                                     |                         |
|                                                                                                                                | <ul style="list-style-type: none"> <li>Upper reach in grazed pasture, little riparian vegetation and close to Saddle Road</li> </ul>                                                                                                                                                          | Moderate Low    | <ul style="list-style-type: none"> <li>Physical modifications further reduce the experiential qualities, but the rating remains low.</li> </ul>                                                                                                                     | Low                     |
| <b>OVERALL RATING</b>                                                                                                          |                                                                                                                                                                                                                                                                                               | <b>MODERATE</b> |                                                                                                                                                                                                                                                                     | <b>MODERATE<br/>LOW</b> |

| CROSSING POINT 3B |                                                                                                                                                                                                 |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Attribute         | EXISTING NATURAL CHARACTER                                                                                                                                                                      | RATING    | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | RATING   |
| Active Bed        | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                               |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |
| Abiotic           | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Well vegetated, largely natural process, very minor changes</li> </ul>                                                                | Moderate  | <ul style="list-style-type: none"> <li>Area potentially impacted by the road already heavily modified by human activities</li> <li>Predominantly intermittent channels will be affected</li> <li>Flow regime has already adjusted to changes in land use and land cover</li> <li>Possibly a slight change to the timing and volume of storm runoff but any effect will attenuate and moderate downstream</li> <li>Proposed changes will have no effect on existing runoff character or processes</li> </ul>                                  | Moderate |
|                   | <b>Morphology</b> <ul style="list-style-type: none"> <li>Largely natural channel driven by natural processes</li> </ul>                                                                         | Moderate- | <ul style="list-style-type: none"> <li>Only changes to the natural channel form will be in the immediate vicinity of the Project</li> <li>Intermittent channel will be replaced by culvert</li> <li>Channel in this area already modified by human activities</li> <li>Bed and channel adjusted to the current flow regime that will not change</li> <li>Potentially a reduction in silt and attenuation of low flows</li> <li>Proposed changes will affect existing character and processes, but these effects will be localised</li> </ul> | Moderate |
|                   | <b>Water Quality</b> <ul style="list-style-type: none"> <li>Land use a mix of pine forest, native vegetation, scrub, and pasture</li> <li>Modelling indicates moderate water quality</li> </ul> | Moderate  | <ul style="list-style-type: none"> <li>Crossing point is at the top of the headwaters and involves diversion, piping, and infill of the existing stream as well as discharge from a stormwater treatment wetland.</li> <li>Will not result in any significant change to overall water quality so rating remains unchanged.</li> </ul>                                                                                                                                                                                                        | Moderate |



| CROSSING POINT 3B                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                              |               |                                                                                                                                                                                                                                                                                                                                                                                                           |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Attribute                                                                                                                                           | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                   | RATING        | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                          | RATING   |
| <b>Active Bed</b> <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i> |                                                                                                                                                                                                                                                                                                                                                                                              |               |                                                                                                                                                                                                                                                                                                                                                                                                           |          |
| <b>Biotic</b>                                                                                                                                       | <b>Exotic aquatic flora and fauna</b> <ul style="list-style-type: none"> <li>Section of exotic wetland in upper reach.</li> <li>Small amount of macrophytes present in open sections, but not in vegetated channels</li> <li>Native fish present</li> </ul>                                                                                                                                  | High          | <ul style="list-style-type: none"> <li>Entire headwaters being lost under road, loss of natural stream, culverts and cut-off drains proposed.</li> <li>No stream habitat will remain for exotic flora or fauna to inhabit.</li> <li>Cut off drains will not function as streams (and so are not considered as stream habitat post-construction), however may provide habitat for exotic flora.</li> </ul> | Low      |
|                                                                                                                                                     | <b>Indigenous taxa assemblages</b> <ul style="list-style-type: none"> <li>MCI 89 and QMCI 4.03, both indicative of fair water and habitat quality. Taxa richness 19, EPT % abundance 8%.</li> <li>Fish restricted access due to grade and location but At Risk – Declining longfin eel likely to be present. Also koura and shortfin eel. IBI of 52 indicative of moderate value.</li> </ul> | Moderate      | <ul style="list-style-type: none"> <li>Entire headwaters being lost under road, loss of natural stream, culverts and cut-off drains proposed.</li> <li>No stream habitat will remain for indigenous flora or fauna to inhabit.</li> </ul>                                                                                                                                                                 | Very Low |
|                                                                                                                                                     | <b>Ecosystem functioning</b> <ul style="list-style-type: none"> <li>Upper section, stock access and lack of riparian margins along some of the stream length. Pine forest on the wider margins.</li> <li>Lower section native margins, bedrock, some sediment deposition but natural channel.</li> <li>SEV score of 0.66 indicative of moderate ecological value and function.</li> </ul>    | Moderate      | <ul style="list-style-type: none"> <li>Entire headwaters being lost under road, loss of natural stream, culverts and cut-off drains proposed.</li> <li>No stream habitat will remain; therefore, all ecosystem function is lost.</li> </ul>                                                                                                                                                               | Very Low |
| <b>Margin</b> <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                                     |                                                                                                                                                                                                                                                                                                                                                                                              |               |                                                                                                                                                                                                                                                                                                                                                                                                           |          |
| <b>Abiotic</b>                                                                                                                                      | <b>Structures and human modifications</b> <ul style="list-style-type: none"> <li>None known</li> </ul>                                                                                                                                                                                                                                                                                       | Moderate High | <ul style="list-style-type: none"> <li>One culvert of approximately 87m length proposed but low profile and scale and only on intermittent channel</li> <li>Large wetland treating and attenuating stormwater runoff from the state highway</li> <li>Proposed changes will affect the existing character which is already highly modified</li> </ul>                                                      | Moderate |

| CROSSING POINT 3B                                                                                                       |                                                                                                                                                                       |                      |                                                                                                                                                                                                                                                    |                     |
|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Attribute                                                                                                               | EXISTING NATURAL CHARACTER                                                                                                                                            | RATING               | POST DEVELOPMENT                                                                                                                                                                                                                                   | RATING              |
| Margin <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                |                                                                                                                                                                       |                      |                                                                                                                                                                                                                                                    |                     |
| <b>Biotic</b>                                                                                                           | <b>Terrestrial Ecology</b> <ul style="list-style-type: none"> <li>• Secondary broadleaf forest and scrubland</li> <li>• Pine plantation</li> <li>• Pasture</li> </ul> | Moderate             | <ul style="list-style-type: none"> <li>• Entire headwaters being lost under road, loss of natural stream, culverts and cut-off drains proposed.</li> <li>• No stream habitat will remain; therefore, all riparian margins will be lost.</li> </ul> | Low                 |
| Experiential <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i> |                                                                                                                                                                       |                      |                                                                                                                                                                                                                                                    |                     |
|                                                                                                                         | <ul style="list-style-type: none"> <li>• Upper reach in grazed pasture, little riparian vegetation and close to Saddle Road</li> </ul>                                | Moderate Low         | <ul style="list-style-type: none"> <li>• Physical modifications further reduce the experiential qualities at this location, but the rating remains low.</li> </ul>                                                                                 | Low                 |
| <b>OVERALL RATING</b>                                                                                                   |                                                                                                                                                                       | <b>MODERATE HIGH</b> |                                                                                                                                                                                                                                                    | <b>MODERATE LOW</b> |

| CROSSING POINT 4D (CU-10) 100m                                                                                                                      |                                                                                                                                                                                                                                                                                                                    |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Attribute                                                                                                                                           | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                         | RATING       | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | RATING       |
| <b>Active Bed</b> <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i> |                                                                                                                                                                                                                                                                                                                    |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |              |
| <b>Abiotic</b>                                                                                                                                      | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Significant changes to flow regime – intermittent streams with discrete wetland systems</li> </ul>                                                                                                                                                       | Moderate     | <ul style="list-style-type: none"> <li>Area potentially impacted by the road already affected by human activities</li> <li>Flow regime has already adjusted to changes in land use and land cover</li> <li>Possibly a slight change to the timing and volume of storm runoff</li> <li>Proposed changes will have a small effect on existing runoff character or processes</li> </ul>                                                                                                                                                | Moderate Low |
|                                                                                                                                                     | <b>Morphology</b> <ul style="list-style-type: none"> <li>Natural drainage channel</li> </ul>                                                                                                                                                                                                                       | Moderate-Low | <ul style="list-style-type: none"> <li>All of the sub-catchment will be used as spoil area (approx. 87,300m<sup>2</sup>) and re-contoured/landscaped</li> <li>The natural channels and drainage depressions will be infilled and new channel/drainage lines formed on the surface of the fill</li> <li>Channel in this area already modified by human activities</li> <li>Bed and channel adjusted to the current flow regime that will not change</li> <li>Potentially a reduction in silt and attenuation of low flows</li> </ul> | Low          |
|                                                                                                                                                     | <b>Water Quality</b> <ul style="list-style-type: none"> <li>Unfenced so unrestricted access – cattle</li> <li>Catchment-level modelling indicates low water quality</li> </ul>                                                                                                                                     | Low          | <ul style="list-style-type: none"> <li>Crossing point involves piping of the stream at the downstream end of the sub-catchment and remainder of gully to be totally infilled for spoil disposal. with a new channel formed on top.</li> <li>Will not result in any significant change to overall water quality so rating remains unchanged.</li> </ul>                                                                                                                                                                              | Low          |
| <b>Biotic</b>                                                                                                                                       | <b>Exotic aquatic flora and fauna</b> <ul style="list-style-type: none"> <li>Some areas of wetland vegetation comprising a mix of exotic and native species.</li> <li>Stream channel typically hardbottom and limited macrophyte assemblages instream.</li> <li>Native fish recorded in lower catchment</li> </ul> | Moderate     | <ul style="list-style-type: none"> <li>Gully system to be completely filled for spoil disposal</li> <li>Exotic flora and fauna will remain absent, but the stream and wetland habitat gone.</li> <li>Post-development diversion may be more favourable habitat for exotic flora.</li> </ul>                                                                                                                                                                                                                                         | Low          |

| CROSSING POINT 4D (CU-10) 100m                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |                                                                                                                                                                                                                                                                                  |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Attribute                                                                                                                                           | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | RATING   | POST DEVELOPMENT                                                                                                                                                                                                                                                                 | RATING   |
| <b>Active Bed</b> <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |                                                                                                                                                                                                                                                                                  |          |
| <b>Biotic</b>                                                                                                                                       | <b>Indigenous taxa assemblages</b> <ul style="list-style-type: none"> <li>Longfin eel (At Risk Declining). Therefore, IBI of 34 is indicative of 'very poor' biotic integrity but reasonable diversity given the presence of barriers.</li> <li>MCI of 88 and SQMCI 4.32 indicative of poor to fair water and habitat quality.</li> <li>Stock access may have impacts on MCI values, however the presence of hard bottom substrates and oxygenated water would provide reasonable habitat for indigenous taxa.</li> </ul>                                                                                                                                                            | Moderate | <ul style="list-style-type: none"> <li>Gully system to be completely filled for spoil disposal.</li> <li>Loss of habitat for indigenous flora and fauna and post-development conditions less favourable for indigenous fauna.</li> </ul>                                         | Low      |
|                                                                                                                                                     | <b>Ecosystem functioning</b> <ul style="list-style-type: none"> <li>Natural channel, good quality considering stock access.</li> <li>Small waterfalls, runs and chutes, woody debris instream meaning good habitat and hydrologic heterogeneity.</li> <li>Hard bottom stream with variable substrate sizes, sediment deposition in places.</li> <li>Some sections incised, but typically good floodplain connectivity.</li> <li>Riparian margins effectively absent, isolated trees present.</li> <li>SEV value of 0.56, indicative of moderate as a reflection of the hydrologic and habitat heterogeneity, hard bottom substrates and incised channel to provide shade.</li> </ul> | Moderate | <ul style="list-style-type: none"> <li>Post development gully (stream and wetland) system will be filled with spoil, therefore will be lost.</li> <li>Diversion on top of spoil will provide limited ecological function, not reflective of natural conditions.</li> </ul>       | Very Low |
| <b>Margin</b> <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |                                                                                                                                                                                                                                                                                  |          |
| <b>Abiotic</b>                                                                                                                                      | <b>Structures and human modifications</b> <ul style="list-style-type: none"> <li>None known</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Moderate | <ul style="list-style-type: none"> <li>Culvert proposed beneath the main alignment</li> <li>Existing drainage lines will be infilled and new 'streams' formed on the fill surface</li> <li>Proposed changes will have a significant effect on the existing character.</li> </ul> | Low      |

| CROSSING POINT 4D (CU-10) 100m                                                                                          |                                                                                                                                                                                                                                                                                                                                                                               |                         |                                                                                                                                                                                                                                                                                                                                             |            |
|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Attribute                                                                                                               | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                    | RATING                  | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                            | RATING     |
| Margin <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                |                                                                                                                                                                                                                                                                                                                                                                               |                         |                                                                                                                                                                                                                                                                                                                                             |            |
| <b>Biotic</b>                                                                                                           | <b>Terrestrial Ecology</b> <ul style="list-style-type: none"> <li>• Divaricating shrubland and exotic dominated wetland (native species present)</li> <li>• Records of two indigenous moths present (<i>Meterana grandiosa</i> and <i>Meterana exquisite</i>), both classified as At Risk,</li> <li>• Likely to be pasture birds like pipit and also wetland birds</li> </ul> | Moderate                | <ul style="list-style-type: none"> <li>• Post development gully (stream and wetland) system will be filled with spoil, therefore will be lost.</li> <li>• Diversion on top of spoil will have some riparian planting but restricted by location in wind farm and engineered materials.</li> <li>• Wetlands will not be replaced.</li> </ul> | Low        |
| Experiential <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i> |                                                                                                                                                                                                                                                                                                                                                                               |                         |                                                                                                                                                                                                                                                                                                                                             |            |
|                                                                                                                         | <ul style="list-style-type: none"> <li>• Rural working farm, QEII open space covenant present and areas of regenerating shrubland</li> </ul>                                                                                                                                                                                                                                  | Moderate Low            | <ul style="list-style-type: none"> <li>• The Project intercepts several tributaries in the mid-section of this catchment, further reducing the experiential quality with filled gully and modification of waterbodies</li> </ul>                                                                                                            | Very Low   |
| <b>OVERALL RATING</b>                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                               | <b>MODERATE<br/>LOW</b> |                                                                                                                                                                                                                                                                                                                                             | <b>LOW</b> |

| CROSSING POINT 5A- (CU-07) 180m |                                                                                                                                                                                                                                                                                                                                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                      |              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Attribute                       | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                           | RATING       | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                     | RATING       |
| Active Bed                      | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                    |              |                                                                                                                                                                                                                                                                                                                                                                                                                                      |              |
| Abiotic                         | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Most in high pastoral areas, modified drainage channels and almost complete vegetation clearance</li> </ul>                                                                                                                                                                | Moderate-Low | <ul style="list-style-type: none"> <li>No significant changes to the flow regime are anticipated</li> <li>May be some small changes to the timing and volume of storm runoff.</li> <li>Catchment already modified by extensive land use change</li> </ul>                                                                                                                                                                            | Low          |
|                                 | <b>Morphology</b> <ul style="list-style-type: none"> <li>Channel is largely natural but got some human modification</li> <li>Cobble bottom</li> <li>Comparatively deep channel</li> </ul>                                                                                                                                            | Moderate     | <ul style="list-style-type: none"> <li>Channels in this area have already modified by human activities</li> <li>Some changes to the channel caused by culverts and realignment etc.</li> <li>Some channels will be lost but replaced with formed drainage lines</li> <li>Potentially a reduction in silt and attenuation of low flows</li> <li>Proposed changes will have small effect on existing character or processes</li> </ul> | Low          |
|                                 | <b>Water Quality</b> <ul style="list-style-type: none"> <li>Mostly pastoral</li> <li>Modified by cattle</li> <li>High fine sediment loading</li> <li>DRP elevated at times</li> <li>Measured <i>E. coli</i> concentrations often high</li> <li>Small fenced area at one of the headwater tributaries but rest is unfenced</li> </ul> | Moderate Low | <ul style="list-style-type: none"> <li>Crossing involves piping and diversion of the existing channel. The sub-catchment remains predominantly unfenced pastoral land use upstream. Hence the rating remains unchanged</li> </ul>                                                                                                                                                                                                    | Moderate Low |
| Biotic                          | <b>Exotic aquatic flora and fauna</b> <ul style="list-style-type: none"> <li>Majority of catchment cobble bottom and at least partially shaded, so minimal macrophytes. Macrophytes effectively absent from most stream channel.</li> <li>Native fish recorded. (longfin eel - At Risk Declining)</li> <li>Koura recorded</li> </ul> | High         | <ul style="list-style-type: none"> <li>Stream modification resulting from culverts and loss of channel length.</li> <li>Unlikely to be substantive change to water quality but may be some modification to habitat to make it more conducive to exotic flora.</li> </ul>                                                                                                                                                             | Moderate Low |

| CROSSING POINT 5A- (CU-07) 180m                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                                                                                                                                                                                                                                                                                                                                      |        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Attribute                                                                                                                                           | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | RATING | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                     | RATING |
| <b>Active Bed</b> <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                                                                                                                                                                                                                                                                                                                                      |        |
| <b>Biotic</b>                                                                                                                                       | <b>Indigenous taxa assemblages</b> <ul style="list-style-type: none"> <li>MCI scores indicative of good water and habitat quality (111, 111, 119). SQMCI values 4.92 to 6.17 indicative of fair to excellent water and habitat quality.</li> <li>Fish restricted by access, but At Risk Declining longfin eel recorded</li> </ul>                                                                                                                                                                                                                                                  | High   | <ul style="list-style-type: none"> <li>Stream modification resulting from culverting and loss of channel length. Loss or modification of habitat for fauna so a reduction in quality of fauna anticipated.</li> </ul>                                                                                                                | Low    |
|                                                                                                                                                     | <b>Ecosystem functioning</b> <ul style="list-style-type: none"> <li>SEV scores indicative of moderate to high ecological value (0.76, 0.56 and 0.7).</li> <li>Riparian margins more intact and vegetated than neighbouring 5B sub-catchment immediately upstream and downstream of crossing.</li> <li>Instream habitat and hydrologic heterogeneity good, with pools, runs and riffles present.</li> <li>Some sediment deposition likely influencing overall functionality.</li> <li>Lower quality than the DoC Reserve in lower part of catchment but still very good.</li> </ul> | High   | <ul style="list-style-type: none"> <li>Stream modification resulting from culverting and loss of channel length. Loss or modification of stream channels.</li> <li>Some ecosystem functioning retained through culverts (hydrologic, temperature control) but overall ecosystem functioning impeded by the modifications.</li> </ul> | Low    |
| <b>Margin</b> <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                                                                                                                                                                                                                                                                                                                                      |        |
| <b>Abiotic</b>                                                                                                                                      | <b>Structures and human modifications</b> <ul style="list-style-type: none"> <li>Limited fencing</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | High   | <ul style="list-style-type: none"> <li>One culvert proposed</li> <li>Some realignment and construction of artificial channels</li> <li>Proposed changes will have a significant effect on the existing character, but this should dissipate over time and certainly downstream</li> </ul>                                            | Low    |

| CROSSING POINT 5A- (CU-07) 180m |                                                                                                                                                                                     |             |                                                                                                                                                                                                                         |            |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Attribute                       | EXISTING NATURAL CHARACTER                                                                                                                                                          | RATING      | POST DEVELOPMENT                                                                                                                                                                                                        | RATING     |
| <b>Biotic</b>                   | <b>Terrestrial Ecology</b> <ul style="list-style-type: none"> <li>Manuka kanuka shrublands/forest and secondary broadleaf with old growth signatures – fragmented mosaic</li> </ul> | High        | <ul style="list-style-type: none"> <li>Modification resulting from culverting and loss of channel length.</li> <li>Road alignment through area of lower quality riparian margin however still complete loss.</li> </ul> | Low        |
| <b>Experiential</b>             | <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i>                                                                          |             |                                                                                                                                                                                                                         |            |
|                                 | <ul style="list-style-type: none"> <li>Upper reaches in rural working landscape steep stream gullies, some of which support indigenous vegetation /scrub</li> </ul>                 | Moderate    | <ul style="list-style-type: none"> <li>Physical modifications and traffic activity further reduce the experiential qualities at this location. The alignment traverses the middle of the catchment.</li> </ul>          | Very Low   |
| <b>OVERALL RATING</b>           |                                                                                                                                                                                     | <b>HIGH</b> |                                                                                                                                                                                                                         | <b>LOW</b> |



| CROSSING POINT 5B Five culverts (460m total) 1780m diversions |                                                                                                                                                                                                                                                                                                                              |              |                                                                                                                                                                                                                                                                                                                                                                                                                    |              |
|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Attribute                                                     | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                   | RATING       | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                   | RATING       |
| Active Bed                                                    | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                            |              |                                                                                                                                                                                                                                                                                                                                                                                                                    |              |
| Abiotic                                                       | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Most in high pastoral areas, modified drainage channels and almost complete vegetation clearance</li> </ul>                                                                                                                                                        | Moderate     | <ul style="list-style-type: none"> <li>Some changes to the flow regime are anticipated</li> <li>May be some small changes to the timing and volume of storm runoff but this effect will dissipate and attenuate downstream</li> <li>Catchment already modified by extensive land use change</li> </ul>                                                                                                             | Low          |
|                                                               | <b>Morphology</b> <ul style="list-style-type: none"> <li>Channel is largely natural but some human modification</li> <li>Steeply incised</li> </ul>                                                                                                                                                                          | Moderate     | <ul style="list-style-type: none"> <li>Channels in this area have already modified by human activities</li> <li>All of sub-catchment entering CU-05 is being used as spoil site. Complete stream realignment and construction required.</li> <li>Potentially a reduction in silt and attenuation of low flows</li> <li>Proposed changes will have significant effect on existing character or processes</li> </ul> | Low          |
|                                                               | <b>Water Quality</b> <ul style="list-style-type: none"> <li>Mostly pastoral</li> <li>Modified by cattle</li> <li>High fine sediment loading</li> <li>DRP elevated at times</li> <li>Measured <i>E. coli</i> concentrations often high</li> <li>Water temperature likely high during summer due to lack of shading</li> </ul> | Moderate Low | <ul style="list-style-type: none"> <li>Crossing involves piping and diversion of the existing channel. The sub-catchment remains predominantly unfenced pastoral land use upstream. Hence the rating remains unchanged.</li> </ul>                                                                                                                                                                                 | Moderate Low |

**CROSSING POINT 5B Five culverts (460m total) 1780m diversions**

| Attribute     | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RATING               | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                  | RATING          |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Biotic</b> | <p><b>Exotic aquatic flora and fauna</b></p> <ul style="list-style-type: none"> <li>• Cobble bottom and at least partially shaded, so minimal macrophytes. Macrophytes effectively absent from most stream channel.</li> <li>• Exotic wetlands in the headwaters with some native species.</li> <li>• Native fish recorded. (longfin eel, At Risk Declining)</li> <li>• Koura recorded.</li> </ul>                                                                                                                                                                                                                                                                         | <p>High</p>          | <ul style="list-style-type: none"> <li>• Currently proposed to be located under spoil and culverts therefore predominantly lost.</li> <li>• Exotic flora and fauna will remain absent, but the stream and wetland habitat gone.</li> <li>• Post-development diversion may be more favourable habitat for exotic flora.</li> </ul> | <p>Low</p>      |
|               | <p><b>Indigenous taxa assemblages</b></p> <ul style="list-style-type: none"> <li>• Macroinvertebrate indices fair, good and excellent at different locations (MCI 120, 101 and 88). Highest score obtained within the proposed alignment was at this crossing point.</li> <li>• SQMCI up to 6.31, indicative of excellent water and habitat quality.</li> <li>• Fish access restricted, but longfin eel likely to be present.</li> <li>• Koura recorded.</li> </ul>                                                                                                                                                                                                        | <p>High</p>          | <ul style="list-style-type: none"> <li>• Currently proposed to be located under spoil and culverts therefore predominantly lost.</li> <li>• Loss of habitat for indigenous flora and fauna and post-development conditions less favourable for indigenous fauna</li> </ul>                                                        | <p>Very Low</p> |
|               | <p><b>Ecosystem functioning</b></p> <ul style="list-style-type: none"> <li>• SEV scores indicative of moderate ecological value (0.52, 0.55. and 0.66) and driven primarily by lack of riparian margins to provide shade, riparian filtration and organic matter input.</li> <li>• Instream habitat and hydrologic heterogeneity good, with pools, runs and riffles present.</li> <li>• Shade also provided by incised channels.</li> <li>• Some stock access to channels resulting in pugging on banks.</li> <li>• Some sediment deposition likely influencing overall functionality.</li> <li>• Lower quality than the DOC Reserve in lower part of catchment</li> </ul> | <p>Moderate High</p> | <ul style="list-style-type: none"> <li>• Currently proposed to be located under spoil and culverts therefore ecosystem function predominantly lost.</li> <li>• Diversion on top of spoil will provide limited ecological function, not reflective of natural conditions.</li> </ul>                                               | <p>Very Low</p> |

| CROSSING POINT 5B Five culverts (460m total) 1780m diversions                                                                  |                                                                                                                                                                                                                                                                        |                      |                                                                                                                                                                                                                                                                                                                                                    |            |
|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Attribute                                                                                                                      | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                             | RATING               | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                   | RATING     |
| <b>Margin</b> <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                |                                                                                                                                                                                                                                                                        |                      |                                                                                                                                                                                                                                                                                                                                                    |            |
| <b>Abiotic</b>                                                                                                                 | <b>Structures and human modifications</b> <ul style="list-style-type: none"> <li>None known</li> </ul>                                                                                                                                                                 | Moderate-High        | <ul style="list-style-type: none"> <li>Five culverts proposed</li> <li>Significant realignment and construction of artificial channels</li> <li>Proposed changes will have a significant effect on the existing character.</li> </ul>                                                                                                              | Low        |
| <b>Biotic</b>                                                                                                                  | <b>Terrestrial Ecology</b> <ul style="list-style-type: none"> <li>Wetlands present predominantly exotic</li> <li>Manuka kanuka shrubland</li> <li>Old growth tree-lands</li> <li>Riparian margins are less intact</li> <li>Less vegetated than tributary 5A</li> </ul> | Moderate             | <ul style="list-style-type: none"> <li>Currently proposed to be located under spoil and culverts therefore existing terrestrial ecology predominantly lost.</li> <li>Diversion on top of spoil will have some riparian planting but restricted by location in windfarm and engineered materials.</li> <li>Wetlands will not be replaced</li> </ul> | Low        |
| <b>Experiential</b> <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i> |                                                                                                                                                                                                                                                                        |                      |                                                                                                                                                                                                                                                                                                                                                    |            |
|                                                                                                                                | <ul style="list-style-type: none"> <li>Upper reaches in rural working landscape steep stream gullies, some of which support indigenous vegetation /scrub.</li> </ul>                                                                                                   | Moderate             | <ul style="list-style-type: none"> <li>Physical modifications and traffic activity further reduce the experiential qualities at this location</li> </ul>                                                                                                                                                                                           | Very Low   |
| <b>OVERALL RATING</b>                                                                                                          |                                                                                                                                                                                                                                                                        | <b>MODERATE HIGH</b> |                                                                                                                                                                                                                                                                                                                                                    | <b>LOW</b> |

| CROSSING POINT 6A 190m stream bed loss, no culvert                                                                                                  |                                                                                                                                                                                                                                                                 |              |                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Attribute                                                                                                                                           | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                      | RATING       | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                  | RATING   |
| <b>Active Bed</b> <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i> |                                                                                                                                                                                                                                                                 |              |                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |
| <b>Abiotic</b>                                                                                                                                      | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Moderate change to natural flow regime</li> <li>Large changes to land use</li> </ul>                                                                                                                  | Moderate-Low | <ul style="list-style-type: none"> <li>Headwater catchment so no significant changes to the flow regime are anticipated</li> <li>May be some small changes to the timing and volume of storm runoff but this effect will dissipate and attenuate downstream</li> <li>Catchment already modified by extensive land use change</li> </ul>                                                                                           | Low      |
|                                                                                                                                                     | <b>Morphology</b> <ul style="list-style-type: none"> <li>Moderately modified channel, some natural reaches within it. Channels interacting with human modifications.</li> <li>Much of channel is protected from stock</li> <li>Fine cobbled sand bed</li> </ul> | Moderate-Low | <ul style="list-style-type: none"> <li>Channels in this area have already modified by human activities</li> <li>Bed and channel adjusted to the current flow regime that will not change significantly</li> <li>Significant changes to the channel caused by the highway and associated earthworks.</li> <li>Formation of new artificial channel</li> <li>Potentially a reduction in silt and attenuation of low flows</li> </ul> | Low      |
|                                                                                                                                                     | <b>Water Quality</b> <ul style="list-style-type: none"> <li>Outside of fenced QEII open space covenant area, land use is mostly pasture on steep hillsides</li> <li>Catchment-level modelling indicates moderate water quality overall</li> </ul>               | Moderate     | <ul style="list-style-type: none"> <li>Crossing point is at the extreme upstream part of the sub-catchment and involves infill of the existing gully. Prevailing land use remains the same and no stormwater discharge, hence the rating remains unchanged</li> </ul>                                                                                                                                                             | Moderate |
| <b>Biotic</b>                                                                                                                                       | <b>Exotic aquatic flora and fauna</b> <ul style="list-style-type: none"> <li>Macrophytes not present for most of area.</li> <li>Fish may be present in short section of permanent reach, but unlikely.</li> </ul>                                               | Moderate     | <ul style="list-style-type: none"> <li>Headwaters being lost under road – complete loss post development, therefore no habitat for exotic flora and fauna to inhabit.</li> </ul>                                                                                                                                                                                                                                                  | Very Low |

| CROSSING POINT 6A 190m stream bed loss, no culvert                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                                                                                                                                                                                                                       |                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Attribute                                                                                                                                           | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                              | RATING          | POST DEVELOPMENT                                                                                                                                                                                                      | RATING          |
| <b>Active Bed</b> <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                                                                                                                                                                                                                       |                 |
| <b>Biotic</b>                                                                                                                                       | <b>Indigenous taxa assemblages</b> <ul style="list-style-type: none"> <li>Fish may be present in short section of permanent watercourse.</li> <li>Majority of impacted reach not suitable for fish species.</li> <li>Majority of reach not suitable for sensitive macroinvertebrates. Short section of permanent stream may have macroinvertebrates and koura.</li> </ul>                                               | Moderate        | <ul style="list-style-type: none"> <li>Headwaters being lost under road – complete loss post development, therefore no habitat for indigenous flora and fauna to inhabit.</li> </ul>                                  | Very Low        |
|                                                                                                                                                     | <b>Ecosystem functioning</b> <ul style="list-style-type: none"> <li>Majority of impact reach low quality, unshaded, modified intermittent channel.</li> <li>Short section of permanent stream of higher quality impacted. Hard bottom, with riparian margins, so shaded and protected from stock access.</li> <li>Anticipate similar SEV score to upper 5B catchment (indicative of moderate to high value).</li> </ul> | Moderate        | <ul style="list-style-type: none"> <li>Headwaters being lost under road – complete loss post development, therefore complete loss of ecosystem function.</li> </ul>                                                   | Very Low        |
| <b>Margin</b> <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                                                                                                                                                                                                                       |                 |
| <b>Abiotic</b>                                                                                                                                      | <b>Structures and human modifications</b> <ul style="list-style-type: none"> <li>Fenced margins</li> <li>Similar to wider catchment</li> </ul>                                                                                                                                                                                                                                                                          | Moderate        | <ul style="list-style-type: none"> <li>Length of existing stream channel will be lost</li> <li>Proposed changes will have a significant but localised effect on the existing character.</li> </ul>                    | Low             |
| <b>Biotic</b>                                                                                                                                       | <b>Terrestrial Ecology</b> <ul style="list-style-type: none"> <li>Margins in secondary broadleaf forest and scrubland but not entirely intact (fragmented mosaic)</li> <li>Potential for forest birds</li> <li>Pipit</li> </ul>                                                                                                                                                                                         | High            | <ul style="list-style-type: none"> <li>Headwaters being lost under road. No diversion proposed, therefore complete loss of riparian margin.</li> <li>Downstream of crossing point riparian margins remain.</li> </ul> | Very Low        |
| <b>Experiential</b> <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i>                      |                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                                                                                                                                                                                                                       |                 |
|                                                                                                                                                     | <ul style="list-style-type: none"> <li>Upper reaches in working rural landscape/wind farm has low experiential value</li> </ul>                                                                                                                                                                                                                                                                                         | Moderate        | <ul style="list-style-type: none"> <li>Physical modifications and traffic activity further reduce the experiential qualities at this location</li> </ul>                                                              | Low             |
| <b>OVERALL RATING</b>                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>MODERATE</b> |                                                                                                                                                                                                                       | <b>VERY LOW</b> |

| CROSSING POINT 7A . Loss of 470m stream under footprint                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                 |               |                                                                                                                                                                                                                                                                                                                                                                                    |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Attribute                                                                                                                                           | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                      | RATING        | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                   | RATING   |
| <b>Active Bed</b> <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                 |               |                                                                                                                                                                                                                                                                                                                                                                                    |          |
| <b>Abiotic</b>                                                                                                                                      | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Largely natural flow regime</li> <li>Moderate changes to land cover</li> <li>Some changes to timing of flows</li> </ul>                                                                                                                                                                                                                               | Moderate      | <ul style="list-style-type: none"> <li>Only upper reaches of catchment affected</li> <li>Largely natural flow regime</li> <li>Small changes to existing land cover</li> <li>Catchment area to increase. Potential for some minor changes to timing of flows but catchment yields should be unchanged</li> <li>Change in area may result in greater catchment discharge.</li> </ul> | Moderate |
|                                                                                                                                                     | <b>Morphology</b> <ul style="list-style-type: none"> <li>Some modification to channel but largely natural.</li> </ul>                                                                                                                                                                                                                                                                                           | Moderate-High | <ul style="list-style-type: none"> <li>Significant length of channel will be lost but much likely to have intermittent flow</li> <li>Potential for reduction in sediment yield due to dual forebay wetland and sediment basin.</li> </ul>                                                                                                                                          | Low      |
|                                                                                                                                                     | <b>Water Quality</b> <ul style="list-style-type: none"> <li>Forested QEII covenanted area, but with pasture on steep hillsides outside this area.</li> <li>Unfenced with cattle and sheep access below QEII open space covenant area</li> <li>Catchment-level modelling indicates moderate water quality overall</li> <li>High SIN and DRP measured just downstream of QEII open space covenant area</li> </ul> | Moderate      | <ul style="list-style-type: none"> <li>Wetland and sediment basin to treat stormwater runoff.</li> <li>Crossing is at the extreme upstream part of the sub-catchment and involves infill of the existing gully. Prevailing land use remains the same, hence the rating remains unchanged.</li> </ul>                                                                               | Moderate |
| <b>Biotic</b>                                                                                                                                       | <b>Exotic aquatic flora and fauna</b> <ul style="list-style-type: none"> <li>Affected reaches at top of catchment, incised hard bottom channels, with no exotic macrophytes.</li> <li>No exotic fish recorded.</li> </ul>                                                                                                                                                                                       | High          | <ul style="list-style-type: none"> <li>Stream will sit under road, infilling of stream. Cut-Off drain length will not replicate loss.</li> </ul>                                                                                                                                                                                                                                   | Very Low |

| CROSSING POINT 7A . Loss of 470m stream under footprint |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |                                                                                                                                                                                                                                                                                                    |          |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Attribute                                               | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | RATING        | POST DEVELOPMENT                                                                                                                                                                                                                                                                                   | RATING   |
|                                                         | <b>Indigenous taxa assemblages</b> <ul style="list-style-type: none"> <li>MCI from both areas indicative of good water and habitat quality (101, 109). QMCI indicative of fair to good.</li> <li>Limited habitat for fish. Fish survey not conducted, anticipate koura would be dominant species. Possibly longfins where pools provide sufficient habitat.</li> </ul>                                                                                                                                                                                                                                                                                                    | High          | <ul style="list-style-type: none"> <li>Stream will sit under road, infilling of stream therefore no habitat for indigenous fauna. Cut-Off drain length will not replicate loss.</li> <li>Modification of flow regime likely to introduce less favourable conditions for indigenous taxa</li> </ul> | Very Low |
|                                                         | <b>Ecosystem functioning</b> <ul style="list-style-type: none"> <li>Two clear areas of impact, one inside QEII open space covenant and one outside.</li> <li>SEV outside 0.50 indicative of moderate ecological value.</li> <li>Hardbottom, incised stream channels with fragmented riparian margins.</li> <li>Stock access along much of channel. Some areas wetland in nature due to pugging. Downstream reaches cobbles and more intact.</li> <li>SEV inside 0.78, indicative of high ecological value. Riparian margin intact, shaded and stable banks. Evidence of sediment deposition from upstream. Hydrologic and instream habitat heterogeneity good.</li> </ul> | High          | <ul style="list-style-type: none"> <li>Stream will sit under road, infilling of stream therefore ecosystem function lost.</li> <li>Cut-Off drain length will not replicate loss and will not replace ecosystem function.</li> </ul>                                                                | Very Low |
| <b>Margin</b>                                           | <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |                                                                                                                                                                                                                                                                                                    |          |
| <b>Abiotic</b>                                          | <b>Structures and human modifications</b> <ul style="list-style-type: none"> <li>General lack of structures</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Moderate High | <ul style="list-style-type: none"> <li>Wetland and sediment basin proposed.</li> <li>Proposed changes will have a significant effect on the existing character.</li> </ul>                                                                                                                         | Low      |

| CROSSING POINT 7A . Loss of 470m stream under footprint |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |             |                                                                                                                                                                                                                                                                       |            |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Attribute                                               | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | RATING      | POST DEVELOPMENT                                                                                                                                                                                                                                                      | RATING     |
| Biotic                                                  | <p><b>Terrestrial Ecology</b></p> <ul style="list-style-type: none"> <li>Fauna connection</li> <li>Terrestrial vegetation in the lower catchment a mosaic of age classes of indigenous forest and scrub. Old-growth forest present with areas of younger, diverse broadleaved forests and scrub and raupō wetland.</li> <li>QE covenanted area makes up approximately 40% of the vegetation.</li> <li>Excellent riparian vegetation</li> <li>Raupō wetland</li> <li>Adjoins Manawatū Gorge Scenic Reserve, which provides good connection for fauna.</li> </ul> | Very High   | <ul style="list-style-type: none"> <li>Stream will sit under road, infilling of stream therefore riparian margins lost.</li> <li>Diversion length will not replicate length lost and will not replace the type and quality of riparian vegetation present.</li> </ul> | Very Low   |
| Experiential                                            | <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |             |                                                                                                                                                                                                                                                                       |            |
|                                                         | <ul style="list-style-type: none"> <li>Stream flows through indigenous forest (QE11 covenant and MASR)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                               | High        | <ul style="list-style-type: none"> <li>Physical modifications and traffic activity will significantly reduce the experiential qualities at this location</li> </ul>                                                                                                   | Low        |
| <b>OVERALL RATING</b>                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>HIGH</b> |                                                                                                                                                                                                                                                                       | <b>LOW</b> |



| CROSSING POINT 7B approx. 700m natural stream channel loss- diversion & CU03, 67m in length                                                         |                                                                                                                                                                                                                                                                                                                                                                    |          |                                                                                                                                                                                                                                                                                                                                                                                                                                  |              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Attribute                                                                                                                                           | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                         | RATING   | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                 | RATING       |
| <b>Active Bed</b> <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i> |                                                                                                                                                                                                                                                                                                                                                                    |          |                                                                                                                                                                                                                                                                                                                                                                                                                                  |              |
| <b>Abiotic</b>                                                                                                                                      | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Significant change in land cover</li> <li>Likely change to flow statistics</li> <li>Several online ponds</li> </ul>                                                                                                                                                                                      | Moderate | <ul style="list-style-type: none"> <li>Flow in much of this catchment is intermittent</li> <li>Catchment area likely to increase because of wetland formation but effects to be managed and flow attenuated</li> <li>Some changes to the volume and timing of runoff expected</li> <li>Effects will be attenuated and moderated at the confluence</li> <li>Potential changes to the timing and volume of storm runoff</li> </ul> | Low          |
|                                                                                                                                                     | <b>Morphology</b> <ul style="list-style-type: none"> <li>Natural channel apart from a few impoundments</li> </ul>                                                                                                                                                                                                                                                  | Moderate | <ul style="list-style-type: none"> <li>Some artificial channel but much of the existing channel has intermittent flow</li> <li>Majority of natural channels to be replaced by artificial channels.</li> <li>Potential reduction in sediment yield and total load</li> </ul>                                                                                                                                                      | Low          |
|                                                                                                                                                     | <b>Water Quality</b> <ul style="list-style-type: none"> <li>Unfenced with stock access (sheep and cattle)</li> <li>Pasture with minimal channel shading</li> <li>Artificial ponds/farm dams</li> <li>Exotic weeds choking channel</li> </ul>                                                                                                                       | Low      | <ul style="list-style-type: none"> <li>Crossing involves near-complete loss of existing channel in the sub-catchment and replacement with permanent diversion. Provided this results in complete removal of stock from the catchment with revegetation/retirement of former pasture in the sub-catchment then an increase in rating may result.</li> </ul>                                                                       | Moderate-Low |
| <b>Biotic</b>                                                                                                                                       | <b>Exotic aquatic flora and fauna</b> <ul style="list-style-type: none"> <li>Macroinvertebrates indicative of poor to fair habitat and water quality (66, 70, 90). SQMCI similar.</li> <li>Possibly shortfin eels in online ponds and may be habitat for longfin eels.</li> <li>Downstream barrier to fish mean passage restricted and limits diversity</li> </ul> | Moderate | <ul style="list-style-type: none"> <li>Stream and wetland habitat will be lost within this section</li> <li>Diversion on/adjacent to embankment will provide limited ecological function, not reflective of natural conditions.</li> <li>Post-development diversion may be more favourable habitat for exotic flora.</li> </ul>                                                                                                  | Low          |

| CROSSING POINT 7B approx. 700m natural stream channel loss- diversion & CU03, 67m in length |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |                                                                                                                                                                                                                                                                                                                                                                                                  |          |
|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Attribute                                                                                   | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                   | RATING   | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                 | RATING   |
| Active Bed                                                                                  | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                            |          |                                                                                                                                                                                                                                                                                                                                                                                                  |          |
| Biotic                                                                                      | <b>Indigenous taxa assemblages</b> <ul style="list-style-type: none"> <li>• Macroinvertebrates indicative of poor to fair habitat and water quality (66, 70, 90). SQMCI similar.</li> <li>• Possibly shortfin eels in online ponds and may be habitat for longfin eels.</li> <li>• Downstream barrier to fish mean passage restricted and limits diversity</li> </ul>                                                                                                        | Moderate | <ul style="list-style-type: none"> <li>• Majority of 7B Stream and wetland will be lost within this section and therefore habitat for indigenous fauna lost.</li> <li>• Diversion on/adjacent to embankment will provide limited ecological function, not reflective of natural conditions.</li> <li>• Post-development diversion may be less favourable habitat for indigenous taxa.</li> </ul> | Low      |
|                                                                                             | <b>Ecosystem functioning</b> <ul style="list-style-type: none"> <li>• SEV scores of 0.44, 0.4 and 0.7 indicative of moderate to high ecological function.</li> <li>• Stream function modified by stock access, online ponds and effectively no riparian margins.</li> <li>• In-stream habitat heterogeneity impacted by stock access and online structures. Lower reaches of higher quality.</li> <li>• Headwater seep wetlands (exotic) degraded but functional.</li> </ul> | Moderate | <ul style="list-style-type: none"> <li>• Majority of 7B Stream and wetland will be lost within this section and therefore ecosystem functioning lost.</li> <li>• Diversion on/adjacent to embankment will provide limited ecological function, not reflective of natural conditions.</li> </ul>                                                                                                  | Very Low |
| Margin                                                                                      | <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                            |          |                                                                                                                                                                                                                                                                                                                                                                                                  |          |
| Abiotic                                                                                     | <b>Structures and human modifications</b> <ul style="list-style-type: none"> <li>• Farm dams present in upper reaches</li> </ul>                                                                                                                                                                                                                                                                                                                                             | Moderate | <ul style="list-style-type: none"> <li>• One culvert and significant realignment of stream channels</li> <li>• Loss of natural channels and replacement</li> <li>• One wetland proposed.</li> </ul>                                                                                                                                                                                              | Low      |

| CROSSING POINT 7B approx. 700m natural stream channel loss- diversion & CU03, 67m in length |                                                                                                                                                                                                                                                                                     |                         |                                                                                                                                                                                                                                                                                     |            |
|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Attribute                                                                                   | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                          | RATING                  | POST DEVELOPMENT                                                                                                                                                                                                                                                                    | RATING     |
| <b>Biotic</b>                                                                               | <b>Terrestrial Ecology</b> <ul style="list-style-type: none"> <li>• Secondary broadleaf</li> <li>• Exotic wetlands in upper section –wetland birds (pipit).</li> <li>• Forest and scrubland</li> <li>• Mostly devoid of terrestrial vegetation apart from lower sections</li> </ul> | Low                     | <ul style="list-style-type: none"> <li>• Majority of 7B Stream and wetland will be lost.</li> <li>• Diversion on/adjacent to embankment will provide opportunity for planting to improve riparian margins from pre-development but not reflective of natural conditions.</li> </ul> | Low        |
| <b>Experiential</b>                                                                         | <b>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</b>                                                                                                                                                                          |                         |                                                                                                                                                                                                                                                                                     |            |
|                                                                                             | <ul style="list-style-type: none"> <li>• 7B in working rural landscape, grazed pasture to stream edge</li> </ul>                                                                                                                                                                    | Low                     | <ul style="list-style-type: none"> <li>• Loss of most of the natural stream bed into artificial diversion, runs along foot of road batter</li> </ul>                                                                                                                                | Very low   |
| <b>OVERALL RATING</b>                                                                       |                                                                                                                                                                                                                                                                                     | <b>MODERATE<br/>LOW</b> |                                                                                                                                                                                                                                                                                     | <b>LOW</b> |

| CROSSING POINT – RAUPO WETLAND 3 piers in wetland and permanent access track |                                                                                                                                                                                                                                                                                                                                      |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |
|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Attribute                                                                    | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                           | RATING   | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | RATING        |
| Active Bed                                                                   | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                    |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |
| Abiotic                                                                      | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Hydrology of the raupō wetland controlled by rainfall and drainage from the bluffs and hillslopes above</li> <li>Largely the result of impeded drainage further downslope</li> <li>No flow from tributary 7A is elevated significantly above the active channel</li> </ul> | High     | <ul style="list-style-type: none"> <li>Proposed development unlikely to affect wetland processes</li> <li>Piers and access tracks may prevent some wetland storage resulting in slightly more water in other locations</li> <li>All hydrological processes will remain unchanged in both character and magnitude</li> </ul>                                                                                                                                                                                                                                             | Moderate      |
|                                                                              | <b>Morphology</b> <ul style="list-style-type: none"> <li>Rock fall/debris flow has created wetland</li> </ul>                                                                                                                                                                                                                        | High     | <ul style="list-style-type: none"> <li>There will be no change to the morphology of the wetland other than a reduction in total area (i.e. the surface area equivalent to the size of the piers and maintenance access provision).</li> <li>The Project will have effects adjacent to the wetland but any effects on the actual wetland will be very small</li> <li>It should be recognised, however, that the wetland is vulnerable to both further rock fall/debris flow and drainage should a permanent channel form through the current drainage barrier</li> </ul> | Moderate High |
|                                                                              | <b>Water Quality</b> <ul style="list-style-type: none"> <li>No significant areas of standing or flowing water are known from within the raupō wetland.</li> <li>The only permanent water observed is with the main stream channel where most of the flow is derived from the 7A branch</li> </ul>                                    | Moderate | <ul style="list-style-type: none"> <li>No standing water is present in the “Eco-bridge wetland”, hence installation of piers will have no impact on water quality</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                            | Moderate      |
| Biotic                                                                       | <b>Exotic aquatic flora and fauna</b> <ul style="list-style-type: none"> <li>Approximately 50% exotic to indigenous aquatic plants, dominated by well-established raupō.</li> <li>Barrier to fish passage restricts fish access.</li> </ul>                                                                                          | High     | <ul style="list-style-type: none"> <li>Partial modification of wetland, and some works in the footprint.</li> <li>Post-development conditions may be more favourable habitat for exotic flora.</li> </ul>                                                                                                                                                                                                                                                                                                                                                               | High          |

| CROSSING POINT - ECO-BRIDGE WETLAND 3 piers in wetland and permanent access track                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                                                                                                                                                                                                                                                |        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Attribute                                                                                                                                           | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                             | RATING | POST DEVELOPMENT                                                                                                                                                                                                                               | RATING |
| <b>Active Bed</b> <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                                                                                                                                                                                                                                                |        |
| <b>Biotic</b>                                                                                                                                       | <b>Indigenous taxa assemblages</b> <ul style="list-style-type: none"> <li>Not much standing water</li> <li>Macroinvertebrate samples not taken and not particularly useful for wetland habitats as indicator. Based on what has been seen in the lower reaches, expect macroinvertebrates to be indicative of good water and habitat quality.</li> <li>Fish passage restricted from Manawatu River, but shortfin and longfin eels likely to be present where water present.</li> </ul> | High   | <ul style="list-style-type: none"> <li>Partial modification of wetland and some works in the footprint. No change expected to indigenous fauna</li> </ul>                                                                                      | High   |
|                                                                                                                                                     | <b>Ecosystem functioning</b> <ul style="list-style-type: none"> <li>Raupō wetland</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                           | High   | <ul style="list-style-type: none"> <li>Partial modification of wetland and some works in the footprint.</li> </ul>                                                                                                                             | High   |
| <b>Margin</b> <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                                                                                                                                                                                                                                                |        |
| <b>Abiotic</b>                                                                                                                                      | <b>Structures and human modifications</b> <ul style="list-style-type: none"> <li>No structures or human modifications (other than land use change) in the immediate vicinity</li> </ul>                                                                                                                                                                                                                                                                                                | High   | <ul style="list-style-type: none"> <li>Three piers will be constructed in the wetland</li> <li>Any effect of these on the hydrology will be negligible</li> <li>The Eco-bridge will be a significant height above the raupō wetland</li> </ul> | Low    |

| CROSSING POINT - ECO-BRIDGE WETLAND 3 piers in wetland and permanent access track |                                                                                                                                                                                                                                                                        |             |                                                                                                                                                                                                                                                                                          |                 |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Attribute                                                                         | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                             | RATING      | POST DEVELOPMENT                                                                                                                                                                                                                                                                         | RATING          |
| <b>Biotic</b>                                                                     | <b>Terrestrial</b> <ul style="list-style-type: none"> <li>High value raupō wetland</li> <li>50% indigenous / 50% non-indigenous</li> <li>Birds (white head and cryptic wetland species)</li> <li>Mosaic indigenous vegetation – contiguous with DOC reserve</li> </ul> | High        | <ul style="list-style-type: none"> <li>Partial modification of wetland, and some works in the footprint.</li> <li>Post-development conditions may be more favourable habitat for exotic flora.</li> </ul> Presence of structures likely to impact the suitability of the site for fauna. | Moderate        |
| <b>Experiential</b>                                                               | <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i>                                                                                                                                                             |             |                                                                                                                                                                                                                                                                                          |                 |
|                                                                                   | <ul style="list-style-type: none"> <li>Wetland area unmodified, adjacent lowland forest remnants in combination with the adjacent Reserve.</li> </ul>                                                                                                                  | High        | 3 piers in wetland and Eco-bridge overhead will with traffic will transform the wetland and significantly diminish the experiential quality of the area                                                                                                                                  | Low             |
| <b>OVERALL RATING</b>                                                             |                                                                                                                                                                                                                                                                        | <b>HIGH</b> |                                                                                                                                                                                                                                                                                          | <b>MODERATE</b> |

| CROSSING POINT 9 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               |                                                                                                                                                                                                                          |          |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Attribute        | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | RATING        | POST DEVELOPMENT                                                                                                                                                                                                         | RATING   |
| Active Bed       | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                |               |                                                                                                                                                                                                                          |          |
| Abiotic          | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Most natural processes remain but with a range of effects, particularly in the lower catchment</li> <li>Runoff processes modified by land use change in the upper catchment</li> <li>Much of catchment in scrub and forest and therefore a natural flow regime</li> </ul>                                                                                                                                                                              | Moderate-High | <ul style="list-style-type: none"> <li>Proposed changes will have very minor effect on existing runoff character or processes</li> </ul>                                                                                 | Moderate |
|                  | <b>Morphology</b> <ul style="list-style-type: none"> <li>Most of the channel length has natural form and affected by natural processes;</li> <li>Highly modified bed interacting with human interventions rather than natural processes in the lower catchment and the terrace adjacent to the Pohangina River;</li> <li>Some short reaches affected by human interventions and modifications;</li> <li>Some culverts, fords and farm bridges</li> <li>Channel form and bed character largely natural</li> </ul> | Moderate      | <ul style="list-style-type: none"> <li>Any changes will only occur at the interfluvium</li> <li>Some loss of channel adjacent to the interfluvium</li> <li>Reduction in sediment yield from treatment devices</li> </ul> | Low      |
|                  | <b>Water Quality</b> <ul style="list-style-type: none"> <li>Appears to be poorly defined, small headwater stream.</li> <li>Lack of canopy cover and unimpeded stock access would imply low water quality</li> </ul>                                                                                                                                                                                                                                                                                              | Low           | <ul style="list-style-type: none"> <li>Project results in stream loss and discharge from cut-off drain</li> <li>Not expected to alter prevailing water quality so no change in rating</li> </ul>                         | Low      |
| Biotic           | <b>Exotic aquatic flora and fauna</b> <ul style="list-style-type: none"> <li>Upper headwaters of short tributary reaches. Exotic wetland features present.</li> </ul>                                                                                                                                                                                                                                                                                                                                            | Low           | <ul style="list-style-type: none"> <li>Loss of headwater catchment, forms majority of recorded habitat length but no substantive change in exotic flora/fauna.</li> </ul>                                                | Low      |

| CROSSING POINT 9 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |                                                                                                                                                                                                                       |          |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Attribute        | EXISTING NATURAL CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                          | RATING   | POST DEVELOPMENT                                                                                                                                                                                                      | RATING   |
| Active Bed       | <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i>                                                                                                                                                                                                                                                                                                                                   |          |                                                                                                                                                                                                                       |          |
| Biotic           | <b>Indigenous taxa assemblages</b> <ul style="list-style-type: none"> <li>Fish surveys not undertaken but due to modification of lower reaches and elevation in relation to Pohangina River, don't expect much fish diversity.</li> <li>Macroinvertebrate surveys not undertaken but based on knowledge of area, expect indices would reflect poor water and habitat quality, resulting from unimpeded stock access, channel modified and lack of shade.</li> </ul> | Low      | <ul style="list-style-type: none"> <li>Loss of headwater catchment, forms majority of recorded habitat length. Loss of habitat reduces potential for indigenous fauna.</li> </ul>                                     | Low      |
|                  | <b>Ecosystem functioning</b> <ul style="list-style-type: none"> <li>Highly modified headwater sections of stream with unimpeded stock access. Resulting channel modification and wetland presence.</li> <li>Poor instream habitat heterogeneity. Disconnection from lower catchment due to land downstream being worked for agriculture. No defined channel present.</li> </ul>                                                                                     | Very Low | <ul style="list-style-type: none"> <li>Loss of headwater catchment, forms majority of recorded habitat length, but no change from pre-development state in respect of ecosystem function.</li> </ul>                  | Very Low |
| Margin           | <i>Indicators (vegetation, patterns/type, structures and human modifications)</i>                                                                                                                                                                                                                                                                                                                                                                                   |          |                                                                                                                                                                                                                       |          |
| Abiotic          | Structures and human modifications <ul style="list-style-type: none"> <li>No structures</li> </ul>                                                                                                                                                                                                                                                                                                                                                                  | High     | <ul style="list-style-type: none"> <li>Several small 'structures' on the interfluvium</li> <li>These structures will have a minor effect on the existing natural character</li> </ul>                                 | Moderate |
| Biotic           | Terrestrial <ul style="list-style-type: none"> <li>Riparian margins absent.</li> <li>Pipit likely.</li> <li>Some exotic wetland, stock access and degraded.</li> <li>No connectivity to other margins.</li> </ul>                                                                                                                                                                                                                                                   | Low      | <ul style="list-style-type: none"> <li>Loss of headwater catchment, forms majority of recorded habitat length, but no change from pre-development state in respect of riparian margins/terrestrial values.</li> </ul> | Low      |



| CROSSING POINT 9 |                                                                                                                          |                 |                                                                                                              |              |
|------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------|--------------|
| Attribute        | EXISTING NATURAL CHARACTER                                                                                               | RATING          | POST DEVELOPMENT                                                                                             | RATING       |
| Experiential     | <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i>               |                 |                                                                                                              |              |
|                  | <ul style="list-style-type: none"> <li>Some remnant indigenous riparian vegetation remains in the lower reach</li> </ul> | Moderate        | <ul style="list-style-type: none"> <li>Reduction in the current naturalness of the crossing point</li> </ul> | Moderate Low |
| OVERALL RATING   |                                                                                                                          | MODERATE<br>LOW |                                                                                                              | LOW          |

## MANAWATŪ RIVER BRIDGE CROSSING POINT

| MANAWATŪ RIVER BRIDGE CROSSING - new bridge, one pier in river channel and one on each river bank                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Attribute                                                                                                                                           | NATURAL CHARACTER ATTRIBUTES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | RATING        | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | RATING        |
| <b>Active Bed</b> <i>Indicators (bed shape and morphology, sedimentation, flow regime, water quality, structures and other human modifications)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |
| <b>Abiotic</b>                                                                                                                                      | <b>Flow Regime</b> <ul style="list-style-type: none"> <li>Flow regime of the river is not managed and remains largely natural with infrequent large magnitude floods and generally higher flows in the winter and lower flows in the summer.</li> <li>Natural flow volumes are assumed to be modified by water abstraction upstream, however, there is considerable available allocation.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Moderate High | <ul style="list-style-type: none"> <li>No changes will occur to the flow regime. The current flow volume and variability will remain.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Moderate High |
|                                                                                                                                                     | <b>Morphology</b> <ul style="list-style-type: none"> <li>The proposed bridge site is at the lower end of the gorge immediately upstream of Parahaki Island and approximately 600m upstream of the confluence with the Pohangina River.</li> <li>The rocky gorge gives way to wider gravel bed. Flood flows continuously shape the gravel bed and island margins.</li> <li>There is active erosion of largely fluvial deposits on the true right bank which is exposing bedrock in places.</li> <li>There are no existing structures in the bed.</li> </ul>                                                                                                                                                                                                                                                                                                              | High          | <ul style="list-style-type: none"> <li>No change to the wider channel form and any modifications will be in the immediate vicinity of the bridge.</li> <li>A single pier will be constructed within the active bed.</li> <li>The bridge will span the river but at a considerable height above the active channel.</li> <li>Riprap will be visible at the base of the piers on the river banks but not the central pier.</li> <li>The two abutments may be visible following construction, but the impact is likely to dissipate and moderate over time with the growth of vegetation</li> </ul>                                                                                                                                                                                                                  | High          |
|                                                                                                                                                     | <b>Water Quality</b> <ul style="list-style-type: none"> <li>Water quality in this section of the Manawatū River is moderately degraded.</li> <li>Concentrations of key nitrogen (NO<sub>3</sub>-N &amp; NH<sub>4</sub>-N) and phosphorus species (DRP) are substantially higher than natural background levels which may be causing environmental impairment. Water clarity is also moderately degraded from natural state.</li> <li>Important to note that periphyton monitoring data collected at the Upper Gorge monitoring site suggests that, despite being increased above natural state, nutrients are not causing periphyton growth at levels that would affect the aesthetics of this section of the Manawatū River.</li> <li>Under normal conditions, pathogen concentrations are only slightly elevated above natural background levels. However,</li> </ul> | Moderate      | <ul style="list-style-type: none"> <li>Prior to closure, SH3 through the Gorge contributed untreated road stormwater directly to the Manawatu River. The Project will treat all stormwater prior to discharge and most of this flow will enter tributaries along the alignment prior to flowing to the Manawatu River. Hence in terms of water quality the situation is actually an improvement.</li> <li>Upstream of any of the project stormwater inputs, the Manawatu River has a large catchment with a substantial area of agriculture (including dairy farming) as well as receiving various industrial and municipal wastewater discharges.</li> <li>The upstream land use and these discharges will dwarf any impact of stormwater from the Project on the water quality at the crossing site.</li> </ul> | Moderate      |

**MANAWATŪ RIVER BRIDGE CROSSING - new bridge, one pier in river channel and one on each river bank**

| Attribute     | NATURAL CHARACTER ATTRIBUTES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | RATING | POST DEVELOPMENT                                                                                                                                                                                                                                    | RATING |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
|               | <p>sporadic faecal contamination does occur, and this section of the river is unsuitable for swimming up to 30% of the time (based on the swimming maps on the MfE website).</p> <ul style="list-style-type: none"> <li>Stormwater contaminants, such as copper, zinc and hydrocarbons, are likely to be increased above natural levels due to run-off from SH3.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |        | <ul style="list-style-type: none"> <li>Overall the water quality at the new Manawatu River bridge crossing site will not be altered to an extent that would result in a change in rating from the current situation.</li> </ul>                     |        |
| <b>Biotic</b> | <p><b>Exotic aquatic Flora and Fauna</b></p> <ul style="list-style-type: none"> <li>No exotic aquatic macrophytes were observed although some species are likely to be present. FFDB records show perch have been recorded within the general area, while brown trout were also recorded during the fish survey within a gully system (and in FFDB records).</li> <li>A conservative approach assumes fish populations are dominated by indigenous species.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | High   | <ul style="list-style-type: none"> <li>Post-development conditions are not expected to result in changes to the composition of exotic flora and fauna</li> </ul>                                                                                    | High   |
|               | <p><b>Indigenous taxa assemblages</b></p> <ul style="list-style-type: none"> <li>Macroinvertebrate indices (MCI &amp; QMCI) from 2017 sampling data (provided by Horizons) for the upper gorge area (values are likely to be similar for the identified proposed bridge crossing site) are slightly less compared to reference sites (data provided by Horizons). However, macroinvertebrate sampling is designed for wadeable streams as opposed to rivers. Greater stonefly diversity and abundance would have been expected within the sample.</li> <li>Fish diversity from the FFDB records show an array of indigenous species present within the Manawatū River and connecting waterways (near the proposed crossing). There are no downstream physical barriers to fish migration and from a conservative approach, it could be assumed there is a natural assemblage of indigenous species using the Manawatū River as habitat or as a corridor.</li> </ul> | High   | <ul style="list-style-type: none"> <li>Following construction of the bridge, substrates present will be similar to predevelopment.</li> <li>As such, it is expected that the composition of indigenous taxa assemblages will not change.</li> </ul> | High   |

**MANAWATŪ RIVER BRIDGE CROSSING - new bridge, one pier in river channel and one on each river bank**

| Attribute | NATURAL CHARACTER ATTRIBUTES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | RATING | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                   | RATING |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
|           | <p><b>Ecosystem Functioning</b></p> <ul style="list-style-type: none"> <li>A SEV assessment is inappropriate for a large river system, instead functions have been assessed qualitatively.</li> <li>The river bed, at the location of the proposed bridge crossing is unmodified and functions are likely to be similar to what was occurring historically. Modification on the surrounding banks (and Parahaki Island within the river) includes changes in vegetation type and a slight increase in impervious surfaces (adjacent road and railway corridor).</li> <li>Although this area is outside the active bed, it has an effect on the functions within the Manawatū River. These changes may have had an impact on functions such as organic matter input, decontamination of pollutants and habitat for aquatic fauna.</li> </ul> | High   | <ul style="list-style-type: none"> <li>Structures in the riverbed will be below the level of the active bed and superficially the riverbed will maintain a level of functionality similar to predevelopment.</li> <li>The placement of piers across the river width will reduce the available riverbed by a small proportion therefore reducing habitat availability by a small amount.</li> </ul> | High   |

**Margin** *Indicators (vegetation, patterns/type, structures and human modifications)*

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Abiotic</b> | <p><b>Structures and human modifications</b></p> <ul style="list-style-type: none"> <li>The river margin includes riparian planting to mitigate erosion, but active erosion is occurring on the true right bank. Extensive modification of the margin includes the railway line, SH3 and the Manawatū Gorge carpark. The railway is located on a fill embankment with a large box culvert through which a stream discharges. There are several smaller culverts under the embankment</li> </ul> | Moderate | <ul style="list-style-type: none"> <li>The Project will result in the addition of three piers within the context of the river although only one will be in the active channel.</li> <li>The bridge will span the river but at a considerable height above the active channel.</li> <li>Riprap may be visible on the true left bank around the pier, but soft engineering options are being explored.</li> <li>Generally, all riprap will be below the active bed and therefore not visible.</li> <li>The two abutments may be visible following construction, but their impact will dissipate and moderate over time with the growth of vegetation.</li> <li>Likely to be some modification of the banks in the immediate vicinity of the abutments.</li> </ul> | Low |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|

| MANAWATŪ RIVER BRIDGE CROSSING - new bridge, one pier in river channel and one on each river bank |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |
|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Attribute                                                                                         | NATURAL CHARACTER ATTRIBUTES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | RATING               | POST DEVELOPMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | RATING          |
| Biotic                                                                                            | <p><b>Terrestrial Ecology</b></p> <ul style="list-style-type: none"> <li>The margins of the Manawatū River crossing reach are subjected to frequent disturbance resulting in those species present at the margin being adapted to a high frequency of disturbance.</li> <li>There is some secondary broadleaved regeneration on higher bank elevations which connects to the high value alluvial old growth forest.</li> <li>Forest communities present on banks do not represent pre-human forest cover.</li> <li>Willow and other exotic tree species are common on the margins of the river and Parahaki Island.</li> <li>'At Risk – Relict' Giant Maidenhair fern (<i>Adiantum formosum</i>) identified in close proximity to the crossing point</li> <li>The exposed gravel beach and wetted margin habitats provide seasonal habitat for bird species of conservation concern and reliant on the gravel river beds for breeding (e.g., black-fronted and banded dotterel). Thus, the terrestrial values of the riverbed vary with season (highest September to February).</li> <li>The terrestrial portions of the river bed make an important contribution to the breeding migration patterns of river bed birds and thus pattern and process values are high.</li> <li>The disturbance regime is too high for the persistence of other significant terrestrial fauna (lizards) and terrestrial invertebrate communities High (seasonal).</li> </ul> | Moderate High        | <ul style="list-style-type: none"> <li>The riverbanks will be cleared of vegetation for the construction of the bridge and will be stabilised.</li> <li>Enhancement and landscaping planting will be undertaken; however, the planting will not reflect natural conditions.</li> <li>Parahaki Island will not be directly impacted by the bridge.</li> <li>Fauna that utilise the island are unlikely to be affected by operational road noise following construction.</li> <li>Shadow effect restricts ability of plants to grow.</li> </ul> | Low             |
| Experiential                                                                                      | <i>Indicators (human perception and how the area appears underpinned by biotic and abiotic attributes)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |
|                                                                                                   | <ul style="list-style-type: none"> <li>The gorge with its steep vegetated slopes and swift flowing river have high experiential values, albeit the road and rail modifications detract from the feeling of remoteness and pristine natural environment.</li> <li>From the river bed the sounds and smells of the river are evident.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Moderate High        | <ul style="list-style-type: none"> <li>The addition of the new bridge and abutment structures will reduce the wild and remote qualities of this part of the river at the mouth of the gorge.</li> <li>The central pier will permanently interact with the river itself and the overhead structure will change the natural spatial qualities of the gorge.</li> </ul>                                                                                                                                                                          | Low             |
| <b>OVERALL RATING</b>                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>MODERATE HIGH</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>MODERATE</b> |

## **APPENDIX I.5 : NATURAL CHARACTER CONTEXT PHOTOGRAPHS**

# CATCHMENT 1



Stream 1A Looking upstream



Stream 1B Looking downstream

| No | Revision | Note: * indicates signatures on original issue of drawing or last revision of drawing | Drawn | Checked | Approved | Date |
|----|----------|---------------------------------------------------------------------------------------|-------|---------|----------|------|
|    |          |                                                                                       |       |         |          |      |
|    |          |                                                                                       |       |         |          |      |
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Drawn **EMc**

Drafting Check **BEv**

Approved **BEv**

Date **27 Jan 2020**

Scale **N/A**

Designed **BEv/BFa**

Design Check **BEv**

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Client **NZ TRANSPORT AGENCY**

Project **TE AHU A TURANGA MANAWATŪ TARARUA HIGHWAY**

Title **NATURAL CHARACTER ASSESSMENT: CONTEXT PHOTOGRAPHS**

Original Size **A3**

Project Number: **51-38113**

Drawing Number: **CAT-01** Rev:

# CATCHMENT 2



Catchment 2, view west, Mangamanaia Stream



Stream 2B Looking upstream



Stream 2C Looking upstream



Catchment 2C Looking South-East (downstream) from top of catchment



Stream 2C Mid-reach



Catchment 2E Looking West to East across catchment with Eastern Tributary (Stream E2, lined with willows) in background

| No | Revision | Note | Drawn | Checked | Approved | Date |
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Project **TE AHU A TURANGA MANAWATŪ TARARUA HIGHWAY**

Title **NATURAL CHARACTER ASSESSMENT: CONTEXT PHOTOGRAPHS**

Original Size **A3** Project Number: **51-38113** Drawing Number: **CAT-02** Rev:



# CATCHMENT 3



Catchment - stream 3A



3A just upstream of bush



Looking upstream along stream 3A



Stream 3A Looking upstream



3A Looking downstream across Wetland W3A11



Stream 3B Looking downstream

| No | Revision | Note | Drawn | Checked | Approved | Date |
|----|----------|------|-------|---------|----------|------|
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Title **NATURAL CHARACTER ASSESSMENT: CONTEXT PHOTOGRAPHS**  
Original Size **A3**    Project Number: **51-38113**    Drawing Number: **CAT-03**    Rev:

# CATCHMENT 4



Catchment 4



C4 in Manawatu Gorge Scenic Reserve



4A Main stream looking downstream. Bottom of Catchment 4F in distance on left



Catchment 4D Lower-catchment looking downstream



Catchment 4D Mid-catchment looking downstream



Catchment 4F Looking downstream from top of catchment

| No | Revision | Note: * indicates signatures on original issue of drawing or last revision of drawing | Drawn | Checked | Approved | Date |
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Project **TE AHU A TURANGA MANAWATŪ TARARUA HIGHWAY**

Title **NATURAL CHARACTER ASSESSMENT: CONTEXT PHOTOGRAPHS**

Original Size **A3** Project Number: **51-38113**

Drawing Number: **CAT-04** Rev:

# CATCHMENT 5



5A in Manawatu Gorge Scenic Reserve



Looking upstream along stream 5A



Stream 5A Upper-reach looking downstream



Stream 5B Gully at top looking downstream



5B Looking up Stream gully from downstream end



Stream 5B Lower-reach looking upstream

| No | Revision | Note: * indicates signatures on original issue of drawing or last revision of drawing | Drawn | Checked | Approved | Date |
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Project **TE AHU A TURANGA MANAWATŪ TARARUA HIGHWAY**

Title **NATURAL CHARACTER ASSESSMENT: CONTEXT PHOTOGRAPHS**

Original Size **A3** Project Number: **51-38113** Drawing Number: **CAT-05** Rev:

# CATCHMENT 6



6A upper end- QEII Covenant



6A QEII Covenant



C6 in Manawatu Gorge Scenic Reserve



Catchment 6A Looking downstream from top of catchment



Stream 6A1 downstream end of novocoil pipe under farm track at top of Catchment 6A

| No | Revision | Note | Drawn | Checked | Approved | Date |
|----|----------|------|-------|---------|----------|------|
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Title **NATURAL CHARACTER ASSESSMENT: CONTEXT PHOTOGRAPHS**

Original Size **A3**

Project Number: **51-38113**

Drawing Number: **CAT-06** Rev:

# CATCHMENT 7



7A Top end of Stream in QEII Covenant



Stream 7A



Stream 7A Upstream of QEII Stream looking upstream



Stream 7A QEII I covenant ooking downstream



Catchment 7B Main-stream looking downstream



Stream 7B (downstream end) looking downstream

| No | Revision | Note: * indicates signatures on original issue of drawing or last revision of drawing | Drawn | Checked | Approved | Date |
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Project **TE AHU A TURANGA MANAWATŪ TARARUA HIGHWAY**

Title **NATURAL CHARACTER ASSESSMENT: CONTEXT PHOTOGRAPHS**

Original Sta

**A3**

Project Number: **51-38113**

Drawing Number: **CAT-07** Rev:

# CATCHMENT 8



Catchment 8 to left of SH 58



Catchment 8A Looking upstream



Stream 8A Looking downstream alongside SH3

| No | Revision | Note: * indicates signatures on original issue of drawing or last revision of drawing | Drawn | Checked | Approved | Date |
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| Drafting Check | <b>BEv</b> | Design Check                                                             | <b>BEv</b>     |
| Approved       | <b>BEv</b> | Date <b>27 Jan 2020</b>                                                  |                |
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| Client        | <b>NZ TRANSPORT AGENCY</b>                               |                 |                 |
| Project       | <b>TE AHU A TURANGA MANAWATŪ TARARUA HIGHWAY</b>         |                 |                 |
| Title         | <b>NATURAL CHARACTER ASSESSMENT: CONTEXT PHOTOGRAPHS</b> |                 |                 |
| Original Size | <b>A3</b>                                                | Project Number: | <b>51-38113</b> |
|               |                                                          | Drawing Number: | <b>CAT-08</b>   |
|               |                                                          | Rev:            |                 |

# CATCHMENT 9



Gullies at the top of the catchment looking down toward the stream

|    |          |                                                                                       |       |         |                                                                                      |                                                                                       |                                                                                                                                                                                                                                                                  |                                                                          |                                                                |                                                          |                                   |                                    |
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|    |          |                                                                                       |       |         |                                                                                      |                                                                                       | Approved <b>BEv</b>                                                                                                                                                                                                                                              | Date <b>27 Jan 2020</b>                                                  | Title <b>NATURAL CHARACTER ASSESSMENT: CONTEXT PHOTOGRAPHS</b> |                                                          |                                   |                                    |
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## **APPENDIX I.6: NATURAL CHARACTER MAPS**

### **Waterways and Catchments Overview Plans**

Drawing 1 TAT-3-DG-E-4100

Drawing 2 TAT-3-DG-E-4101

### **Natural Character Plans**

Drawing 3 TAT-3-DG-E-4121

Drawing 4 TAT-3-DG-E-4122

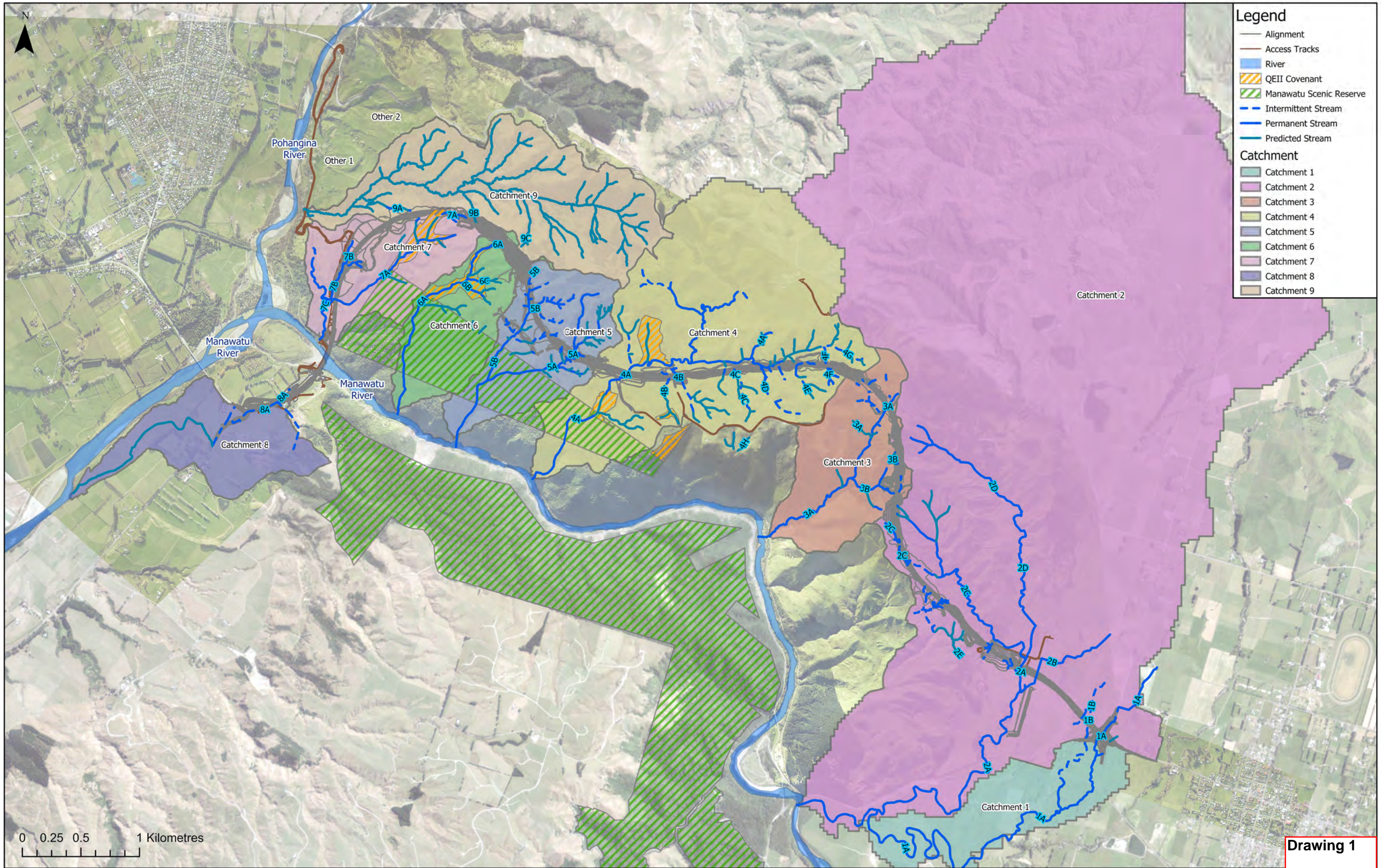
Drawing 5 TAT-3-DG-E-4123

Drawing 6 TAT-3-DG-E-4124

Drawing 7 TAT-3-DG-E-4125

Drawing 8 TAT-3-DG-E-4126





CLIENT



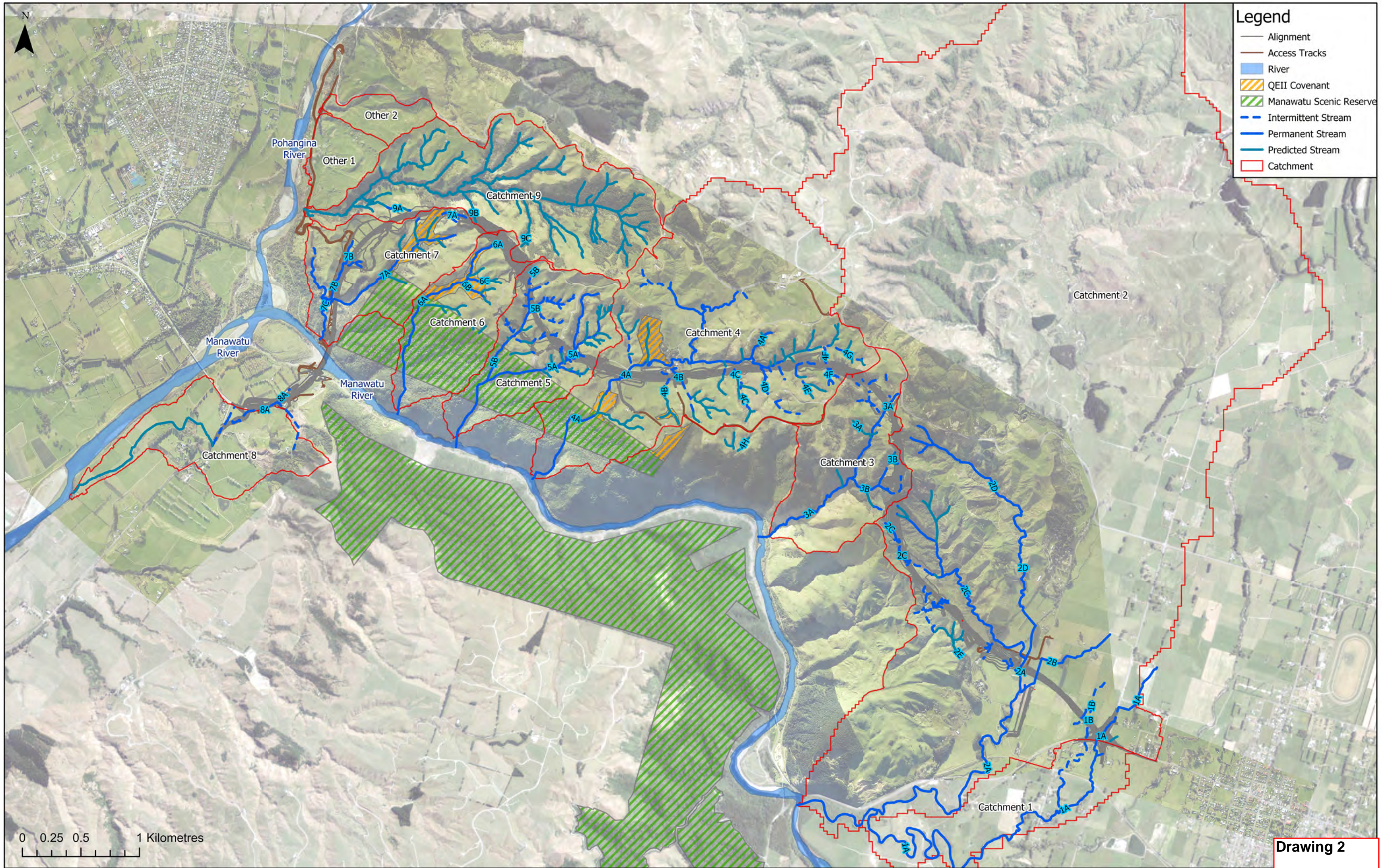
**Te Ahu a Turanga**  
Manawatū Tararua Highway

| REV | DATE     | REVISION DETAILS            | APPROVED   |
|-----|----------|-----------------------------|------------|
| A   | 24.02.20 | ISSUED FOR REGIONAL CONSENT | D. MCGAHAN |

| SCALE    | SIZE       |
|----------|------------|
| 1:30,000 | A3         |
| DRAWN    | C. SMITH   |
| DESIGNED | H. ATKINS  |
| REVIEWED | D. MCGAHAN |

| CONSENT              |      |
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| NOT FOR CONSTRUCTION | DATE |
| T. WATTERSON         |      |

| PROJECT                                    | TITLE                                  |
|--------------------------------------------|----------------------------------------|
| TE AHU A TURANGA: MANAWATU TARARUA HIGHWAY | WATERWAYS AND CATCHMENTS OVERVIEW PLAN |
| DRAWING No. TAT                            | PROJECT No. TAT                        |
| PHASE 3                                    | TYPE DG                                |
| DISC E                                     | NUMBER 4100                            |
| REV A                                      |                                        |



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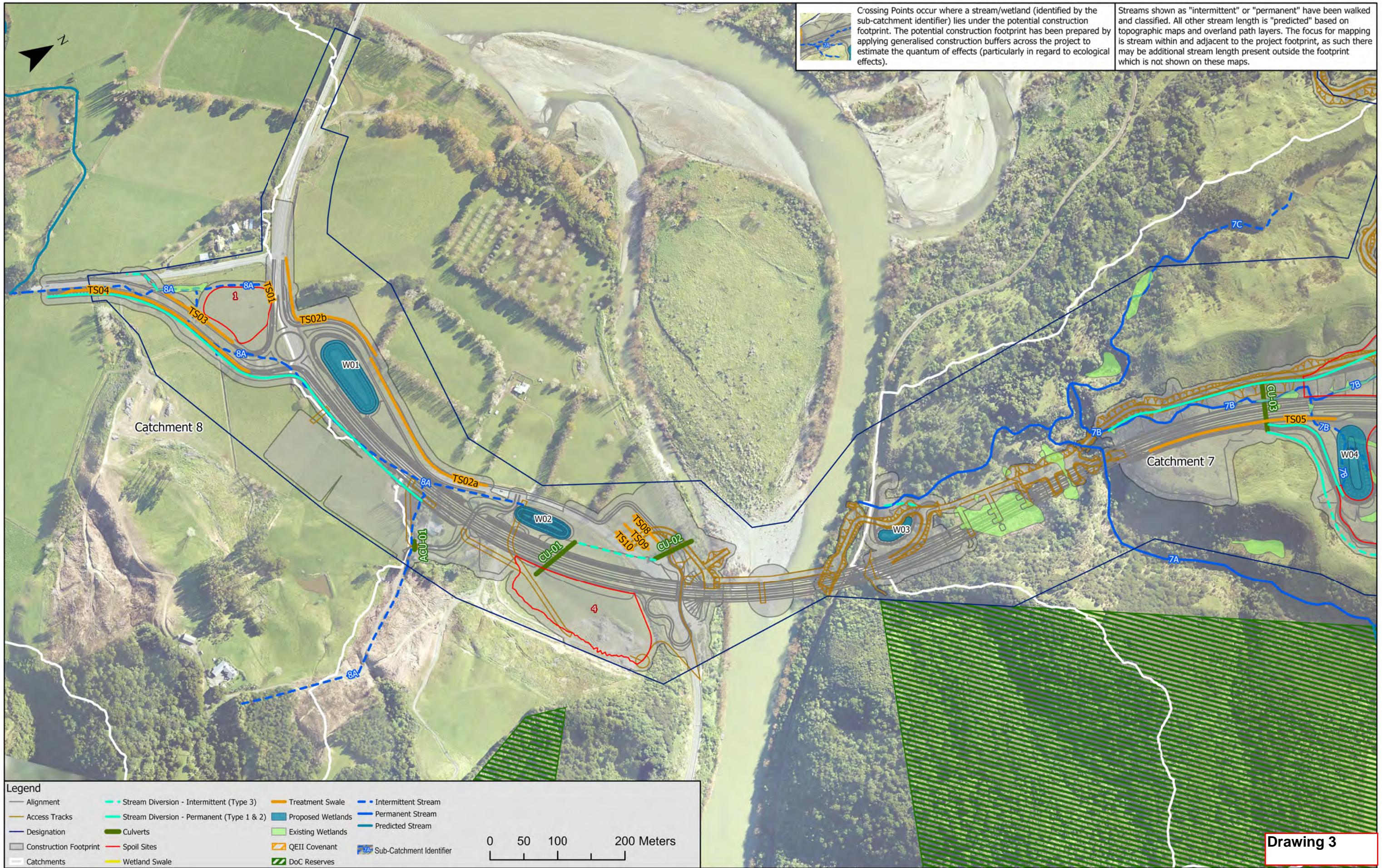
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| REVIEWED | D. MCGAHAN |

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| T. WATTERSON         |      |

| PROJECT     | TE AHU A TURANGA: MANAWATU TARARUA HIGHWAY |
|-------------|--------------------------------------------|
| TITLE       | WATERWAYS OVERVIEW PLAN                    |
| DRAWING No. | TAT - 3 - DG - E - 4101 - A                |
| PROJECT No. | TAT - 3 - DG - E - 4101 - A                |
| PHASE       | 3                                          |
| TYPE        | DG                                         |
| DISC        | E                                          |
| NUMBER      | 4101                                       |
| REV         | A                                          |



Crossing Points occur where a stream/wetland (identified by the sub-catchment identifier) lies under the potential construction footprint. The potential construction footprint has been prepared by applying generalised construction buffers across the project to estimate the quantum of effects (particularly in regard to ecological effects).

Streams shown as "intermittent" or "permanent" have been walked and classified. All other stream length is "predicted" based on topographic maps and overland path layers. The focus for mapping is stream within and adjacent to the project footprint, as such there may be additional stream length present outside the footprint which is not shown on these maps.

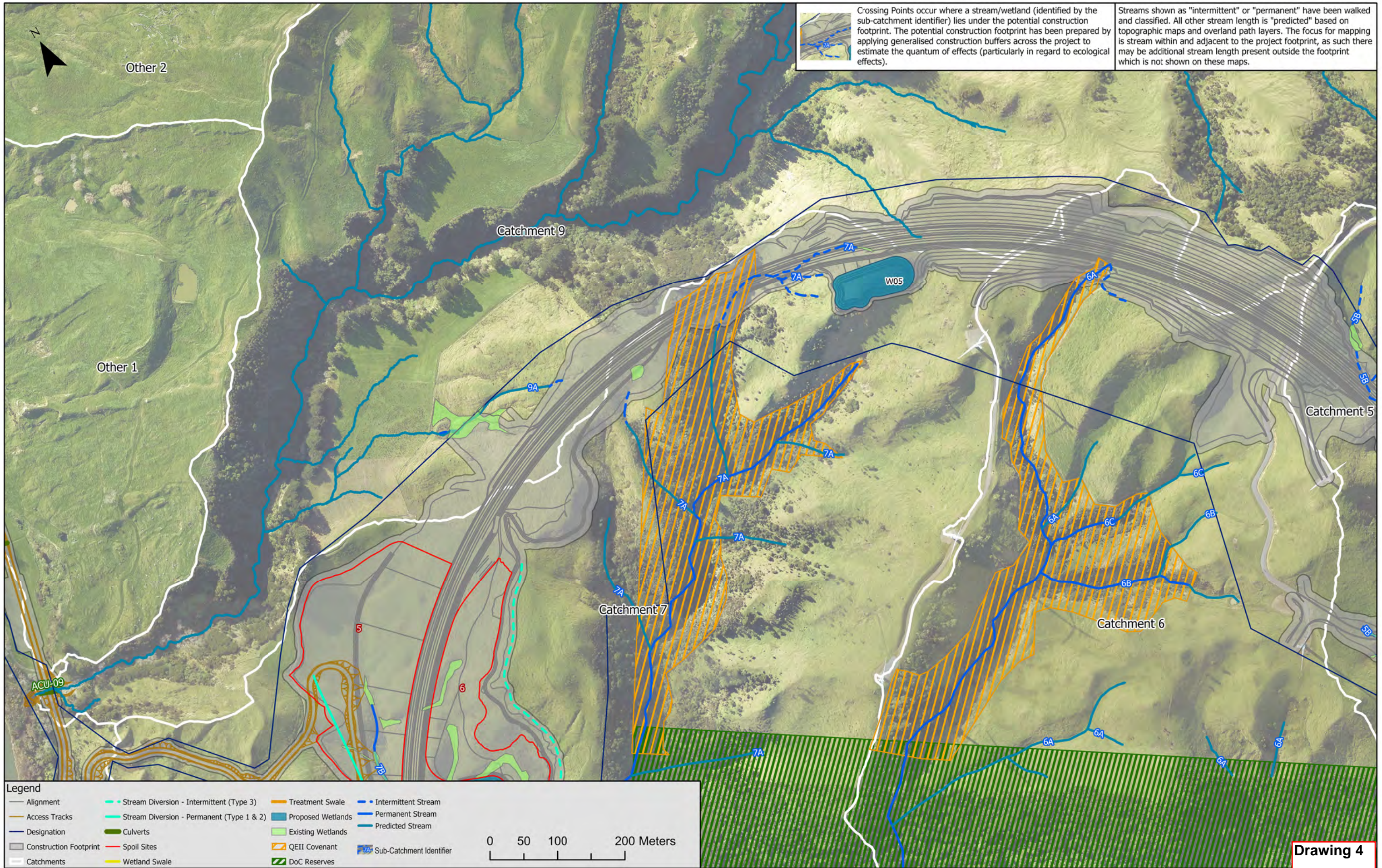
**Legend**

- Alignment
- Stream Diversion - Intermittent (Type 3)
- Treatment Swale
- Intermittent Stream
- Access Tracks
- Stream Diversion - Permanent (Type 1 & 2)
- Proposed Wetlands
- Permanent Stream
- Designation
- Culverts
- Existing Wetlands
- Predicted Stream
- Construction Footprint
- Spoil Sites
- QEII Covenant
- Sub-Catchment Identifier
- Catchments
- Wetland Swale
- DoC Reserves

0 50 100 200 Meters

**Drawing 3**

|                   |                                                     |     |          |                             |            |        |      |                      |                                            |
|-------------------|-----------------------------------------------------|-----|----------|-----------------------------|------------|--------|------|----------------------|--------------------------------------------|
| <b>CLIENT</b><br> | <b>Te Ahu a Turanga</b><br>Manawātū Tararua Highway | REV | DATE     | REVISION DETAILS            | APPROVED   | SCALE  | SIZE | CONSENT              | PROJECT                                    |
|                   |                                                     | A   | 24.02.20 | ISSUED FOR REGIONAL CONSENT | D. MCGAHAN | 1:5000 | A3   | NOT FOR CONSTRUCTION | TE AHU A TURANGA: MANAWATU TARARUA HIGHWAY |
|                   |                                                     |     |          |                             |            |        |      | DATE                 | TITLE                                      |
|                   |                                                     |     |          |                             |            |        |      | T. WATTERSON         | NATURAL CHARACTER PLAN<br>SHEET 1          |
|                   |                                                     |     |          |                             |            |        |      | DRAWING No.          | PROJECT No.                                |
|                   |                                                     |     |          |                             |            |        |      | TAT                  | TAT                                        |
|                   |                                                     |     |          |                             |            |        |      | PHASE                | TYPE                                       |
|                   |                                                     |     |          |                             |            |        |      | 3                    | DG                                         |
|                   |                                                     |     |          |                             |            |        |      | DISC                 | NUMBER                                     |
|                   |                                                     |     |          |                             |            |        |      | E                    | 4121                                       |
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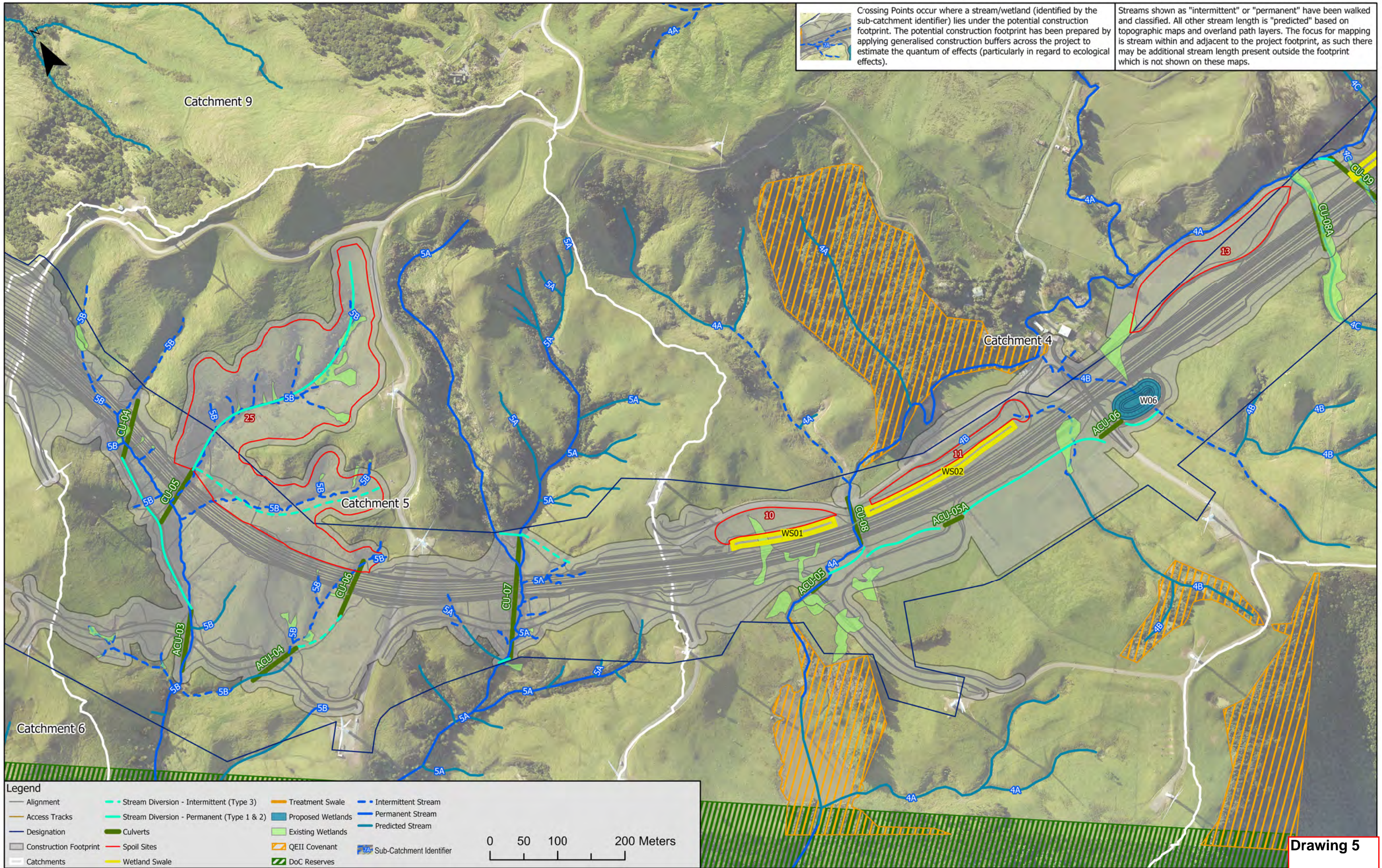
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- QEII Covenant
- Sub-Catchment Identifier
- Catchments
- Wetland Swale
- DoC Reserves

0 50 100 200 Meters

**Drawing 4**

|                      | <h2 style="margin: 0;">Te Ahu a Turanga</h2> <h3 style="margin: 0;">Manawātū Tararua Highway</h3> | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>REV</th> <th>DATE</th> <th>REVISION DETAILS</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>24.02.20</td> <td>ISSUED FOR REGIONAL CONSENT</td> </tr> </tbody> </table> | REV  | DATE             | REVISION DETAILS | A | 24.02.20 | ISSUED FOR REGIONAL CONSENT | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>APPROVED</td> <td>D. MCGAHAN</td> </tr> </table> | APPROVED | D. MCGAHAN | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>SCALE</td> <td>1:5000</td> </tr> <tr> <td>SIZE</td> <td>A3</td> </tr> <tr> <td>DRAWN</td> <td>C. SMITH</td> </tr> <tr> <td>DESIGNED</td> <td>H. ATKINS</td> </tr> <tr> <td>REVIEWED</td> <td>D. MCGAHAN</td> </tr> </table> | SCALE | 1:5000 | SIZE | A3 | DRAWN | C. SMITH | DESIGNED | H. ATKINS | REVIEWED | D. MCGAHAN | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2" style="text-align: center;">CONSENT</td> </tr> <tr> <td colspan="2" style="text-align: center;">NOT FOR CONSTRUCTION</td> </tr> <tr> <td style="width: 50%;">DATE</td> <td style="width: 50%;">T. WATTERSON</td> </tr> </table> | CONSENT |  | NOT FOR CONSTRUCTION |  | DATE | T. WATTERSON | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>PROJECT</td> <td>TE AHU A TURANGA: MANAWATU TARARUA HIGHWAY</td> </tr> <tr> <td>TITLE</td> <td>NATURAL CHARACTER PLAN SHEET 2</td> </tr> <tr> <td>DRAWING No.</td> <td>TAT - 3 - DG - E - 4122 - A</td> </tr> </table> | PROJECT | TE AHU A TURANGA: MANAWATU TARARUA HIGHWAY | TITLE | NATURAL CHARACTER PLAN SHEET 2 | DRAWING No. | TAT - 3 - DG - E - 4122 - A |
|----------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------|------------------|---|----------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------|----------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------|------|----|-------|----------|----------|-----------|----------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--|----------------------|--|------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--------------------------------------------|-------|--------------------------------|-------------|-----------------------------|
|                      |                                                                                                   | REV                                                                                                                                                                                                                                                        | DATE | REVISION DETAILS |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
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| APPROVED             | D. MCGAHAN                                                                                        |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
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| SIZE                 | A3                                                                                                |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| DRAWN                | C. SMITH                                                                                          |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| DESIGNED             | H. ATKINS                                                                                         |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| REVIEWED             | D. MCGAHAN                                                                                        |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| CONSENT              |                                                                                                   |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| NOT FOR CONSTRUCTION |                                                                                                   |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| DATE                 | T. WATTERSON                                                                                      |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| PROJECT              | TE AHU A TURANGA: MANAWATU TARARUA HIGHWAY                                                        |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| TITLE                | NATURAL CHARACTER PLAN SHEET 2                                                                    |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| DRAWING No.          | TAT - 3 - DG - E - 4122 - A                                                                       |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
|                      |                                                                                                   |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |



Crossing Points occur where a stream/wetland (identified by the sub-catchment identifier) lies under the potential construction footprint. The potential construction footprint has been prepared by applying generalised construction buffers across the project to estimate the quantum of effects (particularly in regard to ecological effects).

Streams shown as "intermittent" or "permanent" have been walked and classified. All other stream length is "predicted" based on topographic maps and overland path layers. The focus for mapping is stream within and adjacent to the project footprint, as such there may be additional stream length present outside the footprint which is not shown on these maps.

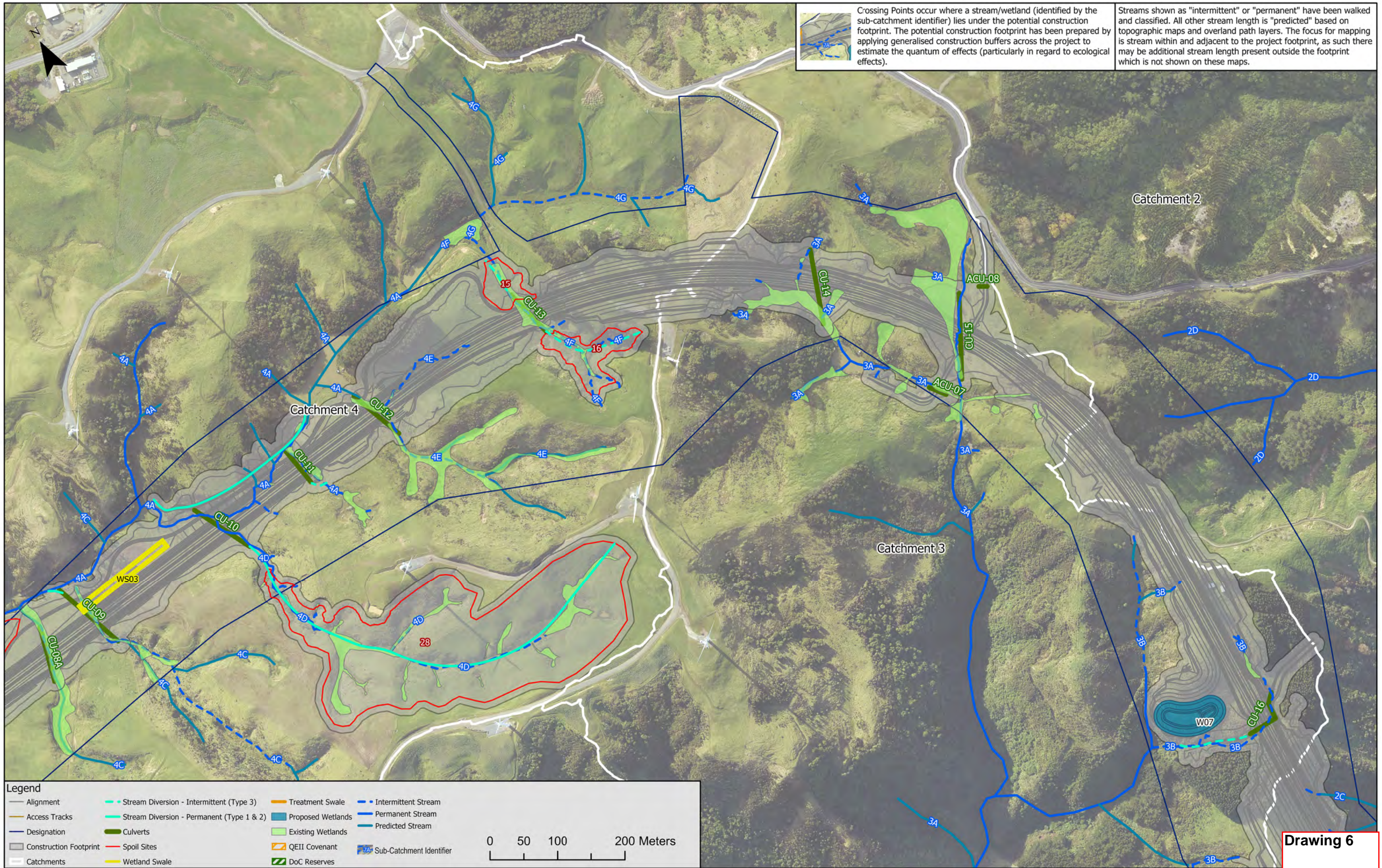
**Legend**

- Alignment
- Stream Diversion - Intermittent (Type 3)
- Treatment Swale
- Intermittent Stream
- Proposed Wetlands
- Permanent Stream
- Access Tracks
- Stream Diversion - Permanent (Type 1 & 2)
- Existing Wetlands
- Predicted Stream
- Designation
- Spoil Sites
- QEII Covenant
- Sub-Catchment Identifier
- Construction Footprint
- Culverts
- DoC Reserves
- Catchments
- Wetland Swale

0 50 100 200 Meters

**Drawing 5**

|                      | <h2 style="margin: 0;">Te Ahu a Turanga</h2> <h3 style="margin: 0;">Manawātū Tararua Highway</h3> | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>REV</th> <th>DATE</th> <th>REVISION DETAILS</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>24.02.20</td> <td>ISSUED FOR REGIONAL CONSENT</td> </tr> </tbody> </table> | REV  | DATE             | REVISION DETAILS | A | 24.02.20 | ISSUED FOR REGIONAL CONSENT | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>APPROVED</td> <td>D. MCGAHAN</td> </tr> </table> | APPROVED | D. MCGAHAN | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>SCALE</td> <td>1:5000</td> </tr> <tr> <td>SIZE</td> <td>A3</td> </tr> <tr> <td>DRAWN</td> <td>C. SMITH</td> </tr> <tr> <td>DESIGNED</td> <td>H. ATKINS</td> </tr> <tr> <td>REVIEWED</td> <td>D. MCGAHAN</td> </tr> </table> | SCALE | 1:5000 | SIZE | A3 | DRAWN | C. SMITH | DESIGNED | H. ATKINS | REVIEWED | D. MCGAHAN | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2" style="text-align: center;">CONSENT</td> </tr> <tr> <td colspan="2" style="text-align: center;">NOT FOR CONSTRUCTION</td> </tr> <tr> <td style="width: 50%;">DATE</td> <td style="width: 50%;">T. WATTERSON</td> </tr> </table> | CONSENT |  | NOT FOR CONSTRUCTION |  | DATE | T. WATTERSON | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>PROJECT</td> <td>TE AHU A TURANGA: MANAWATU TARARUA HIGHWAY</td> </tr> <tr> <td>TITLE</td> <td>NATURAL CHARACTER PLAN SHEET 3</td> </tr> <tr> <td>DRAWING No.</td> <td>TAT - 3 - DG - E - 4123 - A</td> </tr> </table> | PROJECT | TE AHU A TURANGA: MANAWATU TARARUA HIGHWAY | TITLE | NATURAL CHARACTER PLAN SHEET 3 | DRAWING No. | TAT - 3 - DG - E - 4123 - A |
|----------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------|------------------|---|----------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------|----------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------|------|----|-------|----------|----------|-----------|----------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--|----------------------|--|------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--------------------------------------------|-------|--------------------------------|-------------|-----------------------------|
|                      |                                                                                                   | REV                                                                                                                                                                                                                                                        | DATE | REVISION DETAILS |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| A                    | 24.02.20                                                                                          | ISSUED FOR REGIONAL CONSENT                                                                                                                                                                                                                                |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| APPROVED             | D. MCGAHAN                                                                                        |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| SCALE                | 1:5000                                                                                            |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| SIZE                 | A3                                                                                                |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| DRAWN                | C. SMITH                                                                                          |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| DESIGNED             | H. ATKINS                                                                                         |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| REVIEWED             | D. MCGAHAN                                                                                        |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| CONSENT              |                                                                                                   |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| NOT FOR CONSTRUCTION |                                                                                                   |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| DATE                 | T. WATTERSON                                                                                      |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| PROJECT              | TE AHU A TURANGA: MANAWATU TARARUA HIGHWAY                                                        |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| TITLE                | NATURAL CHARACTER PLAN SHEET 3                                                                    |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
| DRAWING No.          | TAT - 3 - DG - E - 4123 - A                                                                       |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |
|                      |                                                                                                   |                                                                                                                                                                                                                                                            |      |                  |                  |   |          |                             |                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                                         |       |        |      |    |       |          |          |           |          |            |                                                                                                                                                                                                                                                                                                                         |         |  |                      |  |      |              |                                                                                                                                                                                                                                                                                                    |         |                                            |       |                                |             |                             |



Crossing Points occur where a stream/wetland (identified by the sub-catchment identifier) lies under the potential construction footprint. The potential construction footprint has been prepared by applying generalised construction buffers across the project to estimate the quantum of effects (particularly in regard to ecological effects).

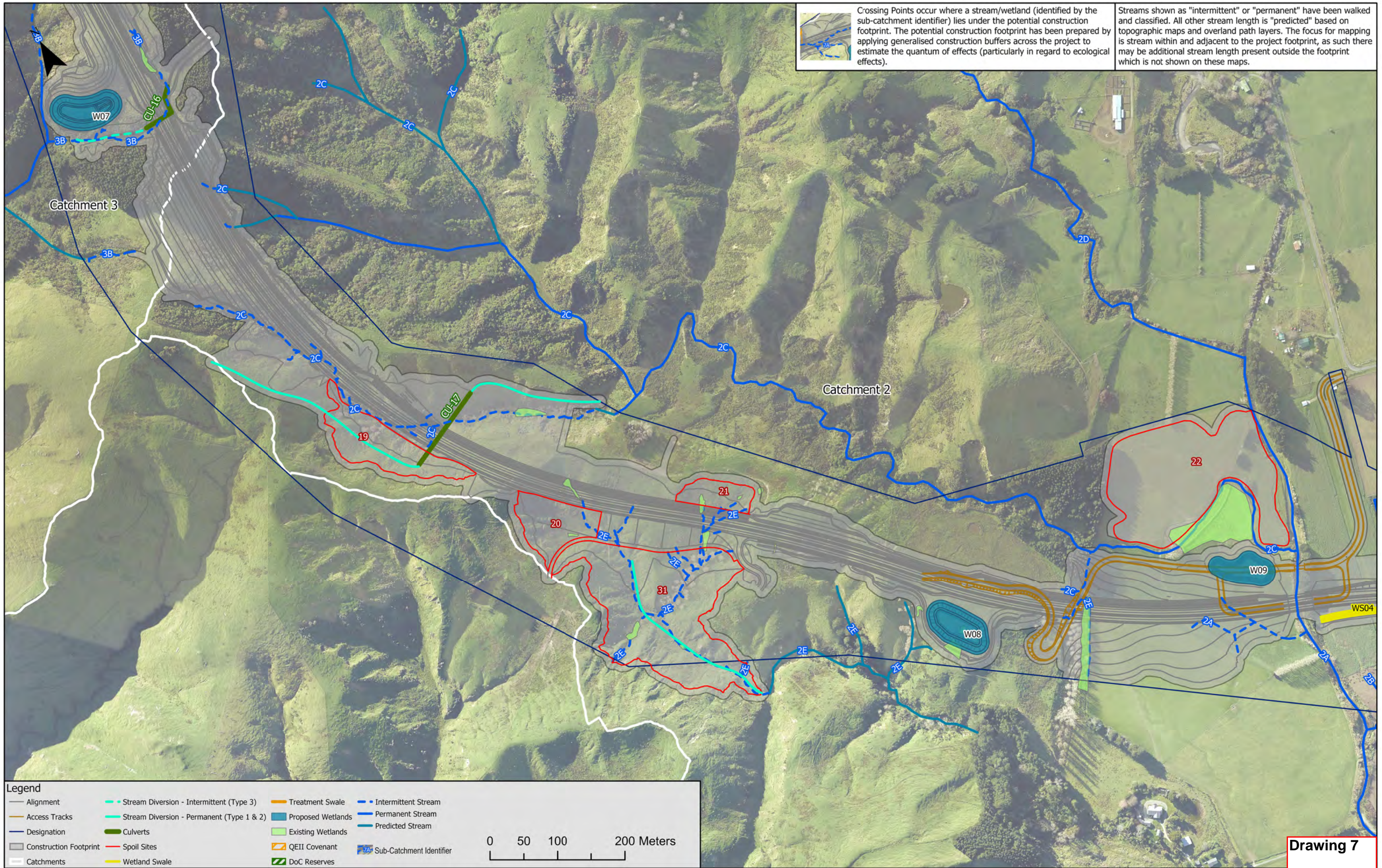
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**Legend**

|                          |                                             |                     |                            |
|--------------------------|---------------------------------------------|---------------------|----------------------------|
| — Alignment              | — Stream Diversion - Intermittent (Type 3)  | — Treatment Swale   | — Intermittent Stream      |
| — Access Tracks          | — Stream Diversion - Permanent (Type 1 & 2) | — Proposed Wetlands | — Permanent Stream         |
| — Designation            | — Culverts                                  | — Existing Wetlands | — Predicted Stream         |
| — Construction Footprint | — Spoil Sites                               | — QEII Covenant     | — Sub-Catchment Identifier |
| — Catchments             | — Wetland Swale                             | — DoC Reserves      |                            |

0 50 100 200 Meters

**Drawing 6**



Crossing Points occur where a stream/wetland (identified by the sub-catchment identifier) lies under the potential construction footprint. The potential construction footprint has been prepared by applying generalised construction buffers across the project to estimate the quantum of effects (particularly in regard to ecological effects).

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**Legend**

|                          |                                             |                     |                            |
|--------------------------|---------------------------------------------|---------------------|----------------------------|
| — Alignment              | — Stream Diversion - Intermittent (Type 3)  | — Treatment Swale   | — Intermittent Stream      |
| — Access Tracks          | — Stream Diversion - Permanent (Type 1 & 2) | — Proposed Wetlands | — Permanent Stream         |
| — Designation            | — Culverts                                  | — Existing Wetlands | — Predicted Stream         |
| — Construction Footprint | — Spoil Sites                               | — QEII Covenant     | — Sub-Catchment Identifier |
| — Catchments             | — Wetland Swale                             | — DoC Reserves      |                            |

0 50 100 200 Meters

**Drawing 7**

| <p><b>WAKA KOTAHI</b><br/>NZ TRANSPORT AGENCY</p> | <p><b>Te Ahu a Turanga</b><br/>Manawātū Tararua Highway</p> | <table border="1"> <thead> <tr> <th>REV</th> <th>DATE</th> <th>REVISION DETAILS</th> <th>APPROVED</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>24.02.20</td> <td>ISSUED FOR REGIONAL CONSENT</td> <td>D. McGAHAN</td> </tr> </tbody> </table> | REV        | DATE             | REVISION DETAILS | APPROVED | A                                                                                                                                                                                          | 24.02.20 | ISSUED FOR REGIONAL CONSENT | D. McGAHAN | <table border="1"> <thead> <tr> <th>SCALE</th> <th>SIZE</th> </tr> </thead> <tbody> <tr> <td>1:5000</td> <td>A3</td> </tr> </tbody> </table> | SCALE    | SIZE       | 1:5000                                                                                                                                                                                                                                                                                      | A3      | <table border="1"> <thead> <tr> <th colspan="2">CONSENT</th> </tr> </thead> <tbody> <tr> <td>NOT FOR CONSTRUCTION</td> <td>DATE</td> </tr> <tr> <td colspan="2">T. WATTERSON</td> </tr> </tbody> </table> | CONSENT |      | NOT FOR CONSTRUCTION | DATE | T. WATTERSON                               |   | <table border="1"> <thead> <tr> <th>PROJECT</th> <td>TE AHU A TURANGA: MANAWATU TARARUA HIGHWAY</td> </tr> <tr> <th>TITLE</th> <td>NATURAL CHARACTER PLAN SHEET 5</td> </tr> <tr> <th>DRAWING No.</th> <td>TAT - 3 - DG - E - 4125 - A</td> </tr> </thead> </table> | PROJECT | TE AHU A TURANGA: MANAWATU TARARUA HIGHWAY | TITLE | NATURAL CHARACTER PLAN SHEET 5 | DRAWING No. | TAT - 3 - DG - E - 4125 - A |
|---------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------|------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------|----------------------|------|--------------------------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--------------------------------------------|-------|--------------------------------|-------------|-----------------------------|
|                                                   |                                                             | REV                                                                                                                                                                                                                                              | DATE       | REVISION DETAILS | APPROVED         |          |                                                                                                                                                                                            |          |                             |            |                                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                           |         |      |                      |      |                                            |   |                                                                                                                                                                                                                                                                     |         |                                            |       |                                |             |                             |
| A                                                 | 24.02.20                                                    | ISSUED FOR REGIONAL CONSENT                                                                                                                                                                                                                      | D. McGAHAN |                  |                  |          |                                                                                                                                                                                            |          |                             |            |                                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                           |         |      |                      |      |                                            |   |                                                                                                                                                                                                                                                                     |         |                                            |       |                                |             |                             |
| SCALE                                             | SIZE                                                        |                                                                                                                                                                                                                                                  |            |                  |                  |          |                                                                                                                                                                                            |          |                             |            |                                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                           |         |      |                      |      |                                            |   |                                                                                                                                                                                                                                                                     |         |                                            |       |                                |             |                             |
| 1:5000                                            | A3                                                          |                                                                                                                                                                                                                                                  |            |                  |                  |          |                                                                                                                                                                                            |          |                             |            |                                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                           |         |      |                      |      |                                            |   |                                                                                                                                                                                                                                                                     |         |                                            |       |                                |             |                             |
| CONSENT                                           |                                                             |                                                                                                                                                                                                                                                  |            |                  |                  |          |                                                                                                                                                                                            |          |                             |            |                                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                           |         |      |                      |      |                                            |   |                                                                                                                                                                                                                                                                     |         |                                            |       |                                |             |                             |
| NOT FOR CONSTRUCTION                              | DATE                                                        |                                                                                                                                                                                                                                                  |            |                  |                  |          |                                                                                                                                                                                            |          |                             |            |                                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                           |         |      |                      |      |                                            |   |                                                                                                                                                                                                                                                                     |         |                                            |       |                                |             |                             |
| T. WATTERSON                                      |                                                             |                                                                                                                                                                                                                                                  |            |                  |                  |          |                                                                                                                                                                                            |          |                             |            |                                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                           |         |      |                      |      |                                            |   |                                                                                                                                                                                                                                                                     |         |                                            |       |                                |             |                             |
| PROJECT                                           | TE AHU A TURANGA: MANAWATU TARARUA HIGHWAY                  |                                                                                                                                                                                                                                                  |            |                  |                  |          |                                                                                                                                                                                            |          |                             |            |                                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                           |         |      |                      |      |                                            |   |                                                                                                                                                                                                                                                                     |         |                                            |       |                                |             |                             |
| TITLE                                             | NATURAL CHARACTER PLAN SHEET 5                              |                                                                                                                                                                                                                                                  |            |                  |                  |          |                                                                                                                                                                                            |          |                             |            |                                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                           |         |      |                      |      |                                            |   |                                                                                                                                                                                                                                                                     |         |                                            |       |                                |             |                             |
| DRAWING No.                                       | TAT - 3 - DG - E - 4125 - A                                 |                                                                                                                                                                                                                                                  |            |                  |                  |          |                                                                                                                                                                                            |          |                             |            |                                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                           |         |      |                      |      |                                            |   |                                                                                                                                                                                                                                                                     |         |                                            |       |                                |             |                             |
|                                                   |                                                             | <table border="1"> <thead> <tr> <th>SCALE</th> <th>SIZE</th> </tr> </thead> <tbody> <tr> <td>1:5000</td> <td>A3</td> </tr> </tbody> </table>                                                                                                     | SCALE      | SIZE             | 1:5000           | A3       | <table border="1"> <thead> <tr> <th>CONSENT</th> <td>NOT FOR CONSTRUCTION</td> </tr> <tr> <th>DATE</th> <td></td> </tr> <tr> <th>REVIEWED</th> <td>D. McGAHAN</td> </tr> </thead> </table> | CONSENT  | NOT FOR CONSTRUCTION        | DATE       |                                                                                                                                              | REVIEWED | D. McGAHAN | <table border="1"> <thead> <tr> <th>PROJECT</th> <th>PHASE</th> <th>TYPE</th> <th>DISC</th> <th>NUMBER</th> <th>REV</th> </tr> </thead> <tbody> <tr> <td>TE AHU A TURANGA: MANAWATU TARARUA HIGHWAY</td> <td>3</td> <td>DG</td> <td>E</td> <td>4125</td> <td>A</td> </tr> </tbody> </table> | PROJECT | PHASE                                                                                                                                                                                                     | TYPE    | DISC | NUMBER               | REV  | TE AHU A TURANGA: MANAWATU TARARUA HIGHWAY | 3 | DG                                                                                                                                                                                                                                                                  | E       | 4125                                       | A     |                                |             |                             |
| SCALE                                             | SIZE                                                        |                                                                                                                                                                                                                                                  |            |                  |                  |          |                                                                                                                                                                                            |          |                             |            |                                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                           |         |      |                      |      |                                            |   |                                                                                                                                                                                                                                                                     |         |                                            |       |                                |             |                             |
| 1:5000                                            | A3                                                          |                                                                                                                                                                                                                                                  |            |                  |                  |          |                                                                                                                                                                                            |          |                             |            |                                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                           |         |      |                      |      |                                            |   |                                                                                                                                                                                                                                                                     |         |                                            |       |                                |             |                             |
| CONSENT                                           | NOT FOR CONSTRUCTION                                        |                                                                                                                                                                                                                                                  |            |                  |                  |          |                                                                                                                                                                                            |          |                             |            |                                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                           |         |      |                      |      |                                            |   |                                                                                                                                                                                                                                                                     |         |                                            |       |                                |             |                             |
| DATE                                              |                                                             |                                                                                                                                                                                                                                                  |            |                  |                  |          |                                                                                                                                                                                            |          |                             |            |                                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                           |         |      |                      |      |                                            |   |                                                                                                                                                                                                                                                                     |         |                                            |       |                                |             |                             |
| REVIEWED                                          | D. McGAHAN                                                  |                                                                                                                                                                                                                                                  |            |                  |                  |          |                                                                                                                                                                                            |          |                             |            |                                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                           |         |      |                      |      |                                            |   |                                                                                                                                                                                                                                                                     |         |                                            |       |                                |             |                             |
| PROJECT                                           | PHASE                                                       | TYPE                                                                                                                                                                                                                                             | DISC       | NUMBER           | REV              |          |                                                                                                                                                                                            |          |                             |            |                                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                           |         |      |                      |      |                                            |   |                                                                                                                                                                                                                                                                     |         |                                            |       |                                |             |                             |
| TE AHU A TURANGA: MANAWATU TARARUA HIGHWAY        | 3                                                           | DG                                                                                                                                                                                                                                               | E          | 4125             | A                |          |                                                                                                                                                                                            |          |                             |            |                                                                                                                                              |          |            |                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                           |         |      |                      |      |                                            |   |                                                                                                                                                                                                                                                                     |         |                                            |       |                                |             |                             |

