

Report pursuant to s 42A Resource Management Act 1991

In the matter of:

A Notice of Requirement to construct, operate, use, maintain and improve approximately 11.5km of new State Highway connection between Ashhurst and Woodville

And:

A hearing by Manawatū District Council, Palmerston North City Council and Tararua District Council pursuant to s102

Requiring Authority:

New Zealand Transport Agency

Hearing date:

25 March 2019



Section 42A Technical Evidence: Water Quality, Aquatic Habitat, and Natural Character.

By: Logan Arthur Brown



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1 Introduction

1. My full name is Logan Arthur Brown. I hold the qualification of a Masters in Science, a Bachelor of Business Studies (majoring in Economics), and a Bachelor of Science (majoring in Ecology).
2. I am currently the Freshwater and Partnerships Manager at Manawatū-Whanganui Regional Council (“**Horizons**”). I have held this position since 2016. Prior to that I was the Senior Environmental Water Quality Scientist at Horizons. My role involved focusing on biological processes and drivers within freshwater environments. I was responsible for delivery of Horizons coastal and estuary monitoring programmes, the State of the Environment (“**SOE**”) monitoring programmes for biological parameters which included periphyton, macroinvertebrates and fish, Horizons contact recreation, and Horizons LakeSPI monitoring programme. Prior to my role with Horizons, I was employed by the Department of Conservation (“**DOC**”) as a Freshwater Technical Support Officer in Whanganui.
3. In carrying out the above roles, I have been working in the Manawatū-Whanganui regions waterways as a Water Quality Scientist for the past 11 years.
4. I have reviewed, researched and prepared freshwater assessments with respect to resource consent applications and proposed plan changes / policy statements. I have also presented evidence before local authorities and the Environment Court.
5. I have prepared this evidence on behalf of the Territorial Authorities, Palmerston North City Council, Manawatū District Council and Tararua District Council (the “**Territorial Authorities**”) in relation to the Notices of Requirement (“**NOR**”) for Te Ahu a Turanga – Manawatū Tararua Highway Project (“**the Project**”) lodged by the New Zealand Transport Agency (“**NZTA**”). I understand that my evidence will accompany the planning report being prepared by the Territorial Authorities under s 42A of the Resource Management Act 1991 (“**RMA**”).

1.1 Expert Witnesses – Code Of Conduct

6. I confirm that I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2014 and that I agree to comply with it. I confirm that I have considered all the material facts that I am aware of that might alter or detract from the

opinions that I express, and that except where I state I am relying on information provided by another party, the content of this evidence is within my area of expertise.

7. While employed by Horizons, my s 42A Report has been prepared independently of my role as Freshwater and Partnerships Manager. My opinions are expressed as an expert in freshwater environments, and are entirely my own. I am aware that Horizons made a submission on the NOR but I have had no involvement in the preparation of that submission. I understand the submission notes that regulatory matters under the One Plan will be dealt with at the resource consent stage.

2 Background and Scope of Evidence

2.1 Background

8. The Project is defined as the construction, operation, use, maintenance and improvement of approximately 11.5km of new State Highway connection between Ashhurst and Woodville under the RMA. This proposed new section of State Highway will replace the indefinitely closed State Highway 3 route through the Manawatū Gorge. A detailed description of the Project is set out in Part C of the Assessment of Environmental Affects (“AEE”) submitted by the NZTA.

2.2 Scope of evidence

9. My evidence addresses the Natural Character and Freshwater assessments included in Technical Reports (Technical Assessment No 4 - Landscape, Natural Character and Visual Effects, Appendix 4.A - The Natural Character Assessment, and Appendix 6.C - the Freshwater Ecological Impact Assessment). Those reports consider freshwater features/characteristics within the NOR corridor with a view to informing the natural character assessment. The AEE states that freshwater ecological values and associated mitigation are to be assessed as part of the resource consent phase of the Project. My s 42A report therefore focuses on freshwater matters and related methodology within this context, and with the knowledge that further more detailed assessment will need to occur once detailed design is confirmed through resource consent applications to Horizons.
10. My assessment considers the following matters:

- a) Methodology, data collection and assessment techniques;
- b) Freshwater – Ecological Impact Assessment;
- c) Review of submissions;
- d) Draft NOR conditions; and
- e) Conclusions.

11. My evidence should be read in conjunction with expert evidence of the other experts that have contributed to the s 42A Planning Assessment. In particular, the evidence of Mr John Hudson (Landscape and Natural Character) and Mr James Lambie (Ecology) are relevant to the consideration of the matters that I address.

2.3 Reports and material considered

12. In preparing this evidence, I have read the following reports and documents:

- a) Technical Assessment Number 4 (Landscape, Natural Character and Visual Effects);
- b) Te Ahu a Turanga – Manawatū Tararua Highway Project Appendix 4.A. Natural Character Assessment;
- c) Te Ahu a Turanga – Manawatū Tararua Highway Project Appendix 6.C Freshwater – Ecological Impact Assessment;
- d) Te Ahu a Turanga – Manawatū Tararua Highway Project Appendices 6.A and 6.B -Assessments of Terrestrial Vegetation and Habitats, and Fauna; and
- e) The submissions that relate specifically to freshwater environments.

2.4 Site visit

13. I am familiar with the area the Project covers and the Manawatū Gorge and Scenic Reserve in the vicinity of the Project. In preparing this s 42A report, I have not yet visited the individual sites within the NOR corridor. However, given my current and previous roles with Horizons and DOC, I am familiar with the characteristics and nature of the

streams in the region across a gradient from native forested catchments through to catchments in intensive land use. I have undertaken monitoring in the Manawatū River at both ends of the Manawatū Gorge, as well as in the Manawatū Gorge itself. I have also regularly monitored streams that are contained within and sourced from the Ruahine Ranges.

2.5 Statutory Context

14. The relevant statutory documents and provisions relating to the evaluation of the NOR have been set out in the s 42A Planning Assessment. For the purposes of preparing this evidence, I have had particular regard to the One Plan in relation to Natural Character and Schedule B (Surface Water Management Values) and Schedule E (Water Quality Targets).

3 Existing Environment

15. The existing aquatic environment (as well as the natural character of the aquatic environment with respect to biophysical attributes) is described at Appendix 4.A - the Natural Character Assessment, and 6.C - the Freshwater – Ecological Impact Assessment and for brevity is not repeated here.

4 Methodology, Data Collection and Assessment Techniques

16. The supporting documentation with the AEE outlines how the natural character assessments have been undertaken for the Project. In summary:
 - a) Ten attributes have been selected to define the natural character of a site or catchment, with each of these attributes (depending on its “naturalness”) given a score from Very High to Very Low. A high score is intended to reflect a site that is more natural for the particular attribute (characteristic);
 - b) No weighting is applied to any of the attributes; i.e. no single attribute is considered more important than another when measuring natural character;
 - c) From this information a rating is given for each of the attributes;

- d) The median score of the ten attributes is then taken to derive the natural character of a site (either at a site or catchment scale);
 - e) Those sites that are characterised as having a high level of natural character are then assessed further, with a view to establishing the change as a result of the proposed activity on each of the attributes;
 - f) The overall change in natural character at a site or reach/catchment scale is then determined and put forward as the effect on natural character;
17. Only the long-term effects of the activity are considered in the natural character assessments. Effects that occur during construction are disregarded on the basis that if best practice is followed in terms of construction (including erosion and sediment control) then there will be no on-going effects. The assumption appears to have been made that the construction effects will only be temporary in nature i.e. sediment discharges will only be temporary and occur during construction.
18. I have concerns about the approach to sediment discharges for streams and rivers. Sediment discharge into waterways can be an issue during the construction phase, when fine soils from areas of open ground associated with earthworks can be carried into water by rain or other events. These effects may continue to occur for a period of time after the works are completed. Once discharged to a stream, sediment does not disappear during the next high flow event. The sediment will be moved downstream at a speed driven by the hydrology, sinuosity and complexity of the particular streambed. Sediment will be deposited in pools and on the inside of stream beds, therefore changing the characteristics of the stream. The assumption that long-term sediment will not affect the natural character of those streams and rivers therefore, does not account for the complexities in the systems.

Attribute selection

19. The selection of the ten attributes contributing to a waterbody plays an important role in defining the natural character of a site or catchment.
20. The supporting documentation with the AEE uses areas within the stream/river corridor to measure and define natural character. The four areas and the defining attributes used in the application are:

- a) Active bed (six attributes):
 - i. Abiotic including flow regime, active bed/body shape and water quality;
 - ii. Biotic including indigenous taxa assemblages, ecosystem functioning, and presence/absence of exotic aquatic flora and fauna.
- b) Margin (two attributes):
 - i. Abiotic including structure and human modifications;
 - ii. Biotic including terrestrial ecology.
- c) Context (one attribute):
 - i. Abiotic and biotic including land use - degree of modification.
- d) Experiential.

21. A natural character assessment should be assisted or informed by the relevant statutory instruments (RPS, Regional Plan etc.) and what they prioritise. However, the stated attributes do not account for the factors set out in Policy 6-8 of the One Plan. Also, while the methodology is robust and repeatable in that it clearly defines a method, the current attributes fail to consider the regional context in which the affected waterways exist. By that I mean that the attributes do not account for the values contained within Schedule B (these are values that have been identified at either the reach or catchment scale for the region's rivers) and/or the targets contained in Schedule E to protect these values.

22. Schedule B was developed during the development of the One Plan and is supported by technical documents that assign both reach specific values (such as trout spawning) and catchment wide values (such as contact recreation) to the regions waterways. The identification of these values was undertaken through a public consultation process, and has the benefit of placing the values within the regional context. The identification of these values then allowed for the development of water quality targets (contained in Schedule E) that at the time were thought to provide a level of protection to the identified values.

23. As it stands therefore, the natural character assessment fails to consider any of the values identified within the One Plan and how these might relate to natural character at

a site or catchment scale. Taking the regional context a step further, one of the attributes that has been used within the natural character component scale relates to water quality. Assessment of the water quality attribute uses thresholds that have been developed at a national level through the McDowell 2013 report¹. In my opinion, this also fails to place the waterways and its perceived values located within the NOR corridor in a regional context.

24. The One Plan provides water quality targets within the regions waterways with the aim of managing periphyton growth. In addition, Horizons has a number of SOE monitoring sites that are reference sites which could be used to place the waterways within the NOR corridor in the regional context (i.e. the departure from natural state). This is important given that some of the regions reference sites are known to have naturally elevated levels of phosphorus, which is a reflection of the geology in the catchment and not an impact from human presence (i.e. not to be considered less natural because it is elevated).

Defining Significant Diminishment - Level of Natural Character

25. In the methodology (Section 3.4) NZTA's experts uses a five point scale with the ability for in-between ratings (if required), when undertaking the assessment for each of the attributes. This information is then used in the AEE as the basis for establishing whether there is a change, as between natural character values before and after, the road. The point scale is also used to establish a threshold for what constitutes significantly diminished. The reasoning for this is repeated below:

"In this assessment, a reduction in natural character from High to Moderate (or less) is considered to constitute a significant reduction in the level of natural character. Waterbodies with high natural character are more sensitive to change that could adversely impact on the attributes and qualities that contribute to the high natural character, than those areas that have a moderate or low level of natural character. A reduction from High to Moderate is

¹ McDowell, R.W., Snelder, T.H., Cox, N (2013). Establishment of reference conditions and trigger values for chemical, physical and micro-biological indicators in New Zealand streams and rivers. AgResearch Client Report. Prepared for the Ministry for the Environment.

considered to be significant, as it requires reductions in several of the 10 assessment attributes for the overall level of natural character to be affected. The interrelated nature of the attributes means that modification of a waterbody will typically result in a reduction to the rating of several attributes, rather than just one.”

26. In the absence of any direction within the One Plan, the extent of change required for an attribute to be “significantly diminished” was agreed as between the team of experts who contributed to the natural character assessment. However, aside from a footnote within the report, no written explanation for the assumptions sitting behind the two point step change has ever been provided. It is therefore difficult to test the assumptions and conclusions as to natural character.
27. An example of some of the methodology’s limitations is what happens when a site changes from very high to either high or high medium at an attribute level. In my opinion a change from very high to high medium is the same change as a site going from high to medium. For example, when considering the reasoning provided above that *“Waterbodies with high natural character are more sensitive to change that could adversely impact on the attributes and qualities that contribute to the high natural character, than those areas that have a moderate or low level of natural character”* a change from very high to high medium is likely to result in a significant diminishment in the attribute (and potentially the natural character) at the site due to the high values that were first encountered.
28. In other words, I would suggest that the higher the natural character the smaller the degree of change it takes to significantly diminish the attributes and qualities of an area. This would seem more consistent with the directive to preserve and protect natural character under the objectives and policies of the One Plan.
29. The definition of “significantly diminished” put forward by NZTA does not adequately (or at least as far as can be determined in the absence of further explanation) address these matters when having regard to the need to preserve natural character. Mr Hudson also raises concerns over the blunt approach of the NZTA experts to the significance of a change in the level of natural character.

Weighting of attributes

30. The natural character assessment assumes that all attributes play as important a role as each other in the development of the overall natural character score. However, I do not consider this is necessarily the case.
31. Take, for example, riparian vegetation and its removal. The removal of riparian vegetation at a site will obviously affect the riparian vegetation score that a site is assigned, but it will not be the only attribute impacted (as is the case under the current scoring system). The reality is that the removal of the riparian vegetation will also have an effect on the aquatic fauna that is found at a site. There will be less terrestrial invertebrates falling into streams for fish to eat, less woody debris falling into streams to create habitat for fish and stream macroinvertebrates, and the removal of shading will result in potentially greater periphyton growth (which sees further changes in the aquatic assemblages within a stream making it more susceptible to invasion from exotic species). All of these factors have a role in changing the natural character at a site and potentially at a catchment scale.
32. Another example would be stormwater inputs (so a change in the water quality attribute). An increase in stormwater inputs would decrease the quality of the water when it is discharging however, this will have very little influence on the other attributes (assuming it is not at toxic levels) that are being used as part of the natural character assessment, such as the riparian zone. If the riparian zone remains intact and only the stormwater related attribute changes, you should not see any changes in other attributes such as the exotic fauna/plants (etc.) present.
33. In my opinion, the treatment of all attributes as being equal undervalues some of the more important drivers of natural character at both a site and reach scale. Equal weighting of attributes results in a more simplified process and some would argue a less subjective assessment. However, it also underplays the complicated processes within streams and rivers (and their beds and margins) and that some attributes will play a more important role than others. These processes, and the differing values assigned within the relevant regional statutory instruments, are reflected to a greater degree within the One Plan and its schedules.

Scale of Assessment

34. The scale at which the natural character assessment is undertaken is vital when considering the different characteristics of the various catchments/scales. These variations will account for differences across a range of factors such as geology, rainfall, and hydrology; with these factors determining the geomorphological processes that occur within a stream and river. In turn these various features will influence the biological communities (both in-river and within the river margin/corridor). All factors will influence the attribute state at any given site.
35. NZTA experts have assessed the site at a number of scales. Assessment has occurred at a site level, at a catchment level, and across multiple catchments.
36. When moving from the local area (scale) towards a broad scale assessment, care needs to be taken not to upscale to such an extent that lower attribute values are given to a catchment because the broad scale has captured a large variety of different drivers in the morphological processes.
37. An example of a broad scale assessment that averages the overall characteristics of streams can be found in section 4.5 of the Natural Character assessment. This section groups the generic streams and wetland along the NOR corridor, noting: *“The waterbodies along the route include perennial, permanent and ephemeral streams, wetlands and constructed stock water ponds, most of which are accessible by stock. Most of the gullies support pasture and open scrub while some of the very steep sided gullies are densely covered in indigenous vegetation. There are five QEII open space covenants in the vicinity of the corridor, comprising densely vegetated gullies and slopes. The covenants are fenced.”* This grouping includes a number of systems which will each have their own drivers for the characteristics that are present. For example, an ephemeral stream has different processes that determine the biological characteristics at a site, which by way of another example, are different to attributes of wetlands. Therefore grouping all of the different types of waterways encountered in the NOR corridor will simply average out the ratings and potentially undervalue a site/catchment as a result of not comparing “apples with apples”.
38. Another example of this scaling issue is within what has been defined as the Lower Pohangina River Reach (Section 4.4). This reach includes the Pohangina River downstream of the Saddle Bridge to the SH3 Bridge and therefore includes the

confluence with the Manawatū catchment. At this point in the catchment the two rivers have experienced vastly different human influences. The Pohangina River on the true left is draining from the Ruahine Ranges and extensive sheep and beef country and then on the true right mostly from extensive sheep and beef and some dairy. On the contrary, the Manawatū River sees a combination of intensive landuse (mostly dairy, extensive sheep and beef), and a number of point source discharges from towns upstream of the Manawatū Gorge.

39. The clumping of these two river systems within a single assessment is in my opinion inappropriate. Looking at water quality (and also fauna, both native and exotic) for these two rivers and deriving one attribute state for water quality, will inevitably water down the higher water quality in the Pohangina River and result in a lower attribute rating as part of natural character that has been considered.
40. The use of an appropriate scale for assessing natural character is therefore vital to ensure that accurate assessments can be undertaken on both the current state and what changes may occur as a result of any proposed activity.

5 Change to attribute state versus natural character

41. I have considered Objective 6-2 of the One Plan in relation to where local and broad scale assessments have identified natural character as being high (and above). Of importance is the objectives reference to the attributes and qualities of an area with high natural character. Objective 6-2 provides at (a) through (c):
 - a) The characteristics and values of:
 - i. the Region's outstanding natural features and landscapes, including those identified in Schedule G; and
 - ii. the natural character of the coastal environment, wetlands[^], rivers[^] and lakes[^] and their margins are protected from inappropriate subdivision, use and development.
 - 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.
 - c) Promote the rehabilitation or restoration of the natural character of the coastal environment, wetlands[^], rivers[^] and lakes[^]and their margins.
- 42. Once a site is identified as having high natural character, a further assessment step is necessary to assess the change as a result of the proposed activity. This step formed part of the NZTA approach, albeit while looking at the extent of change on the overall value for natural character, not the specific attributes and qualities referred to in the objective (Objective 6-2).
- 43. In this regard, I note under sub-section 6-2 b (ii), that the assessment requires an assessment of the level of change at the attribute level, not the overall value given to natural character at those sites/catchment areas. This is different to the approach that NZTA has undertaken at Appendix 4.A, Tables 9, 10 and 11 of the natural character assessment report. These tables identify those sites and catchments which would have significant changes in natural character as a result of the activity; highlighted with an asterisk. In addition, each of the tables contains relevant attributes, the current (existing) state and the changes that could occur under a number of different scenarios as a result of the proposed activity.
- 44. For ease of demonstrating where there is a significant decline (using the same definition as contained in the Natural Character assessment – i.e. a change from high to medium) I have reproduced and highlighted the individual attributes in green. When adopting this approach there are a number of attributes which are considered to have (at the very least) significantly diminished as a result of the Project.

Table 1: reproduction of Table 9 from the Natural Character assessment showing the change in the attribute shows for the different scenarios in the designation corridor.

West Stream (chainage 4000-6000) Stream from QEII West Crossing to Raupo Wetland, old growth forest							
Current state			Future state at stream catchment scale			Future state at stream catchment scale	
River Component	Existing (whole catchment)		Site Embankment	Site Viaduct	Site QEII crossing (culvert & bridge)	Whole Stream embankment and QEII west crossing	Whole Stream viaduct and QEII west crossing
Active bed	Morphology/modification	H	L	MH	M	M	MH
	Flow regime	H	M	H	MH	H	H
	Water quality	H	M	M	M	M	M
	Aquatic (indigenous taxa assemblages)	M	L	M	M	ML	M
	Ecosystem functioning	H	L	H	M	M	MH
	Exotic aquatic flora and fauna (absence)	VH	M	VH	VH	H	VH
Margin	Morphology/physical modification	H	VL	H	M	ML	MH
	Terrestrial ecology	H	VL	M	M	L	M
Context	Land use /modification	MH	M	M	M	M	M
All	Experiential	H	M	M	M	MH	MH
	OVERALL LEVEL OF NATURAL CHARACTER	H	ML	MH	M	M	MH

Table 2: reproduction of Table 10 from the Natural Character assessment showing the change in the attribute shows for the different scenarios in the designation corridor.

Stream Crossing – Construction Access to Saddle Road				
River Component		Existing whole stream	Future culvert crossing	Future whole stream
Active bed	Morphology/modification	H	M	H
	Flow regime	H	H	H
	Water quality	VH	VH	VH
	Aquatic (indigenous taxa assemblages)	H	H	H
	Ecosystem functioning	H	HM	H
	Exotic aquatic flora and fauna (absence)	HM	HM	HM
Margin	Morphology/physical modification	H	M	H
	Terrestrial ecology	H	H	H
Context	Land use /modification	MH	MH	MH
All	Experiential	H	MH	H
	OVERALL LEVEL OF NATURAL CHARACTER	H	MH	H

Table 3: reproduction of Table 11 from the Natural Character assessment showing the change in the attribute shows for the different scenarios in the designation corridor.

QEII East - Crossing					
		Crossing site only		Whole stream	
River Component		Existing	Future crossing	Existing	Future with crossing
Active bed	Morphology/modification	H	ML	H-VH	MH
	Flow regime	H	MH	H-VH	H
	Water quality	H	M	H	M
	Aquatic (indigenous taxa assemblages)	H	M	H-VH	H
	Ecosystem functioning	H	M	H-VH	H
	Exotic aquatic flora and fauna (absence)	VH	VH	VH	VH
Margin	Morphology/physical modification	H	L	VH	MH
	Terrestrial ecology	H	L	H-VH	MH
Context	Land use /modification	MH	M	H-VH	H
All	Experiential	H	ML	H-VH	H
	OVERALL LEVEL OF NATURAL CHARACTER	H	M	H	H

6 Freshwater – Ecological Impact Assessment

45. Supporting documentation presented in Appendix 6.C with the AEE includes the report “Freshwater – Ecological Impact Assessment”.
46. I note the scope of this report in the context of the NOR process. In particular, there is an important caveat regarding limitations of the freshwater assessment until further information is collected from the streams that are contained within the NOR corridor and effects from construction activities are holistically assessed.
47. The scope of the Freshwater Ecological Impact Assessment (section 1.2) is:

“As such, the purpose of this freshwater ecological report is to assist with understanding the sensitivity of the freshwater ecology within the Project area and feed into the natural character assessment, and inform the location of the designation by:

- a) Describing and assessing existing freshwater ecological values present under the corridor;*
- b) Discussing the likely and potential effects on the ecological values present from the Project (operation); and*
- c) Provide preliminary recommendations for appropriate avoidance, remediation and/or mitigation of adverse effects from the Project on the freshwater ecological values present.”*

48. The third bullet point is the most vital in the assessment with the report providing preliminary recommendations for the appropriate avoidance, remediation and/or mitigation of adverse effects. However, this statement does not align with another important caveat within the report, which is: *“Resource consents will be required at a later date and it is during this process that adverse effects on freshwater ecological values and associated mitigation will be addressed”* (Section 5).
49. The infield assessments that have been undertaken by NZTA have used recognised methodologies for data collection. However, it is important to note that the collection of this data has involved one-off sampling points and does not necessarily capture all of the ecological values at a site (which can vary depending on the season in which sampling is undertaken). It also excludes construction effects, as I have discussed

earlier in my evidence. See the third paragraph of section 4.2 of the Freshwater Ecological Impact Assessment.

50. With the collection of this information, NZTA experts have been able to assign waterway characteristics and associated ecological values (as contained in Table 6.C.7) to each of the waterways that will be affected as part of the Project. In doing so, the report identifies that some of the streams within the NOR corridor have high ecological values and that the proposal will have a high level of ecological impact on those streams with these high values (refer Table 6.C.9).
51. Within the Freshwater – Ecological Impact Assessment Report, section 4.1.1 NZTA experts have also established how much of a waterway will be affected by the proposal with the following lengths of streams and their associated value being identified. Overall, the Project may result in approximately:
 - a) 1190m of high value waterway being culverted;
 - b) 30m of high value waterway being bridged;
 - c) 670m of moderate value waterway being culverted;
 - d) 780m of moderate value waterway being diverted;
 - e) 560m of low value waterway being culverted;
 - f) 630m of negligible to low value waterway being culverted; and
 - g) 130m of negligible to low value waterway being diverted.
52. The Freshwater Ecological Assessment Report is unclear on whether the assessment of stream length that is lost includes the permanent loss of waterways (most likely headwater ephemeral streams) as a result of cut and fill works, and areas that will be required for sediment and erosion control devices. Clarification from NZTA as to whether these effects have been considered in the assessment is important as an assessment without the inclusion of these factors will, in my opinion, under-represent the loss of stream habitat.
53. To establish the effects of the Project the NZTA experts have taken the ecological value of the waterway and then considered the magnitude of effect as the percentage of the

sub-catchment that is affected as a result of the Project. Depending on the stream length affected by the Project a magnitude of effect rating is given to the sub-catchment ranging from low through to high. In order to be considered a high magnitude of effect at least 20% of the sub-catchment needs to be affected by the activity.

54. This magnitude of effect approach is of concern as effects can be watered down by choosing a larger catchment for the assessment and it does not take into consideration any localised or cumulative effects within a sub-catchment.
55. The magnitude of effect methodology also assumes that all habitats are created equal i.e. that ephemeral and permanent streams have the same values, when in fact the values associated with these stream types vary. In my opinion they would be better treated as separate systems as part of the assessment of effects of an activity.
56. However, even with the above caveats, the assessment provided in Table 6.C.9 shows that for those sites that have a high ecological value (5A, 5B, 6A, 6B, 6C, 7A, and 7B(4200-4400)), even with a moderate magnitude effect (change), the level of ecological effect of the activity will still be high on these sites.
57. The assessment is however silent on how these effects will either be avoided, remedied or mitigated. Although I note in section 4.2 that the following is stated:

“We recommend that the loss of permanent and intermittent habitat (including stream diversions) along the alignment be mitigated. This is recommended in situations where the level of the effect is moderate or higher. This is recommended with the recognition that an aim should be to ensure that there is no net loss of aquatic habitat, but is tempered by the current quality (functionality) of the waterway and its realistic potential condition given the current land use.

It is noted that there is an ongoing local, regional and national level drive to reduce the amount of tributary and headwater aquatic habitat reduction due to continued small scale loss. While the process we follow (EIANZ 2018) suggests that effects which are low and very low should not normally be of concern, very low equating to “less than minor” and not requiring mitigation, the emphasis is still on minimising adverse ecological effects and on a target of “no net loss” in the quantum of onsite aquatic habitat.

The assessment in this report will be updated as more detail is provided on the Project. This will allow a more accurate measure of both construction and operational effects on the existing freshwater ecological values to inform the resource consent applications. This will also provide more guidance as to how adverse effects can be appropriately mitigated. Resource consents will be required at a later date and it is during this process that adverse effects on freshwater ecological values and associated mitigation will be addressed.

Stream replacement and enhancement will likely be required as part of the Project to mitigate for the loss/modification of habitat, however there may be other mitigations options or amendments to the design to reduce/avoid adverse impacts on ecological values (i.e. constructing bridges as opposed to culverts). There is potential for mitigation (i.e. stream enhancement) to be conducted within the affected sub-catchments within the designation corridor. However, mitigation will also likely be required outside the designation corridor.”

58. The above passage outlines that there is still uncertainty as to the potential envelope of effects until the final road design and construction methodology is established. Therefore, the ability to establish or recommend appropriate mitigation for the Project cannot be established at this point.
59. I note that NZTA is undertaking a number of monitoring programmes within some of the streams that are contained within the NOR corridor to further inform, refine the values, and establish baseline information for the catchments. The collection of this information is vital to allow a more accurate assessment of the effects of the proposal and at this stage in the process any conclusions drawn on the full effects on water quality, and aquatic habitat are premature.
60. What is clear to date from the information provided with the AEE is that there will be a high level of ecological effect (significant effect) on those streams that have been identified as having high ecological values. Additionally there are a number of streams that will have a moderate level of ecological impact as a result of the Project.

7 Review of submissions

61. I have been provided with a copy of submission points that relate specifically to freshwater. These submitters being Brent Barrett (submitter s317), Manawatū River Source to Sea (submitter s360), Royal Forest and Bird Protection Society (submitter

s295), Chris Teo-Sherrell (submitter s166), Department of Conservation (submitter s369), and Rachel J Keedwell (submitter s295).

62. Submissions s317, s360, s166, s244, all contain points that relate to the discharge of stormwater from the road network into the streams in the designation corridor. The change in water quality as a result of the stormwater discharges has been identified as parameter that will affect the attribute state for water quality in the natural character assessment. Until the final design stage the placement of stormwater and any associated treatment devices cannot be assessed. A cautious approach to the impact of stormwater is justified in those circumstances, noting that the Natural Character Assessment (page 73) identifies that *“introduction of stormwater borne contaminants in a stream catchment of natural character justifying a full point reduction in score.”* In the case of Eastern QEII this saw a reduction from high to moderate for this attribute.
63. Submission s295 raises concern around downstream environments as a result of the proposed activity and correctly identifies that works in the headwaters have the ability to influence stream characteristics further downstream in a catchment. This concern specifically relates to the discharge of sediment into the waterways as a result of the works and the time that this takes to clear from the system. As I have already stated, sedimentation effects can take a long time to work their way out of streams and rivers and timing will depend on the morphological processes that are operating in that particular stream. In addition some of the streams that run through the NOR corridor will enter the mainstem of the Manawatū River, with reaches of the stream network that will have characteristics more representative of natural state. Any sediment that makes its way into these reaches downstream of the works area is likely to have a more pronounced effect compared to a stream that runs through rural land-use. These effects can therefore be long term.
64. The loss of stream length can also result in changes to characteristics of stream reaches downstream of the loss area. This is due to the increase in speed that water travels given a loss in length; which creates the potential for more erosion downstream of the lost area and therefore results in changes in the characteristics that are seen downstream. Both these factors are important when considering the effects of an activity on a stream and its associated values. However, at this point in time I do not believe we have enough detailed information to be able to assess what the full effects of

the activity will be. These matters will need to be assessed at the resource consenting stage.

65. Another important consideration when considering effects relates to connectivity of systems and ensuring that certain activities, such as the placement of culverts, do not result in impeding migratory species in catchments. Activities, like culverts, have the potential to change the natural character both upstream and downstream of the activity area. They can impact downstream by the release of sediment into the water column and changing habitat available for fauna during their installation, and upstream by potentially creating barriers to migratory species i.e. perched culvert, water velocity through the culvert to fast preventing fish migration etc. Forest and Bird correctly identify in their submission that waterways needed to be considered for connectivity.

8 Draft Requirement conditions

66. In relation to aquatic habitat and natural character I have considered the proposed draft conditions, and in particular condition 5 (e). The condition proposed restricts the maximum length of stream that can be permanently disturbed by diversion of other physical modifications within the QEII West and QEII East bush blocks. However, I can find no justification for the length of stream that can be impacted under the proposed conditions.
67. If the reasoning behind the proposed distances can be provided by NZTA with peer review, the inclusion of such a maximum distance may be appropriate. However, if there was no ability to review the justification for the condition as part of the NOR hearing, I would recommend that this condition is deleted. A consequence of removal, however, would be that there is no control within the designation of how much stream length can be modified, with resultant unknown effects, including on freshwater ecology, natural character and indigenous biological diversity.
68. In addition, I note that the proposed condition only includes reference to the QEII East and QEII West waterways and makes no mention to other waterways that will be impacted as a part of the designation. The reasoning behind this may be contained in information that has been used to derive the proposed distances for the QEII East and QEII West streams but at this time I'm unable to comment on the appropriateness (or otherwise) of the scope of the condition. If a condition is to be included, I recommend

that it specify the maximum length of streams able to be disturbed for all streams within the NOR corridor.

9 Conclusions

69. The assessment of natural character of stream and rivers within the NOR corridor has been undertaken following a standardised approach using ten attribute states that are thought to define natural character at a number of sites. Each of the attributes is then scored from very high to low and the median score over the ten attribute values is used to derive the natural character of a site or catchment (or grouping of catchments).
70. This approach has caused me to raise the following concerns:
- a) The selection of the ten attributes fail to show any relationship or recognition of the values that have been identified in various parts of the One Plan, including Schedule B;
 - b) The attributes and qualities are assumed to have equal weighting in defining natural character at a site, which is not necessarily the case. The equal treatment of all attributes undervalues some of the more important drivers of natural character, at both a site and reach scale. Equal weighing of attributes results in a more simplified process and arguably a less subjective assessment. However, this underplays the complicated processes of streams and rivers and the relationship and weighting of individual attributes (i.e. some will play a more important role than others).
 - c) An appropriate scale at which the assessment is undertaken is vital in determining the natural character of a site. If the scale becomes too broad the assessment results in the averaging of the attributes. This then undervalues some attributes which are a reflection of different morphological processes and which should not be compared. At a maximum, assessments should be at the catchment scale and in many instances, it will be appropriate to use a smaller sub-catchment scale.
71. To date the information provided with the AEE shows that there will be a high level of ecological effect (significant effect) on those streams that have been identified as having high ecological values. Additionally there are a number of streams that will have

a moderate level of ecological impact as a result of the Project. Further, when considering the sites that have been identified as having high natural character there are attributes that will be significantly diminished as a result of the Project.

72. While NZTA anticipates that mitigation will be required, the details of how this will or can be achieved is currently lacking and requires development. Until this point in the process the ability to assess actual effects on streams is limited. The collection of further monitoring information by NZTA will be critical to these effects assessments..
73. The lack of justification or effects assessment in relation to the proposed maximum stream length condition within the QEII Trust West and East blocks is also of concern. It is impossible to assess the appropriateness of this condition without this information. If supporting information is not available then I recommend that this condition is deleted from the NOR conditions. If the condition is retained, all streams should be included.



Logan Arthur Brown

1 March 2019