Forbes Ecology

Ōtaki to North of Levin State Highway Project

Ecology Multi-criteria Assessment

Commissioned by Stantec

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Cover photograph:
An old-growth forest remnant at Arapaepae, Levin.

1.0 INTRODUCTION

1.1 Project Scope and Deliverables

Stantec engaged Forbes Ecology Limited to provide professional ecology consulting services in relation to the Waka Kotahi's Ōtaki to North of Levin state highway Project. The Project involves the development of a new four lane state highway from the northern extent of the Peka Peka to Ōtaki expressway to North of Levin.

The scope of work was to assess, for the purposes of a multi-criteria analysis (MCA), ecological constraints for a range of potential state highway alignments (termed MCA 1A), and for options of roundabouts, grade separation structures (and one bifurcation structure; termed MCA 1B), and local roads (termed MCA 1C).

The ecological assessment considered factors that would present constraint to motorway development. These factors related to flora, fauna, ecosystems and habitat attributes of the terrestrial, wetland, and freshwater ecology located within the Project area.

The ecology constraints assessment was presented to two Project MCA workshops held over video conferencing during May and June 2020. This report documents the analyses and results of these ecological constraints assessments and the corresponding recommended MCA scoring.

2.0 METHODS

2.1 Desktop Review and GIS Analysis

The following existing data sources were reviewed for information relevant to the assessment:

- Horizons One Plan.
- Online spatial databases:
    - Our Environment (Landcare Research web portal).
        - Predicted Potential Vegetation.
        - Threatened Environment Classification.
        - Land Cover Database.
        - Pre-Human Wetlands.
        - Protected natural areas (Crown Conservation Estate, regional parks, and a range of covenant schemes: Nga Whenua Rahui, Nature Heritage Fund, Queen Elizabeth II National Trust, or local council reserves via the Reserves Act).
    - DOC GIS.
    - New Zealand Plant Conservation Network online botanical survey species lists.
    - Data from earlier site visits to selected locations where access has been possible.

2.2 Field Survey and Constraints Analysis

In earlier Project stages, in addition to extensive site visits on public land, site visits on private land were made to the following key localities:

- 3/10/2017 – Arapaepae Bush/Prouse Homestead and adjacent 1.4 ha remnant.
- 26/02/2018 – Mang-ahuia stream and Waikawa water race, north of Mokena Kohere Street.

Levels of ecological constraint were assigned to terrestrial vegetation and habitats based on the criteria listed in Table 1. Here the Project constraints scores 1–5 were aligned with EIANZ (2018) impact assessment criteria and also Schedules B and F of the Horizons One Plan.

For the purposes of the MCA assessment, the Project was broken into zones (A-L) for assessment. Scoring was conducted on the basis of the zone extent. Zones are referred to in the following constraints assessment.

Table 1. Ecological constraint categories and thresholds adopted for the assessment.

Constraint score	Constraint score description	Ecological attributes		One Plan Schedule B	One Plan Schedule F
		Ecosystems	Species	• Site of Significance – Aquatic (SOS–A) • SOS – Riparian (SOS–R) • Natural State (NS)	• Threatened or At-Risk habitat type (Threatened or At-Risk)
Fatal flaw	Option not supportable	Values present are beyond the limits of biodiversity offsetting meaning that the option should not proceed on ecological ground alone			
5	The option includes significant difficulties or problems in terms of the criterion being evaluated and no apparent benefits.	Area rates High for 3 or all of the four assessment matters listed in Table 4	Nationally Threatened species, found in ZOI either permanently or seasonally	SOS–A, R, or NS	Threatened or At-Risk
4	The option includes clear aspects of difficulty in terms of the criterion being evaluated, and very limited perceived benefits.	Area rates High for 2 of the assessment matters, Moderate and Low for the remainder, or area rates High for 1 of the assessment matters, Moderate for the remainder. Likely to be regionally important and recognised as such	Species listed as At Risk–Declining, found in the ZOI, either permanently or seasonally	SOS–A, R, or NS	Threatened or At-Risk
3	The option presents some aspects of reasonable difficulty in terms of the criterion being evaluated and problems cannot be completely avoided. There are few apparent benefits in terms of the criterion.	Area rates High for one matter, Moderate and Low for the remainder, or Area rates Moderate for 2 or more assessment matters Low or Very Low for the remainder Likely to be important at the level of the Ecological District	Species listed as any other category or At Risk, found in the ZOI either permanently or seasonally	SOS–A, R, or NS	Threatened or At-Risk
2	The option presents only minor aspects of difficulty on the basis of the criterion being evaluated, and may provide some benefits in terms of the criterion.	Area rates Low or Very Low for Majority of assessment matters and Moderate for one. Limited ecological value other than as local habitat for tolerant native species	Locally (ED) uncommon or distinctive species	Not Schedule B	Not Schedule F

1	The option presents few difficulties on the basis of the criterion being evaluated and may provide significant benefits in terms of the attribute.	Area rates Very Low for 3 matters and Moderated, Low of Very Low for remainder	Nationally and locally common indigenous species	Not Schedule B	Not Schedule F

Local roads were assessed using a 1–3 traffic light scoring system, as follows:

- 1 = green = option is likely to have only minor impacts or issues,
- 2 = orange = option is likely to have moderate impacts or issues,
- 3 = red = option is likely to have serious or significant negative impacts or issues.

It is important to note the context in which this constraints assessment is made. In the absence of detailed data on ecological values, the scope of the constraints assessment focuses on delineating ecological features and describing levels of ecological constraints. This is in contrast to determining ecological values and magnitudes of effect which is the process of ecological impact assessment (EIANZ, 2018), as would be required to inform an assessment of a preferred engineering option as part of an RMA environmental effects assessment.

It is recommended that ecological studies be progressed at the earliest opportunity to allow sufficient time for the assessments to inform the designation and resource consenting stages of the Project.

3.0 MCA 1A – ECOLOGICAL FEATURES AND CONSTRAINTS

3.1 Zone-by-Zone Summary of Ecological Constraints for Alignment Options

Zone A

White and Green have similar levels of interaction with first order waterways. These two alignments have similar levels of effect to pastoral wetland.

Table 2. Recommended MCA constraint scores for Zone A.

Option	Terrestrial	Freshwater & wetland
A - Green	1	3
A - White	1	3

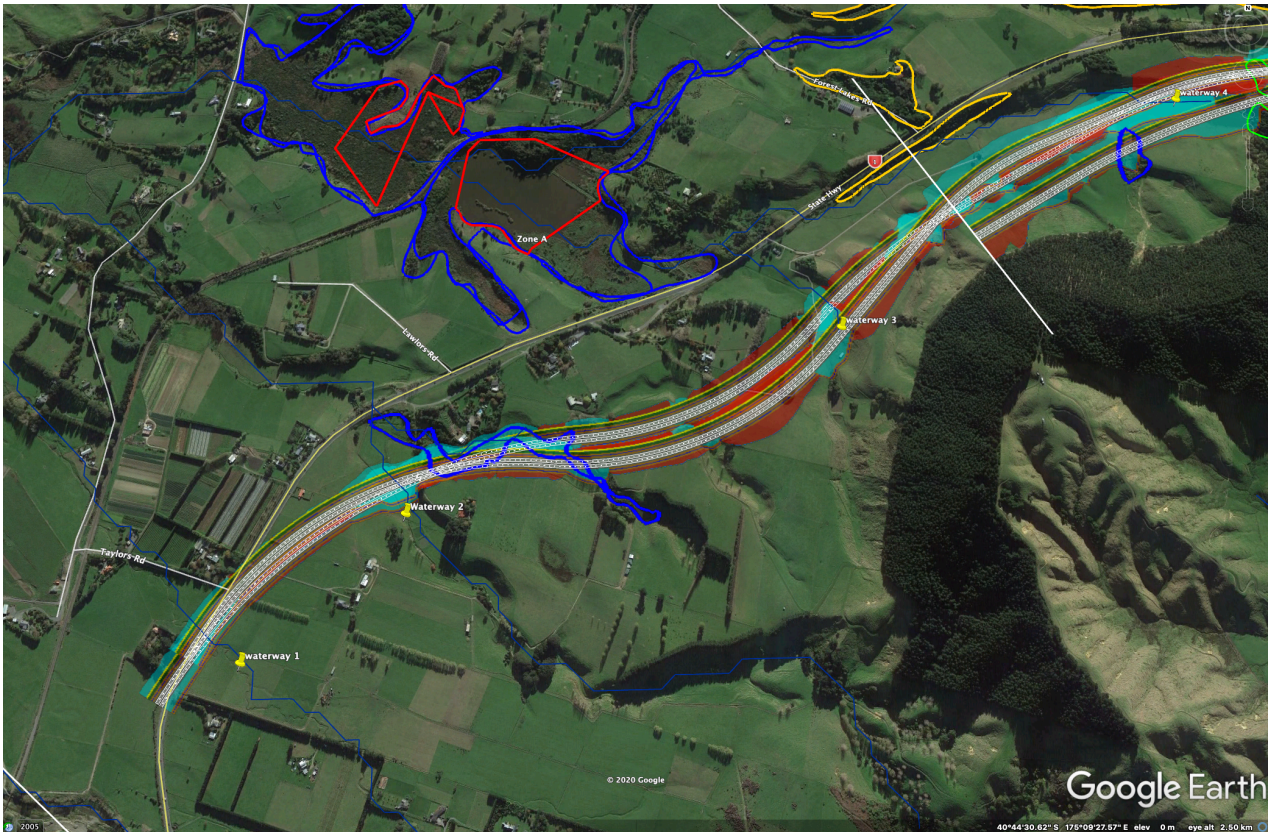

Figure 1. Terrestrial, freshwater and wetland ecological constraints for Zone A.

Zone B

White and Cyan both clip significant old growth forest (Forest 3). White, Cyan and Green all have similar levels of interaction with secondary forest (Forest 2). All three options have similar lengths of interaction with first order waterways.

Table 3. Recommended MCA constraint scores for Zone B.

Option	Terrestrial	Freshwater & wetland
B - Cyan	4	2
B - Green	2	2
B - White	4	2

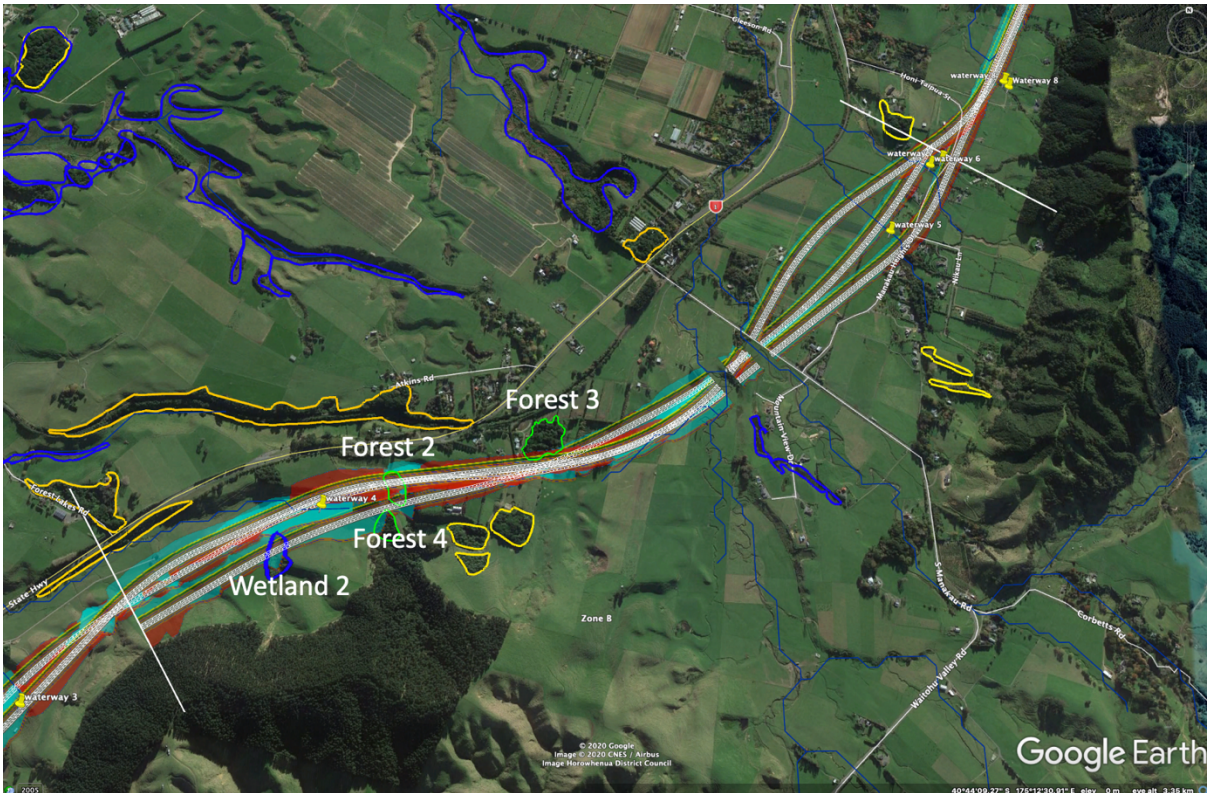

Figure 2. Terrestrial, freshwater and wetland ecological constraints for Zone B.

Zone C

Green and Purple interact with waterways (i.e., Manga-huia stream & Waikawa water race) containing At Risk fish species – giant kokopu, longfin eel. Otherwise, stream interactions are similar. Manga-huia stream and the Waikawa water race qualify for Schedule B due to fish fauna rarity. No terrestrial ecology issues of note.

Table 4. Recommended MCA constraint scores for Zone C.

Option	Terrestrial	Freshwater & wetland
C - Green	1	4
C - Purple	1	4
C - White	1	2

Figure 3. Terrestrial, freshwater and wetland ecological constraints for Zone C.

Zone D

Both Cyan and Blue interact with Waikawa water race – home to At Risk fish species – giant kokopu and longfin eel. Both alignments interact with Kuku stream, assuming a culvert – assuming At Risk species present.

Table 5. Recommended MCA constraint scores for Zone D.

Option	Terrestrial	Freshwater & wetland
D - Cyan	3	4
D - Dark Blue	1	4

Figure 4. Terrestrial, freshwater and wetland ecological constraints for Zone D.

Zone E

Both Cyan and Green interact with pastoral wetland.

Table 6. Recommended MCA constraint scores for Zone E.

Option	Terrestrial	Freshwater & wetland
E - Cyan	1	2
E - Green	1	2

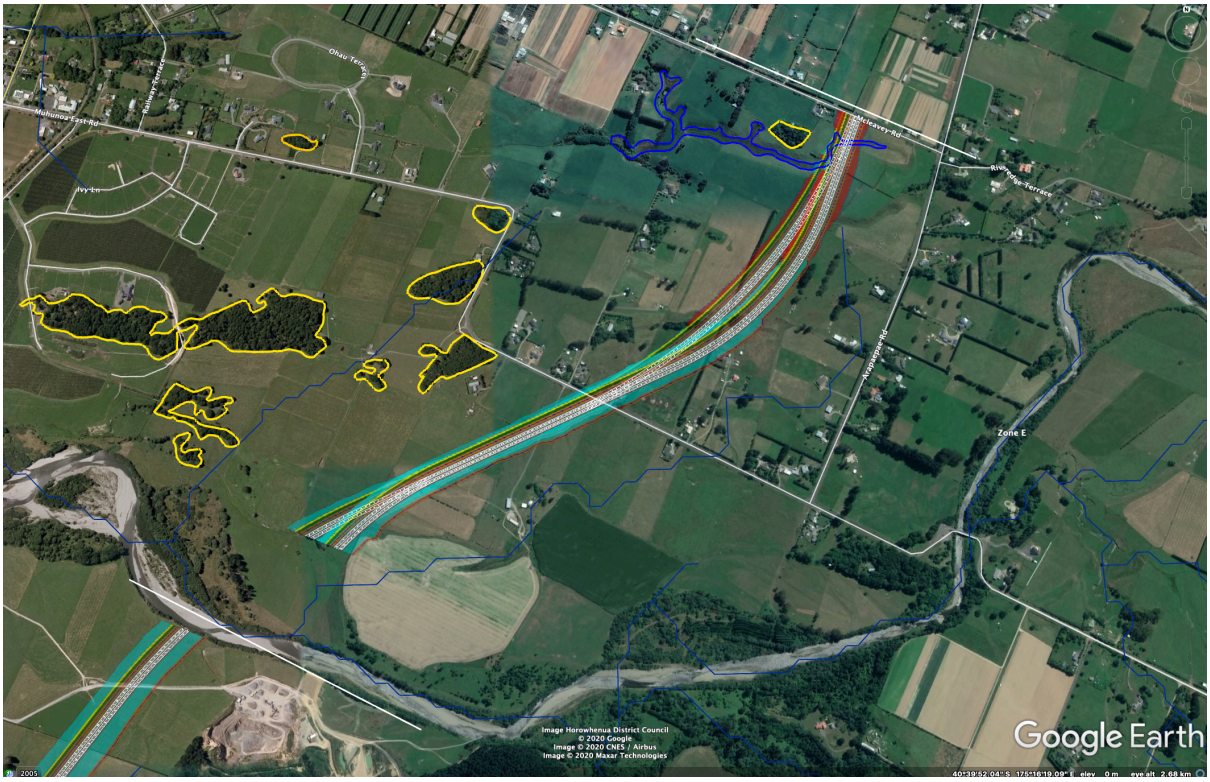

Figure 5. Terrestrial, freshwater and wetland ecological constraints for Zone E.

Zone F

No issues for any alignment.

Table 7. Recommended MCA constraint scores for Zone F.

Option	Terrestrial	Freshwater & wetland
F - Blue	1	1
F - Purple	1	1
F - White	1	1

Figure 6. Terrestrial, freshwater and wetland ecological constraints for Zone F.

Zone G

As mapped, Purple clips a significant old-growth forest remnant (Forest 6) containing Nationally Threatened land snails. However this interaction has subsequently been confirmed to be avoided[1].

No issues with these alignments.

Table 8. Recommended MCA constraint scores for Zone G.

Option	Terrestrial	Freshwater & wetland
G - Cyan	1	1
G - Purple	1	1
G - White	1	1

Figure 7. Terrestrial, freshwater and wetland ecological constraints for Zone G.

[1] Discussed and agreed with the project team during the MCA workshop 1.

Zone H

No issues for any alignment.

Table 9. Recommended MCA constraint scores for Zone H.

Option	Terrestrial	Freshwater & wetland
H - Cyan	1	1
H - Purple	1	1

Figure 8. Terrestrial, freshwater and wetland ecological constraints for Zone H.

Zone K

All alignments interact equally with first and second order streams.

Table 10. Recommended MCA constraint scores for Zone K.

Option	Terrestrial	Freshwater & wetland
K - Cyan	1	2
K - Dark Blue	1	2
K - Yellow	1	2

Figure 9. Terrestrial, freshwater and wetland ecological constraints for Zone K.

Zone L

Black, Green and Purple interact with similar extents of wetland. Orange has no wetland interaction but does interact with much more first order waterway.

Table 11. Recommended MCA constraint scores for Zone L.

Option	Terrestrial	Freshwater & wetland
L - Black	1	2
L - Green	1	2
L - Orange	1	2
L - Purple	1	2

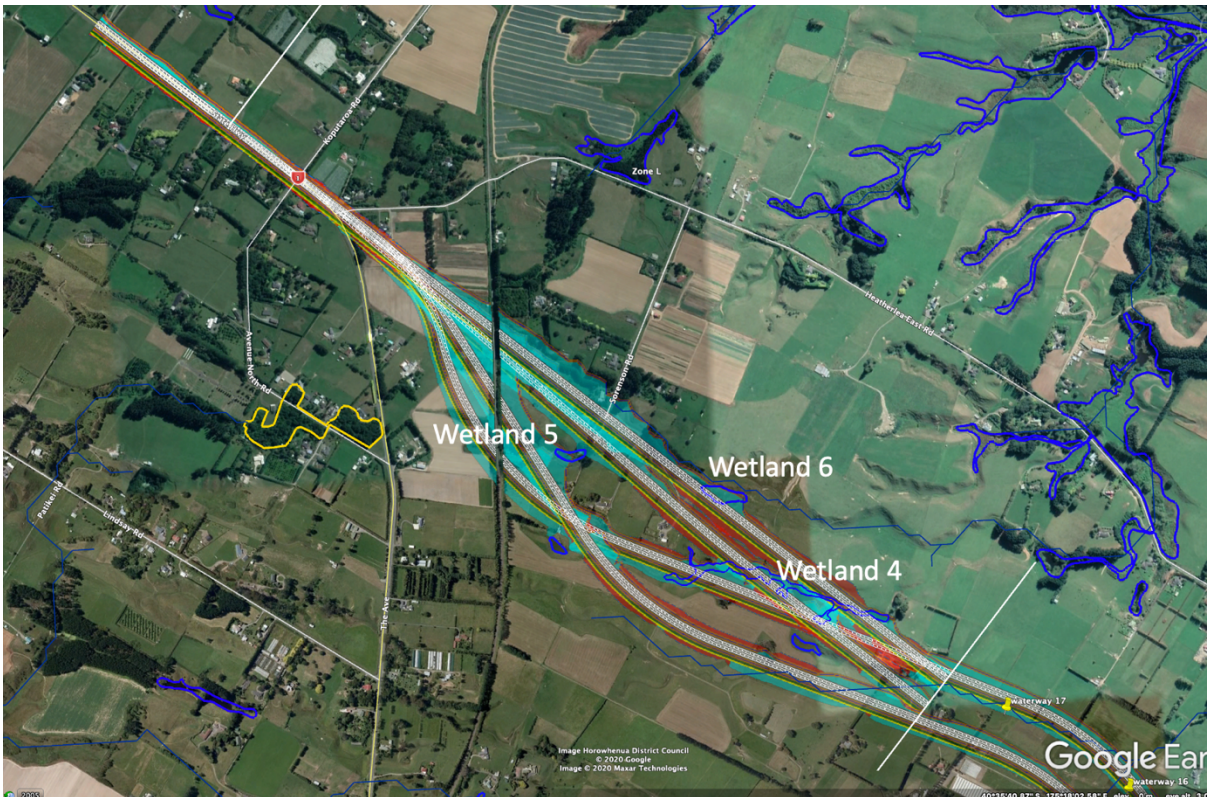

Figure 10. Terrestrial, freshwater and wetland ecological constraints for Zone L.

3.2 Constraints Analysis Results

The nature and extent of interactions between alignment options for each of the Zones were quantified in GIS (prior to the MAC workshops and updated following the workshops) and are presented in Table 12.

Table 12. Nature and extent of interactions between O2NL alignment options and ecological constraints.

Feature	Unit	Ref number	Type/description	Alignment options								
				A - White	A-Green							
Waterway	m	1–3	1 Order	405	348							
Wetland	ha	1	Pastoral	1.5	1.53							
				B - White	B-Green	B-Cyan						
Forest	ha	2 & 4	Secondary	0.39	0.41	0.56						
Forest	ha	3	Old-growth (OG)	0.22	0	0.12						
Waterway	m	4–7	1 Order	209	632	536						
Wetland	ha	2	Planted margin	0	0.02	0.54						
				C - White	C-Green		C-Purple					
Waterway	m	8 & 9	1 Order	198	188		197					
Waterway	m	10 (Manga hui stream SOS-A)	Permanent/1 Order	143	134		84					
Waterway	m	11 (Waikawa water race SOS-A)	Permanent water race	0	63		295					
						D-Cyan		D-Dark Blue				
Waterway	m	11 (Waikawa water race SOS-A)	Permanent water race			133		127				
Waterway	m	13 & 15	1 Order			195		150				
Waterway	m	12	2 Order			83		93				
Waterway	m	14 (Kuku Stream)	3 Order, Permanent			90		167				
Forest	ha	5	Unknown (swamp forest?)			0.34		0				
					E-Green	E-Cyan						
Wetland	ha	3	Unknown (seepage?)		0.15	0.23						
						G-Cyan	G-Purple		G-White			
Forest	ha	6 (Arapaepae Bush)	OG, snails			0	0		0			
						K-Cyan		K-Dark Blue		K-Yellow		
Waterway	m	16	2 Order (trib Koputaroa stm)			78		81		124		
Waterway	m	17	1 Order (trib Koputaroa stm)			193		210		187		
					L-Green		L-Purple				L-Black	L-Orange
Wetland	ha	4–6	Pastoral, pond, pastoral seep		0.8		0.68				0.72	0.1
Waterway	m	17	1 Order (trib Koputaroa stm)		120		40				10	440

3.3 Recommended MCA 1A Scores

In summary, the following (Table 13) constraint scores are recommended for the MCA 1A process.

Table 13. Recommended MCA 1A ecology constraint scores.

Alignment Option	Terrestrial ecology	Waterway and wetland ecology
A - Green	1	3
A - White	1	3
B - Cyan	4	2
B - Green	2	2
B - White	4	2
C - Green	1	4
C - Purple	1	4
C - White	1	2
D - Cyan	3	4
D - Dark Blue	1	4
E - Cyan	1	2
E - Green	1	2
F - Orange	1	1
F - Purple	1	1
F - White	1	1
G - Cyan	1	1
G - Purple	1	1
G - White	1	1
H - Cyan	1	1
H - Purple	1	1
K - Cyan	1	2
K - Dark Blue	1	2
K - Yellow	1	2
L - Black	1	2
L - Green	1	2
L - Orange	1	2
L - Purple	1	2

4.0 MCA 1B – ECOLOGICAL FEATURES AND CONSTRAINTS

4.1 Summary of ecological constraints for roundabout and grade separation options

Manakau South

- Option A (roundabout) Freshwater = 3. Concerns relate to interactions with Waiauti Stream[2] – reasonable difficulty possible (i.e., three points of stream interaction). Terrestrial = 1.
- Option B (grade separation) Freshwater = 4. Concerns relate to interactions with Waiauti Stream – Clear aspects of difficulty (e.g., seven points of stream interaction). Terrestrial = 1.

Figure 11. Terrestrial, freshwater and wetland ecological constraints for South Manakau roundabout and grade separation options.

[2] Waiauti Stream at this location is 3rd order (both branches), is not listed in One Plan Schedule B, and there are no freshwater fish records publicly available for the stream. It is however likely at least one At Risk fish species is present (given the stream and catchment attributes); therefore, I have assumed the stream has moderate to high ecological value).

Manakau North

- Option C (roundabout) Freshwater = 1. Few difficulties. Terrestrial = 4. Loss of 0.34 ha forest remnant (unverified; query Schedule F). Terrestrial would be scored 1 if forest impact could be avoided.
- Option D (grade separation) Freshwater = 4. Concerns relate to interactions with Waikawa Stream, and Waterway 12 (2nd order). Terrestrial = 5. Loss of a 0.34 ha forest remnant (unverified; query Schedule F) and loss of swamp forest on eastern branch. Terrestrial would be scored 1 if forest impact could be avoided.
- Option E (no connection) both Freshwater and Terrestrial = 1. Option presents no additional constraint.

Figure 12. Terrestrial, freshwater and wetland ecological constraints for North Manakau roundabout and grade separation options.

Kimberly

- Option A (roundabout) both Freshwater and Terrestrial = 1. Few difficulties.
- Option B (grade separation) both Freshwater and Terrestrial = 1. Few difficulties.

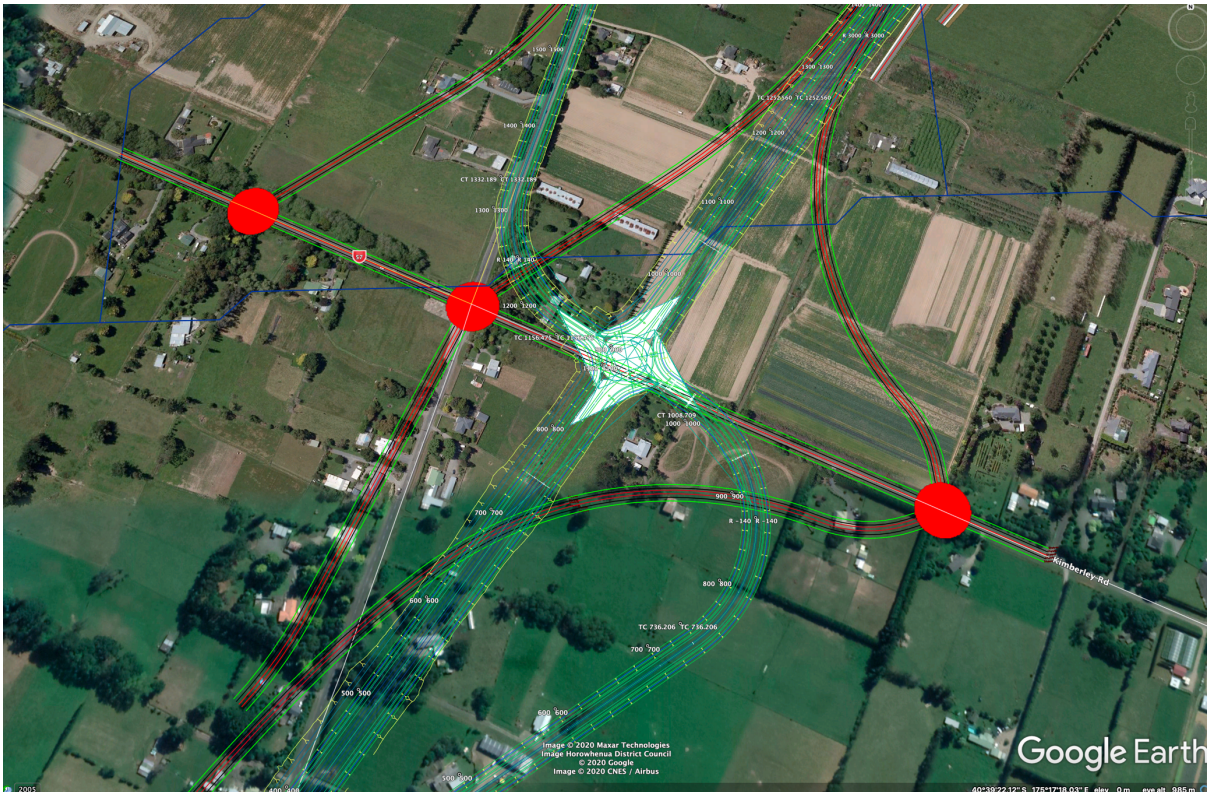

Figure 13. Terrestrial, freshwater and wetland ecological constraints for Kimberly roundabout and grade separation options.

Tararua

- Option C (roundabout) both Freshwater and Terrestrial = 1. Few difficulties.
- Option D (grade separation) both Freshwater and Terrestrial = 1. Few difficulties.

Figure 14. Terrestrial, freshwater and wetland ecological constraints for Tararua roundabout and grade separation options.

State Highway 1 meets State Highway 57

- Option A (roundabout) Freshwater = 2. Minor aspects of difficulty regarding interactions with Waterway 16. Terrestrial = 1. Few difficulties.
- Option B (grade separation) Freshwater = 2. Minor aspects of difficulty regarding interactions with Waterway 16. Terrestrial = 1. Few difficulties.
- Option C (bifurcation) Freshwater = 2. Minor aspects of difficulty regarding interactions with Waterway 16. Terrestrial = 1. Few difficulties.

Figure 15. Terrestrial, freshwater and wetland ecological constraints for SH1/SH57 roundabout (top) and grade separation (bottom) and bifurcation options.

North Levin

- Option A (roundabout) Terrestrial and freshwater = 1. Few difficulties.
- Option B (grade separation) both Freshwater and Terrestrial = 1. Few difficulties.

Figure 16. Terrestrial, freshwater and wetland ecological constraints for North Levin option.

4.2 Recommended MCA 1B Scores

In summary, the following (Table 14) constraint scores are recommended for the MCA 1B process and remained unchanged through the MCA workshop.

Table 14. Recommended MCA 1B ecology constraint scores.

Option	Terrestrial Ecology	Freshwater and Wetland Ecology
Manakau - Roundabout at South	1	3
Manakau - Grade Separation at South	1	4
Manakau - Roundabout at North	4	1
Manakau - Grade Separation at North	5	4
Manakau - No Connection	1	1
K/T - Roundabout at Kimberley	1	1
K/T - Grade Separation at Kimberley	1	1
K/T - Roundabout at Tararua	1	1
K/T - Grade Separation at Tararua	1	1
Split - Bifurcation	2	1
Split - Roundabout	2	1
Split - Grade Separation	2	1
North Levin - Roundabout	1	1
North Levin - Grade Separation	1	1

5.0 MCA 1C – ECOLOGICAL FEATURES AND CONSTRAINTS

The range of local road options were assessed and scored as using the 1–3 traffic light scale. Results are presented in Table 15. All results were green as the local road options tended to either follow existing formed roads or cross areas of cultivated land devoid of ecological constraints. The recommended scores remained unchanged through the MCA workshop.

Table 15. Recommended MCA 1C ecology constraint scores.

Option	Terrestrial Ecology	Freshwater and wetland ecology	Comments
A1 - Taylors Road / PP2O Tie-in - Connect current SH1 via Waitohu stream bridge / Taylors Road	1	1	Follows existing road
A2 - Taylors Road / PP2O Tie-in - Connect via a new underpass (Taylors Road realignment abandoned)	1	1	Re-aligned SH1 crosses Waterway 1
A3 - Taylors Road / PP2O Tie-in - Connect via a new underpass (Taylors Road via Waitohu Stream bridge)	1	1	Re-aligned SH1 crosses Waterway 1
B1 - South Manakau Road - Reconnect South Manakau Road via an underpass (expressway over)	1	1	Follows existing roads
B2 - South Manakau Road - Reconnect South Manakau Road via an overbridge (expressway under)	1	1	Potential interaction with Waterway 5
B3 - South Manakau Road - Sever South Manakau Road and provide access via Honi Taipua Street	1	1	Follows existing roads
C1 - Honi Taipua Street - Sever Honi Taipua Street and access via Manakau Heights Drive	1	1	No issues
C2 - Honi Taipua Street - Reconnect Honi Taipua Street via an overbridge (expressway under)	1	1	No issues
C3 - Honi Taipua Street - Reconnect Honi Taipua Street via a footbridge only (expressway under), vehicle access via Manakau Heights Drive	1	1	No issues
C4 - Honi Taipua Street - Sever Honi Taipua Street and create a Mokena Kohere Street footbridge	1	1	Crosses Waterway 8 at right angles
D1 - North Manakau Road - Reconnect North Manakau Road via an overbridge (expressway under)	1	1	No issues – in cultivated paddock
D2 - North Manakau Road - Reconnect North Manakau Road via an underpass (expressway over)	1	1	Follows exiting road
E1 - Kuku East Road - Reconnect Kuku East Road via an overbridge (expressway under)	1	1	Follows existing road
E2 - Kuku East Road - Reconnect Kuku East Road via an underpass (expressway over)	1	1	Follows existing road
EQ - Quarry Access - Provide access under the Ohau River Bridge (expressway over)	1	1	Crosses cultivated land
F1 - Muhunoa East Road - Reconnect Muhunoa East Road via an overbridge (expressway under)	1	1	Follows existing road

F2 - Muhunoa East Road - Reconnect Muhunoa East Road via an underpass (expressway over)	1	1	Follows existing road
F3 - Muhunoa East Road - Sever Muhunoa East Road and provide access via Arapaepae Road or Mcleavey Road	1	1	Follows existing roads
G1 - Mcleavey Road - Reconnect Muhunoa East Road via an overbridge (expressway under)	1	1	Follows existing roads or is on cultivated land
G2 - Mcleavey Road - Reconnect Muhunoa East Road via an underpass (expressway over)	1	1	Follows existing roads
G3 - Mcleavey Road - Sever Muhunoa East Road and provide access via Muhunoa East Road or Arapaepae Road	1	1	Follows existing roads
H1 - Arapaepae Road south of Kimberley Road - Sever Arapaepae Road and provide access via Muhunoa East Road	1	1	Follows existing roads
H2 - Arapaepae Road south of Kimberley Road - Sever Arapaepae Road and provide access via Mcleavey Road	1	1	Clips top end of Wetland 3
H3 - Arapaepae Road south of Kimberley Road - Sever Arapaepae Road and provide access via Kimberley Road / new link	1	1	Follows existing roads or is on cultivated land
I1 - Muhunoa East - Muhunoa East, Mcleavey and Kimberley severed, new connecting road built	1	1	Clips top end of Wetland 3 (assumed no effect to McLeavey Bush)
J1 - Kimberley Road - Reconnect Kimberley Road via an overbridge (expressway under)	1	1	Follows existing roads or is on cultivated land
J2 - Kimberley Road - Reconnect Kimberley Road via an underpass (expressway over)	1	1	Follows existing roads or is on cultivated land
J3 - Kimberley Road - Sever Kimberley Road and provide access via Arapaepae South and a new link	1	1	Follows existing roads or is on cultivated land
J4 - Kimberley Road - Sever Kimberley Road and provide access via Tararua Road and a new link	1	1	Follows existing roads or is on cultivated land
K1 - Queen Street - Reconnect Queen Street via an underpass (expressway over)	1	1	Follows existing roads or is on cultivated land
K2 - Queen Street - Reconnect Queen Street via an overbridge (expressway below ground level)	1	1	Follows existing roads
L2 - Waihou Road - Reconnect Waihou Road via a new link to Wakefield Street	1	1	Follows existing roads or is on cultivated land
N1 - Sorenson Road - Reconnect Sorenson Road via an underpass (expressway over)	1	1	Follows existing roads or is on cultivated land
N2 - Sorenson Road - Reconnect Sorenson Road via an overbridge (expressway under)	1	1	Follows existing roads or is on cultivated land
N3 - Sorenson Road - Retain Sorenson Road status quo based on alignment selection	1	1	Follows existing roads or is on cultivated land
P1 - Heatherlea East Road and Koputaroa Road - Reconnect Heatherlea East Road and Koputaroa Road via an intersection to a new roundabout on SH1	1	1	Follows existing roads or is on cultivated land
P2 - Heatherlea East Road and Koputaroa Road - Reconnect Heatherlea East Road and Koputaroa Road via an interchange on SH1	1	1	Follows existing roads or is on cultivated land
Q1 - Avenue North Road - Convert to cul de sac, active mode access to SH1 only	1	1	Follows existing roads or is on cultivated land

REFERENCES & BIBLIOGRAPHY

EIANZ. (2018). Ecological Impact Assessment (EcIA). EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems [2nd edition].

Leathwick J.R., Morgan, F. Wilson, G., Rutledge, D., McLeod, M., & Johnston, K. (2003). Land Environments of New Zealand: A Technical Guide. David Bateman: Auckland.

Leathwick, J.R., McGlone, M., Walker, S., & Briggs C.M. (2005). Predicted potential natural vegetation of New Zealand. Lincoln, Manaaki Whenua Press. [Poster]

Ravine, D. (1995). Manawatu Plains Ecological District Survey Report for the Protected Natural Areas Programme. Department of Conservation: Wanganui.