TE TUPU NGĀTAHI
SUPPORTING GROWTH

North West Strategic Assessment of Ecological Effects

December 2022

Version 1

WAKA KOTAHI NZ TRANSPORT AGENCY

AT

New Zealand Government

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Appendices

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Abbreviations

Acronym/Term	Description
AEE	Assessment of Effects on the Environment
ASH	Alternative State Highway
AT	Auckland Transport
AUP:OP	Auckland Unitary Plan Operative in Part
BCI	Brigham Creek Interchange
CC2W	City Centre to Westgate
ED	Ecological District
FTN	Frequent Transit Network
FULSS	Future Urban Land Supply Strategy
FUZ	Future Urban Zone
NAL	North Auckland Line
NoR	Notice of Requirement (under the Resource Management Act 1991)
Project Area	Area that is located within the designation footprint (including all its associated NoRs)
RMA	Resource Management Act 1991
RTC	Rapid Transit Corridor
RAMC	Regional Active Mode Corridor
RUB	Rural Urban Boundary
SG	Te Tupu Ngātahi Supporting Growth
SH16	State Highway 16
TAR	Threatened or At Risk
The Council	Auckland Council
Waka Kotahi	Waka Kotahi NZ Transport Agency
ZOI	Zone of Influence

Glossary of Acronyms / Terms

Acronym/Term	Description
Auckland Council	Means the unitary authority that replaced eight councils in the Auckland Region as of 1 November 2010.
Current ecological baseline	Means the prevailing ecological state at the time of the assessment.
Ecological Feature	Specific aspects of an ecosystem that are described and evaluated; the term includes components such as species and habitats and related processes and functions, such as habitat buffers and roosting and feeding habitat.
Greenfields	Generally rural land identified to be urbanised over time.
Hydroperiod	Flow and or soil saturation period of streams or wetlands.
Likely Future Ecological Environment	The likely future environment informed by the Auckland Unitary Plan (AUP).
Primary Study Area	Area associated with the designation boundary.
Project Area	Area of land that is within the proposed designation boundary.
Project Footprint	Area of land that is within the road design.
Rapid Habitat Assessment	The RHA provides a standardised protocol for making a quick, qualitative, site-based assessment of physical stream habitat conditions (Clapcott, 2015).
Secondary Study Area	Area associated with a 100 m radius from the designation boundary.
Significant Ecological Area	An overlay within the Auckland Unitary Plan Operational in Part, whereby areas of terrestrial, freshwater or marine habitat of significant indigenous vegetation or significant habitats of indigenous fauna are identified and protected from the adverse effects of subdivision, use or development.
Wetland	Defined in the Resource Management Act 1991 as “includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions”.
Whenuapai Assessment Package	Four Notices of Requirement and one alteration to an existing designation for the Whenuapai Arterial Transport Network for Auckland Transport.
Zone of Influence	The Zone of Influence is defined in the EIANZ Guidelines as “the areas/resources that may be affected by the biophysical changes caused by the proposed Project and associated activities.”

1 Executive Summary

This Ecological Impact Assessment (EcIA) has been prepared for the North West Strategic Projects Notices of Requirement (NoRs) for Waka Kotahi NZ Transport Agency (Waka Kotahi) and Auckland Transport (AT) (the "Strategic Assessment Package") (Table 1-1).

Table 1-1 North West Strategic Assessment Package – Notices of Requirement and Projects

Notice	Project
NoR S1	Alternative State Highway (**ASH**), including Brigham Creek Interchange (**BCI**)
NoR S2	SH16 Main Road Upgrade
NoR S3	Rapid Transit Corridor (**RTC**), including the Regional Active Mode Corridor (**RAMC**)
NoR KS	Kumeu Rapid Transit Station
NoR HS	Huapai Rapid Transit Station
NoR S4	Access Road Upgrade

As the Strategic Assessment Package relates to proposed designations, this EcIA assesses district plan matters only. Regional matters (along with Wildlife Act (1953) compliance) will be subject to a future consenting phase along with a supporting EcIA. As such, regional matters have not been formally assessed in this report, however the relevant matters have been screened to inform the designation boundary and future regional resource consents.

In order to inform the ecological baseline, ecological features within each Notice of Requirement (NoR) boundary were identified, mapped and their value assessed in terms of representativeness, rarity/distinctiveness, diversity/pattern and ecological context. A summary of the ecological values are provided for terrestrial vegetation (Table 1-2), district plan trees[1] (Table 1-3), terrestrial fauna (Table 1-4), streams (Table 1-5) and wetlands (Table 1-6).

Table 1-2 Ecological values of terrestrial vegetation types for each NoR

Vegetation Type	Abbrev.	NoR S1	NoR S2	NoR S3	NoR HS	NoR KS	NoR S4
Brown Field	BF	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Exotic Forest	EF	Moderate	-	-	-	-	-
Exotic Forest – Native Understorey	EF.1	High	-	High	-	-	-
Exotic Forest – Exotic Understorey	EF.2	Moderate	-	Moderate	-	-	-
Exotic Grassland	EG	Low	Low	Low	Low	Low	Low
Exotic Scrub	ES	Low	Low	Low	Low	Low	Low

[1] Only district plan vegetation (trees >4m in high and or in open space) were included as it is an NoR application.

Vegetation Type	Abbrev.	NoR S1	NoR S2	NoR S3	NoR HS	NoR KS	NoR S4
Planted Vegetation – Native (recent)	PL.1	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Planted Vegetation - Native (mature)	PL.2	High	-	-	-	-	High
Planted Vegetation – Exotic (amenity)	PL.3	Low	Low	Low	Low	-	Low
Treeland – Mixed Native/Exotic	TL.2	High	High	High	High	High	-
Treeland – Exotic-Dominated	TL.3	Moderate	Moderate	Moderate	Moderate	Low	Moderate
Kānuka Scrub/Forest	VS2	High	-	-	-	-	-
Pūriri Forest	WF7	Very High	-	-	-	-	-
Kahikatea, pukatea forest	WF8	-	Very High	Very High	-	-	-

Table 1-3 Ecological values of District Plan trees for each NoR

Vegetation Type	Abbrev.	NoR S1	NoR S2	NoR S3	NoR HS	NoR KS	NoR S4
Exotic Forest	EF	Moderate	-	-	-	-	-
Treeland – Mixed Native/Exotic	TL.2	Moderate	-	-	-	-	-
Treeland – Exotic-Dominated	TL.3	Moderate	Low	Low	Low	-	Low
Kahikatea, pukatea forest	WF8	-	Low	Low	-	-	-
Unitary Plan Notable Trees	-	-	Negligible	Negligible	-	-	-
Open Space Trees (Huapai Domain)	-	-	-	Low	-	-	-

Table 1-4 Ecological values of terrestrial fauna for each NoR

Fauna Type	NoR S1	NoR S2	NoR S3	NoR HS	NoR KS	NoR S4
Mammals						
Long-tailed bats	Very High	Very High	Very High	Very High	Very High	Very High
Birds						

Fauna Type	NoR S1	NoR S2	NoR S3	NoR HS	NoR KS	NoR S4
Long-tailed cuckoo	Very High	Very High	Very High	Very High	Very High	Very High
Brown teal	Very High	Very High	Very High	Very High	Very High	-
Dabchick	Very High	Very High	Very High	Very High	Very High	-
Banded rail	High	High	High	High	High	-
North Island fernbird	High	High	High	High	High	-
Spotless crake	High	High	High	High	High	-
New Zealand pipit	High	High	High	High	High	High
North Island kākā	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Little black shag	Moderate	Moderate	Moderate	Moderate	Moderate	-
Pied shag	Moderate	Moderate	Moderate	Moderate	Moderate	-
Herpetofauna						
Copper skink	High	High	High	High	High	High
Ornate skink	High	High	High	High	High	High

Table 1-5 Ecological values of directly impacted streams for each NoR

Stream ID	NoR S1	NoR S2	NoR S3	NoR HS	NoR KS	NoR S4
S1-S1a	Moderate	-	-	-	-	-
S1-S2	Moderate	-	-	-	-	-
S1-S1b	High	-	-	-	-	-
S1-S3	Low	-	-	-	-	-
S1-S9	Low	-	-	-	-	-
S1-S10	Low	-	-	-	-	-
S1-S13	Low	-	-	-	-	-
S1-S14	Low	-	-	-	-	-
S1-S16	Low	-	-	-	-	-
S1-S20a	Moderate	-	Moderate	-	-	-
S1-S20d	Low	-	Low	-	-	-
S1-S20e	Low	-	Low	-	-	-
S1-S21	Moderate	-	Moderate	-	-	-

Stream ID	NoR S1	NoR S2	NoR S3	NoR HS	NoR KS	NoR S4
S1-S23	Low	-	Low	-	-	-
S1-S25	Low	-	Low	-	-	-
S1-S27	Low	-	-	-	-	-
S1-S28	Low	-	-	-	-	-
W4-S1	High	-	High	-	-	-
S2-S1	-	Low	-	-	-	-
S2-S3	-	Moderate	-	-	-	-
S2-S4	-	-	-	-	High	-

Table 1-6 Ecological values of directly impacted wetlands for each NoR

Wetland	NPS-FM	NoR S1	NoR S2	NoR S3	NoR HS	NoR KS	NoR S4
S1-W1	Natural	Low	-	-	-	-	-
S1-W2	Natural	Low	Low	-	-	-	-
S1-W4	Natural	Moderate	-	-	-	-	-
S1-W56	Natural	Low	-	-	-	-	-
S1-W6	Natural	High	-	-	-	-	-
S1-W11	Natural	High	-	-	-	-	-
S1-W12	Natural	Low	-	-	-	-	-
S1-W19	Natural	High	-	-	-	-	-
S1-W20	Natural	Moderate	-	-	-	-	-
S1-W21	Natural	High	-	-	-	-	-
S1-W22	Natural	High	-	-	-	-	-
S1-W23 & S1-W23 (OW)	Natural	Low	-	-	-	-	-
S1-W24 & S1-W24 (OW)	Natural	Low	-	-	-	-	-
S1-W25	Natural	Low	-	-	-	-	-
S1-W31 & S1-W31 (OW)	Natural	Low	-	-	-	-	-

Wetland	NPS-FM	NoR S1	NoR S2	NoR S3	NoR HS	NoR KS	NoR S4
S1-W33	Natural	Low	-	-	-	-	-
S1-W34 & S1-W34 (OW)	Natural	Low	-	-	-	-	-
S1-W38	Natural	Low	-	Low	-	-	-
S1-W39	Natural	Low	-	Low	-	-	-
S1-W40	Natural	High	-	-	-	-	-
S1-W41	Natural	Moderate	-	Moderate	-	-	-
S1-W42	Natural	Low	-	Low	-	-	-
S1-W43 & S1-W43 (OW)	Natural	Low	-	Low	-	-	-
S1-W44	Natural	Moderate	-	Moderate	-	-	-
S1-W45 & S1-W45 (OW)	Natural	Low	-	Low	-	-	-
S1-W46 & S1-W46 (OW)	Natural	Moderate	-	Moderate			
S1-W47	Natural	Low		Low			
S1-W50 & S1-W50 (OW)	Natural	Low		Low			
S1-W53	Natural	High					
S1-W54	Natural	Moderate		Moderate			
S1-W69	Natural	Moderate		Moderate			
S1-W72	Natural	Negligible					
S1-W2			Low				
S2-W2			High	High	High		
S2-W3			Moderate	Moderate	Moderate		
S2-W5 & S2-W5 (OW)			Low	Low	Low		
S2-W6			Low				

Wetland	NPS-FM	NoR S1	NoR S2	NoR S3	NoR HS	NoR KS	NoR S4
S2-W8			Moderate	Moderate			
S2-W9 & S2-W9 (OW)			High	High			
S2-W10			Low				
S2-W11			Low				
S2-W12			Moderate	Moderate		Moderate	
S2-W12a			Moderate	Moderate		Moderate	
S4-W1							Low

Construction Effects

Table 1-7 to Table 1-10 provides a summary of district matter ecological effects during construction prior to any mitigation. The summary represents the level of effect for the baseline and the likely future ecological environment as one where they are the same and with a * where they differ. Where the level of effect was assessed to be **Moderate** or higher, then mitigation has been suggested and final mitigation will be confirmed as a condition through an Ecological Management Plan. Construction effect mitigation measures will include:

- A Bat Management Plan (BMP) for NoR S1, S3, HS, KS, and S4. Details of the BMP will depend on bat habitat within the future ecological environment and is likely to include bat habitat surveys prior to construction, siting of compounds and laydown areas to avoid bat habitat, lighting design to reduce light levels and spill from construction areas and restriction of nightworks around treeland bat habitat.
- Bird management will be required for brown teal and dabchick at NoR S1, S2, S3, HS, and KS. Considerations for bird management will include a bird survey prior to construction to confirm Threatened or At Risk (TAR) species are not present and to provide guidance if TAR species are present, including the avoidance of the bird breeding season (September to February) during construction).

Table 1-7 Summary of ecological effects during construction prior to mitigation for district plan trees

Construction - Terrestrial vegetation (district plan vegetation only)	
NoR	**Permanent loss of habitat/ecosystem, fragmentation, and edge effects due to vegetation removal (district plan vegetation only)**
NoR S1	Very Low (EF), Low (TL.2 & TL.3)
NoR S2	Very Low (TL.3, WF8, & Unitary Plan notable tree)
NoR S3	Very Low (TL.3, WF8, Unitary Plan notable tree, Unitary Plan open space trees)
NoR HS	Very Low (TL.3)

Construction - Terrestrial vegetation (district plan vegetation only)	
NoR KS	N/A
NoR S4	Low (TL.3)

Table 1-8 Summary of ecological effects during construction prior to mitigation for bats

Construction - Bats			
NoR	**Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)**	**Loss of foraging habitat due to removal of district plan vegetation**	**Mortality or injury to bats due to removal of district plan vegetation**
NoR S1	**Moderate**	Low	**Moderate**
NoR S2	Low	Low	Low
NoR S3	**Moderate**	Low	Low
NoR HS	**Moderate**	Low	Low
NoR KS	**Moderate**	N/A	N/A
NoR S4	Low	Low	**Moderate** *Low

Notes: * = Indicates a level of effect associated with the Likely Future Ecological Environment that is different from the baseline level of effects.

Table 1-9 Summary of ecological effects during construction prior to mitigation for birds

Construction - Birds				
NoR	**Disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust etc.)**	**Loss of foraging habitat due to removal of district plan vegetation**	**Nest loss due to removal of district plan vegetation**	**Mortality or injury to birds due to removal of district plan vegetation**
NoR S1				
Non-TAR Birds	Low	Low	Low	Low
Long-tailed cuckoo	Low	Very Low	Very Low	Very Low
New Zealand pipit	Very Low	Very Low	Very Low	Very Low
North Island kākā	Very Low	Very Low	Very Low	Very Low

Construction - Birds				
Brown teal, dabchick	**Moderate**	N/A	N/A	N/A
North Island fernbird, banded rail, spotless crake	Low	N/A	N/A	N/A
Little black shag, pied shag	Low	N/A	N/A	N/A
NoR S2				
Non-TAR Birds	Low	Very Low	Low	Low
Long-tailed cuckoo	Low	Low	Low	Low
New Zealand pipit	Very Low	Very Low	Very Low	Very Low
North Island kākā	Very Low	Very Low	Very Low	Very Low
Brown teal, dabchick	**Moderate**	N/A	N/A	N/A
North Island fernbird, banded rail, spotless crake	Low	N/A	N/A	N/A
Little black shag, pied shag	Low	N/A	N/A	N/A
NoR S3				
Non-TAR Birds	Low	Very Low	Low	Low
Long-tailed cuckoo	Low	Low	Low	Low
New Zealand pipit	Very Low	Very Low	Very Low	Very Low
North Island kākā	Very Low	Very Low	Very Low	Very Low
Brown teal, dabchick	**Moderate**	N/A	N/A	N/A
North Island fernbird, banded rail, spotless crake	Low	N/A	N/A	N/A
Little black shag, pied shag	Very Low	N/A	N/A	N/A
NoR HS				
Non-TAR Birds	Low	Very Low	Low	Low
Long-tailed cuckoo	Low	Low	Low	Low
New Zealand pipit	Very Low	Very Low	Very Low	Very Low
North Island kākā	Very Low	Very Low	Very Low	Very Low

Construction - Birds				
Brown teal, dabchick	**Moderate**	N/A	N/A	N/A
North Island fernbird, banded rail, spotless crake	Low	N/A	N/A	N/A
Little black shag, pied shag	Low	N/A	N/A	N/A
NoR KS				
Non-TAR Birds	Low	N/A	N/A	N/A
Long-tailed cuckoo	Low	N/A	N/A	N/A
New Zealand pipit	Very Low	N/A	N/A	N/A
North Island kākā	Very Low	N/A	N/A	N/A
Brown teal, dabchick	**Moderate**	N/A	N/A	N/A
North Island fernbird, banded rail, spotless crake	Low	N/A	N/A	N/A
Little black shag, pied shag	Low	N/A	N/A	N/A
NoR S4				
Non-TAR Birds	Low	Very Low	Low	Low
Long-tailed cuckoo	Low	Low	Low	Low
New Zealand pipit	Very Low	Very Low	Very Low	Very Low
North Island kākā	Very Low	Very Low	Very Low	Very Low

Table 1-10 Summary of ecological effects during construction prior to mitigation for lizards

Construction – Lizards	
NoR	**Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, dust etc.)**
NoR S1	Low
NoR S2	Very Low
NoR S3	Very Low
NoR HS	Very Low
NoR KS	Very Low

Construction – Lizards	
NoR S4	Very Low

The residual (post-mitigation) level of effect for all construction effects are considered **Negligible** or **Very Low**.

Operational Effects

Table 1-11 to Table 1-13 provides a summary of district plan matter ecological effects during operation due to the presence of the road resulting in disturbance or loss in connectivity to bats, birds and lizards. The summary represents the level of effect for the baseline and the likely future ecological environment as one where they are the same and with a * where they differ. Where the level of effect was assessed to be **Moderate** or higher, then mitigation has been developed.

Operational effect mitigation measures will include:

- A BMP for all NoRs. The BMP should include the retention of mature trees where possible, buffer planting, hop-overs and unders at strategic locations as outlined in Appendix 14. In addition, the BMP should consider lighting design along strategic location of the road (stream crossings).
- Bird management will be required for long-tailed cuckoo at NoR S1, and S3. Bird management will also be required for brown teal and dabchick at NoR S1, S3, and HS. Considerations for bird management will include retention of vegetation near wetland habitat (where practicable), buffer planting between the road alignment and suitable habitat adjacent to the road, and installation of vegetation hop-overs in key areas.

Table 1-11 Summary of ecological effects during operation prior to mitigation for bats

Operation - Bats		
NoR	**Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration**	**Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape**
NoR S1	**High**	**Very High**
NoR S2	Low	**Moderate**
NoR S3	**High**	**High**
NoR HS	**Moderate**	**Moderate**
NoR KS	**Moderate**	**Moderate**
NoR S4	**Moderate**	**Moderate**

Table 1-12 Summary of ecological effects during operation prior to mitigation for birds

Operation - Birds		
NoR	**Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)**	**Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure**
NoR S1		
Non-TAR Birds	Low	Low
Long-tailed cuckoo	Low	**Moderate**
New Zealand pipit	Very Low	Low
North Island kākā	Very Low	Low
Brown teal, dabchick	**Moderate**	**Moderate**
North Island fernbird, banded rail, spotless crake	Low	Low
Little black shag, pied shag	Very Low	Very Low
NoR S2		
Non-TAR Birds	Very Low	Very Low
Long-tailed cuckoo	Low	Low
New Zealand pipit	Very Low	Very Low
North Island kākā	Very Low	Very Low
Brown teal, dabchick	Low	Low
North Island fernbird, banded rail, spotless crake	Very Low	Very Low
Little black shag, pied shag	Very Low	Very Low
NoR S3		
Non-TAR Birds	Very Low	Very Low
Long-tailed cuckoo	Low	**Moderate**
New Zealand pipit	Very Low	Low
North Island kākā	Very Low	Low
Brown teal, dabchick	**Moderate**	**Moderate**

Operation - Birds		
North Island fernbird, banded rail, spotless crake	Low	Low
Little black shag, pied shag	Very Low	Low
NoR HS		
Non-TAR Birds	Low	Low
Long-tailed cuckoo	Low	Low
New Zealand pipit	Low	Low
North Island kākā	Low	Low
Brown teal, dabchick	**Moderate**	Low
North Island fernbird, banded rail, spotless crake	Low	Low
Little black shag, pied shag	Low	Low
NoR KS		
Non-TAR Birds	Low	Low
Long-tailed cuckoo	Low	Low
New Zealand pipit	Low	Low
North Island kākā	Low	Low
Brown teal, dabchick	Low	Low
North Island fernbird, banded rail, spotless crake	Low	Low
Little black shag, pied shag	Low	Low
NoR S4		
Non-TAR Birds	Very Low	Very Low
Long-tailed cuckoo	Low	Low
New Zealand pipit	Very Low	Low
North Island kākā	Very Low	Low

Table 1-13 Summary of ecological effects during operation prior to mitigation for lizards

Operation - Lizards		
NoR	**Disturbance and displacement of existing and future lizards due to**	**Loss in connectivity due to permanent habitat loss, light and noise/vibration effects from the road,**

Operation - Lizards		
	light, noise, and vibration effects from the presence of the road	**leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure**
NoR S1	Low	Low
NoR S2	Low	Low
NoR S3	Low	Low
NoR HS	Low	Low
NoR KS	Low	Low
NoR S4	Low	Low

The residual (post-mitigation) level of effect for all operational effects are **Negligible, Very Low** or **Low**.

Positive Effects

There is the potential for positive effects which apply to each of the NoRs. This includes improved blue/green infrastructure and associated landscaping, and mass revegetation of sloping berms, batters and embankments to connect with retained forest remnant/mature trees. Additionally, the scale of the proposed bat mitigation in association with the revegetation and stormwater wetlands mentioned above will have positive ecological outcomes for native fauna. Specifically, the development of the ASH will result in a 'green' corridor which will buffer the rural areas to the south of the ASH against future urban development for portions to the north of the ASH. Similarly, the proposed bat mitigation associated with Ngongetepara, Kumeu and Ahukuramu watercourses are likely to improve ecological connectivity around and through the future urban environment.

2 Introduction

This Ecological Impact Assessment (EcIA) has been prepared for the North West Strategic Projects and Kumeū Huapai Local Arterials Notices of Requirement (NoRs) for Waka Kotahi NZ Transport Agency (Waka Kotahi) and Auckland Transport (AT) (the "Strategic Assessment Package").

The NoRs are to designate land for future strategic and local arterial transport corridors as part of Te Tupu Ngātahi Supporting Growth Programme (Te Tupu Ngātahi) to enable the construction, operation and maintenance of transport infrastructure in the North West area of Auckland.

This report assesses the transport effects of the North West Strategic Assessment Package identified in Table 2-1 below. Refer to the main AEE for a more detailed project description.

Table 2-1 North West Strategic Assessment Package – Notices of Requirement and Projects

Notice	Project
NoR S1	Alternative State Highway (**ASH**), including Brigham Creek Interchange (**BCI**)
NoR S2	SH16 Main Road Upgrade
NoR S3	Rapid Transit Corridor (**RTC**), including the Regional Active Mode Corridor (**RAMC**)
NoR KS	Kumeu Rapid Transit Station
NoR HS	Huapai Rapid Transit Station
NoR S4	Access Road Upgrade

2.1 Purpose and Scope of this Report

This assessment forms part of a suite of technical reports prepared to support the assessment of effects within the Strategic Assessment Package. Its purpose is to inform the AEE that accompanies the Strategic Assessment Package sought by Waka Kotahi and AT.

This report considers the actual and potential effects associated with the construction, operation and maintenance of the Strategic Assessment Package on the existing and likely future environment as it relates to ecological effects (District Plan/NoR matters) and recommends measures that may be implemented to avoid, remedy and/or mitigate these effects.

The key matters addressed in this report are as follows:

a) Identify and describe the ecological context/baseline of the Strategic Assessment Package area;
b) Identify and describe the actual and potential ecological effects of each Project corridor, resulting from activities which relate to district matters in the AUP:OP, within the Strategic Assessment Package;
c) Recommend measures as appropriate to avoid, remedy or mitigate actual and potential ecological effects (including any conditions/management plan required) for each Project corridor within the Strategic Assessment Package;
d) Set out ecological considerations that will need to be considered and assessed as part of a future regional resource consent;

e) Present an overall conclusion of the level of actual and potential ecological effects for each Project corridor within the Strategic Assessment Package after recommended measures are implemented.

2.2 Report Structure

The report is structured as follows:

a) Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines;
b) Description of each Project corridor and project features within the Strategic Assessment Package as it relates to Ecology;
c) A discussion on area wide positive effects;
d) An area wide desktop assessment;
e) Identification and description of the existing and likely future ecological environment for each NoR;
f) Description of the actual and potential adverse ecological effects of construction and operation of each NoR as they relate to district plan matters, including recommended measures to avoid, remedy or mitigate potential adverse ecological effects;
g) Description of potential adverse ecological effects for consideration during resource consenting;
h) Overall conclusion of the level of potential adverse ecological effects for each NoR after recommended measures are implemented.

This report should be read alongside the AEE, which contains further details on the history and context of the Project. The AEE also contains a detailed description of works to be authorised for the Project, likely staging and the typical construction methodologies that will be used to implement this work. These have been reviewed by the author of this report and have been considered as part of this assessment of ecological effects. As such, they are not repeated here, unless a description of an activity is necessary to understand the potential effects, then it has been included in this report for clarity.

3 Assessment Approach

3.1 EcIA Assessment

The approach followed in this study is consistent with the approach outlined in the Ecological Impact Assessment (EcIA) Guidelines (Roper Lindsay et al., 2018) (hereinafter referred to as the EIANZ Guidelines). The overarching goal of the ecological assessment is to determine the ecological effects of specific Project features or activities. The requirements for such an assessment are outlined with the EIANZ Guidelines and forms the basis of this report. This process is summarised in Figure 3-1 below. Note that that for the impact management (Stage 3) additional consideration was given to the permitted baseline and the future environment under the UP.

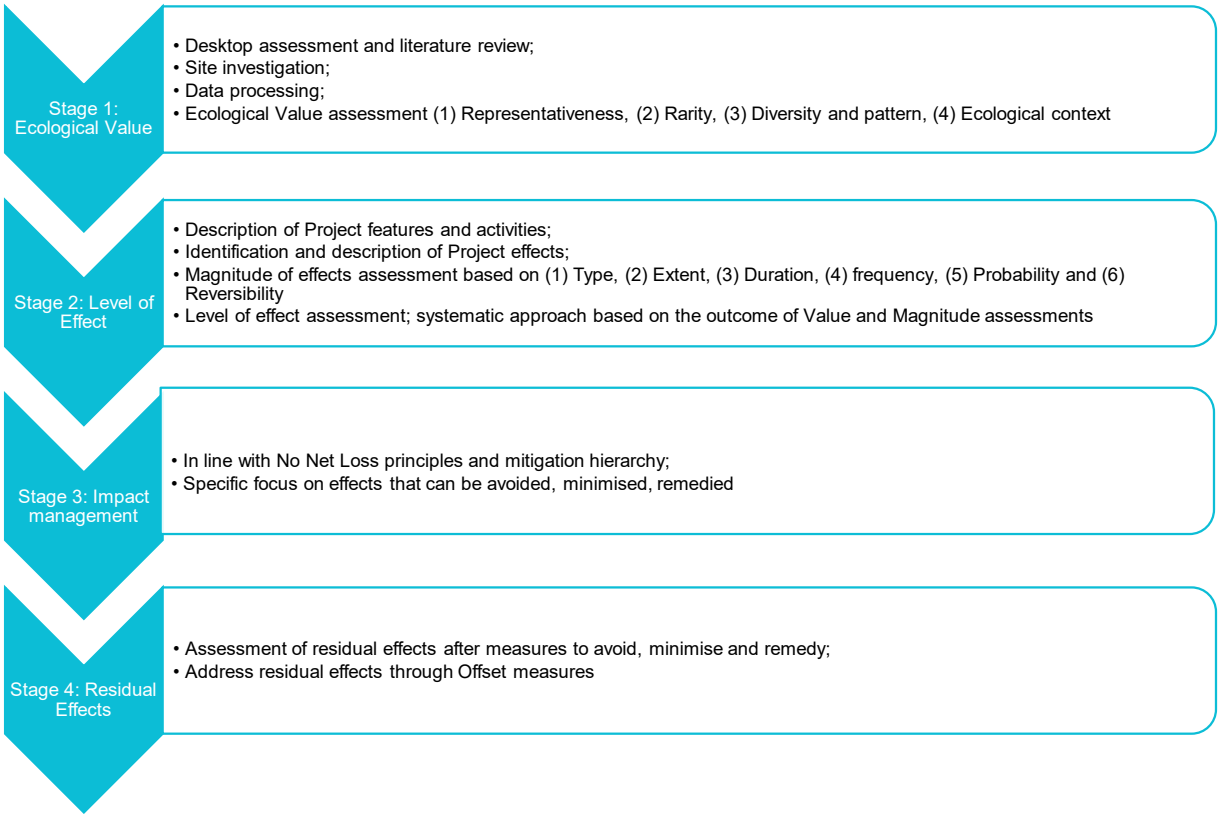

Figure 3-1: Approach process followed for this assessment

3.2 EcIA and the Likely Future Ecological Environment

The EIANZ Guidelines provide guidance to assist with the assessment of the likely future ecological environment in this report. The assessment states:

"The ecologist needs to consider the permitted baseline in order to describe the potential "future ecological environment and to assess effects at that time, and should discuss this with the project planner or legal advisor if in any doubt".

The NW Planning Team has advised of the following to inform the assessment of the likely future environment:

- The purpose of the NoRs within the Strategic Assessment Package is to protect the transport corridors that will support the future urbanisation of Whenuapai, Redhill's North, Kumeū and Huapai. Construction and operation of the new and upgraded corridors will not occur until urbanization has at least been confirmed by way of a plan change or is under development. Guidance on the future urbanization can be taken form the Spatial Land Use Strategy – North West (2021).
- In addition the AUP:OP permits activities for infrastructure, which will also change the likely future environment. These activities include vegetation clearance and the removal of trees, excluding notable trees and street trees. The relevant permitted activities for ecology provisions are set out in Appendix 2.
- Given the planned urbanization of Whenuapai, Redhills North, Kumeū and Huapai, assessing the effects on the environment solely as it exists today (i.e., at the time of ecological site investigation/the preparation of this ecology assessment) will not provide an accurate reflection of the environment in which ecological effects, resulting from the construction and operation of each of the NoRs, will be experienced.
- The assessment of ecological effects should therefore take account of the likely future environment, which takes account of permitted activities for infrastructure and planned urbanisation within the FUZ.

A summary of the likely future environment is provided in the assessment section of each NoR (Sections 8.2, 9.2, 10.2, and 11.2).

3.3 Assessment of District Plan Matters and Approach to Regional Matters

Designations are a form of 'spot zoning' over a route in a district plan. The designation authorises Waka Kotahi or AT, as the relevant requiring authority, to undertake work and activity without the need for land use consent. The designated area is still subject to restrictions on land use under regional matters in the AUP:OP.

As the North West Strategic Assessment Package relates to proposed designation this ecological effects assessment assesses District plan matters only. Regional matters will be subject to a future consenting phase along with a supporting ecological impact assessment (EcIA). As such regional matters have not been formally assessed in this report, however the relevant matters have been screened to inform the designation boundary and future regional resource consents and are presented in Sections 8.4, 9.4, 10.4, and 11.4.

Appendix 3 sets out the split between District and Regional matters in the AUP:OP

3.4 Wildlife Act Matters

The Wildlife Act (1953) includes specific provisions for activities that may disturb, injure or kill native animals. Construction and operational activities that may require consideration under the Wildlife Act are outlined in Appendix 3. The scope of this report pertains to District matters and although not required for NoRs, further consideration has been given to ecological effects under the Wildlife Act in Sections 8.4, 9.4, 10.4, and 11.4. Construction and operational activities that may require consideration under the Wildlife Act are outlined in Appendix 3.

4 Assessment Methodology

Desktop and site investigations were undertaken for ecological features within all six NoRs. Ecological features within the proposed designation boundary and a distance of approximately 100 m[2] radius of the designation have been mapped and included onto this assessment. Vegetation, stream and wetland features were investigated and mapped to provide context for potential adjustments to the proposed designation boundary. In addition to the area including into the ecological mapping, potential habitat for native fauna was considered within the Zone of Influence (ZOI) (see Section 4.1).

4.1 Zone of Influence

The ZOI of the Project relates to an area occupied by habitats and species that are adjacent to and may go beyond the boundary of the Project Area. It is defined in the EIANZ Guidelines as "the areas/resources that may be affected by the biophysical changes caused by the proposed Project and associated activities." The distance of the ZOI and type of effect from the Project can be different for different species and habitat types. The ZOI is used throughout this report to describe the impacts of the Project (construction and operation) on adjacent or connected terrestrial, freshwater and wetland habitats and associated native species. For example, all Significant Ecological Area's (SEA's) within 2 km of each Project Area has been included in the desktop review, along with their connectivity to each Project Area. This is to ensure that important habitat within the wider landscape has been taken into consideration and can be used to inform the potential for flora and fauna to be present within each of the Project Areas and also whether the Project ZOI extends out to these SEA's.

The ZOI of the Project on different species differs depending on how individual species use their environment e.g., mobile species such as long-tailed bats have a larger home range and more diverse habitat requirements compared to lizards and threatened plant species which may be restricted to a small area or specific habitat type. This affects how a species could be impacted by the Projects and this was taken into consideration during the desktop review and site investigations. To reflect the likelihood of a species occurring or dispersal ability within each of the Project Areas, varying search distances were used depending on the species context.

4.2 Desktop Review

A desktop review of existing ecological records was undertaken to gain an understanding of the species and habitats that could be present within the ZOI[3] of each of the six Projects.

The sources of information that were reviewed to determine the likelihood of a species or habitat occurring within or adjacent to each of the Project Areas include:

- Auckland Council Geomaps[4];
- Department of Conservation (DOC) Bioweb records[5];

[2] The designation boundary has undergone several rounds of refinement. The ecological mapping was undertaken on the initial designation boundary and is considered sufficiently wide to provide a contingency for relatively small adjustment during refinement. The 100 m area mapping was included to provide additional context regarding the nature and extent of ecological features (including wetlands).

[3] Defined in the EIANZ Guidelines as "the areas/resources that may be affected by the biophysical changes caused by the proposed Project and associated activities".

[4] https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html

[5] https://www.doc.govt.nz/our-work/monitoring-reporting/request-monitoring-data/

- Department of Conservation Threat Classification Series[6];
- Ecological Regions and Districts of New Zealand (McEwen, 1987);
- iNaturalist records[7], records within approximately 2-5 km buffer of Project Areas;
- Indigenous terrestrial and wetland ecosystems of Auckland (Singers et al., 2017);
- National Institute of Water and Atmospheric Research (NIWA) freshwater fish database[8];
- New Zealand Bird Atlas eBird database[9]; recorded within 10km^2 grid squares. Results from grid square AA65;
- NZ River Name Lines (LINZ Data Service[10]);
- SGA Redhills Notice of Requirement (2020).

4.3 Site Investigations

Site investigations[11] were undertaken in order to:

- Prepare an ecological baseline of terrestrial, freshwater and wetland ecology;
- Inform the assessment of each of the NoRs against the relevant district matters (terrestrial ecology);
- Set out freshwater and wetland matters which may be considered as part of a future regional resource consent, or under relevant wildlife legislation;
- Inform the designation footprint.

4.3.1 Terrestrial Habitat

Site walkovers were undertaken between November 2021 and January 2022 by ecologists; to map and describe the habitats present within and adjacent to the Project Areas of each of the six NoRs. Habitats were classified into ecosystem type based on those described in Singers et al. (2017). The habitats were also assessed as to their potential to support indigenous fauna, including birds, bats, and lizards.

Habitat assessment focused on areas of potentially significant value, such as habitat that was identified as an SEA, classified as forest habitat on Auckland Council's Geomaps – Ecosystems Current Extent (Singers et al., 2017) or appears to be wetland or forest habitat based on aerial photos and during site investigation. Species records from relevant literature and biodiversity databases were used to focus search efforts on certain areas within the Project areas.

During the site walkovers the vegetation assessment included recording the dominant or characteristic species present and the general quality described, including structure, maturity, presence of weeds and evidence of grazing and foliar dieback. Vegetation surveys also included searches for any rare or threatened plant species previously recorded within the Project Areas.

[6] All Department of Conservation Threat Classification Documents are listed in the below webpage. When individual reports are referenced hereafter, they are referenced in-text and in Section 12. https://www.doc.govt.nz/about-us/science-publications/conservation-publications/nz-threat-classification-system/

[7] https://www.inaturalist.org/

[8] https://nzffdms.niwa.co.nz/search

[9] https://ebird.org/atlasnz/home

[10] https://data.linz.govt.nz/layer/103632-nz-river-name-lines-pilot/

[11] Not all features where subject to a site investigation due to access constraints. Features assessed at desktop level are identified throughout the report.

Common plant names are predominantly used within this report. Maps showing the vegetation cover along the NoRs are provided in Appendix 5. Terrestrial ecological value assessment methodology is discussed in Section 4.4.

A bat survey was undertaken for the wider study area using a landscape scale approach (Appendix 11). Bat monitors were deployed between November 2021 and January 2022 and again during March and April 2022. Monitoring data for 14 suitable days for each survey period (i.e., weather conditions not constraining bat activity) were analysed and used for the report.

4.3.2 Bat Surveys

A bat survey was undertaken for the wider North West study area (Appendix 11). The stream corridors associated with Totara Creek, Ngongetepara, Kumeu and Ahukuramu catchments are considered the most likely to indicate bat activity. The bat monitors were deployed between November 2021 and January 2022. Monitoring data for 14 suitable days (weather conditions not constraining bat activity) were analysed and used for the report.

4.3.3 Freshwater Habitat

Where access allowed, streams within the six NoRs identified on Auckland Council Geomaps ('Named Streams') were ground truthed and classified as permanent, intermittent or ephemeral, according to the stream definitions described by Storey & Wadhwa (2009). Any additional streams observed during site walkovers were also classified. Streams are mapped in Appendix 5.

Freshwater assessments were undertaken on all streams identified on site and included stream classification and implementation of the Rapid Habitat Assessment (RHA) protocol and were undertaken by experienced ecologists. The RHA provides a standardised protocol for making a quick, qualitative, site-based assessment of physical stream habitat conditions (Clapcott, 2015). Stream Ecological Valuation (SEV) assessments were not undertaken but are expected to be included during the regional resource consenting phase. As such, macroinvertebrate and fish surveys were not undertaken as part of this assessment. However, NIWA fish records (Franklin et al*.,* 2018) were used to inform potential ecological value of streams. Access was restricted at several locations and as such stream assessments were based solely on desktop information. Freshwater ecological value assessment methodology is discussed in Section 4.4.

4.3.4 Wetland Habitat

Potential wetland habitat areas were identified by ecologists based on Auckland Council Geomaps contours and the presence of wetland vegetation on aerial maps Including a review of historical images). Potential wetlands were mapped and where access permitted, verified through the use of the rapid technique outlined in wetland delineation protocol (Ministry for the Environment, 2020). Because the wetland delineation predominantly relied on desktop assessment, a more conservative delineation was adopted. Ambiguous areas were assumed to be wetlands. Wetland areas are mapped in Appendix 5.

Note that the scope of the specialist study, for route protection, did not provide for a detailed wetland delineation. The key focus was to confirm wetland presence and approximate extent. This approach is considered practical for the purposes of route protection, while it is expected that a more detailed wetland assessment will be undertaken during the regional resource consenting phase.

Wetlands were assessed based on the RMA definition of a wetland[12] and classified into ecosystem type based on those described in Singers et al. (2017). If the habitat present met this definition, it was then further evaluated against the provisions of the NPS-FM for natural wetlands (assessed for potential exclusion on the basis of being artificial or pasture dominated, and temporary rain derived ponding). Details regarding the wetland value assessment is outlined in Section 4.4.

4.4 Ecological Value Assessment

The ecological value of each ecological feature (terrestrial, freshwater and wetland) was assessed using a spreadsheet template by assigning a score of 0 (None), 1 (Low), 2 (Moderate), 3 (High) or 4 (Very High) based on professional judgement (with justification) to attributes associated with each of the four ecological matters recommended within EIANZ (2018): (1) Representativeness 2) Rarity/distinctiveness 3) Diversity and pattern 4) Ecological context including. Considerations in relation to the four matters and corresponding aspects for terrestrial, freshwater and wetland features are detailed below:

Terrestrial Ecology

1) **Representativeness**: Typical structure, species composition and indigenous representation
2) **Rarity/distinctiveness**: Species of conservation significance, distinctive ecological values
3) **Diversity and pattern**: Habitat diversity, species diversity and patterns in habitat use
4) **Ecological context**: Size, shape and buffering function, sensitivity to change, ecological networks (linkages, pathways, migration)

Freshwater Ecology

1) **Representativeness**: RHA score for accessible sites and riparian habitat modification based on desktop stream and catchment assessments
2) **Rarity/distinctiveness**: Species of conservation significance informed by the potential occurrence of Threatened and At-Risk (TAR) fish species
3) **Diversity and pattern**: Level of natural diversity informed by the habitat diversity subsection of the RHA. Stream order, slope and hydroperiod were applied as desktop proxies to judge the likely habitat diversity for streams where access was constraint
4) **Ecological context**: Stream order and hydroperiod

Wetland Ecology

1) **Representativeness**: Hydrological modification based on observations of drains, ponds and catchment land use. Native vegetation informed by site visit and review of landcover information;
2) **Rarity/distinctiveness**: Wetland type (rare or distinctive); distinctive ecological values (ecosystem services) in a larger catchment context;
3) **Diversity and pattern**: Representation of different hydroperiods (permanent, seasonal or temporary) and the structural complexity of vegetation cover
4) **Ecological context**: flood attenuation, streamflow regulation, sediment trapping, water purification, connectivity and migration

[12] "wetland includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions"

The score for each matter was constrained to the highest score for each aspect (for example a High score allocated to a wetland for flood attenuation will result in a High score for the Ecological context matter). The combined ecological value score (ranging from Very High to Negligible), for the four matters, was determined in accordance with the EIANZ Guidelines.

5 Strategic Assessment Package Overview

An overview of the Strategic Assessment Package is provided in Figure 5-1 below, with a brief summary of the Strategic Assessment Package projects provided in Table 5-1

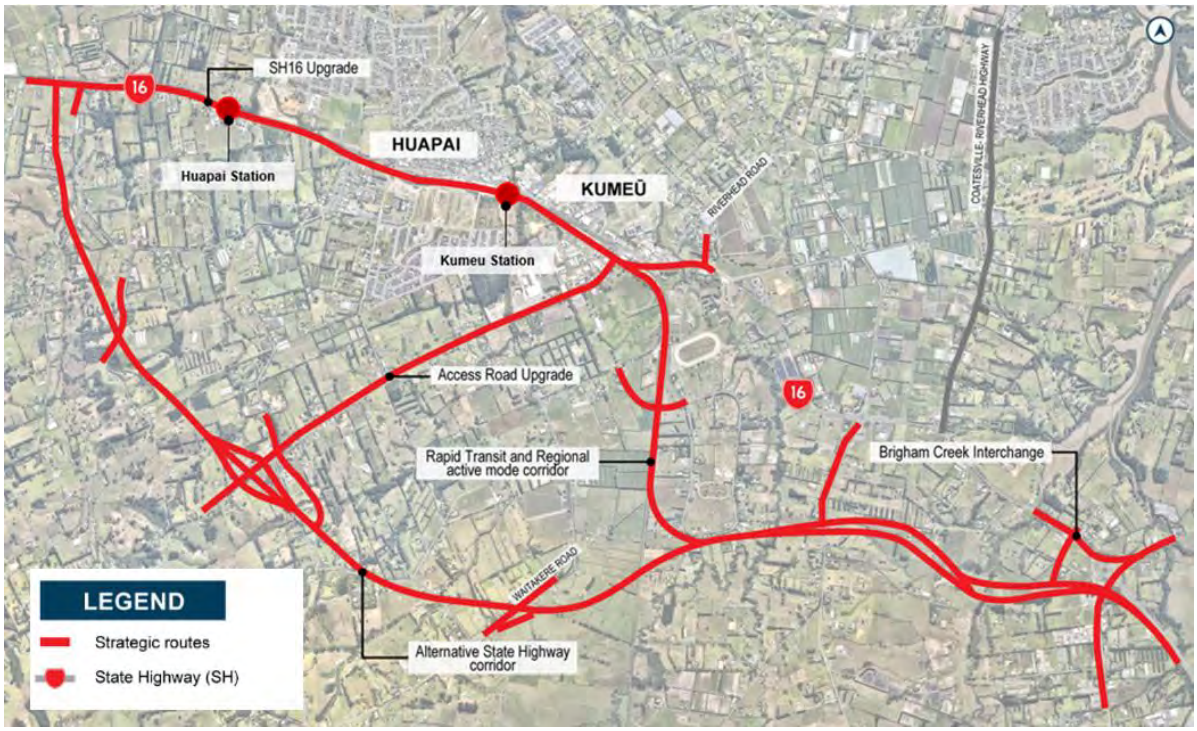

Figure 5-1 North West Strategic Assessment Package – Overview of NoRs for Assessment

Table 5-1 Strategic Assessment Package Project Summary

Corridor	NoR	Description	Requiring Authority
Alternative State Highway, Including Brigham Creek Interchange	S1	A new four-laned dual carriageway motorway and the upgrade of Brigham Creek Interchange.	Waka Kotahi
State Highway 16 Main Road Upgrade (alteration to existing designation 6766)	S2	Upgrade to urban corridor including active modes and realignment of Station Road intersection with SH16.	Waka Kotahi
Rapid Transit Corridor	S3	New Rapid Transit Corridor and active mode corridor in one co-located corridor.	Waka Kotahi
Kumeu RTC Station	KS	New rapid transit station, including transport interchange facilities and accessway.	Waka Kotahi
Huapai RTC Station	HS	New rapid transit station, including transport interchange facilities, park and ride and accessway.	Waka Kotahi
Access Road Upgrade	S4	Upgrade of Access Road to a four-lane cross-section with separated cycle lanes	Auckland Transport

Corridor	NoR	Description	Requiring Authority
		and footpaths on both sides of the corridor.	

Please refer to the AEE for further information on these projects, including a project description, key project features and the planning context.

6 Area Wide Ecological Desktop Review

This section presents the findings of an area wide (all six NoRs) desktop study (which includes a review of the documents listed in Section 4.2 for all of the habitats and species ('ecological features') present within the ZOI of NoRs S1-S4, NoR HS, and NoR KS. Because of the scale of the available data, all NoR specific baseline ecological environment sections below (Sections 8.2.2, 9.2.2, 10.2.2 and 11.2.2) will refer back to this area wide desktop review section.

6.1 Historical Ecological Context

The majority of NoRs (NoR S1 Alternative State Highway (ASH), including Brigham Creek Interchange (BCI), NoR S2 SH16 Main Road Upgrade, NoR S3 Rapid Transit Corridor (RTC), including the Regional Active Mode Corridor (RAMC), NoR KS Kumeu RTC Station, NoR HS Huapai RTC Station and NoR S4 Access Road Upgrade) are present within the Rodney Ecological District (ED), while the Brigham Creek Interchange (BCI) sections of NoR S1 and NoR S3 are within Tamaki Ecological District. In the Project Area, the EDs are characterised by fertile soils from sediments containing volcanic ash (McEwen, 1987). Originally forested, the landscape would have been dominated by northern North Island lowland mixed podocarp broadleaved forest with abundant pūriri and kahikatea, pukatea forest riparian, floodplain and swampy areas and kauri podocarp, broadleaved forest on the steeper slopes and ridge lines (Singers, 2017).

Presently, only 18% indigenous land cover (Rodney ED) and 11% (Tamaki ED) of the native land cover; and 3% (Rodney ED) and 1% (Tamaki ED) of freshwater wetlands and wetland forests remain in the Tamaki Ecological District (Lindsay et al., 2009). The extent of remaining indigenous vegetation cover in the Project Area is severely limited and reduced to small fragments of regenerating vegetation following historical clearance.

6.2 Terrestrial Habitat and Fauna

6.2.1 Terrestrial Vegetation

Where natural habitat remains, the AUP:OP has mapped and classified habitats as terrestrial or marine SEAs. SEAs which occur within 2 km of the six NoRs are presented and described in Table 6-1. A distance of 2 km was selected as potential ZOI for adverse effects of the Project depending on the potential receiving environment and the habitats and species present with a SEA.

Table 6-1 Significant Ecological Areas present within 2 km of the Project Area

SEA	Relevant NoR	Distance from Relevant NoR (km)	SEA Type Terrestrial/ Marine	SEA Description
SEA_T_7036	NoR S1	1.05	Terrestrial	• Representative of <10% natural extent within ED: Kauri, podocarp, broadleaved forest (WF11) (24.67ha)
	NoR S2	0.75		
	NoR S3	0.60		

SEA	Relevant NoR	Distance from Relevant NoR (km)	SEA Type Terrestrial/ Marine	SEA Description
	NoR S4	1.95		• Threatened ecosystems: *Machaerina* sedgeland, (WL11) (5.9ha), Puriri forest, (WF7) • Threatened species: *Coprosma rigida* • Rare species: Kaikomako (*Pennantia corymbose*) and Pacific gecko (*Hoplodactylus pacificus*) • Habitat diversity: Pūriri forest (WF7), Mānuka, kānuka scrub (VS3), Kānuka scrub/forest (VS2), Broadleaved species scrub/forest (VS5), Unclassified (UC) and Kauri, podocarp, broadleaved forest (WF11)
	NoR KS	1.30		
	NoR HS	0.60		
SEA_T_2649	NoR S2	1.10	Terrestrial	• Representative of <10% natural extent within ED: Kauri, podocarp, broadleaved forest (WF11) (3.59 ha)
	NoR S3	1.00		
	NoR S4	1.70		
	NoR HS	1.80		
	NoR KS	1.00		
SEA_T_2650	NoR S1	0.50	Terrestrial	• Representative of <10% natural extent within ED: MF4 (24.43 ha) • Threatened ecosystems: Kahikatea Forest, (MF4) (24.4ha) • Threatened species: tuna / longfin eel (*Anguilla dieffenbachia*), īnanga / whitebait (*Galaxius maculatus, Paranephrops)* • LENZ LVL 4 remaining vegetation: <10% indigenous cover left, 10-20% left • Rare species: Kaikomako (*Pennantia corymbose*)
	NoR S2	0.65		
	NoR HS	0.60		
SEA_T_6311	NoR S1	1.60	Terrestrial	• Representative of <10% natural extent within ED: Kauri, podocarp, broadleaved forest (WF11) (1.27 ha) • Habitat diversity: Kauri, podocarp, broadleaved forest (WF11) and Pūriri forest (WF7)
SEA_T_6329	NoR S2	1.50	Terrestrial	• Representative of <10% natural extent within ED: Kahikatea Forest (MF4) (3.09 ha) • Threatened ecosystems: Kahikatea Forest (MF4) (3.1 ha)
	NoR S1	1.50		
SEA_T_6381	NoR S1	1.60	Terrestrial	• Threatened species: Kākā (*Nestor meridionalis septentrionalis*)
SEA_T_6382	NoR S1	1.65	Terrestrial	• Threatened species: Kākā (Nestor meridionalis septentrionalis)

SEA	Relevant NoR	Distance from Relevant NoR (km)	SEA Type Terrestrial/ Marine	SEA Description
				• Habitat diversity: Taraire, tawa, podocarp forest (WF9), Kānuka scrub/forest (VS2) • Buffer: Buffers a Protected Area.
SEA_T_6813	NoR S1	1.90	Terrestrial	• Habitat type supports typical species richness. • Migration pathway.
SEA_T_2034	NoR S1	0.00	Terrestrial	• An area of riparian vegetation, which is an important migration pathway for threatened fish species including īnanga (*Galaxias maculatus*). Threatened species: īnanga (*Galaxias maculatus*).
	NoR S3	0.00		
SEA-M2-57b	NoR S1	0.00	Marine	• This area covers the inner Waitematā Harbour, and it contains various mudflats and mangrove-lined inlets and creeks, with a natural succession between terrestrial, freshwater and marine habitats. These habitats are an important migration corridor for indigenous freshwater fish and for coastal fringe bird species.
	NoR S3	0.00		

6.2.2 Bats

The DOC and Supporting Growth desktop records confirm the presence of long-tailed bats (*Chalinolobus tuberculatus*) within a 10 km radius of the four NoRs (Figure 6-1). The conservation status of this species is 'Nationally Critical' (O'Donnell et al., 2017). There are records of bats within 3 km to the south of the Project Area, near Redhills; and 3 km to the north of the Project Area in the Riverhead Forest. The presence of bats has also been confirmed along Totara Creek by the Tonkin & Taylor (T&T) ecological assessment for the Spedding Block Whenuapai Plan Change (Tonkin & Taylor, 2020). The Tonkin & Taylor report concludes that riparian margins across the Plan Change area (Spedding Block) are likely to support bats foraging and movement between known bat populations in the Waitakere ranges and Riverhead Forest.

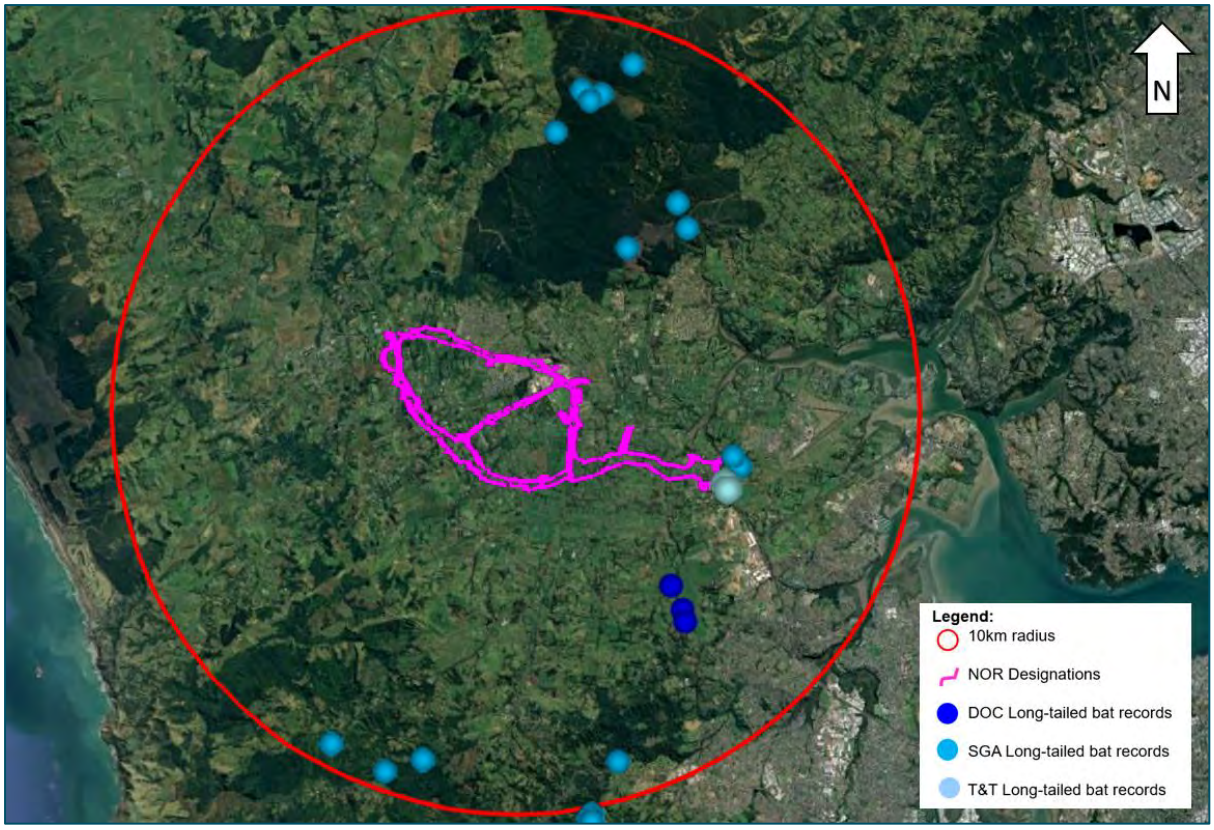

Figure 6-1 Long-tailed bat records within 10 km radius of the Project Area

6.2.3 Birds

The area wide desktop review identified 58 forest, freshwater, and coastal bird species (35 of which are native) within a 2 km buffer of the six NoRs. The full species list can be found in Appendix 4. This included 18 native bird species which are listed as 'At Risk' or 'Threatened' (Robertson et al., 2021) (Table 6-2). The majority of these native bird species are associated with coastal and marine habitats which are located < 1 km from NoRs S1 and S3, and > 1 km from NoRs S2, S4, HS and KS.

Table 6-2 Desktop study At-Risk and Threatened bird species records and their conservation status

Common Name	Māori Name	Scientific Name	Conservation Status (Robertson et al., 2021)
Banded rail	Mioweka	*Gallirallus philippensis assimilis*	At Risk – Declining
Bar-tailed godwit	Kuaka	*Limosa lapponica bauer*	At Risk – Declining
Black shag	Kawau	*Phalacrocorax carbo novaehollandiae*	At Risk – Naturally Uncommon
Black-billed gull	Tarāpuka	*Larus bulleri*	Threatened – Nationally Critical
Brown teal	Pāteke	*Anas chlorotis*	At Risk – Recovering

Common Name	Māori Name	Scientific Name	Conservation Status (Robertson et al., 2021)
Caspian tern	Taranui	*Hydroprogne caspia*	Threatened – Nationally Vulnerable
Dabchick	Weweia	*Poliocephalus rufopectus*	Threatened – Nationally Increasing
Little black shag	Kawau tūī	*Phalacrocorax sulcirostris*	At Risk – Naturally Uncommon
Long-tailed cuckoo*	Koekoeā	*Eudynamys taitensis*	Threatened – Nationally Vulnerable
New Zealand pipit	Hīoi	*Anthus novaeseelandiae*	At Risk – Declining
North Island fernbird*	Mātātā	*Poodytes punctatus*	At Risk – Declining
North Island kākā	Kākā	*Nestor meridionalis septentrionalis*	At Risk – Recovering
Northern New Zealand dotterel	Tūturiwhatu	*Charadrius obscurus aquilonius*	At Risk – Recovering
Pied shag*	Kāruhiruhi	*Phalacrocorax varius*	At Risk – Recovering
Red-billed gull	Tarāpunga	*Larus novaehollandiae scopulinus*	At Risk – Declining
Southern Diving-Petrel	-	*Pelecanoides urinatrix chathamensis*	At Risk – Relict
Spotless crake*	Pūweto	*Zapornia tabuensis*	At Risk – Declining
White-fronted tern	Tara	*Sterna striata*	At Risk – Declining

Notes: * - No records within 2 km buffer of NoRs but are anticipated to occur in the wider Project Area.

6.2.4 Herpetofauna

A review of the DOC Bioweb database found four native lizard records within a 5 km buffer of the NoRs (Table 6-3). No records were found within the NoR boundaries. However, this is likely to indicate that lizard surveys have not been completed, rather than lizards not being present. Three of the four native lizard species identified in the DOC Bioweb search have a threat status of 'At Risk' (Hitchmough et al., 2021).

The copper skink (At Risk – Declining) is widespread and frequently recorded within highly modified habitats such as exotic scrub and rank grassland. The closest record is less than 1 km from one of the NoR boundaries. As such, this species is highly likely to occur within and adjacent to all of the NoR areas.

Table 6-3 Native lizard species records within 5 km buffer of NoRs

Common name	Latin name	Threat Class (Hitchmough et al., 2021)
Auckland green gecko	*Naultinus elegans*	At Risk – Declining
Pacific gecko	*Dactylocnemis pacificus*	Not Threatened – Taxonomically indeterminate
Copper skink	*Oligosoma aeneum*	At Risk – Declining
Forest gecko	*Mokopirirakau granulatus*	At Risk – Declining
Ornate skink*	*Oligosoma ornatum*	At Risk – Declining
Moko skink*	*Oligosoma moco*	At Risk – Relict

Notes: * - No records within 5 km buffer of NoRs but are anticipated to occur in the wider Project Area.

6.3 Freshwater Habitat and Fauna

6.3.1 Streams

The NZ River Name Lines (LINZ Data Service) map indicated that NoRs S1, S2 and S3 will cross a number of named rivers and streams (Table 6-4). Various tributaries will also be affected in NoRs S1, S2, S3, HS, KS, and S4, these are detailed in the relevant NoR sections (8.2.3.4, 9.2.3.4, 10.2.3.4, and 11.2.3.4).

Table 6-4 Desktop assessment of named streams that will be crossed Project wide (LINZ Database)

Relevant NoR	Stream Name
NoR S1: Alternative State Highway, including Brigham Creek Interchange	Ahukuramu Stream
	Kumeu River
	Pakinui Stream
	Karure Stream
	Ngongetepara Creek
	Brigham Creek
	Totara Creek
NoR S2: SH16 Main Road Upgrade	Kumeu River
NoR S3: Rapid Transit Corridor and Regional Active Mode Corridor	Kumeu River
	Pakinui Stream
	Karure Stream

Relevant NoR	Stream Name
	Ngongetepara Creek
	Brigham Creek
	Totara Creek

6.3.2 Fish

The NIWA freshwater fish database was reviewed for native fish records within stream catchments affected by the Project. Of the fish recorded, three species are classified as 'At Risk – Declining'; īnanga (*Galaxias maculatus*), longfin eel (*Anguilla australis*) and torrentfish (*Cheimarrichthys fosteri*) (Dunn et al., 2017). The desktop review results are presented in Table 6-5.

Table 6-5 Native freshwater fish species recorded within the catchments associated with NoRs S1-S4, HS and KS

Common Name	Scientific Name	Conservation Status (Dunn et al., 2017)	Streams and Relevant NoRs					
			S1, S3	S1, S3	S1, S3	S1	S1 - S4, KS	S1, S3
			Brigham Creek	Ngongetepara Stream	Totara Creek	Ahukuramu Stream	Kumeu River	Pakinui Stream
Banded kōkopu	*Galaxias fasciatus*	Not Threatened	X	X	X	X	X	
Common bully	*Gobiomorphus cotidianus*	Not Threatened	X		X	X	X	
Crans bully	*Gobiomorphus basalis*	Not Threatened	X					
Īnanga	*Galaxias maculatus*	At Risk - Declining	X		X		X	
Koura	*Paranephrops*	N/A	X			X	X	
Longfin eel	*Anguilla dieffenbachii*	At Risk - Declining	X	X	X		X	
Redfin bully	*Gobiomorphus huttoni*	Not Threatened					X	
Shortfin eel	*Anguilla australis*	Not Threatened	X	X	X	X	X	X
Torrentfish	*Cheimarrichthys fosteri*	At Risk - Declining				X		

Common Name	Scientific Name	Conservation Status (Dunn et al., 2017)	Streams and Relevant NoRs					
			S1, S3	S1, S3	S1, S3	S1	S1 - S4, KS	S1, S3
			Brigham Creek	Ngongetepara Stream	Totara Creek	Ahukuramu Stream	Kumeu River	Pakinui Stream
Unidentified eel	*Anguilla* sp.	N/A		X	X		X	
Unidentified galaxiid	*Galaxias* sp.	N/A					X	

6.4 Wetland Habitat

A desktop review of existing ecological records was undertaken to gain an understanding of the wetland habitat that could be present within the ZOI of each of the six NoRs. There has been limited study or the wetland ecosystems within the Project Area. This is likely due to the high levels of modification in the landscape, particularly historical drainage and reclamation. The Auckland Council floodplain mapping and 'ecosystem potential extent' data set would suggest that the Kumeū River floodplain was once a swamp and flood-plain kahikatea, pukatea forest (WF8). As the habitat type is now almost entirely absent, this would imply the wetlands have been largely converted to agriculture, however numerous modified wetlands are likely to remain throughout the landscape. No specific desktop information on wetlands within the NoRs have been identified, however, most are likely to be modified by historical agricultural and existing urban expansion.

7 Strategic Area Positive Effects

The following section outlines the positive effects of the proposed alignment for each NoR in relation to specific ecological features (Table 7-1). The statement regarding positive effects assumes that native planting will occur on the roadsides as part of the landscape management.

There is the potential for positive effects which apply to each of the NoRs. These include:

- Improved blue/green infrastructure (stormwater wetlands, swales, raingardens) and associated landscaping (which will be indigenous species).
- Mass revegetation of sloping berms, batters and embankments to connect with retained forest remnant/mature trees. Particularly relevant for NoR S1 which largely traverses the rural zone.
- The scale of the proposed bat mitigation in association with the revegetation and stormwater wetlands mentioned above will have positive ecological outcomes for native fauna. Specifically, the development of the ASH will result in a 'green' corridor which will buffer the rural areas to the south of the ASH against future urban development for portions to the north of the ASH. Similarly, the proposed bat mitigation associated with Ngongetepara, Kumeu and Ahukuramu watercourses are likely to improve ecological connectivity around and through the future urban environment.

Table 7-1 Summary of positive effects associated with each NoR

Relevant NoR	Ecological Feature	Positive Effect
NoR S1, NoR S3	Ahukuramu Stream, Kumeu River, Pakinui Stream, Karure Stream, Ngongetepara Creek, Brigham Creek and Totara Creek.	The Project landscape planting will tie into stream and riparian corridors. Riparian vegetation will be retained (where practicable) and enhanced (weeds control and indigenous vegetation planted).
NoR S2	Ahukuramu Stream and Kumeu River tributaries.	
NoR S4	Kumeu River tributaries, Totara Creek and Brigham Creek tributaries.	
NoR HS, NoR KS	Kumeu River tributaries	
NoR S1, NoR S3	Ahukuramu Stream, Kumeu River, Pakinui Stream, Karure Stream, Ngongetepara Creek, Brigham Creek and Totara Creek.	Existing infrastructure upgrades will include new bridge structures, culvert upgrades and additional/improvements to stormwater infrastructure. Upgrading undersized structures and improvements in culvert design such as embedding culverts with natural substrate/increased design capacity will improve habitat connectivity for freshwater and terrestrial species. This will include improved fish passage and
NoR S2	Ahukuramu Stream and Kumeu River tributaries.	

Relevant NoR	Ecological Feature	Positive Effect
		improved riparian habitat connectivity.

8 NoR S1: Alternative State Highway, Including Brigham Creek Interchange

8.1 Project Corridor Features

The ASH corridor features an east-west alignment, crossing several catchments including that of Totara Creek, Ngongetepara, Kumeu and Ahukuramu systems. The portion of the ASH to the east of the North Auckland Line (NAL) is characteristically flat with more sensitive ecological features associated with the riparian zones and floodplain areas of Totara Creek, Ngongetepara and Kumeu systems. The central portion of the ASH (between the NAL and Tawa Road) crosses several head water systems associated with Kumeu tributaries. To the west of Tawa Road the topography is notably steeper with several patches of mature native vegetation present. On the western end the corridor crosses the Ahukuramu Stream.

The proposed BCI is located in Redhills North. The interchange is the eastern connection of the ASH and is mostly situated to the west of Totara Creek and associated SEA (M2-57b and T_2034).

Details regarding the design features are outlined within the AEE, but are summarised below for the ASH (Section 8.1.1) and BCI (Section 8.1.2)

8.1.1 Alternative State Highway Design Features

Key features of the proposed new corridor include the following:

The construction of a new four-lane motorway corridor with a cross-section of approximately 50 m to accommodate a four-lane dual carriageway and separated cycle lanes and footpaths. The typical cross section includes an active mode corridor with central and side barriers (

- Figure 8-1).
- An underpass at Taupaki Road and bridges over the NAL with further grade separations at Waitakere Road, Pomona Road, Tawa Road, Puke Road and Foster Road. Tawa Road is designed to future proof for a full diamond interchange;
- The western end of the alignment ties-in at a proposed three-legged roundabout with SH16 Main Road, immediately west of Foster Road;
- The re-alignment of the following local roads:
  - Pomona Road, approximately 1.5 km (two sections);
  - Motu Road, approximately 200 m; and
  - Puke Road, approximately 500 m.
- Likely posted speed of 100 km/h, design speed (of which effects will be assessed on) is 110 km/h;
- Stormwater dry ponds, wetlands and culverts;
- Batter slopes to enable the construction of the corridor, and associated cut and fill activities;

- Vegetation removal within the proposed corridor;
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

Figure 8-1 Alternative State Highway Typical Cross Sections

8.1.2 Brigham Creek Interchange Overview

The proposed BCI is located in Redhills North and to the west of Whenuapai. This interchange is anchored to the ASH, RTC and Regional Active Mode Corridor strategic projects whilst facilitating a connection to Fred Taylor Drive and Brigham Creek Road. The proposed BCI currently sits within FUZ land. The existing SH16/Fred Taylor Drive/Brigham Creek Road Roundabout will be replaced by a fully grade separated interchange with on and off ramps in a 'Split-Fork" type arrangement.

Note: As part of the Waka Kotahi SH16/18 Connections Project (a non-SGA project), SH16 (south of BCI) is expected to be widened to accommodate an extra lane in each direction as well as a new City Centre to Westgate RTC and active mode facility on the southern side.

SGA's Alternative State Highway, via BCI, will tie in to the SH16/18 Connections Projects.

8.2 Existing and Likely Future Environment

8.2.1 Planning Context

The ASH corridor, including the BCI (NoR S1), is largely rural and is proposed to traverse land zoned under the AUP:OP as Rural – Countryside Living Zone, Rural – Mixed Rural Zone and Rural – Rural Production Zones.

The ASH corridor will also traverse two separate areas of FUZ in Redhills North and Kumeū-Huapai with the BCI also currently sitting within FUZ land.

Table 8-1 below provides a summary of the existing and likely future environment as it relates to the ASH and BCI.

Table 8-1 Alternative State Highway and Brigham Creek Interchange Existing and Likely Future Environment

Environment today	Zoning	Likelihood of Change for the environment[13]	Likely Future Environment[14]	Implications of Future Environment on Ecological Features
Rural	Rural - Mixed Rural Zone Rural - Countryside Living Zone Rural - Production Zone	Low	Rural	All ecological features are likely to remain similar or the same. Vegetation cover, streams and wetland features are likely to be relatively unchanged.
Undeveloped greenfield areas (rural)	Future Urban	**High**	Urban	As land is developed, the majority of terrestrial vegetation (such as planted vegetation, forestry and shelterbelts outside riparian and wetland features adjacent to the NoR will be cleared and developed. However, these features may be present during the construction phase of the road (depending on the time difference between road construction and urban development). Streams, wetlands and riparian vegetation is likely to be retained and potentially locally improved through protection within esplanade reserves and habitat enhancement. Habitat connectivity may be reduced as road crossings and urbanisation fragment the catchment.

8.2.2 Permitted Activities and the Future Ecological Environment

The areas of existing undeveloped greenfields are zoned FUZ in the AUP:OP, and as such are planned for urbanisation. Vegetation clearance within the FUZ, excluding habitat for TAR species, vegetation within 10 m of a riparian strip, and tree removal (excluding district plan vegetation), are identified as permitted activities within Chapters E26 and E15 of the AUP:OP. As such the ecological features (i.e., terrestrial habitat); excluding natural wetlands, streams and riparian edges; which are currently present adjacent to the NoR, will likely be removed by future development, and will not be present when the upgraded transport corridor is operational (albeit we have assumed they will still be present during construction). Subsequently, our effects assessment has taken this into account.

[13] Based on AUP:OP zoning/policy direction
[14] Based on AUP:OP zoning/policy direction

8.2.3 Ecological Baseline

This section presents the findings of the site and desktop investigations in relation to the terrestrial, freshwater, and wetland habitats and associated fauna species ('ecological features') present within the NoR S1 boundary. All features within the study areas were investigated and mapped to provide context for the effects assessment and inform potential adjustments to the proposed designation boundary (Appendix 5). Based on this information, and desktop assessments, an ecological value has been calculated for each ecological feature within this NoR.

8.2.3.1 Terrestrial Habitat

Table 8-2 summarises the vegetation types and their classification (Singers et al., 2017) associated with NoR S1. Maps are presented in Appendix 5.

Table 8-2 Vegetation types present within NoR S1

Habitat	Classification*	Description of Habitat
Brown Field (includes cropland)	BF	This definition includes Industrial zones, metaled carparks, rail corridors, unmanaged or managed land within urban settings, road median strips, pavements, cracks in concrete. Substrate includes metal (stone chip) and concrete surfaces. largely exotic herbfield (weeds) and occasional exotic or native woody species. For the purposes of mapping this has been extended to include bare ground associated with cropland, market gardens and construction sites.
Exotic Forest	EF	Forest vegetation with >50% cover of exotic species in the canopy. Generally used to describe single species forestry plantations. This level of distinction was used for desktop habitat assessment where the understory vegetation was not assessed.
Exotic Forest – Native Understorey	EF.1	Forest vegetation with >50% cover of exotic species in the canopy. Where understorey is indigenous species dominated (>50%) and/or groundcover biomass.
Exotic Forest – Exotic Understorey	EF.2	Forest vegetation with >50% cover of exotic species in the canopy. Where understorey is exotic species dominated (<50% native understorey) and/or groundcover biomass.
Exotic Grassland	EG	Grassland dominated by exotic species. This includes pasture, garden lawns and sport pitches.
Exotic Scrub	ES	Exotic secondary scrub or shrubland with >50% cover/biomass of exotic species. The future trajectory is uncertain. Dominant species include gorse, woolly nightshade and privet species.
Exotic Wetland	EW	Wetland ecosystems with >50% exotic plant biomass.
Planted Wetland - Native (recent)	PLW	Native restoration plantings with <50% exotic biomass.
Planted Vegetation – Native (recent)	PL.1	Native restoration plantings with <50% exotic biomass. Recently planted native scrub and forest <20 years old.

Habitat	Classification*	Description of Habitat
Planted Vegetation - Native (mature)	PL.2	Native restoration plantings with <50% exotic biomass. Mature planted native scrub and forest >20 years old.
Planted Vegetation – Exotic (amenity)	PL.3	Exotic amenity plantings. This includes planted exotic vegetation within parks, amenity areas and private gardens.
Machaerina sedgeland	WL11	Sedgeland-rushland wetland type, in depressions and freshwater margins. Species of *Machaerina, Eleocharis*, lake clubrush and locally *Carex* spp.
Treeland – Mixed Native/Exotic	TL.2	Tree canopy cover 20-80%. Mixed native/exotic: with 25-75% native tree cover. For the purposes of mapping this includes planted and wilding exotic vegetation and mature shelterbelts. This includes mature riparian vegetation and scattered or discontinuous canopy of mature trees within gardens, farms and amenity areas.
Treeland – Exotic-Dominated	TL.3	Tree canopy cover 20-80%: <25% native with exotic tree cover dominant. For the purposes of mapping this includes planted and wilding exotic vegetation and mature shelterbelts. This includes mature riparian vegetation and scattered or discontinuous canopy of mature trees within gardens, farms and amenity areas.
Kānuka Scrub/Forest	VS2	Kānuka-dominated forest with insufficient emergent secondary species to determine trajectory to mature forest type. Occurs on hillslopes, ridges, terraces, and plains especially on free-draining soils. Species include kānuka (*Kunzea ericoides*), *Coprosma* spp*. and Pittosporum* spp.
Pūriri Forest	WF7	Remnant/regenerating pūriri, tōtara forest. Occurs on recent alluvial terraces and floodplain/river valleys. Secondary successions dominated by podocarp trees, notably totara.

Notes: * = Information from Singers et al. (2017).

8.2.3.2 Terrestrial Fauna

Bats

Area wide bat surveys have been undertaken for all NoRs. The results of the bat survey are detailed in Appendix 11. The ABM survey confirmed bat activity at survey locations ABM2, ABM11, ABM17, ABM21, ABM23, ABM25 and ABM27 during the November-December assessment and at all locations (excluding ABM3, ABM12, ABM18, ABM19, and ABM21) during the March-April assessment. Within NoR S1, these areas coincide with the Ahukuramu Stream, Ngongetepara Creek, Kumeu River, and Pakinui Stream and associated corridors. High (100-300) and Very High (>300) number of bat passes were detected for locations ABM6, ABM7, ABM10, ABM11 and ABM17 during the March-April assessment (associated with the ASH west of Tawa Road). The T+T Structure Plan study (T+T, 2020) also detected low levels of bat activity along Totara Creek.

Trees throughout the Project area for NoR S1 were identified as having bat roost potential, this included mature trees, which were largely restricted to exotic species such as radiata pine (*Pinus*

radiata), macrocarpa (*Hesperocyparis macrocarpa*), poplar (*Populus* spp.), ironwood (*Casuarina* spp.) and eucalyptus (*Eucalyptus* spp.). In addition to potential bat roost habitat, foraging habitat occurs throughout the NoR. Potential bat foraging habitat includes mature Treeland habitat but also less mature riparian (exotic and indigenous), wetland/open water and indigenous habitat features such as Treeland (TL.2), Kānuka Scrub/Forest (VS2) and Pūriri Forest (WF7), particularly where these follow linear commuting/foraging corridors, such as stream catchments or vegetated ridgelines.

Birds

No dedicated bird surveys were undertaken for the Project. However, incidental observations of bird species were noted during site walkovers. The full list of birds observed or heard within NoR S1 are available in Appendix 12. The majority of these species are common, introduced and naturalised or common native species such as tūī and silvereye. However, pied shag (At Risk – Recovering) was observed adjacent to Totara Creek (W3-S1) near associated mangroves. Although not observed at the time of survey, potential habitat was identified for a number of other TAR bird species, summarised in Table 8-3 below.

Table 8-3 TAR bird species likely to occur within suitable habitat in NoR S1

Species	Conservation Status (Robertson et al., 2021)	Distribution and Habitat	Project Area Habitat
Banded rail (*Gallirallus philippensis assimilis*)	At Risk – Declining	Breeding and foraging within coastal wetland habitat (saltmarsh and mangroves). Roosting and breeding within wetlands above the high tide. Uncommon but widespread in the Auckland region (Bellingham, 2013).	Likely to occur around the Brigham Creek stream mouth at the Brigham Creek Bridge crossing within coastal Mangrove Forest and scrub (SA1.2). No suitable roosting or breeding habitat within the NoR but may utilise adjacent mangrove for foraging.
Brown teal/Pāteke (*Anas chlorotis*)	At Risk – Recovering	Wetlands with open water, including stock ponds and small streams that retain overhanging marginal vegetation. Rare but widespread in the Auckland region. Reliant on pest predator control (Williams, 2013).	Has the potential to utilise a wide range of open water and wetland locations. However, as this species is reliant on pest control it is unlikely to be resident or breeding within the NoR, but could be present.
Dabchick/Weweia (*Poliocephalus rufopectus)*	Threatened – Nationally Increasing	Small shallow freshwater lakes and ponds, with dense marginal vegetation. Uncommon but widespread in the	Has the potential to utilise any freshwater open water habitat, including stock water ponds, ornamental ponds and stormwater ponds. Likely to breed in

Species	Conservation Status (Robertson et al., 2021)	Distribution and Habitat	Project Area Habitat
		Auckland region (Szabo, 2013).	associated marginal wetland vegetation.
Little black shag/Kawau tūī (*Phalacrocorax sulcirostris*)	At Risk – Naturally Uncommon	Occur in coastal inlets, lakes and ponds, including stormwater ponds. Roosting and breeding in overhanging trees. Common and widespread in the Auckland region (Armitage, 2013).	Has the potential to utilise any freshwater or coastal open water habitat, including stock water ponds, ornamental ponds and stormwater ponds, and around Brigham Creek. No breeding or roosting sites observed.
Long-tailed cuckoo/koekoeā (*Eudynamys taitensis*)	Threatened - Nationally Vulnerable	Summer migrant to New Zealand arriving spending winter in tropical Pacific islands. As a parasite nester, their range is restricted to host species whitehead, brown creeper and yellowhead. Absent as a breeding species from Auckland region (except Te Hauturu-o-Toi, Little Barrier Island) but occur on migration passage throughout New Zealand (Gill, 2013).	Has the potential to briefly occur on migration passage across the project area. Can occur in native/exotic forest, scrub, farmland or urban areas on passage to breeding/winter habitat.
New Zealand pipit/Hīoi (*Anthus novaeseelandiae*)	At Risk – Declining	Occur in open habitat such as coastal and alpine grasslands, but also utilise modified landscapes such as pasture and scrub within the rural landscape. Rare but widespread in the Auckland region (Beauchamp, 2013).	Has the potential to utilise any open habitat such as Exotic Grassland and Exotic Scrub. Habitat suitability is low throughout NoR S1 due to agricultural intensification and likely moderate to high pest predator numbers.
North Island fernbird/Mātātā (*Bowdleria punctata vealeae*)	At Risk – Declining	Dense wetland vegetation. Rare but widespread in the Auckland region (Miskelly, 2013).	Has the potential to utilise any dense wetland vegetation, for foraging and breeding. This includes native planted wetlands (PLW) and

Species	Conservation Status (Robertson et al., 2021)	Distribution and Habitat	Project Area Habitat
			Machaerina sedgeland (WL11).
North Island kākā (*Nestor meridionalis septentrionalis*)	At Risk – Recovering	Kākā are generally restricted to indigenous forest habitat and offshore islands in the Auckland region. However, they make seasonal migrations to the Auckland mainland, particularly in winter where they often utilize exotic pine and eucalyptus trees in rural and urban areas. Rare but widespread (seasonal migrant) in the Auckland region (Moorhouse, 2013).	Has the potential to utilise any mature treeland (TL.2, TL.3), exotic forest (EF.1. EF.2) or mature indigenous forest types. There is no breeding habitat within the NoR but likely to infrequently utilise exotic trees for seasonal foraging and roosting throughout winter season.
Pied shag (*Phalacrocorax varius*)	(At Risk – Recovering)	Occur in coastal inlets, lakes and ponds, including stormwater ponds. Roosting and breeding in overhanging trees. Common and widespread in the Auckland region (Powlesland, 2013).	Has the potential to utilise any freshwater or coastal open water habitat, including stock water ponds, ornamental ponds and stormwater ponds, and around Brigham Creek. No breeding or roosting sites observed.
Spotless crake/pūweto (*Porzana tabuensis plumbea*)	At Risk – Declining	Wetland vegetation and freshwater lakes and ponds, with dense marginal vegetation. Rare but widespread in the Auckland region (Fitzgerald, 2013).	Has the potential to utilise any dense wetland vegetation, for foraging and breeding. This includes native planted wetlands (PLW), *Machaerina* sedgeland (WL11) and marginal vegetation associated with stock water ponds, ornamental ponds and stormwater ponds.

Lizards

Native lizards were not identified during opportunistic searches completed during the site walkover. However, the introduced plague skink (*Lampropholis delicata*) was identified within NoR S1 at 54 Puke Road and south of Brigham Creek roundabout. Copper skink have been recorded within 1.5 km

of NoR S1. Copper skink is likely to be associated with most of the vegetation units presented in Table 8-2 where there is appropriate understorey. Habitat with potential to support copper skink within NoR S1 is represented by areas with sufficient understorey relating to vegetation units EF, EF.1, EF.2, EG (rank grass that is defined as unmanaged, not grazed or mown), ES, PL.1, PL.2, PL.3, TL.2, TL.3, VS2 and WF7 habitat. Other native lizard species are generally restricted to indigenous forest, indigenous scrub, coastal habitat types or habitat contiguous to such area. As habitat connectivity to SEAs is limited within the wider Project Area it is unlikely that any other species listed in Table 6-3 will occur within the Project Area, however ornate skink have been included together with copper skink, as although unlikely, they have potential of occurring within suitable modified habitat, such as dense riparian vegetation.

8.2.3.3 Terrestrial Ecological Value

Appendix 6 presents the ecological value for the terrestrial vegetation identified within NoR S1. Information obtained for the ecological baseline (Sections 8.2.3.1 and 8.2.3.2), as well as the desktop assessment (Section 6), was used to score the matters that inform the ecological value. The ecological value of habitats ranged from **Negligible** (e.g., BF) to **Very High** (e.g., VS2, WF7).

Notwithstanding the ecological value associated with vegetation/habitat units, specific consideration still needs to be given to individual species and their conservation significance for the following reasons (in accordance with EIANZ Guidelines):

- The habitat value may dilute the conservation value associated with specific species. For example, the combined value for exotic grassland is **Low**, while the value for copper skink (At Risk - Declining) is **High**. The combined value of **Low** therefore understates the conservation value of the species;
- Species may not be restricted to a single vegetation unit;
- Potential effects on species are unrelated to habitat units. For example, impact on highly mobile species (such as bats) by noise and light may be independent of the habitat loss associated with the Project footprint.

For the reasons outlined above, the ecological value assessments for individual species are considered to range from **Moderate** to **Very High** (Table 8-4).

Table 8-4 Ecological value for terrestrial fauna (TAR species only)

Fauna Type	Species Within Habitat	Habitat Units[15]	Conservation Status (NZ Classification System)	Ecological Value
Bats	Long-tailed bat	EF, EF.1, EF.2, TL.2, TL.3, VS2, WF7	Threatened – Nationally Critical	**Very High**
TAR Birds	Long-tailed cuckoo	EF, EF.1, EF.2, PL.2, TL.2, TL.3, VS2, WF7	Threatened – Nationally Vulnerable	**Very High**

[15] Habitat units included in the table also include non-terrestrial habitat units. This is because all birds have been assessed under the terrestrial section for practical reasons.

Fauna Type	Species Within Habitat	Habitat Units[15]	Conservation Status (NZ Classification System)	Ecological Value
	Brown teal, dabchick	OW, PLW, WL.11	Threatened – Nationally Increasing	
	Banded rail	SA1.2	At Risk - Declining	**High**
	North Island fernbird, spotless crake	OW, PLW, WL.11		
	New Zealand pipit	EG, ES		
	North Island kākā	EF, EF.1, EF.2, PL.2, TL.2, TL.3, VS2, WF7	At Risk – Recovering	**Moderate**
	Little black shag	OW, PLW, WL.11	At Risk – Nationally Uncommon	
	Pied shag		At Risk – Recovering	
Herpetofauna (Lizards)	Copper skink	EF, EF.1, EF.2, EG, ES, PL.1, PL.2, PL.3, TL.2, TL.3, VS2, WF7	At Risk – Declining	**High**
	Ornate skink	EF, EF.1, EF.2, TL.2, TL.3, VS2, WF7		

8.2.3.4 Freshwater Habitat

All potential streams within NoR S1 were mapped (Appendix 5) and classified as either permanent or intermittent. Ephemeral streams were mapped when possible. Permanent or intermittent streams that were within the designation boundary were numbered and assessed.

Stream classification, description and RHA assessment

A total of 33 stream branches were identified during the desktop and site investigations within NoR S1. The streams are detailed further in Table 8-5.

In summary, streams within NoR S1 were classified as follows:

- A total of 19 stream branches were identified as intermittent, as three or more of the intermittent stream criteria (Storey & Wadhwa, 2009) were met.
- A total of 14 stream branches were identified as permanent, as there was evidence of continuous flow.

A total of 11 streams (eight intermittent and three permanent) were not accessible and are indicated by * in Table 8-5. The ecological value for these streams were assessed at a desktop level (Section 8.2.3.6).

All other streams were accessed during site investigations and surveyed using the RHA. The streams measured overall habitat quality scores that ranged from 'Poor' to 'Moderate' (Table 8-5). Detailed RHA results are presented in Appendix 10. The RHA category was included within the ecological value assessment for each of the streams where it was applied (Section 8.2.3.6).

Table 8-5 Summary of streams identified in NoR S1

Stream ID	Classification	RHA Category
S1-S1a	Permanent	Moderate
S1-S2	Permanent	Poor
S1-S1b	Permanent	Moderate
S1-S1c	Permanent	Moderate
S1-S3	Intermittent	Poor
S1-S4*	Intermittent	N/A
S1-S5*	Permanent	N/A
S1-S6*	Intermittent	N/A
S1-S7*	Intermittent	N/A
S1-S8*	Intermittent	N/A
S1-S9	Intermittent	Poor
S1-S10	Intermittent	Poor
S1-S11	Permanent	Moderate
S1-S13*	Intermittent	N/A
S1-S14	Intermittent	Poor
S1-S15*	Permanent	N/A
S1-S16*	Intermittent	N/A
S1-S17	Permanent	Moderate
S1-S18*	Permanent	N/A
S1-S19	Intermittent	Poor
S1-S20a	Permanent	Moderate
S1-S20d	Intermittent	Moderate
S1-S20e	Intermittent	Moderate
S1-S21	Permanent	Moderate
S1-S22	Permanent	Moderate

Stream ID	Classification	RHA Category
S1-S23	Intermittent	Poor
S1-S24	Permanent	Poor
S1-S25*	Intermittent	N/A
S1-S26	Intermittent	Poor
S1-S27*	Intermittent	N/A
S1-S28	Intermittent	Poor
S1-S29	Intermittent	N/A
W3-S1	Permanent	Moderate
W4-S1	Permanent	N/A

Notes: * = Streams assessed at a desktop level due to access restrictions.

8.2.3.5 Freshwater Fauna

Fish surveys were not carried out during site investigations, however the following At Risk - Declining species have been recorded in the wider catchment area associated with NoR S1 (Table 6-5):

- Īnanga – Brigham Creek, Totara Creek and Kumeu River
- Longfin eel – Brigham Creek, Ngongetepara Stream, Totara Creek, Kumeu River
- Torrentfish – Ahukuramu Stream.

The freshwater habitats within NoR S1 were assessed for their potential to support native fish during the RHA. Potential habitat, such as undercut banks, overhanging vegetation and macrophytes were observed at the time of survey. In addition, the following species were observed onsite:

- Īnanga at S1-S1a (Ahukuramu Stream) (1 Foster Road)
- Unidentified eels observed at S1-S1b (116 Foster Road) and S1-S17 (Kumeu River) (374 Taupaki Road)
- Freshwater mussel shells (*Echyridella menziesii*) (At Risk - Declining) observed on dry banks of S1-S17 (Kumeu River) (176A Boord Crescent).

8.2.3.6 Freshwater Ecological Value

Appendix 7 presents the ecological value for the aquatic habitats identified within NoR S1. Information obtained for the ecological baseline (Section 8.2.3.4 and 8.2.3.5), as well as the area wide desktop assessment (Section 6), was used to score the matters that inform the ecological value. The ecological values of freshwater habitats are presented in Table 8-6.

Table 8-6 Summary of freshwater ecological value identified in NoR S1

Stream ID	Ecological Value
S1-S1a	Moderate

Stream ID	Ecological Value
S1-S2	Moderate
S1-S1b	High
S1-S1c	Moderate
S1-S3	Low
S1-S4*	Low
S1-S5*	Moderate
S1-S6*	Low
S1-S7*	Low
S1-S8*	Low
S1-S9	Low
S1-S10	Low
S1-S11	Moderate
S1-S13*	Low
S1-S14	Low
S1-S15*	Moderate
S1-S16*	Low
S1-S17	High
S1-S18*	Moderate
S1-S19	Low
S1-S20a	Moderate
S1-S20d	Low
S1-S20e	Low
S1-S21	Moderate
S1-S22	High
S1-S23	Low
S1-S24	High
S1-S25*	Low
S1-S26	Low
S1-S27*	Low

Stream ID	Ecological Value
S1-S28	Low
S1-S29	Moderate
W3-S1	High
W4-S1	High

8.2.3.7 Wetland Habitat

A total of 54 wetlands within NoR S1 were identified and assessed. Details regarding the vegetation cover and NPS-FM classification for each wetland is presented in Table 8-7. Refer to Appendix 5 for a map showing the spatial distribution of wetlands.

Table 8-7 Summary of wetlands identified in NoR S1

Wetland ID	Vegetation/Wetland Type[16]	NPS-FM Classification	Potential for TAR Species
S1-W1	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W2	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W3*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W4	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W5	Planted Wetland (PLW)	Natural wetland	Potential for fernbird and spotless crake.
S1-W56*	Exotic Wetland	Natural wetland	Unlikely to support TAR birds.
S1-W6	Planted Wetland (PLW) and small area of EW	Natural wetland	Potential for fernbird and spotless crake.
S1-W7	*Machaerina* sedgeland (WL11)	Artificial (constructed for stock watering)	Unlikely to support TAR birds.
S1-W8	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W9	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.

[16] Open water, as an ecological feature, has been included under the wetland section.

Wetland ID	Vegetation/Wetland Type[16]	NPS-FM Classification	Potential for TAR Species
S1-W10 & S1-W10 (OW)	*Machaerina* sedgeland (WL11) & Open Water (OW)	Natural wetland	Potential for fernbird and spotless crake.
S1-W11	*Machaerina* sedgeland (WL11)	Natural wetland	Potential for fernbird and spotless crake.
S1-W12*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W13*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W14*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W15*	*Machaerina* sedgeland (WL11)	Natural wetland	Potential for fernbird and spotless crake.
S1-W16 & S1-W16 (OW)	Exotic Wetland (EW) & Open Water (OW)	Natural wetland	Wetland unlikely to support TAR birds. Pond potential to support dabchick and spotless crake.
S1-W17	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W18	Exotic Wetland (EW) & Open Water (OW)	Natural wetland	Unlikely to support TAR birds.
S1-W19	*Machaerina* sedgeland (WL11)	Natural wetland	Potential for fernbird and spotless crake.
S1-W20*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W21*	Planted Wetland (PLW)	Natural wetland	Unlikely to support TAR birds.
S1-W22*	Planted Wetland (PLW)	Natural wetland	Unlikely to support TAR birds.
S1-W23 & S1-W23 (OW)	Exotic Wetland (EW) & Open Water (OW)	Natural wetland	Unlikely to support TAR birds.
S1-W24 & S1-W24 (OW)	Exotic Wetland (EW) & Open Water (OW)	Natural wetland	Unlikely to support TAR birds. King fern present.
S1-W25*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.

Wetland ID	Vegetation/Wetland Type[16]	NPS-FM Classification	Potential for TAR Species
S1-W26*	Planted Wetland (PLW)	Natural wetland	Unlikely to support TAR birds.
S1-W27*	*Machaerina* sedgeland (WL11)	Natural wetland	Potential for dabchick, fernbird and spotless crake.
S1-W28*	Exotic Wetland (EW)	Artificial wetland	Potential for spotless crake.
S1-W29*	Exotic Wetland (EW)	Natural wetland	Potential for spotless crake and fernbird.
S1-W30*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W31 & S1-W31 (OW)	Exotic Wetland (EW) & Open Water (OW)	Natural wetland	Unlikely to support TAR birds.
S1-W32*	Planted Wetland (PLW)	Natural wetland	Potential spotless crake and fernbird.
S1-W33*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W34 & S1-W34 (OW)*	Exotic Wetland (EW) & Open Water (OW)	Natural wetland	Unlikely to support TAR birds.
S1-W36*	Exotic Wetland (EW)	Artificial wetland	Unlikely to support TAR birds.
S1-W37	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W38*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W39	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W40	*Machaerina* sedgeland (WL11)	Natural wetland	Unlikely to support TAR birds.
S1-W41	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W42*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W43 & S1-W43 (OW)	Exotic Wetland (EW) & Open Water (OW)	Natural wetland	Potential for spotless crake and dabchick.

Wetland ID	Vegetation/Wetland Type[16]	NPS-FM Classification	Potential for TAR Species
S1-W44	*Machaerina* sedgeland (WL11)	Natural wetland	Unlikely to support TAR birds.
S1-W45 & S1-W45 (OW)*	Exotic Wetland (EW) & Open Water (OW)	EW: Natural wetland OW: Artificial wetland (Farm ponds)	Potential for spotless crake and dabchick.
S1-W46 & S1-W46 (OW)	Exotic Wetland (EW) & Open Water (OW)	Natural wetland	Exotic Wetland unlikely to support TAR birds. Pond potential to support spotless crake and dabchick.
S1-W47*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S1-W48*	Exotic Wetland (EW)	Artificial wetland	Unlikely to support TAR birds.
S1-W49*	Exotic Wetland (EW)	Artificial wetland	Unlikely to support TAR birds.
S1-W50 & S1-W50 (OW)*	Exotic Wetland (EW) & Open Water (OW)	Natural wetland	Unlikely to support TAR birds.
S1-W51*	Planted Wetland (PLW)	Artificial wetland	Potential for spotless crake.
S1-W53*	Planted Wetland (PLW)	Natural wetland	Potential for spotless crake.
S1-W54	Planted Wetland (PLW)	Natural wetland	Unlikely to support TAR birds.
S1-W55	Planted Wetland (PLW)	Artificial wetland	Potential for spotless crake.
S1-W57 & S1-W57 (OW)	Planted Wetland (PLW) & Open Water (OW)	Artificial wetland (Stormwater Pond)	Potential for dabchick and spotless crake.
S1-W58	Open Water (OW)	Artificial Wetland (Ornamental Pond)	Potential for dabchick and spotless crake.
S1-W59	Open Water (OW)	Artificial Wetland (Ornamental Pond)	Potential for dabchick and spotless crake.
S1-W60	Open Water (OW)	Artificial Wetland (Ornamental Pond)	Unlikely to support TAR birds.
S1-W61	Open Water (OW)	Artificial Wetland	Potential for dabchick and spotless crake.

Wetland ID	Vegetation/Wetland Type[16]	NPS-FM Classification	Potential for TAR Species
		(Ornamental Pond)	
S1-W62	Open Water (OW)	Artificial Wetland (On-stream farm pond)	Potential for dabchick, fernbird and spotless crake.
S1-W63	Open Water (OW)	Artificial Wetland (On-stream farm pond)	Potential for dabchick, and spotless crake.
S1-W64	Open Water (OW)	Artificial Wetland (On-stream farm pond)	Potential for dabchick, and spotless crake.
S1-W65	Open Water (OW)	Artificial Wetland (Farm pond)	Unlikely to support TAR birds.
S1-W66	Open Water (OW)	Artificial Wetland (Ornamental Pond)	Potential for dabchick, and spotless crake.
S1-W67	Open Water (OW)	Artificial Wetland	Potential for dabchick.
S1-W68	Open Water (OW)	Artificial wetland	Unlikely to support TAR birds.
S1-W69*	Exotic Wetland (EW)	Natural Wetland	Unlikely to support TAR birds.
S1-W70	Open Water (OW)	Artificial wetland	Potential for dabchick.
S1-W71	Open Water (OW)	Artificial wetland	Unlikely to support TAR birds.
S1-W72	Exotic Wetland (EW)	Natural Wetland	Unlikely to support TAR birds.

Notes: * = Wetlands assessed at a desktop level due to access restrictions.

8.2.3.8 Wetland Ecological Value

Appendix 8 presents details of the ecological value for the wetland habitats identified within NoR S1. Information obtained for the ecological baseline (Section 8.2.3.7), as well as the area wide desktop assessment (Section 6), was used to score the matters that inform the ecological value. The ecological values of wetland habitats are presented in Table 8-8.

Table 8-8 Summary of wetland ecological value identified in NoR S1

Wetland ID	Ecological Value
S1-W1	Low
S1-W2	Low

Wetland ID	Ecological Value
S1-W3	Low
S1-W4	Moderate
S1-W5	High
S1-W56	Low
S1-W6	High
S1-W7	Moderate
S1-W8	Low
S1-W9	Low
S1-W10 & S1-W10 (OW)	Very High
S1-W11	High
S1-W12	Low
S1-W13	Low
S1-W14	Low
S1-W15	High
S1-W16 & S1-W16 (OW)	Moderate
S1-W17	Low
S1-W18	Moderate
S1-W19	High
S1-W20	Moderate
S1-W21	High
S1-W22	High
S1-W23 & S1-W23 (OW)	Low
S1-W24 & S1-W24 (OW)	Low
S1-W25	Low
S1-W26	Moderate
S1-W27	Very High
S1-W28	Low
S1-W29	Low
S1-W30	Low

Wetland ID	Ecological Value
S1-W31 & S1-W31 (OW)	Low
S1-W32	Moderate
S1-W33	Low
S1-W34 & S1-W34 (OW)	Low
S1-W36	Low
S1-W37	Low
S1-W38	Low
S1-W39	Low
S1-W40	High
S1-W41	Moderate
S1-W42	Low
S1-W43 & S1-W43 (OW)	Low
S1-W44	Moderate
S1-W45 & S1-W45 (OW)	Low
S1-W46 & S1-W46 (OW)	Moderate
S1-W47	Low
S1-W48	Negligible
S1-W49	Negligible
S1-W50 & S1-W50 (OW)	Low
S1-W51	Moderate
S1-W53	High
S1-W54	Moderate
S1-W55	Moderate
S1-W57 & S1-W57 (OW)	Moderate
S1-W58	Low
S1-W59	Low
S1-W60	Low
S1-W61	Low
S1-W62	Low

Wetland ID	Ecological Value
S1-W63	Low
S1-W64	Low
S1-W65	Low
S1-W66	Low
S1-W67	Low
S1-W68	Low
S1-W69	Moderate
S1-W70	Negligible
S1-W71	Negligible
S1-W72	Negligible

8.3 Assessment of Ecological Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

Section 8.3 assesses the ecological effects of activities which relate to district plan matters under the AUP:OP.

8.3.1 Construction Effects - Terrestrial Ecology

The potential construction effects (direct and indirect) to the terrestrial habitat and species within and adjacent to NoR S1 (as they relate to district matters) have been identified:

- Vegetation removal subject to district controls (refer to Appendix 5).
- Disturbance and displacement to roosts/nests and individual (existing) bats, birds and lizards due to construction activities (noise, light, dust etc.). It is assumed that this effect will occur after vegetation clearance (subject to regional consent controls) has been implemented and is therefore likely to happen in habitats adjacent to the project footprint/designation or underneath structures such as bridges.

The following sections detail the magnitude of effect and subsequent level of effect on ecological features (further detail regarding how these were determined are provided in Appendix 1). The effects assessment has considered two scenarios – the current ecological baseline (refer Section 8.2.2) and the 'existing environment' (i.e., allowing for permitted activities) (refer Section 8.2.1).

Impact management and residual effects are also presented where the level of effect is assessed to be **Moderate** or higher.

8.3.1.1 Terrestrial Vegetation

Vegetation to be removed that is subject to district controls is presented in Appendix 5 and also detailed in the table below. The effects of district plan vegetation removal on fauna i.e., bats and birds

(as it relates to loss in foraging habitat, and mortality and injury) is assessed in Sections 8.3.1.2 and 8.3.1.3.

Table 8-9 Assessment of ecological effects for terrestrial vegetation (district plan trees only) and impact management during construction for NoR S1

Effect Description	Permanent loss of habitat/ecosystem, fragmentation, and edge effects due to vegetation removal (district plan trees only)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	**EF (total area of 690.59 m^2)** The magnitude of effect is assessed as **Negligible** due to the small extent of the vegetation and the low likelihood that fragmentation and edge effect will occur despite definite removal of the vegetation. The ecological value of EF is assessed to be **Moderate**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **TL.2 (total area of 198.56 m^2)** The magnitude of effect is assessed as **Low** due to the small extent of the vegetation and the low likelihood that fragmentation and edge effect will occur despite definite removal of the vegetation. The ecological value of TL.2 is assessed to be **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **TL.3 (total area of 9664.11 m^2)** The magnitude of effect is assessed as **Low** due to the low likelihood that fragmentation and edge effect will occur despite definite removal of the vegetation. The ecological value of TL.3 is assessed to be **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	It is assumed that urbanisation (and the associated tree removal) may not have occurred at the time of road construction. As such the level of effects will be the same as the Baseline.
Impact management and residual level of effect	N/A	N/A

Effect Description	Permanent loss of habitat/ecosystem, fragmentation, and edge effects due to vegetation removal (district plan trees only)	
	Baseline	Likely Future Ecological Environment
Management of residual effect	N/A	N/A

8.3.1.2 Bats

Bats may utilise the habitats associated with NoR S1 for roosting or foraging. Specifically, areas of Exotic Forest (EF), Exotic Forest – Native Understorey (EF.1), Exotic Forest – Exotic Understorey (EF.2), Mixed Native/Exotic Treeland (TL.2), Exotic-Dominated Treeland (TL.3), Kānuka Scrub/Forest (VS2) and Pūriri Forest (WF7). During construction of the Project, night works may be required, and site compounds are likely to be lit overnight. Lighting at night has the potential to modify the behaviour of bats if foraging within this area or roosting in nearby isolated stands of mature trees.

Noise and vibration during construction can be an issue if bats are roosting in the immediate vicinity of the construction works. Although bat foraging has been confirmed, ABM survey at the Project scale cannot confirm roost occupation within or adjacent to the designation boundary. However, it can be assumed that bats will utilise roost sites within the Project Area based on:

- Confirmed habitat suitability (numerous trees with moderate to high bat roost potential, connected to linear stream corridors and wetlands)
- Confirmed foraging presence and;
- Frequent utilisation of numerous roosting sites throughout their home range (Smith et al., 2017).

Additionally, bats may be impacted by removal of district plan vegetation through the following effects:

- Disturbance and displacement to existing individuals due to construction activities (noise, light, dust etc.)
- Loss of foraging habitat
- Roost loss
- Mortality or injury to bats

Table 8-10 outlines the effect assessment for bats due to construction activities related to noise and light, and removal of district plan vegetation.

Table 8-10 Assessment of ecological effects for bats and impact management during construction for NoR S1

Effect Description	Disturbance and displacement to roosts and individual bats (existing) adjacent to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Roost loss - Mortality or injury to bats	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Low** due to the relatively short duration of construction related effects. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required.	Same as Baseline due to the retention of vegetation within riparian corridors and the low likelihood of change within the Rural zone where mature trees are likely to remain. Portions of the NoR associated with the FUZ may also provide bat habitat if construction occurs prior to urbanisation.	***Loss of foraging habitat & Roost loss*** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. ***Mortality or injury to bats*** The magnitude of effect is assessed as **Low** due to likely probability, but local extent if impact occurs. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required.	Same as Baseline.

Effect Description	Disturbance and displacement to roosts and individual bats (existing) adjacent to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Roost loss - Mortality or injury to bats	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Impact management and residual level of effect	A Bat Management Plan (BMP) should be developed to include consideration for: • Surveys prior to construction to confirm presence/likely absence. Surveys to confirm bat roost locations if activity is confirmed. • Confirmation of maternity roosts may require a seasonal restriction on construction activity (no or restricted construction during Dec-Mar). • Siting of compounds and laydown areas to avoid EF, EF.1, EF.2, TL.2, TL.3, VS2 and WF7 habitat. • Lighting design to reduce light levels and spill from construction areas. • Restriction of nightworks around EF, EF.1, EF.2, TL.2, TL.3, VS2 and WF7 habitat.	Same as Baseline.	A BMP should be developed to include consideration for: • The provisions of the Wildlife Act. • Timing of vegetation removal. • Design and implementation of a vegetation removal protocol, including pre-felling surveys. The residual impact is assessed as **Very Low** post mitigation.	Same as Baseline.

Effect Description	Disturbance and displacement to roosts and individual bats (existing) adjacent to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Roost loss - Mortality or injury to bats	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	• Bat management should be incorporated with any regional consent conditions (i.e., BMPs) that may be required for regional compliance. The residual impact is assessed as **Very Low** post mitigation.			
Management of residual effect	N/A	N/A	N/A	N/A

8.3.1.3 Birds

Noise, vibration and lighting disturbance caused by construction activities could potentially displace native birds from suitable nesting and foraging habitat adjacent to NoR S1. Additionally, birds may be impacted by removal of district plan vegetation through the following effects:

- Disturbance and displacement to existing individuals due to construction activities (noise, light, dust etc.)
- Loss of foraging habitat
- Nest loss
- Mortality or injury to birds

Table 8-11 outlines the effect assessment for birds due to construction activities related to noise and light, and removal of district plan vegetation.

Table 8-11 Assessment of ecological effects for birds and impact management during construction for NoR S1

	Disturbance and displacement to roosts and individual birds (existing) adjacent to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Non-TAR birds** The magnitude of effect is assessed as **High** due to definite presence of native birds associated with several habitat features of the NoR. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and short duration of effect if disturbance occurs. The ecological value of these species is **Very High**, and the overall level of effect is assessed as	Same as Baseline.	**Non-TAR birds** The magnitude of effect is assessed as **Moderate** due to definite presence of native birds associated with district plan vegetation and the high probability that these effects could occur. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of these species is **High**, and the overall	Same as Baseline.

	Disturbance and displacement to roosts and individual birds (existing) adjacent to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	Low prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (New Zealand pipit)</u>** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and short duration of effect if disturbance occurs. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (North Island kākā)</u>** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and short duration of effect if disturbance occurs. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very**		level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (New Zealand pipit)</u>** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (North Island kākā)</u>** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very**	

	Disturbance and displacement to roosts and individual birds (existing) adjacent to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	Low prior to mitigation. As such no impact management is required. **<u>Wetland TAR birds (brown teal, dabchick)</u>** The magnitude of effect is assessed as **Low** due to a likely probability of disturbance and frequent occurrence. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required. **<u>Wetland TAR birds (North Island fernbird, banded rail, spotless crake)</u>** The magnitude of effect is assessed as **Low** due to the likely probability and continuous occurrence. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low**		**Low** prior to mitigation. As such no impact management is required.	

	Disturbance and displacement to roosts and individual birds (existing) adjacent to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	prior to mitigation. As such no impact management is required. **<u>Wetland TAR birds (little black shag, pied shag)</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and short duration of effect. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as Very **Low** prior to mitigation. As such no impact management is required.			
Impact management and residual level of effect	**<u>Brown teal, dabchick</u>** Impact management is required for brown teal and dabchick. The Bird Management Plan should consider the following: • Where practical, construction works near suitable wetland habitat (refer Table 8-7) should commence prior to the bird breeding season (September to	Same as Baseline.	Impact management will be required under the Wildlife Act to prevent killing or injuring of native birds. As part of this management, timing of vegetation removal should be constrained to avoid the key nesting period (September to February) or pre-clearance inspections should be undertaken prior to vegetation removal.	Same as Baseline.

	Disturbance and displacement to roosts and individual birds (existing) adjacent to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	February) in order to discourage bird nesting. • Bird management should be consistent with any regional consent conditions that may be required for regional compliance. The residual impact is assessed as **Very Low** post mitigation.			
Management of residual effect	N/A	N/A	N/A	N/A

8.3.1.4 Lizards

Construction effects on lizards within habitat adjacent to the NoR associated with noise, light and vibration are presented in Table 8-12. Construction activity mostly relates to the construction of new roads. Lizards present in areas adjacent to the proposed new roads may not be habituated to noise and vibration. Overall, the likelihood of disturbance is expected to be Low. Regional matters as they relate to vegetation removal and lizards are further discussed in Section 8.4.4.

Table 8-12 Assessment of ecological effects for lizards and impact management during construction for NoR S1

Effect Description	Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, dust etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Low** due to the highly likely probability of local lizard disturbance adjacent to construction related noise and vibration in areas where new roads are constructed. The ecological value of copper skink and ornate skink is assessed as **High**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

8.3.2 Operational Effects - Terrestrial Ecology

The Project involves the construction of a new state highway largely within a rural landscape with sections located in future urban zoned areas; therefore, it is likely that operational effects such as fragmentation and noise and lighting may increase from the current baseline. In general, potential operational effects from the Project that relate to District plan matters are summarised below.

- Loss in connectivity to indigenous fauna (e.g., bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road, leading to fragmentation of habitat; and
- Disturbance and displacement of indigenous fauna and their nests/roosts (e.g., bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road.

The following sections detail the magnitude of effect and subsequent level of effect on ecological features (further detail regarding how these were determined are provided in Appendix 1). The effects assessment has considered two scenarios – the current ecological baseline (refer Section 8.2.2) and the 'existing environment' (i.e., allowing for permitted activities) (refer Section 8.2.1).

Impact management and residual effects are also presented where the level of effect is assessed to be **Moderate** or higher.

8.3.2.1 Bats

The loss of connectivity through the presence of the road and associated disturbance such as operational noise/vibration and light can lead to an overall reduction in size and quality of bat foraging habitat, it can impact on bat movement in the broader landscape and can potentially disturb nearby bat roosts (including maternity roost). Lighting spillage from street lighting could also disturb commuting and foraging bats at night and adversely affect insect prey populations. The level of effect on bats due to operational impacts associated with loss in connectivity should be assessed in the context of confirmed bat activity in the broader landscape, the presence of two important ecological nodes (namely Riverhead Forest and Waitakere Ranges), the low degree of existing fragmentation and the future environment (mainly remaining rural).

Table 8-13 outlines the effect assessment for:

- Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to additional fragmentation of terrestrial habitat due to the presence of the infrastructure.
- Disturbance and displacement of bats due to light, noise and vibration from the road.

Table 8-13 Assessment of ecological effects for bats and impact management during operation for NoR S1

Effect Description	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration		Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Moderate** due to the relatively local extent of disturbance and high likelihood of disturbance occurring. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **High** for the disturbance of individual bats and roosts. As such impact management is required.	Same as Baseline.	The magnitude of effect is assessed as **High** due to the high probability of loss in connectivity due to the operation of the ASH in areas with confirmed bat movement and the presence of two known ecological nodes likely important to the regional bat population The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Very High** for loss in connectivity. As such impact management is required.	Same as Baseline.
Impact management and residual level of effect	A BMP should be developed to include consideration for: • Buffer planting and retention of existing mature trees between	Same as Baseline.	A BMP should be developed as outlined in Appendix 14[18]. The map indicates the location and extent of measures to mitigate potential connectivity effects and includes hop-overs/underpasses, buffer	Same as Baseline.

[18] As verified by Dr Ian Davidson-Watts of Davidson-Watts Ecology (Pacific) Limited in Appendix **Error! Reference source not found.**.

Effect Description	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration		Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	the road alignment and features with potential for bat roosts[17]. • Light and noise management through design. • Future presence of roosts within the alignment (placement of flaps on features with high roost potential). The residual impact is assessed as **Low** post mitigation.		planting and existing mature tree features that will be retained, as well as indicating areas where early planting[19] (or planting of mature trees) will occur. The BMP should also have additional consideration for: • Lighting design to minimise light levels and light spill along the road corridor. • As an alternative to early restoration planting, restoration planting can make use of mature trees to achieve the same goal as early restoration planting. • Assumptions in the efficacy of the proposed mitigation will be addressed through an adaptive management framework that will outline bat activity	

[17] This may be in addition to the buffer planting proposed in Appendix **Error! Reference source not found.** and will depend on the presence and location of roosts at the time of construction. The requirement for planting mature trees (as buffer) to mitigate roost disturbance, will depend on the future context such as the location of known roosts, the presence of existing buffer and the feasibility of including other design consideration that can control disturbance effects.

Effect Description	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration		Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
			thresholds, robust monitoring and potential corrective action. The residual impact is assessed as **Low** post mitigation.	
Management of residual effect	N/A	N/A	N/A	N/A

8.3.2.2 Birds

Noise, vibration and lighting disturbance caused by the presence of the road could potentially displace native birds from suitable nesting and foraging habitat within and adjacent to NoR S1, while noise, light and vibration may also affect connectivity in the broader landscape.

Table 8-14 outlines the operational effect assessment and impact management for birds.

Table 8-14 Assessment of ecological effects for birds and impact management during operation for NoR S1

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Non-TAR birds** The magnitude of effect is assessed as **High**, due to the definite likelihood of disturbance due to noise, light and vibration from the areas of new road. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent of effect if disturbance occurs. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (New Zealand pipit)** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent of effect if disturbance occurs.	Same as Baseline.	**Non-TAR birds** The magnitude of effect is assessed as **High** due to the definite likelihood of loss in connectivity from the areas of new road. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Low** due to an unlikely probability, but potentially more than local extent of the effect. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. Further information on impact management is detailed in the row below. **Terrestrial TAR birds (New Zealand pipit)** The magnitude of effect is assessed as **Low** due to a lower probability and potentially more than local extent of the effect.	Same as Baseline.

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (North Island kākā)** The magnitude of effect is assessed as **Negligible** due to an unlikely probability, infrequent and local extent of effect if disturbance occurs. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Wetland TAR birds (brown teal, dabchick)** The magnitude of effect is assessed as **Low** due to a likely probability of disturbance. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required. **Wetland TAR birds (North Island fernbird, banded rail, spotless crake)** The magnitude of effect is assessed as **Low** due to likely probability and local level of effect. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such impact management is not required.		The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (North Island kākā)** The magnitude of effect is assessed as **Low** due to an unlikely probability and regional extent of effect. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Wetland TAR birds (brown teal, dabchick)** The magnitude of effect is assessed as **Low** due to a likely probability of disturbance. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required. **Wetland TAR birds (North Island fernbird, banded rail, spotless crake)** The magnitude of effect is assessed as **Low** due to likely probability and local level of effect. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such impact management is not required.	

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	Likely Future Ecological Environment	Baseline	Likely Future Ecological Environment
	Wetland TAR birds (little black shag, pied shag) The magnitude of effect is assessed as **Negligible** due to the unlikely probability of effect. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required.		**Wetland TAR birds (little black shag, pied shag)** The magnitude of effect is assessed as **Low** due to the unlikely probability of the effect. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	
Impact management and residual level of effect	**Brown teal, dabchick** Impact management is required for brown teal and dabchick. The following mitigation measures should be implemented where practicable: • Retention of vegetation near wetland habitat, where practicable. • Buffer planting between the road alignment and suitable habitat adjacent to the road (specifically at S1-W6, S1-W10, S1-W27, and S1-W66). • Installation of vegetation hop-overs in key areas where the road corridor fragments local areas of suitable habitat (open water and some wetlands). The residual impact is assessed as **Very Low** post mitigation.		**Long-tailed cuckoo** Impact management is required for long-tailed cuckoo. This is due the **Very High** value of the species. Since it is a highly mobile migrant species, it is anticipated that mitigation associated with landscape planting, riparian planting and bat mitigation will result in a **Very Low** residual impact post mitigation. **Brown teal, dabchick** Impact management is required for brown teal and dabchick. The following mitigation measures should be implemented where practicable: • Retention of vegetation near wetland habitat, where practicable. • Buffer planting between the road alignment and suitable habitat adjacent to the road (specifically at S1-W6, S1-W10 & S1-W10 (OW), S1-W16, S1-W27, S1-W45, S1-W59 (OW), and S1-W64).	

	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
			• Installation of vegetation hop-overs in key areas where the road corridor fragments local areas of suitable habitat (open water and some wetlands). The residual impact is assessed as **Very Low** post mitigation.	
Management of residual effect	N/A	N/A	N/A	N/A

8.3.2.3 Lizards

Suitable habitat (EF, EF.1, EF.2, EG, ES, PL.1, PL.2, PL.3, TL.2, TL.3, VS2, WF7) was identified within the NoR boundary which could potentially support native copper skink and ornate skink (At Risk – Declining). Native lizards require vegetated corridors to facilitate natural dispersal, although they are considered to be relatively resident species and do not require migration or large-scale movement to support reproduction, refuge and feeding.

The majority of NoR S1 will be a new road, while a portion of it involves upgrading an existing interchange and localised works to existing local roads. In areas where the new state highway is constructed, it is likely that there will be some localised lizard disturbance from noise, vibration and lighting and fragmentation of lizard habitat for a period during operation. However, in areas with existing roads, it is not expected to result in the additional fragmentation of lizard habitat. Similarly, resident (existing and future) lizards are likely to be habituated to disturbance such as noise, vibration and lighting and no additional effect on lizards is expected, provided that the post-upgraded road will not result in higher levels of noise and vibration.

Table 8-15 outlines the operational effect assessment and impact management for lizards.

Table 8-15 Assessment of ecological effects for lizards and impact management during operation for NoR S1

	Disturbance and displacement of existing and future lizards due to light, noise and vibration effects from the presence of the road		Loss in connectivity due to permanent habitat loss, light and noise/vibration effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Low** due to the likely probability and relatively local extent of disturbance if the effect occurs. The ecological value of copper skink and ornate skink is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.	The magnitude of effect is assessed as **Low** due to the likely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of copper skink and ornate skink is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.
Impact management and residual level of effect	N/A	N/A	N/A	N/A
Management of residual effect	N/A	N/A	N/A	N/A

8.3.3 Effects Conclusions

The ecological level of effects assessed as **Moderate**, **High** or **Very High** for NoR S1, and therefore require impact management, are described in Sections 8.3.3.1 to 8.3.3.3.

8.3.3.1 Long-tailed bats

- **Moderate** level of effect for disturbance and displacement to roosts and individuals (existing) during construction for the Baseline and Future Environment.
- **Moderate** level of effect for mortality or injury to bats due to the removal of district plan vegetation during construction for the Baseline and Future Environment.
- **Very High** level of effect for loss in connectivity due to the presence of the road during operation for the Baseline and Future Environment.
- **High** level of effect for the disturbance and displacement of (new and existing) roosts and individuals due to the presence of the road during operation for the Baseline and Future Environment.

The post mitigation level of effect is considered to be **Very Low** to **Low** for construction and operational related effects.

8.3.3.2 Long-tailed cuckoo

- **Moderate** level of effect for loss in connectivity due to the presence of the road during operation for the Baseline and Future Environment.

The post mitigation level of effect is considered to be **Negligible.**

8.3.3.3 Brown teal, dabchick

- **Moderate** level of effect for disturbance and displacement to nests and individuals (existing) during construction for the Baseline and Future Environment.
- **Moderate** level of effect for disturbance and displacement to roosts and individual birds (existing) due to the presence of the road during operation for the Baseline and Future Environment.
- **Moderate** level of effect for loss in connectivity due to the presence of the road during operation for the Baseline and Future Environment.

The post mitigation level of effect is considered to be **Negligible** for construction and operational effects

8.4 Design and Future Resource Consent Considerations

Ecological effects associated with activities that require regional consents and consideration under the NPS-FM are briefly discussed in the following sections to inform design and alignment options for NoR S1. Wildlife Act Authority permits are also discussed in relation to the potential killing or injuring of native fauna associated with the Project activities.

8.4.1 Terrestrial Ecology

Construction of the Project will result in temporary and permanent loss of vegetation within the NoRs, including suitable habitat that is potentially being used by native fauna (bats, birds, and lizards). Loss of vegetation that is subject to district plan controls is discussed in Section 8.3.1.

The amounts and types of all[20] terrestrial habitat and vegetation (including habitat used by native fauna) that could be lost as a result of the Project is presented in Table 8-16 under the Footprint column.

The terrestrial vegetation to be lost (temporary and permanent) is comprised of both native and exotic vegetation which ranges from **Negligible** to **Very High** ecological value (Section 8.2.3.3). Some of these areas are likely to provide habitat to native fauna, as discussed in Sections 8.4.2 to 8.4.4 below.

Table 8-16 Potential area of permanent terrestrial vegetation loss within the road footprint for NoR S1

Feature	Classification*	Footprint (m²)
Brown Field (includes cropland)	BF	4,976
Exotic Forest^	EF	4,355
Exotic Forest – Native Understorey	EF.1	2,809
Exotic Forest – Exotic Understorey	EF.2	4,843
Exotic Grassland	EG	#
Exotic Scrub	ES	17,792
Planted Vegetation – Native	PL.1	38,499
Planted Vegetation – Mixed	PL.2	2,574
Planted Vegetation – Exotic	PL.3	206,716
Mixed Native/Exotic Treeland^	TL.2	9,007
Exotic-Dominated Treeland^	TL.3	115,719
Kānuka Scrub/Forest	VS2	3,010
Pūriri Forest	WF7	2,395

Notes: * = Classification from Singers et al. (2017). ^ = Includes district plan vegetation. # = Not mapped due to the extent.

As the design develops and resource consent applications are prepared, more detailed habitat and fauna surveys may be required to inform an EcIA (in line with the EIANZ Guidelines) which will be used to support future regional resource consent (for example, removal of vegetation in the riparian setback) and wildlife permit applications (if required).

[20] Includes vegetation that is subject to district and regional plan controls as well as vegetation that can be removed as a permitted activity.

8.4.2 Bats

Mature trees in suitable habitat areas (EF, EF.1, EF.2, TL.2, TL.3, VS2, and WF7) may provide potential habitat for bat roosts and facilitate bat movement in the broader landscape. The presence of bats and roosts will likely be re-assessed prior to obtaining any Regional resource consents for vegetation removal (relevant under regional matters) and to support an application for a wildlife permit. The loss of some of this habitat is already assessed because they are district plan trees.

The presence of bat habitat and bat roosts will require a BMP. The objectives of bat management will be to, where practicable:

- Identify bat priority areas that may be affected by the Project.
- Avoid bat priority areas through alignment and design.
- Avoid effects of lighting and noise on bats within bat priority areas.
- Avoid injury and/or death of roosting bats during vegetation removal.
- Avoid disturbance through construction management (seasonal restriction on vegetation removal December to April)
- Outline additional mitigation where avoidance is not feasible including any offset/compensation that may be required.

8.4.3 Birds

TAR birds associated with terrestrial habitats are likely to include migratory kākā and long-tailed cuckoo. The habitats available (EF, EF.1, EF.2, TL.2, TL.3, VS2, and WF7) provide low quality, nonbreeding habitat and may be used seasonally and infrequently for roosting and foraging. The value of these habitats ranges from **Low** to **Very High.**

TAR birds associated with wetland habitats are likely to include brown teal, dabchick, North Island fernbird, spotless crake, little black shag, and pied shag. TAR birds associated with mangrove forest and scrub (SA1.2) habitats are likely to include banded rail.

Not Threatened native birds are highly likely to be present within the NoR and utilise all identified terrestrial habitats (excluding Brown Fields). Vegetation clearance required for construction could result in the loss of these habitats of local value to native birds. The value of these habitat ranges from **Low** to **Very High** and any vegetation clearance within the bird nesting season (September – February) will need to be managed in accordance with the Wildlife Act 1953. The loss of some of this habitat is already assessed because they are district plan trees.

8.4.4 Lizards

Native copper skink and ornate skink are likely to be present within vegetation impacted by the Project. Therefore, there is potential that site clearance required for construction could kill or injure native lizard species and result in the removal of their habitat. Any vegetation clearance where copper skink or ornate skink are likely to occur will also need to be managed in accordance with the Wildlife Act 1953.

8.4.5 Freshwater Ecology

The construction of NoR S1 will directly impact 18 streams, ranging from **Low** to **Moderate** ecological value. Approximately 1,811.5 m of stream reclamation will be required to accommodate the Project works in NoR S1. The road alignment was adjusted to avoid and minimise effects on the Kumeu River

(and associated floodplains) south of Boord Crescent. Similarly, more sensitive stream and wetland complexes (for example 32 and 34 Pamona Road) and 133 Puke Road will be bridged.

The predicted permanent and intermittent stream loss for the Project is presented in Table 8-17. These calculations will require re-evaluation as part of the future regional consent process. It is expected that details regarding the offset/compensation requirements will be addressed during the future regional resource consent application.

Table 8-17 Potential stream loss (permanent and intermittent) within NoR S1

Stream ID	Hydroperiod	Ecological Value	Length to be lost (m)*
S1-S1a	Permanent	Moderate	38
S1-S2	Permanent	Moderate	30
S1-S1b	Permanent	High	219
S1-S3	Intermittent	Low	46
S1-S9	Intermittent	Low	48.5
S1-S10	Intermittent	Low	121.5
S1-S13*	Intermittent	Low	176.5
S1-S14	Intermittent	Low	115
S1-S16*	Intermittent	Low	143
S1-S20a	Permanent	Moderate	99
S1-S20d	Intermittent	Low	106.5
S1-S20e	Intermittent	Low	42
S1-S21	Permanent	Moderate	69.5
S1-S23	Intermittent	Low	91.5
S1-S25*	Intermittent	Low	253
S1-S27*	Intermittent	Low	101
S1-S28	Intermittent	Low	30.5
W4-S1	Permanent	High	81

Notes: * = Some assessments were carried out at a desktop level, making it difficult to accurately delineate stream width and length. Therefore, lengths are indicative.

During the detailed design phase, stream crossing plans (i.e., bridge or culvert) will be confirmed as well as details regarding fish passage requirements. Under a future regional consent for instream works, earthworks and vegetation removal, impact management would also be required for fish salvage and relocation, sediment control and management of the riparian condition.

8.4.6 Wetland Ecology

Wetland extent and approximate value was considered during the Multi Criteria Assessment (MCA) to inform the Alternatives Assessment for all of the proposed alignment options. This was achieved through a desktop wetland delineation for all of the NoR options along with a proxy based assessment of ecological value (catchment condition, vegetation cover, relationship with other ecological features).

The construction of NoR S1 will impact 32 natural wetlands ranging from **Negligible** to **High** ecological value. Approximately 31,534 m^2 of direct wetland loss will occur (Table 8-18). It is expected that details regarding the offset/compensation requirements will be addressed during the future regional resource consent application.

Table 8-18 Potential wetland loss within NoR S1

Wetland ID	Vegetation Type	Ecological Value	Loss (m^2)*
S1-W1	Exotic Wetland (EW)	Low	248
S1-W2	Exotic Wetland (EW)	Low	988.5
S1-W4	Exotic Wetland (EW)	Moderate	3860
S1-W56	Exotic Wetland	Low	86
S1-W6	Planted Wetland (PLW) and small area of EW	High	1176.5
S1-W11	*Machaerina* sedgeland (WL11)	High	552
S1-W12	Exotic Wetland (EW)	Low	210.5
S1-W19	*Machaerina* sedgeland (WL11)	High	193
S1-W20	Exotic Wetland (EW)	Moderate	6670
S1-W21	Planted Wetland (PLW)	High	1011
S1-W22	Planted Wetland (PLW)	High	1054
S1-W23 & S1-W23 (OW)	Exotic Wetland (EW) & Open Water (OW)	Low	2001.5
S1-W24 & S1-W24 (OW)	Exotic Wetland (EW) & Open Water (OW)	Low	975.5
S1-W25	Exotic Wetland (EW)	Low	275
S1-W31 & S1-W31 (OW)	Exotic Wetland (EW) & Open Water (OW)	Low	85
S1-W33	Exotic Wetland (EW)	Low	235.5
S1-W34 & S1-W34 (OW)	Exotic Wetland (EW) & Open Water (OW)	Low	90
S1-W38	Exotic Wetland (EW)	Low	700

Wetland ID	Vegetation Type	Ecological Value	Loss (m^2)*
S1-W39	Exotic Wetland (EW)	Low	555
S1-W40	*Machaerina* sedgeland (WL11)	High	537.5
S1-W41	Exotic Wetland (EW)	Moderate	1696.5
S1-W42	Exotic Wetland (EW)	Low	812
S1-W43 & S1-W43 (OW)	Exotic Wetland (EW) & Open Water (OW)	Low	168.5
S1-W44	*Machaerina* sedgeland (WL11)	Moderate	127.5
S1-W45 & S1-W45 (OW)	Exotic Wetland (EW) & Open Water (OW)	Low	577.13
S1-W46 & S1-W46 (OW)	Exotic Wetland (EW) & Open Water (OW)	Moderate	1122
S1-W47	Exotic Wetland (EW) & Open Water (OW)	Low	3733
S1-W50 & S1-W50 (OW)	Exotic Wetland (EW)	Low	930
S1-W53	Planted Wetland (PLW)	High	278
S1-W54	Planted Wetland (PLW)	Moderate	169
S1-W69	Exotic Wetland	Moderate	388
S1-W72	Exotic Wetland	Negligible	28

Notes:
* = Some assessments were carried out at a desktop level, therefore areas are indicative.

9 NoR S2: SH16 Main Road Upgrade

9.1 Project Corridor Features

The SH16 Main Road Upgrade is along the existing SH16. The portion of the upgrade to the east of Tapu Road is developed with residual ecological features associated with the existing Kumeu Tributary and Kumeu River (Main Road upgrade). To the west of Tapu Road the area is more rural with ecological features relating to road planting, hedgerows and riparian features of three low order streams.

9.2 Existing and Likely Future Environment

9.2.1 Planning Context

SH16 Main Road is proposed to be upgraded to a 24 m urban corridor along the urban extent of SH16 traversing through well-established retail, commercial and residential environs through Kumeū Huapai. This corridor contains a range of business, residential and open space and rural land uses under the AUP:OP (see zoning column in Table 8-1) between the eastern extent of the Kumeū-Huapai township and the western extent of the upgraded corridor (the intersection with the proposed ASH).

Table 9-1 below provides a summary of the existing and likely future environment as it relates to the SH16 Main Road Upgrade.

Table 9-1 SH16 Main Road Upgrade Existing and Likely Future Environment

Environment today	Zoning	Likelihood of Change for the environment[21]	Likely Future Environment[22]	Implications of Future Environment on Ecological Features
Rural	Rural Mixed Rural Zone, Rural Countryside Living Zone	Low	Rural	All existing ecological features are likely to remain similar or the same. Vegetation cover, streams and wetland features are likely to be relatively unchanged.
Business	Business (Industrial)	Low	Business (Industrial)	All existing ecological features are likely to remain similar or the same. Vegetation cover, streams and wetland features are likely to be relatively unchanged.
	Business (Local Centre)	Low	Business (Local Centre)	All existing ecological features are likely to remain similar or the same. Vegetation cover, streams and wetland features

[21] Based on AUP:OP zoning/policy direction
[22] Based on AUP:OP zoning/policy direction

Environment today	Zoning	Likelihood of Change for the environment[21]	Likely Future Environment[22]	Implications of Future Environment on Ecological Features
				are likely to be relatively unchanged.
	Business (Mixed Use)	Low	Business (Mixed Use)	All existing ecological features are likely to remain similar or the same. Vegetation cover, streams and wetland features are likely to be relatively unchanged.
Residential	Residential	Low	Residential	All existing ecological features are likely to remain similar or the same. Vegetation cover, streams and wetland features are likely to be relatively unchanged.
Open Space	Open Space – Sport and Active Recreation	Low	Open Space	All existing ecological features are likely to remain similar or the same. Vegetation cover, streams and wetland features are likely to be relatively unchanged.
Undeveloped greenfield areas	Future Urban	High	Urban	As land is developed, the majority of terrestrial vegetation (such as planted vegetation, forestry and shelterbelts) outside riparian zones will be cleared and developed. Streams, wetlands and riparian vegetation is likely to be largely retained and potentially locally improved through protection within esplanade reserves and habitat enhancement. Habitat connectivity may be reduced as road crossings and urbanisation fragment the catchment.

Please refer to the AEE for further information on the planning context.

9.2.2 Permitted Activities and the Future Ecological Environment

The areas of existing undeveloped greenfields are zoned FUZ in the AUP:OP, and as such are planned for urbanisation. Vegetation clearance within the FUZ, excluding habitat for TAR species, vegetation within 10 m of a riparian strip, and tree removal (excluding district plan vegetation), are identified as permitted activities within Chapters E26 and E15 of the AUP:OP. As such the ecological

features (i.e., terrestrial habitat); excluding natural wetlands, streams and riparian edges;which are currently present adjacent to the NoR, will likely be removed by future development, and will not be present when the upgraded transport corridor is operational (albeit we have assumed they will still be present during construction). Subsequently, our effects assessment has taken this into account.

9.2.3 Ecological Baseline

This section presents the findings of the site and desktop investigations in relation to the terrestrial, freshwater, and wetland habitats and associated fauna species ('ecological features') present within the NoR S2. All features within the study areas were investigated and mapped to provide context for the effects assessment and inform potential adjustments to the proposed designation boundary (Appendix 5). Based on this information, and desktop assessments, an ecological value has been calculated for each ecological feature within this NoR.

9.2.3.1 Terrestrial Habitat

Table 9-2 summarises the vegetation types and their classification (Singers et al., 2017) associated with NoR S2. Maps are presented in Appendix 5.

Table 9-2 Vegetation types present within NoR S2

Habitat	Classification*	Description of Habitat
Brown Field (includes cropland)	BF	This definition includes Industrial zones, metaled carparks, rail corridors, unmanaged or managed land within urban settings, road median strips, pavements, cracks in concrete. Substrate includes metal (stone chip) and concrete surfaces. largely exotic herbfield (weeds) and occasional exotic or native woody species. For the purposes of mapping this has been extended to include bare ground associated with cropland, market gardens and construction sites.
Exotic Grassland	EG	Grassland dominated by exotic species. This includes pasture, garden lawns and sport pitches.
Exotic Scrub	ES	Exotic secondary scrub or shrubland with >50% cover/biomass of exotic species. The future trajectory is uncertain. Dominant species include gorse, woolly nightshade and privet species.
Exotic Wetland	EW	Wetland ecosystems with >50% exotic plant biomass.
Planted Wetland - Native (recent)	PLW	Native restoration plantings with <50% exotic biomass.
Planted Vegetation - Native	PL.1	Native restoration plantings with <50% exotic biomass. Recently planted native scrub and forest <20 years old.
Planted Vegetation - Exotic	PL.3	Exotic amenity plantings. This includes planted exotic vegetation within parks, amenity areas and private gardens.
Mixed Native/Exotic Treeland	TL.2	Tree canopy cover 20-80%. Mixed native/exotic: with 25-75% native tree cover. For the purposes of mapping this includes planted and wilding exotic vegetation and mature shelterbelts. This includes mature

Habitat	Classification*	Description of Habitat
		riparian vegetation and scattered or discontinuous canopy of mature trees within gardens, farms and amenity areas.
Exotic-Dominated Treeland	TL.3	Tree canopy cover 20-80%: <25% native with exotic tree cover dominant. For the purposes of mapping this includes planted and wilding exotic vegetation and mature shelterbelts. This includes mature riparian vegetation and scattered or discontinuous canopy of mature trees within gardens, farms and amenity areas.
Kānuka Scrub/Forest	VS2	Kānuka-dominated forest with insufficient emergent secondary species to determine trajectory to mature forest type. Occurs on hillslopes, ridges, terraces, and plains especially on free-draining soils. Species include kānuka (*Kunzea ericoides*), *Coprosma* spp. *and Pittosporum* spp.
Raupō reedland	WL19	Raupō-dominated freshwater wetland. Depressions and lake and lagoon margins with recent and organic soils. Raupō, locally with purua grass, lake clubrush, jointed twig rush, pūkio, swamp millet. Includes modified wetland examples where *Carex* spp., *Juncus* spp. and swamp millet are common.
Kahikatea, pukatea forest	WF8	Dominated by podocarp–broadleaved forest, with emergent trees or a canopy of kahikatea and pukatea, and locally, rimu. Swamp maire occurs in areas with a high water table, and tawa, māhoe and locally, tītoki on areas of drier ground. Kiekie, whekī and supplejack are often abundant, creating a dense structure and sub-canopy.

Notes: * = Information from Singers et al. (2017).

9.2.3.2 Terrestrial Fauna

Bats

Area wide bat surveys have been undertaken for all NoRs. The results of the bat survey are detailed in Appendix 11. Although bats were not detected within NoR S2, suitable foraging and commuting habitat occurs (such as vegetated riparian corridors, Kumeu River and mature shelterbelts). Bats have been detected within 0.8 km (ABM9 during the March-April ABM survey) and as such the occasional utilisation by bats within and adjacent to NoR S2 cannot be excluded for the baseline or for the FUZ.

Roost potential for long-tailed bats was considered to be **Negligible** or **Low** within the SH16 Upgrade designation boundary, due to the small number of impacted mature trees and lack of suitable trees with cracks/crevices/loose bark/cavities.

Birds

No dedicated bird surveys were undertaken for the Project. However, incidental observations of bird species were noted during site walkovers. The full list of birds observed or heard within NoR S2 are available in Appendix 12. The majority of these species are common, introduced and naturalised or common native species such as silvereye and welcome swallow. Although not observed at the time of survey, potential habitat was identified for a number of other TAR bird species, summarised in Table 9-3 below.

Table 9-3 TAR bird species likely to occur within suitable habitat in NoR S2

Species	Conservation status (Robertson et al., 2021)	Distribution and habitat	Project Area Habitat
Brown teal/Pāteke (*Anas chlorotis*)	At Risk – Recovering	Wetlands with open water, including stock ponds and small streams that retain overhanging marginal vegetation (Williams, 2013). Rare but widespread in the Auckland region. Reliant on pest predator control.	Has the potential to utilise a wide range of open water and wetland locations. However, as this species is reliant on pest control it is unlikely to be resident or breeding within the NoR but could be present.
Dabchick/Weweia (*Poliocephalus rufopectus)*	Threatened – Nationally Increasing	Small shallow freshwater lakes and ponds, with dense marginal vegetation. Uncommon but widespread in the Auckland region (Szabo, 2013).	Has the potential to utilise any freshwater open water habitat, including stock water ponds, ornamental ponds and stormwater ponds. Likely to breed in associated marginal wetland vegetation.
North Island Fernbird/mātātā (*Bowdleria punctata vealeae*)	At Risk – Declining	Dense wetland vegetation. Rare but widespread in the Auckland region (Miskelly, 2013).	Has the potential to utilise any dense wetland vegetation, for foraging and breeding. This includes native planted wetlands (PLW) and Raupō Reedland (WL19).
North Island kākā (*Nestor meridionalis septentrionalis*)	At Risk – Recovering	Kākā are generally restricted to indigenous forest habitat and offshore islands in the Auckland region. However, they make seasonal migrations to the Auckland mainland, particularly in winter where they often utilize exotic pine and eucalyptus trees in rural and urban areas. Rare but widespread (seasonal migrant) in the Auckland region (Moorhouse, 2013).	Has the potential to utilise any mature treeland (TL.2, TL.3), exotic forest (EF.1. EF.2) or mature indigenous forest types. There is no breeding habitat within the NoR but likely to infrequently utilise exotic trees for seasonal foraging and roosting throughout winter season.

Species	Conservation status (Robertson et al., 2021)	Distribution and habitat	Project Area Habitat
Little black shag/Kawau tūī (*Phalacrocorax sulcirostris*)	At Risk – Naturally Uncommon	Occur in coastal inlets, lakes and ponds, including stormwater ponds. Roosting and breeding in overhanging trees. Common and widespread in the Auckland region (Armitage, 2013).	Has the potential to utilise any freshwater or coastal open water habitat, including stock water ponds, ornamental ponds and stormwater ponds. No breeding or roosting sites observed.
Long-tailed cuckoo/koekoeā (*Eudynamys taitensis*)	Threatened - Nationally Vulnerable	Summer migrant to New Zealand arriving spending winter in tropical Pacific islands. As a parasite nester, their range is restricted to host species whitehead, brown creeper and yellowhead. Absent as a breeding species from Auckland region (except Te Hauturu-o-Toi, Little Barrier Island) but occur on migration passage throughout New Zealand (Gill, 2013).	Has the potential to briefly occur on migration passage across the project area. Can occur in native / exotic forest, scrub, farmland or urban areas on passage to breeding / winter habitat.
New Zealand pipit/Hīoi (*Anthus novaeseelandiae*)	At Risk – Declining	Occur in open habitat such as, coastal and alpine grasslands, but also utilise modified landscapes such as pasture and scrub within the rural landscape. Rare but widespread in the Auckland region (Beauchamp, 2013).	Has the potential to utilise any open habitat such as Exotic Grassland (EG) and Exotic Scrub (ES). Habitat suitability is low due to agricultural intensification and likely moderate to high pest predator numbers.
Pied Shag (*Phalacrocorax varius*)	(At Risk – Recovering)	Occur in coastal inlets, lakes and ponds, including stormwater ponds. Roosting and breeding in overhanging trees. Common and widespread in the	Has the potential to utilise any freshwater or coastal open water habitat, including stock water ponds, ornamental ponds and stormwater ponds.

Species	Conservation status (Robertson et al., 2021)	Distribution and habitat	Project Area Habitat
		Auckland region (Powlesland, 2013).	No breeding or roosting sites observed.
Spotless crake/pūweto *(Porzana tabuensis)*	At Risk – Declining	Wetland vegetation and freshwater lakes and ponds, with dense marginal vegetation. Rare but widespread in the Auckland region (Fitzgerald, 2013).	Has the potential to utilise any dense wetland vegetation, for foraging and breeding. This includes native planted wetlands (PLW), Raupō Reedland (WL19) and marginal vegetation associated with stock water ponds, ornamental ponds and stormwater ponds.

Lizards

Native lizards and introduced lizards were not identified during opportunistic searches completed during the site walkover, however copper skink have been recorded within 0.5 km of NoR S2. Copper skink is likely to be associated with most of the vegetation units presented in Table 9-2 where there is appropriate understorey. However, habitat with a higher potential to support copper skink within NoR S2 is represented by EG, ES, PL.1, PL.3, TL.2, TL.3 and WF8 habitat. Other native lizard species are generally restricted to indigenous forest, indigenous scrub, coastal habitat types or habitat contiguous to such area. As habitat connectivity to SEAs is limited within the wider project ZOI it is unlikely that any other species listed in Table 6-3 will occur within the Project Area, however ornate skink have been included together with copper skink as they have a low probability of occurring within suitable modified habitat, such as dense riparian vegetation.

9.2.3.3 Terrestrial Ecological Value

Appendix 6 presents the ecological value for the terrestrial vegetation identified within NoR S2. Information obtained for the ecological baseline (Sections 9.2.3.1 and 9.2.3.2), as well as the desktop assessment (Section 6), was used to score the matters that inform the ecological value. The ecological value of habitats ranged from **Negligible** (e.g., BF) to **Very High** (e.g., WF8).

Notwithstanding the ecological value associated with vegetation/habitat units, specific consideration still needs to be given to individual species and their conservation significance for the following reasons (in accordance with EIANZ Guidelines):

- The habitat value may dilute the conservation value associated with specific species. For example, the combined value for exotic grassland is **Low**, while the value for copper skink (At Risk - Declining) is **High**. The combined value of **Low** therefore understates the conservation value of the species;
- Species may not be restricted to a single vegetation unit;
- Potential effects on species are unrelated to habitat units. For example, impact on highly mobile species (such as bats) by noise and light may be independent of the habitat loss associated with the Project footprint.

For the reasons outlined above, the ecological value assessments for individual species are considered to range from **Moderate** to **Very High** (Table 9-4).

Table 9-4 Ecological value for terrestrial fauna (TAR species only)

Fauna Type	Species Within Habitat	Habitat Units	Conservation Status (NZ Classification System)	Ecological Value
Bats	Long-tailed bat	TL.2, TL.3, WF8	Threatened – Nationally Critical	**Very High**
TAR Birds	Long-tailed cuckoo	TL.2, TL.3, WF8, VS2	Threatened – Nationally Vulnerable	**Very High**
	Brown teal, dabchick	OW, PLW, WL.11, WL19	Threatened – Nationally Increasing	
	North Island fernbird, spotless crake	OW, PLW, WL.11, WL19	At Risk - Declining	**High**
	New Zealand pipit	EG, ES		
	North Island kākā	TL.2, TL.3, WF8, VS2	At Risk – Recovering	**Moderate**
	Little black shag	OW, PLW, WL.11, WL19	At Risk – Nationally Uncommon	
	Pied shag		At Risk – Recovering	
Herpetofauna (Lizards)	Copper skink	EG, ES, PL.1, PL.3, TL.2, TL.3, WF8	At Risk – Declining	**High**
	Ornate skink	TL.2, TL.3, WF8		

9.2.3.4 Freshwater Habitat

All potential streams within NoR S2 were mapped (Appendix 5) and classified as either permanent or intermittent. Ephemeral streams were mapped when possible. Permanent or intermittent streams that were within the designation boundary were numbered and assessed.

Stream classification and RHA assessment

A total of six stream branches were identified during the desktop and site investigations within NoR S2. The streams are detailed further in Table 9-5.

In summary, streams within NoR S2 were classified as follows:

- One stream branch (S2-S1) was identified as intermittent as three or more of the intermittent stream criteria (Storey & Wadhwa, 2009) were met.
- Five stream branches were identified as permanent as there was evidence of continuous flow.

All streams were accessible during site investigations and surveyed using the RHA. The streams measured overall habitat quality scores that ranged from 'Poor' to 'Moderate' (Table 9-5). Detailed RHA results are presented in Appendix 10.

The barrier to fish migration was assessed at each stream, to describe any fragmentation or loss of connectivity. This is described as either total barrier, partial barrier or no barrier to fish migration.

Table 9-5 Summary of streams identified in NoR S2

Stream ID	Classification	RHA Category
S2-S1	Intermittent	Poor
S2-S2	Permanent	Moderate
S2-S3	Permanent	Poor
S2-S4	Permanent	Poor
S2-S5	Permanent	Moderate
S2-S6	Permanent	Poor

9.2.3.5 Freshwater Fauna

Fish surveys were not carried out during site investigations, however the following At Risk-Declining species have been recorded in the wider catchment area associated with NoR S2 (Table 6-5):

- Īnanga – Kumeu River
- Longfin eel – Kumeu River

The freshwater habitats within NoR S2 were assessed for their potential to support indigenous fish during the RHA. Potential habitat, such as undercut banks, overhanging vegetation and macrophytes were observed at the time of survey.

9.2.3.6 Freshwater Ecological Value

Appendix 7 presents the ecological value for the aquatic habitats identified within NoR S2. Information obtained for the ecological baseline (Section 9.2.3.4 and 9.2.3.5), as well as the area wide desktop assessment (Section 6), was used to score the matters that inform the ecological value. The ecological values for freshwater habitats are presented in Table 9-6.

Table 9-6 Summary of freshwater ecological value identified in NoR S2

Stream ID	Ecological Value
S2-S1	Low
S2-S2	Moderate
S2-S3	Moderate
S2-S4	High
S2-S5	High
S2-S6	Moderate

9.2.3.7 Wetland Habitat

A total of 16 wetlands within NoR S2 were identified and assessed. Details regarding the vegetation cover and NPS-FM classification for each wetland is presented in Table 9-7.

Table 9-7 Summary of wetlands identified in NoR S2

Wetland ID	Vegetation Type	NPS-FM Classification	Potential for TAR Species
S1-W2	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S2-W1*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S2-W2	Planted Wetland (PLW)	Natural wetland	Potential for fernbird and spotless crake.
S2-W3	Planted Wetland (PLW)	Natural wetland	Unlikely to support TAR birds.
S2-W4*	Exotic Wetland (EW)	Artificial wetland	Unlikely to support TAR birds.
S2-W5 & S2-W5 (OW)	Exotic Wetland (EW) & Open Water (OW)	Natural wetland/partially dammed	Potential for spotless crake and dabchick.
S2-W6	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S2-W7*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S2-W8*	Exotic Wetland (EW)	Natural wetland	Potential for spotless crake.
S2-W9 & S2-W9 (OW)	Raupō reedland (WL19) & Open Water (OW)	Natural wetland	Potential for spotless crake and dabchick.

Wetland ID	Vegetation Type	NPS-FM Classification	Potential for TAR Species
S2-W10*	Planted Wetland (PLW)	Natural wetland	Unlikely to support TAR birds.
S2-W11	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.
S2-W12*	Exotic Wetland (EW)	Natural wetland	Potential for spotless crake.
S2-W13	Raupō reedland (WL19)	Natural wetland	Potential for fernbird and spotless crake.
S2-W14	Exotic Wetland (EW)	Artificial wetland (drainage ditch)	Unlikely to support TAR birds.
S2-W15	Planted Wetland (PLW)	Natural wetland	Potential for dabchick.
S2-W16	Open Water (OW)	Artificial wetland	Potential for dabchick.

Notes: * = Wetlands assessed at a desktop level due to access restrictions.

9.2.3.8 Wetland Ecological Value

Appendix 8 presents the ecological value for the wetland habitats identified within NoR S2. Information obtained for the ecological baseline (Section 9.2.3.7), as well as the area wide desktop assessment (Section 6), was used to score the matters that inform the ecological value. The ecological values for wetland habitats are presented in Table 9-8.

Table 9-8 Summary of wetland ecological value identified in NoR S2

Wetland ID	Ecological Value
S1-W2	Low
S2-W1	Low
S2-W2	High
S2-W3	Moderate
S2-W4	Low
S2-W5 & S2-W5 (OW)	Low
S2-W6	Low
S2-W7	Low
S2-W8	Moderate
S2-W9 & S2-W9 (OW)	High
S2-W10	Low

Wetland ID	Ecological Value
S2-W11	Low
S2-W12	Moderate
S2-W13	Moderate
S2-W14	Negligible
S2-W15	Low
S2-W16	Low

9.3 Assessment of Ecological Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

Section 9.3 assesses the ecological effects of activities which relate to plan district matters under the AUP:OP.

9.3.1 Construction Effects - Terrestrial Ecology

Refer to Section 8.3.1.

9.3.1.1 Terrestrial Vegetation

Vegetation to be removed that is subject to district controls is presented in Appendix 5 and also detailed in the table below. The effects of district plan vegetation removal on fauna i.e. bats and birds (as it relates to loss in foraging habitat, and mortality and injury) is assessed in Sections 9.3.1.2 and 9.3.1.3.

Table 9-9 Assessment of ecological effects for terrestrial vegetation (district plan trees only) and impact management during construction for NoR S2

Effect Description	Permanent loss of habitat/ecosystem, fragmentation, and edge effects due to vegetation removal (district plan trees only)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	**TL.3 (total area of 214.24 m^2)** The magnitude of effect is assessed as **Negligible** due to the small extent of tree loss and the very low probability that this will result in additional fragmentation and edge effect. The ecological value of TL.3 is assessed to be **Low**, and the overall level of effect is assessed	Same as Baseline.

Effect Description	Permanent loss of habitat/ecosystem, fragmentation, and edge effects due to vegetation removal (district plan trees only)	
	Baseline	**Likely Future Ecological Environment**
	as **Very Low** prior to mitigation. As such no impact management is required. **<u>WF8 (total area of 99.48 m^2)</u>** The magnitude of effect is assessed as **Negligible** due to the small extent of tree loss and the very low probability that this will result in additional fragmentation and edge effect. The ecological value of WF8 is assessed to be **Low**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Unitary Plan Notable Tree (one mature eucalyptus located on the southern boundary of 396 Main Road)</u>** The magnitude of effect is assessed as **Negligible** due to small extent and low probability associated with this effect. The ecological value of this tree is assessed to be **Negligible**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required.	
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

9.3.1.2 Bats

Bats may utilise the habitats associated with NoR S2 for roosting or foraging. Specifically, areas of TL.2, TL.3, and WF8. During construction of the Project, night works may be required, and site compounds are likely to be lit overnight. Lighting at night has the potential to modify the behaviour of bats if foraging within this area or roosting in nearby isolated stands of mature trees.

Noise and vibration during construction can be an issue if bats are roosting in the immediate vicinity of the construction works. Although bat foraging has been confirmed, ABM survey at the Project scale

cannot confirm roost occupation within or adjacent to the designation boundary. However, it can be assumed that bats will utilise roost sites within the Project Area based on:

- Confirmed habitat suitability (numerous trees with moderate to high bat roost potential, connected to linear stream corridors and wetlands); and
- Confirmed foraging presence

Additionally, bats may be impacted by removal of district plan vegetation through the following effects[23]:

- Disturbance and displacement to existing individuals due to construction activities (noise, light, dust etc.)
- Loss of foraging habitat
- Mortality or injury to bats

Table 9-10 outlines the effect assessment for bats due to construction activities related to noise and light, and removal of district plan vegetation.

[23] Roost lost has been considered but discounted as an effect as the consequence of roost loss (if it does occur at all) is considered less than **Negligible** in the context of this NoR.

Table 9-10 Assessment of ecological effects for bats and impact management during construction for NoR S2

Effect Description	Disturbance and displacement to roosts and individual bats (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Mortality or injury to bats	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Negligible** due to the unlikely probability, relatively short period of construction related effects, and the low baseline bat activity rate. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline due to the retention of vegetation within riparian corridors and the low likelihood of change within the Rural zone where mature trees are likely to remain.	The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.
Impact management and residual level of effect	N/A	N/A	Impact management will be required under the Wildlife Act to prevent killing or injuring of bats. Management might include inspection of trees to confirm potential roost features, constraining the timing of vegetation removal, pre-clearance inspections prior to vegetation removal.	Same as Baseline.
Management of residual effect	N/A	N/A	N/A	N/A

9.3.1.3 Birds

Noise, vibration and lighting disturbance caused by construction activities could potentially displace native birds from suitable nesting and foraging habitat within and adjacent to NoR S2. Additionally, birds may be impacted by removal of district plan vegetation through the following effects:

- Disturbance and displacement to existing individuals due to construction activities (noise, light, dust etc.)
- Loss of foraging habitat
- Nest loss
- Mortality or injury to birds

Table 9-11 outlines the effect assessment for birds due to construction activities related to noise and light, and removal of district plan vegetation.

Table 9-11 Assessment of ecological effects for birds and impact management during construction for NoR S2

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Non-TAR birds** The magnitude of effect is assessed as **Moderate** due to definite presence of native birds associated with several habitat features of the NoR. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and short duration of effect if disturbance occurs. The ecological value of these species is **Very High**, and the overall level of effect is assessed as	Same as Baseline.	**Non-TAR birds** ***Nest loss & Mortality or injury to birds*** The magnitude of effect is assessed as **Moderate** due to definite presence of native birds associated with district plan vegetation. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required. **Non-TAR birds** ***Loss of foraging habitat*** The magnitude of effect is assessed as **Low** due to the likely probability and local and restricted extent if impact occurs.	Same as Baseline.

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	Low prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (New Zealand pipit)</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and short duration of effect if disturbance occurs. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (North Island kākā)</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and short duration of effect if disturbance occurs. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very**		The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (long-tailed cuckoo)</u>** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (New Zealand pipit)</u>** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs.	

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	Low prior to mitigation. As such no impact management is required. **<u>Wetland TAR birds (brown teal, dabchick)</u>** The magnitude of effect is assessed as **Low** due to the likely probability, but short duration of effect if disturbance occurs. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required. **<u>Wetland TAR birds (North Island fernbird, spotless crake)</u>** The magnitude of effect is assessed as **Low** due to the likely probability and short duration of effect if disturbance occurs. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low**		The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (North Island kākā)</u>** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required.	

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	prior to mitigation. As such no impact management is required. **<u>Wetland TAR birds (little black shag, pied shag)</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and short duration of effect if disturbance occurs. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as Very **Low** prior to mitigation. As such no impact management is required.			
Impact management and residual level of effect	**<u>Brown teal, dabchick</u>** Impact management is required for brown teal and dabchick. The Bird Management Plan should consider the following: • Where practical, construction works near suitable wetland habitat (Table 9-7) should commence prior to the bird breeding season (September to	Same as Baseline.	Impact management will be required under the Wildlife Act to prevent killing or injuring of native birds. As part of this management, timing of vegetation removal should be constrained to avoid the key nesting period (September to February) or pre-clearance inspections should be undertaken prior to vegetation removal.	Same as Baseline.

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	February) in order to discourage bird nesting. • Bird management should be consistent with any regional consent conditions that may be required for regional compliance. The residual impact is assessed as **Negligible** post mitigation.			
Management of residual effect	N/A	N/A	N/A	N/A

9.3.1.4 Lizards

Construction effects on lizards associated with noise, light and vibration are presented in Table 9-12. Construction activity relates to the upgrade of an existing road and as such lizards are likely to be habituated to noise and vibration from the existing road. Regional matters as they relate to vegetation removal and lizards are further discussed in Section 9.4.4.

Table 9-12 Assessment of ecological effects for lizards and impact management during construction for NoR S2

Effect Description	Disturbance and displacement of individuals (existing) due to construction activities (noise, dust etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Negligible** due to unlikely probability of lizard disturbance due to construction related noise and vibration. The ecological value of copper skink and ornate skink is assessed as **High**, and the overall level of effect due to construction disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required.	Same as Baseline.
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

9.3.2 Operational Effects - Terrestrial Ecology

The Project involves the upgrading of an existing road in a mixed urban/rural landscape and future urban environment; therefore, although some impacts may increase from the current baseline, many operational effects such as fragmentation and noise and lighting are likely to be pre-existing. In general, potential operational effects from the Project that relate to District plan matters are summarised below.

- Loss in connectivity to indigenous fauna (e.g., bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road, leading to fragmentation of habitat; and
- Disturbance and displacement of indigenous fauna and their nests/roosts (e.g., bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road.

The following sections detail the magnitude of effect and subsequent level of effect on ecological features (further detail regarding how these were determined are provided in Appendix 1). The effects assessment has considered two scenarios – the current ecological baseline (refer Section 9.2.2 and the 'existing environment' (i.e., allowing for permitted activities) (refer Section 9.2.1).

Impact management and residual effects are also presented where the level of effect is assessed to be **Moderate** or higher.

9.3.2.1 Bats

The loss of connectivity through permanent habitat loss and disturbance such as operational noise/vibration and light can lead to an overall reduction in size and quality of bat foraging habitat and can impact on bat movement in the broader landscape. Lighting spillage from street lighting could also disturb commuting and foraging bats at night and adversely affect insect prey populations. The level of effect on bats due to operational impacts associated with loss in connectivity should be assessed in the context of confirmed (but low frequency) bat activity in the broader landscape, the existing degree of fragmentation and that of the future urban environment.

Table 9-13 outlines the effect assessment for:

- Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to additional fragmentation of terrestrial habitat due to the presence of the infrastructure.
- Disturbance and displacement of bats due to light, noise and vibration from the road.

Table 9-13 Assessment of ecological effects for bats and impact management during operation for NoR S2

	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration		Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Negligible** due to the unlikely probability and infrequent occurrence. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Low**. As such no impact management is required.	Same as Baseline. Riparian features with bat habitat potential will remain present within the FUZ.	The magnitude of effect is assessed as **Low** due to unlikely probability (existing fragmentation) at a regional extent. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Moderate** for loss in connectivity. As such impact management is required.	Same as Baseline as riparian features associated with the Kumeu tributaries and Kumeu River will remain present in the FUZ
Impact management and residual level of effect	N/A	N/A	A BMP should be developed to include consideration for: • Lighting design to minimise light levels and light spill along the road corridor in areas not currently affected by light spill. • Buffer planting both sides of the road corridor associated with the Kumeu River (S2-S5) and Kumeu Tributary (S2-S4) crossings to further reduce noise and light resulting in disturbance from the road. The	Same as Baseline.

Effect Description	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration		Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
			extent of buffer planting is outlined in Appendix 14. • Retention of large, mature trees where practicable, to act as hop overs. The residual impact is assessed as **Very Low** post mitigation.	
Management of residual effect	N/A	N/A	N/A	N/A

9.3.2.2 Birds

Noise, vibration and lighting disturbance caused by the presence of the road could potentially displace native birds from suitable nesting and foraging habitat within and adjacent to NoR S2, while noise, light and vibration may also affect connectivity in the broader landscape.

Table 9-14 outlines the operational effect assessment and impact management for birds.

Table 9-14 Assessment of ecological effects for birds and impact management during operation for NoR S2

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Non-TAR birds** The magnitude of effect is assessed as **Low** as NoR S2 is along the existing State Highway 16/Main Road and birds are likely to be habituated to noise, light and vibration from the road. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and local extent of effect. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.	**Non-TAR birds** The magnitude of effect is assessed as **Low** as NoR S2 is along the existing State Highway 16/Main Road. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and local extent of effect. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	Terrestrial TAR birds (New Zealand pipit) The magnitude of effect is assessed as **Negligible** due to the unlikely probability and local extent of effect. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (North Island kākā)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and local extent of effect. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Wetland TAR birds (brown teal, dabchick)**		**Terrestrial TAR birds (New Zealand pipit)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and local extent of effect. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (North Island kākā)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and local extent of effect. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Wetland TAR birds (brown teal, dabchick)**	

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	The magnitude of effect is assessed as **Negligible** due to the unlikely probability and local extent of effect.		The magnitude of effect is assessed as **Negligible** due to the unlikely probability and local extent of effect.	
Impact management and residual level of effect	N/A	N/A	N/A	N/A
Management of residual effect	N/A	N/A	N/A	N/A

9.3.2.3 Lizards

Suitable habitat (EG, ES, PL.1, PL.3, TL.2, TL.3 and WF8) was identified within the NoR boundary which could potentially support native lizards. Native lizards require vegetated corridors to facilitate natural dispersal, although they are considered to be relatively resident species and do not require migration or large-scale movement to support reproduction, refuge and feeding.

NoR S2 corridor includes upgrading the existing State Highway 16/Main Road. The proposed upgrade is therefore not expected to result in the additional fragmentation of lizard habitat. Similarly, resident (existing and future) lizards are likely to be habituated to disturbance such as noise, vibration and lighting and no additional effect on lizards is expected, provided that the post-upgraded road will not result in higher levels of noise and vibration.

Table 9-15 outlines the operational effect assessment and impact management for lizards.

Table 9-15 Assessment of ecological effects for lizards and impact management during operation for NoR S2

Effect Description	Disturbance and displacement of existing and future lizards due to light, noise and vibration effects from the presence of the road		Loss in connectivity due to permanent habitat loss, light and noise/vibration effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Low** as the Project is not expected to further exacerbate existing disturbance adjacent to the NoR. The ecological value of copper skinks and ornate skinks is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.	The magnitude of effect is assessed as **Low** as the Project is not expected to further exacerbate existing and future restrictions on lizard dispersal adjacent to the NoR. The ecological value of copper skinks and ornate skinks is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.
Impact management and residual level of effect	N/A	N/A	N/A	N/A
Management of residual effect	N/A	N/A	N/A	N/A

9.3.3 Effects Conclusions

The ecological level of effects assessed as **Moderate**, **High** or **Very High** for NoR S2, and therefore require impact management, are described in Sections 9.3.3.1 and 9.3.3.2.

9.3.3.1 Long-tailed bats

- **Moderate** level of effect for the loss in connectivity to bats due the presence of the road during operation for the Baseline and Future Environment.

The post mitigation level of effect is considered to be **Very Low**.

9.3.3.2 Brown teal, dabchick

- **Moderate** level of effect for disturbance and displacement to nests and individuals (existing) during construction for the Baseline and Future Environment.

The post mitigation level of effect is considered to be **Negligible**.

9.4 Design and Resource Consent Considerations

Ecological effects associated with activities that require regional consents and consideration under the NPS-FM are briefly discussed in the following sections to inform design and alignment options for NoR S2. Wildlife Act Authority permits are also discussed in relation to the potential killing or injuring of native fauna associated with the Project activities.

9.4.1 Terrestrial Ecology

Construction of the Project will result in temporary and permanent loss of vegetation within the NoRs, including suitable habitat that is potentially being used by native fauna (bats, birds and lizards). Loss of vegetation that is subject to district plan controls is discussed in Section 9.3.1.

The amounts and types of all[24] terrestrial habitat and vegetation (including habitat used by native fauna) that could be lost as a result of the Project is presented in Table 9-16 under the Footprint column.

The terrestrial vegetation to be lost (temporary and permanent) is comprised of both native and exotic vegetation which ranges from **Negligible** to **Very High** ecological value (Section 9.2.3.3). Some of these areas are likely to provide habitat to native fauna, as discussed in Sections 9.4.2 to 9.4.4 below.

Table 9-16 Potential area of permanent terrestrial vegetation loss within the road footprint for NoR S2

Feature	Classification*	Footprint (m²)
Brown Field (includes cropland)	BF	#
Exotic Grassland	EG	#

[24] Includes vegetation that is subject to district and regional plan controls as well as vegetation that can be removed as a permitted activity.

Feature	Classification*	Footprint (m²)
Exotic Scrub	ES	21,532
Planted Vegetation – Native	PL.1	1,595
Planted Vegetation – Exotic	PL.3	6,783
Mixed Native/Exotic Treeland	TL.2	1,398
Exotic-Dominated Treeland^	TL.3	1,502
Kahikatea, pukatea forest	WF8	167

Notes: * = Classification from Singers et al. (2017). ^ = Includes district plan vegetation. # = Not mapped due to the extent.

As the design develops and resource consent applications are prepared, more detailed habitat and fauna surveys may be required to inform an EcIA (in line with the EIANZ Guidelines) which will be used to support future regional resource consent (for example, removal of vegetation in the riparian setback) and wildlife permit applications (if required).

9.4.2 Bats

Mature trees in suitable habitat areas (TL.2, TL.3, and WF8) may provide potential habitat for bat roosts and facilitate bat movement in the broader landscape. The presence of bats should be re-assessed prior to obtaining any regional resource consents for vegetation removal and to support an application for a wildlife permit. The loss of some of this habitat is already assessed because they are district plan trees.

9.4.3 Birds

Native birds are likely to be present within the NoR and utilise all identified terrestrial habitats (excluding Brown Field). Vegetation clearance required for construction could result in the loss of these habitats of local value to native birds. The value of these habitats ranges from **Low** to **Very High** value and any vegetation clearance within the bird nesting season (September – February) will need to be managed in accordance with the Wildlife Act 1953. The loss of some of this habitat is already assessed because they are district plan trees.

9.4.4 Lizards

Native copper skink and ornate skink are likely to be present within vegetation impacted by the Project. Therefore, there is potential that site clearance required for construction could kill or injure native lizard species and result in the removal of their habitat. Any vegetation clearance where copper skink is likely to occur will also need to be managed in accordance with the Wildlife Act 1953.

9.4.5 Freshwater Ecology

The construction of NoR S2 will directly impact two streams ranging from **Low** to **Moderate** value. Approximately 155.5 m of stream loss will be required to accommodate the Project works in NoR S2 (Table 9-17). These calculations will require re-evaluation as part of the future regional consent

process. It is expected that details regarding the offset/compensation requirements will be addressed during the future regional resource consent application.

Table 9-17 Potential stream loss (permanent and intermittent) within NoR S2

Stream ID	Hydroperiod	Ecological Value	Length to be lost (m)*
S2-S1	Intermittent	Low	25
S2-S3	Permanent	Moderate	75

Notes: * = Some assessments were carried out at a desktop level, making it difficult to accurately delineate stream width and length. Therefore, lengths are indicative.

During the detailed design phase, stream crossing plans (i.e., bridge or culvert) will be confirmed. Culvert designs will provide for fish passage where required. Under a future regional consent for instream works, earthworks and vegetation removal, impact management would also be required for fish salvage and relocation, sediment control and management of the riparian condition.

9.4.6 Wetland Ecology

The construction of NoR S2 will directly impact 11 natural wetlands ranging from **Low** to **High** ecological value. Approximately 13,887 m^2 of wetland loss will be required to accommodate the Project works (Table 9-18) in NoR S2. It is expected that details regarding the offset/compensation requirements will be addressed during the future regional resource consent application.

Table 9-18 Potential wetland loss within NoR S2

Wetland ID	Vegetation Type	Ecological Value	Loss (m^2)*
S1-W2	Exotic Wetland (EW)	Low	988.5
S2-W2	Planted Wetland (PLW)	High	1083
S2-W3	Planted Wetland (PLW)	Moderate	2074.5
S2-W6	Exotic Wetland (EW)	Low	134
S2-W11	Exotic Wetland (EW)	Low	566

Notes:
* = Some assessments were carried out at a desktop level, therefore areas are indicative.

10 NoR S3: Rapid Transit Corridor and Regional Active Mode Corridor; NoR KS: Kumeū Rapid Transit Station and NoR HS: Huapai Rapid Transit Station

10.1 Project Corridor Features

Approximately the first 40% of the RTC (from the BCI) is directly associated with the ASH and therefore shares the same ecological features as the ASH, notably the Totara Creek, Ngongetepara and Kumeu rivers. South of Boord Crescent the RTC runs north, parallel to the NAL through a relatively flat rural landscape. Through Huapai the RTC continues parallel and south to the existing SH16 with the main ecological features related to a large Kumeu Tributary and associated riparian and wetland features. Near the Tapu Road and existing SH16 junction the RTC crosses the SH16 and continues parallel and to the north of the existing SH16. The more notable ecological features include several low order stream crossings and natural wetlands. The Kumeu Rapid Transit Station is located to the south of the existing NAL, running parallel to a valley bottom wetland which drains east into a Kumeu Tributary. The riparian features of the Kumeu Tributary are well defined by a mature tree line. To the south of the NAL, the direct catchment consists of pasture and life zone, while to the north is mainly brownfields.

The Huapai Rapid Transit Station is located to the north of the existing SH16 and west of Huapai Town life zone. Ecological features within the designation boundary includes an intermittent stream and wetland complex (partially damned) which forms part of a larger Kumeu tributary draining to the east of the designation. The direct catchment consists of pasture and is fragmented by the existing SH16 and NAL.

10.2 Existing and Likely Future Environment

10.2.1 Planning Context

The Rapid Transit Corridor (**RTC**) and Regional Active Mode Corridor (**RAMC**) form a single, integrated corridor (Note the RAMC only extends to the eastern entrance to Kumeū). This corridor predominately traverses rural land outside of the FUZ, however for assessment purposes it can be split into two sections:

- The **rural section** of the RTC runs from the Brigham Creek Interchange to the entry to Kumeū-Huapai township and is co-located with the RAMC along this section. This rural section traverses land zoned under the AUP:OP as Rural – Countryside Living Zone, with an area zoned as FUZ in Redhills North.
- The **urban section** of the RTC runs from northern end of Waitakere Road to Foster Road and is co-located with the proposed SH16 Main Road upgrade[25] along this section. This urban section contains a range of land uses zoned under the AUP:OP as a mix of business zonings between the eastern extent of the Kumeū-Huapai township and Station Road

[25] Another North West Strategic project – refer to Section **Error! Reference source not found.** of this report

Table 10-1 below provides a summary of the North West existing and likely future environment as it relates to the RTC and the RAMC.

Table 10-1 RTC and RAMC Existing and Likely Future Environment

Environment today	Zoning	Likelihood of Change for the environment[26]	Likely Future Environment[27]	Implications of Future Environment on Ecological Features
Rural	Rural	Low	Rural	N/A
Undeveloped greenfield areas	Future Urban	High	Urban	Loss of exotic vegetation. Roadside and garden planting likely to be retained or regained in Future Environment.
Business	Business (Industrial)	Low	Urban	N/A
	Business (Local Centre)	Low	Urban	N/A
	Business (Town Centre)	Low	Urban	N/A
Residential	Residential	Low	Urban	N/A
Open Space	Open Space – Informal Recreation Open Space – Sport and Active Recreation	Low	Open Space	Ecological features and current value likely retained.
Future Urban Zone/Undeveloped greenfield areas	Future Urban	**High**	Urban	N/A

The RTC stations - Kumeū Rapid Transit Station and Huapai Rapid Transit Station - are located in the urban section of the RTC corridors.

Kumeū Station is proposed to be located on land at 299 and 301 Main Road on the western side of a Kumeū River tributary. The land is zoned under the AUP:OP as Business - Town Centre Zone. An active modes overbridge is proposed across the NAL with active mode connections to:

- The Huapai Triangle crossing land zoned in the AUP:OP as Green Infrastructure Corridor and Residential - Mixed Housing Suburban Zone; and

[26] Based on AUP:OP zoning/policy direction
[27] Based on AUP:OP zoning/policy direction

- Wookey Lane crossing land zoned in the AUP:OP as Green Infrastructure Corridor and Residential - Mixed Housing Suburban Zone; and Business - Light Industry Zone.

Table 10-2 Kumeū Rapid Transit Station Existing and Likely Future Environment

Environment today	Zoning	Likelihood of Change for the environment[28]	Likely Future Environment[29]
Business	Business (Industrial)	Low	Urban
	Business (Town Centre)	Low	Urban
Residential	Residential - Mixed Housing Suburban Zone	Low	Urban
Open Space (located to the north of the proposed station location)	Open Space – Informal Recreation Open Space – Sport and Active Recreation	Low	Open Space

Huapai Station is proposed to be located on land at 29 and 31 Meryl Avenue on the western side of the Ahukuramu. The land is zoned under the AUP:OP as Business - Town Centre Zone. An active modes overbridge is proposed across the NAL and SH16 to FUZ land. Future connections will be determined as part of structure plan process.

Table 10-3 Huapai Rapid Transit Station Existing and Likely Future Environment

Environment today	Zoning	Likelihood of Change for the environment[30]	Likely Future Environment[31]
Residential (located to the east of the proposed station location)	Residential – Single House Zone	Low	Urban
Future Urban Zone / Undeveloped greenfield areas	Future Urban	High	Urban

10.2.2 Permitted Activities and the Future Ecological Environment

The areas of existing undeveloped greenfields are zoned FUZ in the AUP:OP, and as such are planned for urbanisation. Vegetation clearance within the FUZ, excluding habitat for TAR species, vegetation within 10 m of a riparian strip, and tree removal (excluding district plan vegetation), are identified as permitted activities within Chapters E26 and E15 of the AUP:OP. As such the ecological features (i.e., terrestrial habitat), excluding natural wetlands, streams and riparian edges, which are currently present adjacent to the NoR, will likely be removed by future development, and will not be

[28] Based on AUP:OP zoning/policy direction
[29] Based on AUP:OP zoning/policy direction
[30] Based on AUP:OP zoning/policy direction
[31] Based on AUP:OP zoning/policy direction

present when the upgraded transport corridor is operational (albeit we have assumed they will still be present during construction). Subsequently, our effects assessment has taken this into account.

10.2.3 Ecological Baseline

This section presents the findings of the site and desktop investigations in relation to the terrestrial, freshwater, and wetland habitats and associated fauna species ('ecological features') present within the NoR S3, NoR HS, and NoR KS. All features within the study areas were investigated and mapped to provide context for the effects assessment and inform potential adjustments to the proposed designation boundary (Appendix 5). Based on this information, and desktop assessments, an ecological value has been calculated for each ecological feature within this NoR.

10.2.3.1 Terrestrial Habitat

Table 10-4 summarises the vegetation types and their classification (Singers et al., 2017) associated with NoR S3, NoR HS and NoR KS. Maps are presented in Appendix 5.

Table 10-4 Vegetation types present within NoR S3

Habitat	Classification*	Description of Habitat	Relevant NoR
Brown Field (includes cropland)	BF	This definition includes industrial hard standing concrete and unmanaged bare ground. For the purposes of mapping this has been extended to include bare ground associated with cropland, market gardens and construction sites. Consists of small areas patches of rural homesteads.	NoR S3, NoR HS, NoR KS
Exotic Forest – Native Understorey	EF.1	Exotic canopy species are dominant with >50% native understorey.	NoR S3
Exotic Forest – Exotic Understorey	EF.2	Exotic canopy species are dominant with <50% native understorey and/or groundcover biomass.	NoR S3
Exotic Grassland	EG	Grassland dominated by exotic species. This includes pasture, gardens for most of the NoR S2.	NoR S3, NoR HS, NoR KS
Exotic Scrub	ES	Exotic secondary scrub or shrubland with >50% cover/biomass of exotic species. Generally growing along historical farm drains. Dominant species include gorse, woolly nightshade and privet species.	NoR S3, NoR HS, NoR KS
Exotic Wetland	EW	Wetland ecosystems with >50% exotic plant biomass.	NoR S3, NoR HS, NoR KS
Planted Wetland - Native (recent)	PLW	Native restoration plantings with <50% exotic biomass.	NoR S3, NoR HS

Habitat	Classification*	Description of Habitat	Relevant NoR
Planted Vegetation - Native	PL.1	Native restoration plantings with <50% exotic biomass. Planted native scrub and forest <20 years old.	NoR S3, NoR HS, NoR KS
Planted Vegetation - Exotic	PL.3	Exotic amenity plantings. This includes parks and gardens and roadside vegetation dominated by exotic species.	NoR S3, NoR HS
Mixed Native/Exotic Treeland	TL.2	Mixed native/exotic: with 25-75% native tree cover.	NoR S3, NoR KS
Exotic-Dominated Treeland	TL.3	Tree canopy cover 20-80%: <25% native with exotic tree cover dominant. This includes tree lined streams, gardens and mature trees within amenity plantings and shelter belts.	NoR S3, NoR HS, NoR KS
Kahikatea, pukatea forest	WF8	Dominated by podocarp–broadleaved forest, with emergent trees or a canopy of kahikatea and pukatea, and locally, rimu. Swamp maire occurs in areas with a high water table, and tawa, māhoe and locally, tītoki on areas of drier ground. Kiekie, whekī and supplejack are often abundant, creating a dense structure and sub-canopy.	NoR S3
Machaerina sedgeland	WL11	Sedgeland-rushland wetland type, in depressions and freshwater margins. Species of *Machaerina, Eleocharis*, lake clubrush and locally *Carex* spp.	NoR S3
Raupō reedland	WL19	Raupō-dominated freshwater wetland. Depressions and lake and lagoon margins with recent and organic soils. Raupō, locally with purua grass, lake clubrush, jointed twig rush, pūkio, swamp millet. Includes modified wetland examples where *Carex* spp., *Juncus* spp. and swamp millet are common.	NoR S3

Notes: * = Information from Singers et al. (2017).

10.2.3.2 Terrestrial Fauna

Bats

Area wide bat surveys have been undertaken for all NoRs. The results of the bat survey are detailed in Appendix 11. The ABM survey confirmed bat activity at survey locations ABM2, ABM11, ABM17, ABM21, ABM23, ABM25 and ABM27 during the November-December assessment and at all locations (excluding ABM3, ABM12, ABM18, ABM19, and ABM21) during the March-April

assessment. Within NoR S3, these areas coincide with Ngongetepara Creek, Kumeu River, Karure Stream, and Pakinui Stream and associated corridors. High (100-300) and Very High (>300) number of bat passes were detected for locations ABM6, ABM7, ABM10, ABM11 and ABM17 during the March-April assessment (associated with the ASH west of Tawa Road). The T+T Structure Plan study (T+T, 2020) also detected low levels of bat activity along Totara Creek.

Bats were not detected within the Huapai Station NoR (NoR HS) or Kumeu Station NoR (NoR KS). However, they were detected 1.6 km south of NoR HS during the March-April Assessment (ABM16) detected 0.8 km south of NoR KS during the March-April Assessment (ABM9).

Birds

No dedicated bird surveys were undertaken for the Project. However, incidental observations of bird species were noted during site walkovers. The full list of birds observed or heard within NoR S3, NoR HS, and NoR KS are available in Appendix 12. The majority of these species are common, introduced and naturalised or common native species such as silvereye and welcome swallow. However, pied shag (At Risk – Recovering) was observed adjacent to Totara Creek (W3-S1) near associated mangroves. Although not observed at the time of survey, potential habitat was identified for a number of other TAR bird species, summarised in Table 10-5 below.

Table 10-5 TAR bird species likely to occur within suitable habitat in NoR S3

Species	Conservation Status (Robertson et al., 2021)	Distribution and Habitat	Project Area Habitat
Banded rail (*Gallirallus philippensis assimilis*)	At Risk – Declining	Breeding and foraging within coastal wetland habitat (saltmarsh and mangroves). Roosting and breeding within wetlands above the high tide. Uncommon but widespread in the Auckland region (Bellingham, 2013).	Likely to occur around the Brigham Creek stream mouth at the Brigham Creek Bridge crossing within coastal Mangrove Forest and scrub (SA1.2). No suitable roosting or breeding habitat within the NoR but may utilise adjacent mangrove for foraging.
Brown teal/Pāteke (*Anas chlorotis*)	At Risk – Recovering	Wetlands with open water, including stock ponds and small streams that retain overhanging marginal vegetation. Rare but widespread in the Auckland region. Reliant on pest predator control (Williams, 2013).	Has the potential to utilise a wide range of open water and wetland locations. However, as this species is reliant on pest control it is unlikely to be resident or breeding within the NoRs but could be present.
Dabchick/Weweia (*Poliocephalus rufopectus)*	Threatened – Nationally Increasing	Small shallow freshwater lakes and ponds, with dense marginal vegetation.	Has the potential to utilise any freshwater open water habitat, including stock water

Species	Conservation Status (Robertson et al., 2021)	Distribution and Habitat	Project Area Habitat
		Uncommon but widespread in the Auckland region (Szabo, 2013).	ponds, ornamental ponds and stormwater ponds. Likely to breed in associated marginal wetland vegetation.
Little black shag/Kawau tūī (*Phalacrocorax sulcirostris*)	At Risk – Naturally Uncommon	Occur in coastal inlets, lakes and ponds, including stormwater ponds. Roosting and breeding in overhanging trees. Common and widespread in the Auckland region (Armitage, 2013).	Has the potential to utilise any freshwater or coastal open water habitat, including stock water ponds, ornamental ponds and stormwater ponds, and around Brigham Creek. No breeding or roosting sites observed.
Long-tailed cuckoo/koekoeā (*Eudynamys taitensis*)	Threatened - Nationally Vulnerable	Summer migrant to New Zealand arriving spending winter in tropical Pacific islands. As a parasite nester, their range is restricted to host species whitehead, brown creeper and yellowhead. Absent as a breeding species from Auckland region (except Te Hauturu-o-Toi, Little Barrier Island) but occur on migration passage throughout New Zealand (Gill, 2013).	Has the potential to briefly occur on migration passage across the Project Area. Can occur in native/exotic forest, scrub, farmland or urban areas on passage to breeding/winter habitat.
New Zealand pipit/Hīoi (*Anthus novaeseelandiae*)	At Risk – Declining	Occur in open habitat such as coastal and alpine grasslands, but also utilise modified landscapes such as pasture and scrub within the rural landscape. Rare but widespread in the Auckland region (Beauchamp, 2013).	Has the potential to utilise any open habitat such as Exotic Grassland and Exotic Scrub. Habitat suitability is low throughout the NoRs due to agricultural intensification and likely moderate to high pest predator numbers.
North Island fernbird/Mātātā	At Risk – Declining	Dense wetland vegetation.	Has the potential to utilise any dense wetland vegetation, for foraging and breeding. This

Species	Conservation Status (Robertson et al., 2021)	Distribution and Habitat	Project Area Habitat
(*Bowdleria punctata vealeae*)		Rare but widespread in the Auckland region (Miskelly, 2013).	includes native planted wetlands (PLW) and *Machaerina* sedgeland (WL11).
North Island kākā (*Nestor meridionalis septentrionalis*)	At Risk – Recovering	Kākā are generally restricted to indigenous forest habitat and offshore islands in the Auckland region. However, they make seasonal migrations to the Auckland mainland, particularly in winter where they often utilize exotic pine and eucalyptus trees in rural and urban areas. Rare but widespread (seasonal migrant) in the Auckland region (Moorhouse, 2013).	Has the potential to utilise any mature treeland (e.g., TL.2, TL.3), exotic forest (e.g., EF.1. EF.2) or mature indigenous forest types. There is no breeding habitat within the NoR but likely to infrequently utilise exotic trees for seasonal foraging and roosting throughout winter season.
Pied shag (*Phalacrocorax varius*)	(At Risk – Recovering)	Occur in coastal inlets, lakes and ponds, including stormwater ponds. Roosting and breeding in overhanging trees. Common and widespread in the Auckland region (Powlesland, 2013).	Has the potential to utilise any freshwater or coastal open water habitat, including stock water ponds, ornamental ponds and stormwater ponds, and around Brigham Creek. No breeding or roosting sites observed.
Spotless crake/pūweto (*Porzana tabuensis plumbea*)	At Risk – Declining	Wetland vegetation and freshwater lakes and ponds, with dense marginal vegetation. Rare but widespread in the Auckland region (Fitzgerald, 2013).	Has the potential to utilise any dense wetland vegetation, for foraging and breeding. This includes native planted wetlands (PLW), *Machaerina* sedgeland (WL11) and marginal vegetation associated with stock water ponds, ornamental ponds and stormwater ponds.

Lizards

Native lizards were not identified during opportunistic searches completed during the site walkover. However, copper skink have been recorded within 0.5 km of NoR S3, NoR HS, and NoR KS. Copper skink is likely to be associated with most of the vegetation units presented in Table 10-4 where there is appropriate understorey. However, habitat with a higher potential to support copper skink within NoR S3, NoR HS, and NoR KS is represented by isolated patches of EF1, EF.2, EG, ES, PL.1, PL.3, TL.2, TL.3 and WF8. Other native lizard species are generally restricted to indigenous forest, indigenous scrub, coastal habitat types or habitat contiguous to such area. As habitat connectivity to SEAs is limited within the wider project ZOI it is unlikely that any other species listed in Table 6-3 will occur within the Project Area, however ornate skink have been included together with copper skink as they have a low probability of occurring within suitable modified habitat, such as dense riparian vegetation.

10.2.3.3 Terrestrial Ecological Value

Appendix 6 presents the ecological value for the terrestrial vegetation identified within NoR S3, NoR HS and NoR KS. Information obtained for the ecological baseline (Sections 10.2.3.1 and 10.2.3.2), as well as the desktop assessment (Section 6), was used to score the matters that inform the ecological value. The ecological value of habitats ranged from **Negligible** (e.g., BF) to **Very High** (e.g., VS2, WF8).

Notwithstanding the ecological value associated with vegetation/habitat units, specific consideration still needs to be given to individual species and their conservation significance for the following reasons (in accordance with EIANZ Guidelines):

- The habitat value may dilute the conservation value associated with specific species. For example, the combined value for exotic grassland is **Low**, while the value for copper skink (At Risk - Declining) is **High**. The combined value of **Low** therefore understates the conservation value of the species;
- Species may not be restricted to a single vegetation unit;
- Potential effects on species are unrelated to habitat units. For example, impact on highly mobile species (such as bats) by noise and light may be independent of the habitat loss associated with the Project footprint.

For the reasons outlined above, the ecological value assessments for individual species are considered to range from **Moderate** to **Very High** (Table 10-6).

Table 10-6 Ecological value for terrestrial fauna (TAR species only)

Fauna Type	Species Within Habitat	Habitat Units	Conservation Status (NZ Classification System)	Ecological Value
Bats	Long-tailed bat	TL.2, TL.3, WF8	Threatened – Nationally Critical	**Very High**
TAR Birds	Long-tailed cuckoo	TL.2, TL.3, WF8, VS2	Threatened – Nationally Vulnerable	**Very High**

Fauna Type	Species Within Habitat	Habitat Units	Conservation Status (NZ Classification System)	Ecological Value
	Brown teal, dabchick	OW, PLW, WL.11, WL19	Threatened – Nationally Increasing	
	North Island fernbird, spotless crake	OW, PLW, WL.11, WL19	At Risk - Declining	**High**
	New Zealand pipit	EG, ES		
	North Island kākā	TL.2, TL.3, WF8, VS2	At Risk – Recovering	**Moderate**
	Little black shag	OW, PLW, WL.11, WL19	At Risk – Nationally Uncommon	
	Pied shag		At Risk – Recovering	
Herpetofauna (Lizards)	Copper skink	EG, ES, PL.1, PL.3, TL.2, TL.3, WF8	At Risk – Declining	**High**
	Ornate skink	TL.2, TL.3, WF8		

10.2.3.4 Freshwater Habitat

All potential streams within NoR S3, NoR HS and NoR KS were mapped (Appendix 5) and classified as either permanent or intermittent. Ephemeral streams were mapped when possible. Permanent or intermittent streams that were within the designation boundary were numbered and assessed.

Stream classification and RHA assessment

A total of 21 stream branches were identified during the desktop and site investigations within NoR S3. One stream was identified within NoR KS (S2-S4), and no streams were identified within NoR HS. The streams are detailed further in Table 10-7.

In summary, streams within NoR S3 and NoR KS (S2-S4) were classified as follows:

- Nine stream branches were identified as intermittent as three or more of the intermittent stream criteria (Storey & Wadhwa, 2009) were met.
- A total of 12 stream branches were identified as permanent as there was evidence of continuous flow.

Two intermittent streams (S1-S5 and S1-S27) and one permanent stream (S1-S18) were not accessible, therefore an RHA was not undertaken, and ecological value was assessed at a desktop level (Section 10.2.3.6).

All other streams were accessible during site investigations and surveyed using the RHA. The streams measured overall habitat quality scores that ranged from 'Poor' to 'Moderate'. Detailed RHA results are presented in Appendix 10.

Table 10-7 Summary of NoR S3 streams identified in NoR S3, NoR HS, and NoR KS

Stream ID	Classification	RHA Category	Relevant NoR
S2-S1	Intermittent	Poor	NoR S3, NoR HS
S2-S2	Permanent	Moderate	NoR S3, NoR HS
S2-S3	Permanent	Poor	NoR S3
S2-S4	Permanent	Poor	NoR S3, NoR KS
S2-S5	Permanent	Moderate	NoR S3
S2-S6	Permanent	Poor	NoR S3
S1-S17	Permanent	Moderate	NoR S3
S1-S18*	Permanent	N/A	NoR S3
S1-S19	Intermittent	Poor	NoR S3
S1-S20a	Permanent	Moderate	NoR S3
S1-S20d	Intermittent	Moderate	NoR S3
S1-S20e	Intermittent	Moderate	NoR S3
S1-S21	Permanent	Moderate	NoR S3
S1-S22	Permanent	Moderate	NoR S3
S1-S23	Intermittent	Poor	NoR S3
S1-S24	Permanent	Poor	NoR S3
S1-S25*	Intermittent	N/A	NoR S3
S1-S26	Intermittent	Poor	NoR S3
S1-S27*	Intermittent	N/A	NoR S3
S1-S28	Intermittent	Poor	NoR S3
W3-S1	Permanent	Moderate	NoR S3

Notes: * = Streams assessed at a desktop level.

10.2.3.5 Freshwater Fauna

Fish surveys were not carried out during site investigations, however the following At Risk - Declining species have been recorded in the wider catchment area associated with NoR S3, NoR HS, and NoR KS (Table 6-5):

- Īnanga – Brigham Creek, Ngongetepara Stream, Totara Creek, Kumeu River and Pakinui Stream
- Longfin eel – Brigham Creek, Ngongetepara Stream, Totara Creek and Kumeu River

The freshwater habitats within NoR S3 were assessed for their potential to support native fish during the RHA. Potential habitat, such as undercut banks, overhanging vegetation and macrophytes were observed at the time of survey. In addition, the following species were observed onsite:

- Unidentified eels observed at S1-S17 (Kumeu River) (374 Taupaki Road)
- Freshwater mussel shells (*Echyridella menziesii*) (At Risk - Declining) observed on dry banks of S1-S17 (Kumeu River) (176A Boord Crescent)

10.2.3.6 Freshwater Ecological Value

Appendix 7 presents the ecological value for the aquatic habitats identified within NoR S3, and NoR KS. Information obtained for the ecological baseline (Section 10.2.3.4 and 10.2.3.5), as well as the area wide desktop assessment (Section 6), was used to score the matters that inform the ecological value. The ecological values for freshwater habitats are presented in Table 10-8.

Table 10-8 Summary of freshwater ecological value identified in NoR S3, NoR HS, and NoR KS

Stream ID	Ecological Value	Relevant NoR
S2-S1	Low	NoR S3, NoR HS
S2-S2	Moderate	NoR S3, NoR HS
S2-S3	Moderate	NoR S3
S2-S4	High	NoR S3, NoR KS
S2-S5	High	NoR S3
S2-S6	Moderate	NoR S3
S1-S17	High	NoR S3
S1-S18*	Moderate	NoR S3
S1-S19	Low	NoR S3
S1-S20a	Moderate	NoR S3
S1-S20d	Low	NoR S3
S1-S20e	Low	NoR S3
S1-S21	Moderate	NoR S3

Stream ID	Ecological Value	Relevant NoR
S1-S22	High	NoR S3
S1-S23	Low	NoR S3
S1-S24	High	NoR S3
S1-S25*	Low	NoR S3
S1-S26	Low	NoR S3
S1-S27*	Low	NoR S3
S1-S28	Low	NoR S3
S1-S29	Moderate	NoR S3
W4-S1	High	NoR S3

10.2.3.7Wetland Habitat

A total of 53 wetlands within NoR S3, NoR HS, and NoR HS were identified and assessed. Details regarding the vegetation cover and NPS-FM classification for each wetland is presented in Table 10-9.

Table 10-9 Summary of wetlands identified in NoR S3, NoR HS and NoR KS

Wetland ID	Vegetation Type	NPS-FM Classification	Potential for TAR Species	Relevant NoR
S1-W2	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.	NoR S3
S2-W1*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.	NoR S3
S2-W2	Planted Wetland (PLW)	Natural wetland	Potential for fernbird and spotless crake.	NoR S3, NoR HS
S2-W3	Planted Wetland (PLW)	Natural wetland	Unlikely to support TAR birds.	NoR S3, NoR HS
S2-W4*	Exotic Wetland (EW)	Artificial wetland	Unlikely to support TAR birds.	NoR S3
S2-W5 & S2-W5 (OW)	Exotic Wetland (EW) & Open Water (OW)	Natural wetland/partially dammed[32]	Potential for spotless crake and dabchick.	NoR S3, NoR HS

[32] A review of historical images could not confirm if the wetland feature existed prior to the construction of the pond. It was considered that at least a part of the feature did extent prior to the construction of the farm pond and would therefore consider a modified natural wetland, rather than an artificial wetland

Wetland ID	Vegetation Type	NPS-FM Classification	Potential for TAR Species	Relevant NoR
S2-W6	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.	NoR S3
S2-W7*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.	NoR S3, NoR HS
S2-W8*	Exotic Wetland (EW)	Natural wetland	Potential for spotless crake.	NoR S3
S2-W9 & S2-W9 (OW)	Raupō reedland (WL19) & Open Water (OW)	Natural wetland	Potential for spotless crake and dabchick.	NoR S3
S2-W10*	Planted Wetland (PLW)	Natural wetland	Unlikely to support TAR birds.	NoR S3
S2-W11	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.	NoR S3
S2-W12*	Exotic Wetland (EW)	Natural wetland	Potential for spotless crake.	NoR S3, NoR KS
S2-W12a*	Exotic Wetland (EW)	Natural wetland	Potential for spotless crake.	NoR S3, NoR KS
S2-W13	Raupō reedland (WL19)	Natural wetland	Potential for fernbird and spotless crake.	NoR S3
S2-W14	Exotic Wetland (EW)	Artificial wetland (drainage ditch)	Unlikely to support TAR birds.	NoR S3
S2-W15	Planted Wetland (PLW)	Natural wetland	Potential for dabchick.	NoR S3
S2-W16	Open Water (OW)	Artificial wetland	Potential for dabchick.	NoR S3, NoR KS
S2-W16a	Open Water (OW)	Artificial wetland	Unlikely to support TAR birds.	NoR S3, NoR KS
S1-W36*	Exotic Wetland (EW)	Artificial wetland	Unlikely to support TAR birds.	NoR S3
S1-W37	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.	NoR S3

Wetland ID	Vegetation Type	NPS-FM Classification	Potential for TAR Species	Relevant NoR
S1-W38*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.	NoR S3
S1-W39	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.	NoR S3
S1-W40	*Machaerina* sedgeland (WL11)	Natural wetland	Unlikely to support TAR birds.	NoR S3
S1-W41	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.	NoR S3
S1-W42*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.	NoR S3
S1-W43 & S1-W43 (OW)	Exotic Wetland (EW) & Open Water (OW)	Natural wetland	Potential for spotless crake and dabchick.	NoR S3
S1-W44	*Machaerina* sedgeland (WL11)	Natural wetland	Unlikely to support TAR birds.	NoR S3
S1-W45 & S1-W45 (OW)*	Exotic Wetland (EW) & Open Water (OW)	EW: Natural wetland OW: Artificial wetland (Farm ponds)	Potential for spotless crake and dabchick.	NoR S3
S1-W46 & S1-W46 (OW)	Exotic Wetland (EW) & Open Water (OW)	Natural wetland	Exotic Wetland unlikely to support TAR birds. Pond potential to support spotless crake and dabchick.	NoR S3
S1-W47*	Exotic Wetland (EW)	Natural wetland	Unlikely to support TAR birds.	NoR S3
S1-W48*	Exotic Wetland (EW)	Artificial wetland	Unlikely to support TAR birds.	NoR S3
S1-W49*	Exotic Wetland (EW)	Artificial wetland	Unlikely to support TAR birds.	NoR S3

Wetland ID	Vegetation Type	NPS-FM Classification	Potential for TAR Species	Relevant NoR
S1-W50 & S1-W50 (OW)*	Exotic Wetland (EW) & Open Water (OW)	Natural wetland	Unlikely to support TAR birds.	NoR S3
S1-W51*	Planted Wetland (PLW)	Artificial wetland	Potential for spotless crake.	NoR S3
S1-W53*	Planted Wetland (PLW)	Natural wetland	Potential for spotless crake.	NoR S3
S1-W54	Planted Wetland (PLW)	Natural wetland	Unlikely to support TAR birds.	NoR S3
S1-W55	Planted Wetland (PLW)	Artificial wetland	Potential for spotless crake.	NoR S3
S1-W57 & S1-W57 (OW)	Planted Wetland (PLW) & Open Water (OW)	Artificial wetland (Stormwater Pond)	Potential for dabchick and spotless crake.	NoR S3
S1-W58	Open Water (OW)	Artificial Wetland (Ornamental Pond)	Potential for dabchick and spotless crake.	NoR S3
S1-W59	Open Water (OW)	Artificial Wetland (Ornamental Pond)	Potential for dabchick and spotless crake.	NoR S3
S1-W60	Open Water (OW)	Artificial Wetland (Ornamental Pond)	Unlikely to support TAR birds.	NoR S3
S1-W61	Open Water (OW)	Artificial Wetland (Ornamental Pond)	Potential for dabchick and spotless crake.	NoR S3
S1-W62	Open Water (OW)	Artificial Wetland (On-stream farm pond)	Potential for dabchick, fernbird and spotless crake.	NoR S3
S1-W63	Open Water (OW)	Artificial Wetland (On-stream farm pond)	Potential for dabchick, and spotless crake.	NoR S3
S1-W64	Open Water (OW)	Artificial Wetland (On-stream farm pond)	Potential for dabchick, and spotless crake.	NoR S3
S1-W65	Open Water (OW)	Artificial Wetland (Farm pond)	Unlikely to support TAR birds.	NoR S3

Wetland ID	Vegetation Type	NPS-FM Classification	Potential for TAR Species	Relevant NoR
S1-W66	Open Water (OW)	Artificial Wetland (Ornamental Pond)	Potential for dabchick, and spotless crake.	NoR S3
S1-W67	Open Water (OW)	Artificial Wetland	Potential for dabchick.	NoR S3
S1-W68	Open Water (OW)	Artificial wetland	Unlikely to support TAR birds.	NoR S3
S1-W69*	Exotic Wetland (EW)	Natural Wetland	Unlikely to support TAR birds.	NoR S3
S1-W71	Open Water (OW)	Artificial wetland	Unlikely to support TAR birds.	NoR S3

Notes: * = Wetlands assessed at a desktop level due to access restrictions

10.2.3.8 Wetland Ecological Value

Appendix 8 presents the ecological value for the wetland habitats identified within NoR S3, NoR HS and NoR KS. Information obtained for the ecological baseline (Section 10.2.3.7), as well as the area wide desktop assessment (Section 6), was used to score the matters that inform the ecological value. The ecological values for wetland habitats are presented in Table 9-8.

Table 10-10 Summary of wetland ecological value identified in NoR S3, NoR HS and NoR KS

Wetland ID	Ecological Value	Relevant NoR
S1-W2	Low	NoR S3
S2-W1	Low	NoR S3
S2-W2	High	NoR S3, NoR HS
S2-W3	Moderate	NoR S3, NoR HS
S2-W4	Low	NoR S3
S2-W5 & S2-W5 (OW)	Low	NoR S3, NoR HS
S2-W6	Low	NoR S3
S2-W7	Low	NoR S3, NoR HS
S2-W8	Moderate	NoR S3
S2-W9 & S2-W9 (OW)	High	NoR S3
S2-W10	Low	NoR S3
S2-W11	Low	NoR S3

Wetland ID	Ecological Value	Relevant NoR
S2-W12	Moderate	NoR S3, NoR KS
S2-W12a	Moderate	NoR S3, NoR KS
S2-W13	Moderate	NoR S3
S2-W14	Negligible	NoR S3
S2-W15	Low	NoR S3
S2-W16	Low	NoR S3, NoR KS
S2-W16a	Negligible	NoR S3, NoR KS
S1-W36*	Low	NoR S3
S1-W37	Low	NoR S3
S1-W38	Low	NoR S3
S1-W39	Low	NoR S3
S1-W40	High	NoR S3
S1-W41	Moderate	NoR S3
S1-W42	Low	NoR S3
S1-W43 & S1-W43 (OW)	Low	NoR S3
S1-W44	Moderate	NoR S3
S1-W45 & S1-W45 (OW)*	Low	NoR S3
S1-W46 & S1-W46 (OW)	Moderate	NoR S3
S1-W47	Low	NoR S3
S1-W48	Negligible	NoR S3
S1-W49	Negligible	NoR S3
S1-W50 & S1-W50 (OW)*	Low	NoR S3
S1-W51	Moderate	NoR S3
S1-W53	High	NoR S3
S1-W54	Moderate	NoR S3
S1-W55	Moderate	NoR S3
S1-W57 & S1-W57 (OW)	Moderate	NoR S3
S1-W58	Low	NoR S3
S1-W59	Low	NoR S3

Wetland ID	Ecological Value	Relevant NoR
S1-W60	Low	NoR S3
S1-W61	Low	NoR S3
S1-W62	Low	NoR S3
S1-W63	Low	NoR S3
S1-W64	Low	NoR S3
S1-W65	Low	NoR S3
S1-W66	Low	NoR S3
S1-W67	Low	NoR S3
S1-W68	Low	NoR S3
S1-W69	Moderate	NoR S3
S1-W70	Negligible	NoR S3

10.3 Assessment of Ecological Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

Section 10.3 assess the ecological effects of activities which relate to district plan matters under the AUP:OP.

10.3.1 Construction Effects - Terrestrial Ecology

Refer to Section 8.3.1.

10.3.1.1 Terrestrial Vegetation

Vegetation to be removed that is subject to district controls is presented in Appendix 5 and also detailed in Table 10-11 (NoR S3) and Table 10-12 (NoR HS) below. No vegetation to be removed that is subject to district controls was identified in NoR KS. The effects of district plan vegetation removal on fauna i.e., bats and birds (as it relates to loss in foraging habitat, and mortality and injury) is assessed in Sections 10.3.1.2 and 10.3.1.3.

Table 10-11 Assessment of ecological effects for terrestrial vegetation (district plan trees only) and impact management during construction for NoR S3

	Permanent loss of habitat/ecosystem, fragmentation, and edge effects due to vegetation removal (district plan trees only)	
Effect Description	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	**TL.3 (total area of 2980.09 m²) & Huapai Domain Trees (District Plan only) (total area of 3871 m²)** The magnitude of effect is assessed as **Negligible** due to the small overall extent of the vegetation that will be removed and the low likelihood that fragmentation and edge effect will occur despite definite removal of the vegetation. The ecological value of TL.3 and Huapai Domain Trees are assessed to be **Low**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **WF8 (total area of 99.75 m²)** The magnitude of effect is assessed as **Negligible** due to the small extent of tree loss and the very low probability that this will result in additional fragmentation and edge effect. The ecological value of WF8 is assessed to be **Low**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. The magnitude of effect is assessed as **Negligible** as although there is a definite likelihood that these trees will be removed, this does not necessarily translate to the definite loss of habitat for fauna. The ecological value of the Notable Tree is assessed to be **Negligible**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required.	Same as Baseline.

Effect Description	Permanent loss of habitat/ecosystem, fragmentation, and edge effects due to vegetation removal (district plan trees only)	
	Baseline	Likely Future Ecological Environment
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

Table 10-12 Assessment of ecological effects for terrestrial vegetation (district plan trees only) and impact management during construction for NoR HS

Effect Description	Permanent loss of habitat/ecosystem, fragmentation, and edge effects due to vegetation removal (district plan trees only)	
	Baseline	Likely Future Ecological Environment
Level of effect prior to impact management	**TL.3 (total area of 141.31 m^2)** The magnitude of effect is assessed as **Negligible** as although there is a definite likelihood that these trees will be removed, this does not necessarily translate to the definite loss of habitat for fauna. The ecological value of TL.3 is assessed to be **Low**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required.	Same as Baseline.
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

10.3.1.2 Bats

Bats may utilise the habitats associated with NoR S3, NoR HS, and NoR KS for roosting or foraging. Specifically, areas of EF.1, EF.2, TL.2, TL.3, and WF8 habitat. During construction of the Project, night works may be required, and site compounds are likely to be lit overnight. Lighting at night has the potential to modify the behaviour of bats if foraging within this area or roosting in nearby isolated stands of mature trees.

Noise and vibration during construction can be an issue if bats are roosting in the immediate vicinity of the construction works. Although bat foraging has been confirmed, ABM survey at the Project scale cannot confirm roost occupation within or adjacent to the designation boundary. However, it can be assumed that bats will utilise roost sites within the Project Area based on:

- Confirmed habitat suitability (numerous trees with moderate to high bat roost potential, connected to linear stream corridors and wetlands); and
- Confirmed foraging presence.

Additionally, bats may be impacted by removal of district plan vegetation through the following effects[33]:

- Disturbance and displacement to existing individuals due to construction activities (noise, light, dust etc.)
- Loss of foraging habitat
- Mortality or injury to bats

Table 10-13 (NoR S3), Table 10-14 (NoR HS) and Table 10-15 (NoR KS) outline the effect assessment for bats due to construction activities related to noise and light, and removal of district plan vegetation.

[33] Roost loss has been considered but discounted as an effect as the **consequence** of roost loss (if it does occur at all) is considered less than **Negligible** in the context of this NoR.

Table 10-13 Assessment of ecological effects for bats and impact management during construction for NoR S3

	Disturbance and displacement to roosts and individual bats (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Mortality or injury to bats	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Low** due to the relatively short duration of construction related effects. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required.	Same as Baseline.	The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.
Impact management and residual level of effect	A BMP should be developed to include consideration for: • Surveys prior to construction to confirm presence/likely absence. Surveys to confirm bat roost locations if activity is confirmed. • Confirmation of maternity roosts may require a seasonal restriction on construction activity (no or restricted construction during Dec-Mar). • Siting of compounds and laydown areas to avoid EF.1, EF.2, TL.2, TL.3, and WF8 habitat. • Lighting design to reduce light levels and spill from construction areas.	Same as Baseline.	Impact management will be required under the Wildlife Act to prevent killing or injuring of bats. Management might include inspection of trees to confirm potential roost features, constraining the timing of vegetation removal, pre-clearance inspections prior to vegetation removal.	Same as Baseline.

Effect Description	Disturbance and displacement to roosts and individual bats (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Mortality or injury to bats	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	• Restriction of nightworks around EF.1, EF.2, TL.2, TL.3, and WF8 habitat. • Bat management should be incorporated with any regional consent conditions (i.e., BMPs) that may be required for regional compliance. The residual impact is assessed as **Very Low** post mitigation.			
Management of residual effect	N/A	N/A	N/A	N/A

Table 10-14 Assessment of ecological effects for bats and impact management during construction for NoR HS

	Disturbance and displacement to roosts and individual bats (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Mortality or injury to bats	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Low** due to the likely probability and local extent of construction related effects. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required	Same as Baseline as riparian and wetland features are likely to remain present in the future.	The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.
Impact management and residual level of effect	A BMP should be developed to include consideration for: • Surveys prior to construction to confirm presence/likely absence. Surveys to confirm bat roost locations if activity is confirmed. • Confirmation of maternity roosts may require a seasonal restriction on construction activity (no or restricted construction during Dec-Mar). • Siting of compounds and laydown areas to avoid TL.2 and TL.3 habitat. • Lighting design to reduce light levels and spill from construction areas.	Same as Baseline.	Impact management will be required under the Wildlife Act to prevent killing or injuring of bats. Management might include inspection of trees to confirm potential roost features, constraining the timing of vegetation removal, pre-clearance inspections prior to vegetation removal.	Same as Baseline.

Effect Description	Disturbance and displacement to roosts and individual bats (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Mortality or injury to bats	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	• Restriction of nightworks around TL.2 and TL.3 habitat. • Bat management should be incorporated with any regional consent conditions (i.e., BMPs) that may be required for regional compliance. The residual impact is assessed as **Very Low** post mitigation.			
Management of residual effect	N/A	N/A	N/A	N/A

Table 10-15 Assessment of ecological effects for bats and impact management during construction for NoR KS

Effect Description	Disturbance and displacement to roosts and individual bats (existing) due to construction activities (noise, light, dust etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Low** due to due to the relatively short duration of construction related effects. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required	Same as Baseline as riparian (Kumeu Tributary) and wetland features are likely to remain present in the future
Impact management and residual level of effect	A BMP should be developed to include consideration for: • Surveys prior to construction to confirm presence/likely absence. Surveys to confirm bat roost locations if activity is confirmed. • Confirmation of maternity roosts may require a seasonal restriction on construction activity (no or restricted construction during Dec-Mar). • Siting of compounds and laydown areas to avoid TL.2, TL.3, and WF8 habitat. • Lighting design to reduce light levels and spill from construction areas. • Restriction of nightworks around TL.2, TL.3, and WF8 habitat. • Bat management should be incorporated with any regional consent conditions (i.e., BMPs) that may be required for regional compliance. The residual impact is assessed as **Very Low** post mitigation.	N/A
Management of residual effect	N/A	N/A

10.3.1.3 Birds

Noise, vibration and lighting disturbance caused by construction activities could potentially displace native birds from suitable nesting and foraging habitat within and adjacent to NoR S3, NoR HS and NoR KS. Additionally, birds may be impacted by removal of district plan vegetation through the following effects:

- Disturbance and displacement to existing individuals due to construction activities (noise, light, dust etc.)
- Loss of foraging habitat
- Nest loss
- Mortality or injury to birds

Table 10-16(NoR S3), Table 10-17 (NoR HS) and Table 10-18 (NoR KS) outline the effect assessment for birds due to construction activities related to noise and light, and removal of district plan vegetation.

Table 10-16 Assessment of ecological effects for birds and impact management during construction for NoR S3

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Non-TAR birds** The magnitude of effect is assessed as **Moderate** due to definite presence of native birds associated with several habitat features of the NoR. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and short duration of effect if disturbance occurs. The ecological value of these species is **Very High**, and the overall level of effect is assessed as	Same as Baseline.	**Non-TAR birds** ***Nest loss & Mortality or injury to birds*** The magnitude of effect is assessed as **Moderate** due to definite presence of native birds associated with district plan vegetation. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required. **Non-TAR birds** ***Loss of foraging habitat*** The magnitude of effect is assessed as **Low** due to the likely probability and local extent if impact occurs. The ecological value of birds in the context of habitat features are	Same as Baseline.

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	Low prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (New Zealand pipit)</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and short duration of effect if disturbance occurs. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (North Island kākā)</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and short duration of effect if disturbance occurs. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very**		assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (long-tailed cuckoo)</u>** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (New Zealand pipit)</u>** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of these species is **High**, and the overall	

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	Low prior to mitigation. As such no impact management is required. **<u>Wetland TAR birds (brown teal, dabchick)</u>** The magnitude of effect is assessed as **Low** due to a likely probability of disturbance. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required. **<u>Wetland TAR birds (North Island fernbird, banded rail, spotless crake)</u>** The magnitude of effect is assessed as **Low** due to a likely probability of disturbance. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low**		level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (North Island kākā)</u>** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required.	

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	prior to mitigation. As such no impact management is required. **<u>Wetland TAR birds (little black shag, pied shag)</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability of disturbance. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required.			
Impact management and residual level of effect	**<u>Brown teal, dabchick</u>** Impact management is required for brown teal and dabchick. The Bird Management Plan should consider the following: • Where practical, construction works near suitable wetland habitat (refer Table 10-9) should commence prior to the bird breeding season	Same as Baseline.	Impact management will be required under the Wildlife Act to prevent killing or injuring of native birds. As part of this management, timing of vegetation removal should be constrained to avoid the key nesting period (September to February) or pre-clearance inspections should be undertaken prior to vegetation removal.	Same as Baseline.

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	(September to February) in order to discourage bird nesting. • Bird management should be consistent with any regional consent conditions that may be required for regional compliance. The residual impact is assessed as **Very Low** post mitigation.			
Management of residual effect	N/A	N/A	N/A	N/A

Table 10-17 Assessment of ecological effects for birds and impact management during construction for NoR HS

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Non-TAR birds** The magnitude of effect is assessed as **Moderate** due to definite presence of native birds associated with several habitat features of the NoR. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Negligible** due to a likely probability, infrequent occurrence, and short duration of effect if disturbance occurs. The ecological value of these species is **Very High**, and the	Same as Baseline.	**Non-TAR birds** ***Nest loss*** ***Mortality or injury to birds*** The magnitude of effect is assessed as **Moderate** due to definite presence of native birds associated with district plan vegetation. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required. **Non-TAR birds** ***Loss of foraging habitat*** The magnitude of effect is assessed as **Low** due to the likely probability and local and restricted extent if impact occurs.	Same as Baseline.

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (New Zealand pipit)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and short duration of effect if disturbance occurs. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (North Island kākā)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and short duration of effect if disturbance occurs. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very**		The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (New Zealand pipit)** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs.	

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	Low prior to mitigation. As such no impact management is required. **<u>Wetland TAR birds (brown teal, dabchick)</u>** The magnitude of effect is assessed as **Low** due to a likely probability, frequent occurrence, and short period of disturbance. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required. **<u>Wetland TAR birds (North Island fernbird, banded rail, spotless crake)</u>** The magnitude of effect is assessed as **Low** due to a likely probability of disturbance. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low**		The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (North Island kākā)</u>** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required.	

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	prior to mitigation. As such no impact management is required. **<u>Wetland TAR birds (little black shag, pied shag)</u>** The magnitude of effect is assessed as **Low** due to a likely probability of disturbance. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.			
Impact management and residual level of effect	**<u>Brown teal, dabchick</u>** Impact management is required for brown teal and dabchick. The Bird Management Plan should consider the following: • Where practical, construction works near suitable wetland habitat (refer Table 10-9) should commence prior to the bird breeding season	N/A	Impact management will be required under the Wildlife Act to prevent killing or injuring of native birds. As part of this management, timing of vegetation removal should be constrained to avoid the key nesting period (September to February) or pre-clearance inspections should be undertaken prior to vegetation removal.	Same as Baseline.

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	(September to February) on order to discourage bird nesting. • Bird management should be consistent with any regional consent conditions that may be required for regional compliance. The residual impact is assessed as **Very Low** post mitigation.			
Management of residual effect	N/A	N/A	N/A	N/A

Table 10-18 Assessment of ecological effects for birds and impact management during construction for NoR KS

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Non-TAR birds** The magnitude of effect is assessed as **Moderate** due to definite presence of native birds associated with several habitat features of the NoR. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and short duration of effect if disturbance occurs. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (New Zealand pipit)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and short duration of effect if disturbance occurs. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (North Island kākā)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and short duration of effect if disturbance occurs. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required.	Same as Baseline.

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)	
	Baseline	**Likely Future Ecological Environment**
	<u>Wetland TAR birds (brown teal, dabchick)</u> The magnitude of effect is assessed as **Low** due to a likely probability and frequent occurrence of disturbance. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required. **<u>Wetland TAR birds (North Island fernbird, banded rail, spotless crake)</u>** The magnitude of effect is assessed as **Low** due to a likely probability of disturbance. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **<u>Wetland TAR birds (little black shag, pied shag)</u>** The magnitude of effect is assessed as **Low** due to a likely probability of disturbance. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	
Impact management and residual level of effect	**<u>Brown teal, dabchick</u>** Impact management is required for brown teal and dabchick. The Bird Management Plan should consider the following: • Where practical, construction works near suitable wetland habitat (refer Table 10-9) should commence prior to the bird breeding season (September to February) on order to discourage bird nesting. • Bird management should be consistent with any regional consent conditions that may be required for regional compliance.	N/A

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)	
	Baseline	Likely Future Ecological Environment
	The residual impact is assessed as **Very Low** post mitigation.	
Management of residual effect	N/A	N/A

10.3.1.4 Lizards

Construction effects on lizards associated with noise, light and vibration are presented in Table 10-19. Construction activity relates to upgrading existing roads and the construction of new roads. Lizards are likely to be habituated to noise and vibration from the existing roads, however lizards present in areas of the proposed new roads will not be habituated to noise and vibration. Regional matters as they relate to vegetation removal and lizards are further discussed in Section 10.4.4.

Table 10-19 Assessment of ecological effects for lizards and impact management during construction for NoR S3

Effect Description	Disturbance and displacement of individuals (existing) due to construction activities (noise, dust etc.)	
	Baseline	Likely Future Ecological Environment
Level of effect prior to impact management	The magnitude of effect is assessed as **Negligible** due to the unlikely probability, short duration, and local extent of impact. The ecological value of copper skink and ornate skink is assessed as **High**, and the overall level of effect due to construction disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required.	Same as Baseline.
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

Table 10-20 Assessment of ecological effects for lizards and impact management during construction for NoR HS

Effect Description	Disturbance and displacement of individuals (existing) due to construction activities (noise, dust etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Negligible** due to the unlikely probability, short duration, and local extent of impact. The ecological value of copper skink and ornate skink is assessed as **High**, and the overall level of effect due to construction disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required.	Same as Baseline.
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

Table 10-21 Assessment of ecological effects for lizards and impact management during construction for NoR KS

Effect Description	Disturbance and displacement of individuals (existing) due to construction activities (noise, dust etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Negligible** due to the unlikely probability, short duration, and local extent of impact. The ecological value of copper skink and ornate skink is assessed as **High**, and the overall level of effect due to construction disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required.	Same as Baseline.
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

10.3.2 Operational Effects - Terrestrial Ecology

The Project involves the construction of new road and the upgrading of an existing road in a rural landscape and future urban environment; therefore, it is likely that operational effects such as

fragmentation and noise and lighting may increase from the current baseline. In general, potential operational effects from the Project that relate to District plan matters are summarised below.

- Loss in connectivity to indigenous fauna (e.g., bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road, leading to fragmentation of habitat; and
- Disturbance and displacement of indigenous fauna and their nests/roosts (e.g., bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road

The following sections detail the magnitude of effect and subsequent level of effect on ecological features (further detail regarding how these were determined are provided in Appendix 1). The effects assessment has considered two scenarios – the current ecological baseline (refer Section 10.2.2) and the 'existing environment' (i.e., allowing for permitted activities) (refer Section 10.2.1).

Impact management and residual effects are also presented where the level of effect is assessed to be **Moderate** or higher.

10.3.2.1 Bats

The loss of connectivity through permanent habitat loss and disturbance such as operational noise/vibration and light can lead to an overall reduction in size and quality of bat foraging habitat and can impact on bat movement in the broader landscape. Lighting spillage from street lighting could also disturb commuting and foraging bats at night and adversely affect insect prey populations. The level of effect on bats due to operational impacts associated with loss in connectivity should be assessed in the context of confirmed bat activity in the broader landscape, the existing degree of fragmentation and that of the future urban environment.

Table 10-22 (NoR S3), Table 10-23 (NoR HS), and Table 10-24 (NoR KS) outlines the effect assessment for:

- Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to additional fragmentation of terrestrial habitat due to the presence of the infrastructure.
- Disturbance and displacement of bats due to light, noise and vibration from the road.

Table 10-22 Assessment of ecological effects for bats and impact management during operation for NoR S3

Effect Description	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration		Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Moderate** due to the highly likely probability and relatively local extent of disturbance. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **High** disturbance of individual bats and roosts. As such impact management is required.	Same as Baseline.	The magnitude of effect is assessed as **Moderate** due to the high probability of loss in connectivity due to the operation of the RTC in confirmed bat movement and the presence of two known ecological nodes likely important to the regional bat population. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **High** for loss in connectivity. As such impact management is required.	Same as Baseline.
Impact management and residual level of effect	A BMP should be developed to include consideration for: • Buffer planting and retention of existing mature trees between the road	Same as Baseline.	A BMP should be developed as outlined in Appendix 14. The map indicates the location and extent of measures to mitigate potential connectivity effects and includes hop-overs/underpasses, buffer planting and existing mature tree features that will be retained, as well as indicating areas where early	Same as Baseline.

Effect Description	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration		Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	alignment and features with potential for bat roosts[34]. • Light and noise management through design. • Future presence of roosts within the alignment (placement of flaps on features with high roost potential). The residual impact is assessed as **Low** post mitigation.		planting[35] (or planting of mature trees) will occur. The BMP should also have additional consideration for: • Lighting design to minimise light levels and light spill along the road corridor. • As an alternative to early restoration planting. Restoration planting can make use of mature trees to achieve the same goal as early restoration planting. • Assumptions in the efficacy of the proposed mitigation will be addressed through an adaptive management framework that will outline bat activity thresholds, robust monitoring and potential corrective action.	

[34] This may be in addition to the buffer planting proposed in Appendix **Error! Reference source not found.** and will depend on the presence and location of roosts at the time of construction. The requirement for planting mature trees (as buffer) to mitigate roost disturbance, will depend on the future context such as the location of known roosts, the presence of existing buffer and the feasibility of including other design consideration that can control disturbance effects.

Effect Description	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration		Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape	
	Baseline	Likely Future Ecological Environment	Baseline	Likely Future Ecological Environment
			The residual impact is assessed as **Low** post mitigation.	
Management of residual effect	N/A	N/A	N/A	N/A

Table 10-23 Assessment of ecological effects for bats and impact management during operation for NoR HS

Effect Description	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration		Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape	
	Baseline	Likely Future Ecological Environment	Baseline	Likely Future Ecological Environment
Level of effect prior to impact management	The magnitude of effect is assessed as **Low** due to the unlikely probability but permanent duration of the impact. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Moderate** disturbance of individual bats and roosts. As such impact management is required.	Same as Baseline.	The magnitude of effect is assessed as **Low** due to the unlikely probability of loss in connectivity at a regional extent due to the construction of new roads. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Moderate.** As such impact management is required.	Same as Baseline.

Effect Description	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration		Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Impact management and residual level of effect	A BMP should be developed to include consideration for: • Buffer planting and retention of existing mature trees between the road alignment and features with potential for bat roosts[36]. • Light and noise management through design. • Future presence of roosts within the alignment (placement of flaps on features with high roost potential). The residual impact is assessed as **Very Low** post mitigation.	Same as Baseline.	A BMP should be developed as outlined in Appendix 14. The map indicates the location and extent of measures to mitigate potential connectivity effects and includes hop-overs/underpasses, buffer planting and existing mature tree features that will be retained, as well as indicating areas where early planting[37] (or planting of mature trees) will occur. The BMP should also have additional consideration for: • Lighting design to minimise light levels and light spill along the road corridor. • As an alternative to early restoration planting, restoration planting can make use of mature trees to achieve the same goal	Same as Baseline.

[36] This may be in addition to the buffer planting proposed in Appendix **Error! Reference source not found.** and will depend on the presence and location of roosts at the time of construction. The requirement for planting mature trees (as buffer) to mitigate roost disturbance, will depend on the future context such as the location of known roosts, the presence of existing buffer and the feasibility of including other design consideration that can control disturbance effects.

Effect Description	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration		Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
			as early restoration planting. • Assumptions in the efficacy of the proposed mitigation will be addressed through an adaptive management framework that will outline bat activity thresholds, robust monitoring and potential corrective action. The residual impact is assessed as **Very Low** post mitigation.	
Management of residual effect	N/A	N/A	N/A	N/A

Table 10-24 Assessment of ecological effects for bats and impact management during operation for NoR KS

Effect Description	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration		Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Low** due to the unlikely probability but permanent duration of the impact. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Moderate**. As such impact management is required.	Same as Baseline.	The magnitude of effect is assessed as **Low** due to the unlikely probability and regional extent of loss in connectivity due to the construction of new roads. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed **Moderate**. As such impact management is required.	Same as Baseline.
Impact management and residual level of effect	A BMP should be developed to include consideration for: • Buffer planting and retention of existing mature trees between the road alignment and features with potential for bat roosts[38]. • Light and noise management through design.	Same as Baseline.	A BMP should be developed as outlined in Appendix 14. The map indicates the location and extent of measures to mitigate potential connectivity effects and includes hop-overs/underpasses, buffer planting and existing mature tree features that will be retained, as well as indicating areas where early	Same as Baseline.

[38] This may be in addition to the buffer planting proposed in Appendix **Error! Reference source not found.** and will depend on the presence and location of roosts at the time of construction. The requirement for planting mature trees (as buffer) to mitigate roost disturbance, will depend on the future context such as the location of known roosts, the presence of existing buffer and the feasibility of including other design consideration that can control disturbance effects.

Effect Description	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration		Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	• Future presence of roosts within the alignment (placement of flaps on features with high roost potential). The residual impact is assessed as **Very Low** post mitigation.		planting[39] (or planting of mature trees) will occur. The BMP should also have additional consideration for: • Lighting design to minimise light levels and light spill along the road corridor. • As an alternative to early restoration planting. Restoration planting can make use of mature trees to achieve the same goal as early restoration planting. • Assumptions in the efficacy of the proposed mitigation will be addressed through an adaptive management framework that will outline bat activity thresholds, robust monitoring and potential corrective action. The residual impact is assessed as **Very Low** post mitigation.	

Effect Description	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration		Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape	
	Baseline	Likely Future Ecological Environment	Baseline	Likely Future Ecological Environment
Management of residual effect	N/A	N/A	N/A	N/A

10.3.2.2 Birds

Noise, vibration and lighting disturbance caused by the presence of the road could potentially displace native birds from suitable nesting and foraging habitat within and adjacent to NoR S3, NoR HS and NoR KS, while noise, light and vibration may also affect connectivity in the broader landscape. Notably open water associated with wetland S2-W9 will remain post development and may provide suitable habitat for wetland TAR birds including spotless crake and dabchick.

Table 10-25 (NoR S3), Table 10-26 (NoR HS), and Table 10-27 (NoR KS) outline the operational effect assessment and impact management for birds.

Table 10-25 Assessment of ecological effects for birds and impact management during operation for NoR S3

	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Non-TAR birds** The magnitude of effect is assessed as **Low** due to the likely probability of disturbance due to noise, light and vibration from the areas of new road. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and local extent of effect if disturbance occurs. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.	**Non-TAR birds** The magnitude of effect is assessed as **Low** for both effects, due to the likely probability of loss in connectivity in areas of new road. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Low** due to the unlikely probability and regional extent of effect. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required.	Same as Baseline.

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	Terrestrial TAR birds (New Zealand pipit) The magnitude of effect is assessed as **Negligible** due to the unlikely probability and local extent of effect if disturbance occurs. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (North Island kākā)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and local extent of effect if disturbance occurs. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Wetland TAR birds (brown teal, dabchick)**		**Terrestrial TAR birds (New Zealand pipit)** The magnitude of effect is assessed as **Low** due to the unlikely probability and regional extent of effect. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (North Island kākā)** The magnitude of effect is assessed as **Low** due to the unlikely probability and regional extent of effect. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Wetland TAR birds (brown teal, dabchick)**	

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	The magnitude of effect is assessed as **Low** due to a likely probability of local impacts. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required. **Wetland TAR birds (North Island fernbird, banded rail, spotless crake)** The magnitude of effect is assessed as **Low** due to a likely probability of local impacts. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Wetland TAR birds (little black shag, pied shag)** The magnitude of effect is assessed as **Negligible** due to the unlikely		The magnitude of effect is assessed as **Low** due to a likely probability of local impacts. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required. **Wetland TAR birds (North Island fernbird, banded rail, spotless crake)** The magnitude of effect is assessed as **Low** due to a likely probability of local impacts. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Wetland TAR birds (little black shag, pied shag)** The magnitude of effect is assessed as **Low** due to the likely probability of impact.	

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	probability and local extent of effect if disturbance occurs. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required.		The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	
Impact management and residual level of effect	**Brown teal, dabchick** Impact management is required for brown teal and dabchick. The following mitigation measures should be implemented: • Retention of vegetation near wetland habitat, where practicable. • Buffer planting between the road alignment and suitable habitat adjacent to the road. • Installation of vegetation hop-overs in key areas where the road corridor fragments local areas of suitable habitat (open water and some wetlands).	Same as Baseline.	**Long-tailed cuckoo** Impact management is required for long-tailed cuckoo. This is due the **Very High** value of the species. Since it is a highly mobile migrant species, it is anticipated that mitigation associated with landscape planting, riparian planting and bat mitigation will result in a **Negligible** residual impact post mitigation. **Brown teal, dabchick** Impact management is required for brown teal and dabchick. The following mitigation measures should be implemented: • Retention of vegetation near wetland habitat, where practicable.	Same as Baseline.

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	The residual impact is assessed as **Very Low** post mitigation.		• Buffer planting between the road alignment and suitable habitat adjacent to the road (specifically at S1-W27, S1-W45, S1-W59 (OW), S1-W64, S2-W5 & S2-W5 (OW), S2-W9 (OW), and S2-W15). • Installation of vegetation hop-overs in key areas where the road corridor fragments local areas of suitable habitat (open water and some wetlands). The residual impact is assessed as **Very Low** post mitigation.	
Management of residual effect	N/A	N/A	N/A	N/A

Table 10-26 Assessment of ecological effects for birds and impact management during operation for NoR HS

	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Non-TAR birds** The magnitude of effect is assessed as **Moderate** due to the highly likely probability and local extent of impact. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and local extent of effect if disturbance occurs. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.	**Non-TAR birds** The magnitude of effect is assessed as **Moderate** due to the highly likely probability and local extent of impact. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and regional extent of effect. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such impact management is required.	Same as Baseline.

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	Terrestrial TAR birds (New Zealand pipit) The magnitude of effect is assessed as **Low** due to the unlikely probability and local extent (regional extent for loss in connectivity) of effect. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (North Island kākā)** The magnitude of effect is assessed as **Low** due to the unlikely probability and local extent (regional extent for loss in connectivity) of effect if disturbance occurs. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.		**Terrestrial TAR birds (New Zealand pipit)** The magnitude of effect is assessed as **Low** due to the unlikely probability and local extent (regional extent for loss in connectivity) of effect. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (North Island kākā)** The magnitude of effect is assessed as **Low** due to the unlikely probability and local extent (regional extent for loss in connectivity) of effect if disturbance occurs. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	Wetland TAR birds (brown teal, dabchick) The magnitude of effect is assessed as **Low** due to a likely probability of local impacts. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required. **Wetland TAR birds (North Island fernbird, banded rail, spotless crake)** The magnitude of effect is assessed as **Low** due to a likely probability of local impacts. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Wetland TAR birds (little black shag, pied shag)**		**Wetland TAR birds (brown teal, dabchick)** The magnitude of effect is assessed as **Negligible** due to an unlikely probability of local impacts. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Wetland TAR birds (North Island fernbird, banded rail, spotless crake)** The magnitude of effect is assessed as **Low** due to a likely probability of local impacts. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Wetland TAR birds (little black shag, pied shag)**	

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	The magnitude of effect is assessed as **Low** due to the likely probability of local impacts. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.		The magnitude of effect is assessed as **Low** due to the likely probability of local impacts. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	
Impact management and residual level of effect	**Brown teal, dabchick** Impact management is required for brown teal and dabchick. The following mitigation measures should be implemented: • Retention of vegetation near wetland habitat, where practicable. • Buffer planting between the road alignment and suitable habitat adjacent to the road (specifically at S2-W5 & S2-W5 (OW)). • Installation of vegetation hop-overs in key areas. The residual impact is assessed as **Very Low** post mitigation.	Same as Baseline.	N/A	N/A

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	Likely Future Ecological Environment	Baseline	Likely Future Ecological Environment
Management of residual effect	N/A	N/A	N/A	N/A

Table 10-27 Assessment of ecological effects for birds and impact management during operation for NoR KS

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	Likely Future Ecological Environment	Baseline	Likely Future Ecological Environment
Level of effect prior to impact management	**Non-TAR birds** The magnitude of effect is assessed as **Moderate** due to the highly likely probability and local extent of impact. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.	**Non-TAR birds** The magnitude of effect is assessed as **Moderate** due to the highly likely probability and local extent of impact. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	Terrestrial TAR birds (long-tailed cuckoo) The magnitude of effect is assessed as **Negligible** due to the unlikely probability and local extent of effect if disturbance occurs. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (New Zealand pipit)** The magnitude of effect is assessed as **Low** due to the unlikely probability and local extent (regional extent for loss in connectivity) of effects. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (North Island kākā)**		**Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and regional extent of effect. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such impact management is required. **Terrestrial TAR birds (New Zealand pipit)** The magnitude of effect is assessed as **Low** due to the unlikely probability and local extent (regional extent for loss in connectivity) of effects. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (North Island kākā)**	

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	The magnitude of effect is assessed as **Low** due to the unlikely probability and local extent (regional extent for loss in connectivity) of effects. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Wetland TAR birds (brown teal, dabchick)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability of local impacts. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Wetland TAR birds (North Island fernbird, banded rail, spotless crake)**		The magnitude of effect is assessed as **Low** due to the unlikely probability and local extent (regional extent for loss in connectivity) of effects. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Wetland TAR birds (brown teal, dabchick)** The magnitude of effect is assessed as **Negligible** due to the unlikely probability of local impacts. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Wetland TAR birds (North Island fernbird, banded rail, spotless crake)**	

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	The magnitude of effect is assessed as **Low** due to a likely probability of local impacts. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Wetland TAR birds (little black shag, pied shag)** The magnitude of effect is assessed as **Low** due to the likely probability of local impacts. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.		The magnitude of effect is assessed as **Low** due to a likely probability of local impacts. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Wetland TAR birds (little black shag, pied shag)** The magnitude of effect is assessed as **Low** due to the likely probability of local impacts. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	
Impact management and residual level of effect	N/A	N/A	N/A	N/A

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	Likely Future Ecological Environment	Baseline	Likely Future Ecological Environment
Management of residual effect	N/A	N/A	N/A	N/A

10.3.2.3 Lizards

Suitable habitat (e.g., EF1, EF.2, EG, ES, PL.1, PL.3, TL.2, TL.3, and WF8) was identified within the NoR S3, NoR HS, and NoR KS boundary which could potentially support native lizards. Native lizards require vegetated corridors to facilitate natural dispersal, although they are considered to be relatively resident species and do not require migration or large-scale movement to support reproduction, refuge and feeding.

The majority of NoR S3 will be a new road while both stations will also be new. In areas where the new NoR S3 is not in proximity to existing infrastructure (for example the NAL and the SH16), it is likely that there will be some localised lizard disturbance from noise, vibration and lighting and fragmentation of lizard habitat for a period during operation. However, in areas where the NoR is near existing roads and brown fields, it is not expected to result in the additional fragmentation of lizard habitat. Similarly, resident (existing and future) lizards are likely to be habituated to disturbance such as noise, vibration and lighting and no additional effect on lizards is expected, provided that the post-upgraded road will not result in higher levels of noise and vibration.

Table 10-28 (NoR S3), Table 10-29 (NoR HS), and Table 10-30 (NoR KS) outlines the operational effect assessment and impact management for lizards.

Table 10-28 Assessment of ecological effects for lizards and impact management during operation for NoR S3

Effect Description	Disturbance and displacement of existing and future lizards due to light, noise and vibration effects from the presence of the road		Loss in connectivity due to permanent habitat loss, light and noise/vibration effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Low** due to the unlikely probability and local extent of impact. The ecological value of copper skink is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.	The magnitude of effect is assessed as **Low** due to the unlikely probability and local extent of impact. The ecological value of copper skink is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.
Impact management and residual level of effect	N/A	N/A	N/A	N/A
Management of residual effect	N/A	N/A	N/A	N/A

Table 10-29 Assessment of ecological effects for lizards and impact management during operation for NoR HS

Effect Description	Disturbance and displacement of existing and future lizards due to light, noise and vibration effects from the presence of the road		Loss in connectivity due to permanent habitat loss, light and noise/vibration effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Low** due to the unlikely probability and local extent of impact. The ecological value of copper skink is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.	The magnitude of effect is assessed as **Low** due to the unlikely probability and local extent of impact. The ecological value of copper skink is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.
Impact management and residual level of effect	N/A	N/A	N/A	N/A
Management of residual effect	N/A	N/A	N/A	N/A

Table 10-30 Assessment of ecological effects for lizards and impact management during operation for NoR KS

Effect Description	Disturbance and displacement of existing and future lizards due to light, noise and vibration effects from the presence of the road		Loss in connectivity due to permanent habitat loss, light and noise/vibration effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Low** due to the unlikely probability and local extent of impact. The ecological value of copper skink is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.	The magnitude of effect is assessed as **Low** due to the unlikely probability and local extent of impact. The ecological value of copper skink is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.
Impact management and residual level of effect	N/A	N/A	N/A	N/A
Management of residual effect	N/A	N/A	N/A	N/A

10.3.3 Effects Conclusions

The ecological level of effects assessed as **Moderate**, **High** or **Very High** for NoR S3, and therefore require impact management, are described in Sections 10.3.3.1 to 10.3.3.3, for NoR HS in Sections 10.3.3.4 to 10.3.3.5, and for NoR KS in Sections 10.3.3.6 to 10.3.3.7.

10.3.3.1 NoR S3 – Long-tailed bats

- **Moderate** level of effect for disturbance and displacement to roosts and individuals (existing) during construction for the Baseline and Future Environment.
- **High** level of effect for loss in connectivity due to the presence of the road during operation for the Baseline and Future Environment.
- **High** level of effect for the disturbance and displacement of (new and existing) roosts and individuals due to the presence of the road during operation for the Baseline and Future Environment.

The post mitigation level of effect is considered to be **Very Low** to **Low** for construction and operational effects.

10.3.3.2 NoR S3 – Long-tailed cuckoo

- **Moderate** level of effect for loss in connectivity due to the presence of the road during operation for the Baseline and Future Environment.

The post mitigation level of effect is considered to be **Negligible.**

10.3.3.3 NoR S3 – Brown teal, dabchick

- **Moderate** level of effect for disturbance and displacement to nests and individuals (existing) during construction for the Baseline and Future Environment.
- **Moderate** level of effect for disturbance and displacement to roosts and individual birds (existing) due to the presence of the road during operation for the Baseline and Future Environment.
- **Moderate** level of effect for loss in connectivity due to the presence of the road during operation for the Baseline and Future Environment.

The post mitigation level of effect is considered to be **Very Low** for construction and operational effects.

10.3.3.4 NoR HS – Long-tailed bats

- **Moderate** level of effect for disturbance and displacement to roosts and individuals (existing) during construction for the Baseline and Future Environment.
- **Moderate** level of effect for loss in connectivity due to the presence of the road during operation for the Baseline and Future Environment.
- **Moderate** level of effect for the disturbance and displacement of (new and existing) roosts and individuals due to the presence of the road during operation for the Baseline and Future Environment.

The post mitigation level of effect is considered to be **Very Low** for construction and operational effects.

10.3.3.5 NoR HS – Brown teal, dabchick

- **Moderate** level of effect for disturbance and displacement to nests and individuals (existing) during construction for the Baseline and Future Environment.
- **Moderate** level of effect for disturbance and displacement to roosts and individual birds (existing) due to the presence of the road during operation for the Baseline and Future Environment.

The post mitigation level of effect is considered to be **Very Low** for construction and operational effects.

10.3.3.6 NoR KS – Long-tailed bats

- **Moderate** level of effect for disturbance and displacement to roosts and individuals (existing) during construction for the Baseline and Future Environment.
- **Moderate** level of effect for loss in connectivity due to the presence of the road during operation for the Baseline and Future Environment.
- **Moderate** level of effect for the disturbance and displacement of (new and existing) roosts and individuals due to the presence of the road during operation for the Baseline and Future Environment.

The post mitigation level of effect is considered to be **Very Low** for construction and operational effects.

10.3.3.7 NoR KS – Brown teal, dabchick

- **Moderate** level of effect for disturbance and displacement to nests and individuals (existing) during construction for the Baseline and Future Environment.

The post mitigation level of effect is considered to be **Very Low**.

10.4 Design and Resource Consent Considerations

Ecological effects associated with activities that require regional consents and consideration under the NPS-FM are briefly discussed in the following sections to inform design and alignment options for NoR S3, NoR HS and NoR KS. Wildlife Act Authority permits are also discussed in relation to the potential killing or injuring of native fauna associated with the Project activities.

10.4.1 Terrestrial Ecology

Construction of the Project will result in temporary and permanent loss of vegetation within the NoRs, including suitable habitat that is potentially being used by native fauna (bats, birds and lizards). Loss of vegetation that is subject to district plan controls is discussed in Section 10.3.1. The amounts and types of all[40] terrestrial habitat and vegetation (including habitat used by native fauna) that could be lost as a result of the Project is presented in Table 10-31 (NoR S3), Table 10-32 (NoR HS) and Table 10-33 (NoR KS) under the Footprint column.

The terrestrial vegetation to be lost (temporary and permanent) is comprised of both native and exotic vegetation which ranges from **Negligible** to **Very High** ecological value (Section 10.2.3.3). Some of

[40] Includes vegetation that is subject to district and regional plan controls as well as vegetation that can be removed as a permitted activity.

these habitat areas are likely to provide habitat to native fauna, as discussed in Sections 10.4.2 to 10.4.4 below.

Table 10-31 Potential area of permanent terrestrial vegetation loss within the road footprint for NoR S3

Feature	Classification*	Footprint (m²)
Brown Field (includes cropland)	BF	3,358
Exotic Forest – Native Understorey	EF.1	22
Exotic Forest – Exotic Understorey	EF.2	
Exotic Grassland	EG	#
Exotic Scrub	ES	40,427
Planted Vegetation – Native	PL.1	7,075
Planted Vegetation – Exotic	PL.3	64,680
Mixed Native/Exotic Treeland	TL.2	3,366
Exotic-Dominated Treeland^	TL.3	44,869
Kahikatea, pukatea forest	WF8	167

Notes: * = Classification from Singers et al. (2017). ^ = Includes district plan vegetation. # = Not mapped due to the extent.

Table 10-32 Potential area of permanent terrestrial vegetation loss within the road footprint for NoR HS

Feature	Classification*	Footprint (m²)
Exotic Grassland	EG	#
Exotic Scrub	ES	10,813
Planted Vegetation – Native	PL.1	905
Planted Vegetation – Exotic	PL.3	8,314
Mixed Native/Exotic treeland	TL.2	978
Exotic-Dominated Treeland^	TL.3	11,960

Notes: * = Classification from Singers et al. (2017). ^ = Includes district plan vegetation. # = Not mapped due to the extent.

Table 10-33 Potential area of permanent terrestrial vegetation loss within the road footprint for NoR KS

Feature	Classification*	Footprint (m²)
Exotic Grassland	EG	#
Exotic Scrub	ES	4,195

Feature	Classification*	Footprint (m²)
Planted Vegetation – Native	PL.1	665
Planted Vegetation –Exotic	PL.3	670
Mixed Native/Exotic Treeland	TL.2	1,910
Exotic-Dominated Treeland	TL.3	101

Notes: * = Classification from Singers et al. (2017). # = Not mapped due to the extent.

As the design develops and resource consent applications are prepared, more detailed habitat and fauna surveys may be required to inform an EcIA (in line with the EIANZ Guidelines) which will be used to support future regional resource consent (for example, removal of vegetation in the riparian setback) and wildlife permit applications (if required).

10.4.2 Bats

Mature trees in suitable habitat areas (EF.1, EF.2, TL.2, TL.3, and WF8) may provide potential habitat for bat roosts and facilitate bat movement in the broader landscape. The presence of bats should be re-assessed prior to obtaining any regional resource consents for vegetation removal and to support an application for a wildlife permit. The loss of some of this habitat is already assessed because they are district plan trees.

10.4.3 Birds

Native birds are highly likely to be present within NoR S3, NoR HS and NoR KS and utilise all identified terrestrial habitats (excluding Brown Fields). Vegetation clearance required for construction could result in the loss of these habitats of local value to native birds. The value of these habitats ranges from **Low** to **Very High** value and any vegetation clearance within the bird nesting season (September – February) will need to be managed in accordance with the Wildlife Act 1953. The loss of some of this habitat is already assessed because they are district plan trees.

10.4.4 Lizards

Native copper skink are likely to be present within vegetation impacted by the Project. Therefore, there is potential that site clearance required for construction could kill or injure native lizard species and result in the removal of their habitat. Any vegetation clearance where copper skink are likely to occur will also need to be managed in accordance with the Wildlife Act 1953.

10.4.5 Freshwater Ecology

The construction of NoR S3 will directly impact seven existing streams, ranging from **Low** to **Moderate** ecological value. Approximately 598.5 m of stream loss will be required to accommodate the Project works in NoR S3 (Table 10-34). The construction of NoR HS will directly impact one existing stream (S2-S1) (Notes: * = Some assessments were carried out at a desktop level, making it difficult to accurately delineate stream width and length. Therefore, lengths are indicative.

). No streams are expected to be directly impacted by the construction of NoR KS. These calculations will require re-evaluation as part of the future regional consent process. It is expected that details

regarding the offset/compensation requirements will be addressed during the future regional resource consent application.

Table 10-34 Potential stream loss (permanent and intermittent) within NoR S3

Stream ID	Hydroperiod	Ecological Value	Length to be lost (m)*
S1-S20a	Permanent	Moderate	99
S1-S20d	Intermittent	Low	106.5
S1-S20e	Intermittent	Low	34.5
S1-S21	Permanent	Moderate	69.5
S1-S23	Intermittent	Low	91.5
S1-S25*	Intermittent	Low	116.5
W4-S1	Permanent	High	81

Notes: * = Some assessments were carried out at a desktop level, making it difficult to accurately delineate stream width and length. Therefore, lengths are indicative.

Table 10-35 Potential stream loss (permanent and intermittent) within NoR HS

Stream ID	Hydroperiod	Ecological Value	Length to be lost (m)*
S2-S1	Intermittent	Low	11

Notes: * = Some assessments were carried out at a desktop level, making it difficult to accurately delineate stream width and length. Therefore, lengths are indicative.

During the detailed design phase, stream crossing plans (i.e., bridge or culvert) will be confirmed. Under a future regional consent for instream works, earthworks and vegetation removal, impact management would also be required for fish salvage and relocation, sediment control and management of the riparian condition.

10.4.6 Wetland Ecology

The construction of NoR S3 will impact 19 natural wetlands ranging from **Low** to **High** ecological value. Approximately 19,749 m^2 of direct wetland loss will occur (Table 10-36). It is expected that details regarding the offset/compensation requirements will be addressed during the future regional resource consent application.

Table 10-36 Potential wetland loss within NoR S3

Wetland ID	Vegetation Type	Ecological Value	Loss (m^2)*
S1-W38	Exotic Wetland (EW)	Low	700
S1-W39	Exotic Wetland (EW)	Low	555
S1-W41	Exotic Wetland (EW)	Moderate	1696.5

Wetland ID	Vegetation Type	Ecological Value	Loss (m^2)*
S1-W42	Exotic Wetland (EW)	Low	812
S1-W43 & S1-W43 (OW)	Exotic Wetland (EW) & Open Water (OW)	Low	168.5
S1-W44	*Machaerina* sedgeland (WL11)	Moderate	127.5
S1-W45 & S1-W45 (OW)	Exotic Wetland (EW) & Open Water (OW)	Low	577.13
S1-W46 & S1-W46 (OW)	Exotic Wetland (EW) & Open Water (OW)	Moderate	1122
S1-W47	Exotic Wetland (EW) & Open Water (OW)	Low	1238
S1-W50 & S1-W50 (OW)	Exotic Wetland (EW)	Low	1585
S1-W54	Planted Wetland (PLW)	Moderate	67
S1-W69	Exotic Wetland	Moderate	388
S2-W2	Planted Wetland (PLW)	High	1083
S2-W3	Planted Wetland (PLW)	Moderate	824
S2-W5 & S2-W5 (OW)	Exotic Wetland (EW) & Open Water (OW)	Low	1566
S2-W8	Exotic Wetland (EW)	Moderate	2065.5
S2-W9 & S2-W9 (OW)	Raupō reedland (WL19) & Open Water (OW)	High	1241
S2-W12	Exotic Wetland (EW)	Moderate	3559.5
S2-W12a*	Exotic Wetland (EW)	Moderate	373

Notes:* = Some assessments were carried out at a desktop level, therefore areas are indicative.

The construction of NoR HS will impact three natural wetlands ranging from **Low** to **High** ecological value. Approximately 4,537 m^2 of wetland loss will be required to accommodate the Project works (Table 10-37). It is expected that details regarding the offset/compensation requirements will be addressed during the future regional resource consent application.

Table 10-37 Potential wetland loss within NoR HS

Wetland ID	Vegetation Type	Ecological Value	Loss (m^2)*
S2-W2	PLW	High	1128
S2-W3	PLW	Moderate	851
S2-W5	EW	Low	2558

Notes: * = Some assessments were carried out at a desktop level, therefore areas are indicative.

The construction of NoR KS will impact two natural wetlands that are of **Moderate** ecological value. Approximately 1,156 m^2 of wetland loss will be required to accommodate the Project works (Table 10-38). It is expected that details regarding the offset/compensation requirements will be addressed during the future regional resource consent application.

Table 10-38 Potential wetland loss within NoR KS

Wetland ID	Vegetation Type	Ecological Value	Loss (m^2)*
S2-W12	EW	Moderate	713
S2-W12a	EW	Moderate	443

Notes: * = Some assessments were carried out at a desktop level, therefore areas are indicative.

11 NoR S4: Access Road Upgrade

11.1 Project Corridor Features

The NoR S4 corridor features a north-east, southwest alignment along the existing Access Road. The corridor crosses a Kumeu Tributary with mature riparian features and small hillslope wetlands. The direct catchment is rural, but large parts of the area to the north of NoR S4 will be FUZ. Main ecological features associated with the baseline include exotic grassland, mature roadside planting and mature shelterbelts.

11.2 Existing and Likely Future Environment

11.2.1 Planning Context

Access Road/Tawa Road is an existing arterial corridor that runs along the eastern RUB of Kumeū-Huapai.

- The northern side of Access Road is zoned under the AUP:OP as FUZ, with Business – Light Industry Zoning at the north-eastern section of Access Road.
- The southern side of Access Road is predominantly zoned under the AUP:OP as Rural – Countryside Living, with exception to the Kumeū Showgrounds which are zoned as Rural – Mixed Rural Zone are identified as a precinct (I517 Kumeū Showgrounds Precinct) in the AUP:OP.

Table 11-1 below provides a summary of the existing and likely future environment as it relates to Access Road.

Table 11-1 Access Road Upgrade Existing and Likely Future Environment

Environment today	Zoning	Likelihood of Change for the environment[41]	Likely Future Environment[42]	Implications of Future Environment on Ecological Features
Business	Business (Light Industrial) Zone	Low	Business (Light Industrial)	N/A
Rural	Rural – Countryside Living Zone Rural – Mixed Rural Zone	Low	Rural	N/A
Undeveloped greenfield areas (Future Urban Zone)	Future Urban	High	Urban	Loss or decrease of existing features. However, stream corridor is likely to

[41] Based on AUP:OP zoning/policy direction
[42] Based on AUP:OP zoning/policy direction

Environment today	Zoning	Likelihood of Change for the environment[41]	Likely Future Environment[42]	Implications of Future Environment on Ecological Features
				persist in the Future Environment Mature exotic trees adjacent to the NoR, associated with the roadside and shelterbelt will be lost in the likely Future Environment, but may be present during the construction phase of the upgrade.

Please refer to the AEE for further information on the planning context.

11.2.2 Permitted Activities and the Future Ecological Environment

The areas of existing undeveloped greenfields are zoned FUZ in the AUP:OP, and as such are planned for urbanisation. Vegetation clearance within the FUZ, excluding habitat for TAR species, vegetation within 10 m of a riparian strip, and tree removal (excluding district plan vegetation), are identified as permitted activities within Chapters E26 and E15 of the AUP:OP. As such the ecological features (i.e., terrestrial habitat), excluding natural wetlands, streams and riparian edges, which are currently present adjacent to the NoR, will likely be removed by future development, and will not be present when the upgraded transport corridor is operational (albeit we have assumed they will still be present during construction). Subsequently, our effects assessment has taken this into account.

11.2.3 Ecological Baseline

This section presents the findings of the site and desktop investigations in relation to the terrestrial, freshwater, and wetland habitats and associated fauna species ('ecological features') present within the NoR S4. All features within the study areas were investigated and mapped to provide context for the effects assessment and inform potential adjustments to the proposed designation boundary (Appendix 5). Based on this information, and desktop assessments, an ecological value has been calculated for each ecological feature within this NoR.

11.2.3.1 Terrestrial Habitat

Table 11-2 summarises the vegetation types and their classification (Singers et al., 2017) associated with NoR S4. Maps are presented in Appendix 5.

Table 11-2 Vegetation types present within NoR S4

Habitat	Classification*	Description of Habitat
Brown Field (includes cropland)	BF	This definition includes industrial hard standing concrete and unmanaged bare ground. For the purposes of mapping this has been extended to include bare ground associated with cropland, market gardens and construction sites. Consists of small areas patches of rural homesteads.
Exotic Grassland	EG	Grassland dominated by exotic species. This includes pasture and gardens for most of the NoR S4.
Exotic Scrub	ES	Exotic secondary scrub or shrubland with >50% cover/biomass of exotic species. Generally growing along historical farm drains. Dominant species include gorse, woolly nightshade and privet species.
Exotic Wetland	EW	Wetland ecosystems with >50% exotic plant biomass.
Planted Vegetation - Native	PL.1	Native restoration plantings with <50% exotic biomass. Planted native scrub and forest <20 years old.
Planted Vegetation - Mixed	PL.2	Planted native scrub and forest >20 years old.
Planted Vegetation - Exotic	PL.3	Exotic amenity plantings. This includes parks and gardens and roadside vegetation dominated by exotic species.
Exotic-Dominated Treeland	TL.3	Tree canopy cover 20-80%: <25% native with exotic tree cover dominant. This includes tree lined streams, gardens and mature trees within amenity plantings and shelter belts.

Notes: * = Information from Singers et al. (2017).

11.2.3.2Terrestrial Fauna

Bats

Area wide bat surveys have been undertaken for all NoRs. The results of these surveys are detailed in Appendix 11. Within NoR S4, the ABM survey confirmed bat activity at ABM9 during the March-April assessment (associated with S4-S1).

Birds

No dedicated bird surveys were undertaken for the Project and no incidental observations of bird species were noted. Although not observed at the time of survey, potential habitat was identified for a number of other TAR bird species, summarised in Table 11-3 below.

Table 11-3 TAR bird species likely to occur within suitable habitat in NoR S4

Species	Conservation Status (Robertson et al., 2021)	Distribution and Habitat	Project Area Habitat
Long-tailed cuckoo/koekoeā (*Eudynamys taitensis*)	Threatened - Nationally Vulnerable	Summer migrant to New Zealand arriving spending winter in tropical Pacific islands. As a parasite nester, their range is restricted to host species whitehead, brown creeper and yellowhead. Absent as a breeding species from Auckland region (except Te Hauturu-o-Toi, Little Barrier Island) but occur on migration passage throughout New Zealand (Gill, 2013).	Has the potential to briefly occur on migration passage across the project area. Can occur in native/exotic forest, scrub, farmland or urban areas on passage to breeding/winter habitat.
New Zealand pipit/Hīoi (*Anthus novaeseelandiae*)	At Risk – Declining	Occur in open habitat such as coastal and alpine grasslands, but also utilise modified landscapes such as pasture and scrub within the rural landscape. Rare but widespread in the Auckland region (Beauchamp, 2013).	Has the potential to utilise any open habitat such as Exotic Grassland and Exotic Scrub. Habitat suitability is low throughout NoR S4 due to agricultural intensification and likely moderate to high pest predator numbers.
North Island kākā (*Nestor meridionalis septentrionalis*)	At Risk – Recovering	Kākā are generally restricted to indigenous forest habitat and offshore islands in the Auckland region. However, they make seasonal migrations to the Auckland mainland, particularly in winter where they often utilize exotic pine and eucalyptus trees in rural and urban areas. Rare but widespread (seasonal migrant) in the Auckland region (Moorhouse, 2013).	Has the potential to utilise any mature treeland. There is no breeding habitat within the NoR but likely to infrequently utilise exotic trees for seasonal foraging and roosting throughout winter season.

Lizards

Native lizards were not identified during opportunistic searches completed during the site walkover. Copper skink have been recorded 3 km northeast of NoR S4. Copper skink is likely to be associated with most of the vegetation units presented in Table 11-2 where there is appropriate understorey. However, habitat with a higher potential to support copper skink within NoR S4 includes EG, ES, PL.1, PL.2, PL.3, and TL.3. Other native lizard species are generally restricted to indigenous forest, indigenous scrub, coastal habitat types or habitat contiguous to such area. As habitat connectivity to SEAs is limited within the wider project ZOI it is unlikely that any other species listed in Table 6-3 will occur within the Project Area, however ornate skink have been included together with copper skink as they have a low probability of occurring within suitable modified habitat, such as dense riparian vegetation.

11.2.3.3 Terrestrial Ecological Value

Appendix 6 presents the ecological value for the terrestrial vegetation identified within NoR S4. Information obtained for the ecological baseline (Sections 11.2.3.1 and 11.2.3.2), as well as the desktop assessment (Section 6), was used to score the matters that inform the ecological value. The ecological value of habitats ranged from **Negligible** (e.g., BF) to **High** (e.g., PL.2).

Notwithstanding the ecological value associated with habitat units, specific consideration still needs to be given to individual species and their conservation significance for the following reasons (in accordance with EIANZ Guidelines):

- The habitat value may dilute the conservation value associated with specific species. For example, the combined value for exotic grassland is **Low**, while the value for copper skink (At Risk - Declining) is **High**. The combined value of **Low** therefore understates the conservation value of the species;
- Species may not be restricted to a single vegetation unit;
- Potential effects on species are unrelated to habitat units. For example, impact on highly mobile species (such as bats) by noise and light may be independent of the habitat loss associated with the Project footprint.

For the reasons outlined above, the ecological value assessments for individual species are considered to range from **Moderate** to **Very High** (Table 11-4).

Table 11-4 Ecological value for terrestrial fauna (TAR species only)

Fauna Type	Species Within Habitat	Habitat Units	Conservation Status (NZ Classification System)	Ecological Value
Bats	Long-tailed bat	TL.3	Threatened – Nationally Critical	**Very High**
TAR Birds	Long-tailed cuckoo	TL.3	Threatened – Nationally Vulnerable	
	New Zealand pipit	EG, ES	At Risk - Declining	**High**
	North Island kākā	TL.3	At Risk – Recovering	**Moderate**

Fauna Type	Species Within Habitat	Habitat Units	Conservation Status (NZ Classification System)	Ecological Value
Herpetofauna (Lizards)	Copper skink	EG, ES, PL.1, PL.2, PL.3, TL.3	At Risk – Declining	**High**
	Ornate skink	TL.3		

11.2.3.4 Freshwater Habitat

All potential streams within NoR S4 were mapped (Appendix 5) and classified as either permanent or intermittent. Ephemeral streams were mapped when possible. Permanent or intermittent streams that were within the designation boundary were numbered and assessed.

Stream classification and RHA assessment

One stream branch was identified during the desktop and site investigations within NoR S4. Stream S4-S1 was accessed during site investigations and was identified as permanent as there was evidence of continuous flow and the stream measured an overall 'Moderate' habitat quality score. Detailed RHA results are presented in Appendix 10.

11.2.3.5 Freshwater Fauna

Fish surveys were not carried out during site investigations, however 'At Risk – Declining' species īnanga and longfin eel have been recorded upstream of S4-S1. The freshwater habitats within NoR S4 were assessed for their potential to support indigenous fish during the RHA. Potential habitat, such as undercut banks, overhanging vegetation and macrophytes were observed at the time of survey.

11.2.3.6 Freshwater Ecological Value

Appendix 7 presents the ecological value for the aquatic habitats identified within NoR S4. Information obtained for the ecological baseline (Sections 11.2.3.4 and 11.2.3.5), as well as the area wide desktop assessment (Section 6), was used to score the matters that inform the ecological value. The ecological value of S4-S1 was **Moderate**.

11.2.3.7 Wetland Habitat

One wetland within NoR S4 was identified and assessed via desktop (S4-W1). This was classified as a NPS-FM 'natural wetland' with an Exotic Wetland (EW) vegetation type.

11.2.3.8 Wetland Ecological Value

Appendix 8 presents the ecological value for the wetland habitat (S4-W1) identified within NoR S4. Information obtained for the ecological baseline (Section 11.2.3.7), as well as the area wide desktop assessment (Section 6), was used to score the matters that inform the ecological value. The ecological value of S4-W1 was **Low**.

11.3 Assessment of Ecological Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

Section 11.3 assess the ecological effects of activities which are district matters under the AUP:OP.

11.3.1 Construction Effects - Terrestrial Ecology

Refer to Section 8.3.1.

11.3.1.1 Terrestrial Vegetation

Vegetation to be removed that is subject to district controls is presented in Appendix 5 and also detailed in the table below. The effects of district plan vegetation removal on fauna i.e., bats and birds (as it relates to loss in foraging habitat, and mortality and injury) is assessed in Sections 11.3.1.2 and 11.3.1.3.

Table 11-5 Assessment of ecological effects for terrestrial vegetation (district plan trees only) and impact management during construction for NoR S4

	Permanent loss of habitat/ecosystem, fragmentation, and edge effects due to vegetation removal (district plan trees only)	
Effect Description	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	**TL.3 (total area of 2,263.35 m^2)** The magnitude of effect is assessed as **Moderate** due to the extent of removal and high likelihood that habitat loss and additional fragmentation may occur. The ecological value of TL.3 is assessed to be **Low**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	It is assumed that urbanisation (and the associated tree removal) may not have occurred at the time of road construction. As such the level of effects will be the same as the Baseline.
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

11.3.1.2 Bats

Bats may utilise the habitats associated with NoR S4 for roosting or foraging. Specifically, mature trees associated with exotic-dominated treeland stands (TL.3) and shelterbelts. During construction of the Project, night works may be required, and site compounds are likely to be lit overnight. Lighting at night has the potential to modify the behaviour of bats if foraging within this area or roosting in nearby isolated stands of mature trees.

Noise and vibration during construction can be an issue if bats are roosting in the immediate vicinity of the construction works. Although bat foraging has been confirmed, ABM survey at the Project scale

cannot confirm roost occupation within or adjacent to the designation boundary. However, it can be assumed that bats will utilise roost sites within the Project Area based on:

- Confirmed habitat suitability (numerous trees with moderate to high bat roost potential, connected to linear stream corridors and wetlands)
- Confirmed foraging presence and;

Additionally, bats may be impacted by removal of district plan vegetation through the following effects[43]:

- Disturbance and displacement to existing individuals due to construction activities (noise, light, dust etc.)
- Loss of foraging habitat
- Mortality or injury to bats

Table 11-6 outlines the effect assessment for bats due to construction activities related to noise and light, and removal of district plan vegetation.

[43] Roost lost has been considered but discounted as an effect as the **consequence** of roost loss (if it does occur at all) is considered less than **Negligible** in the context of this NoR.

Table 11-6 Assessment of ecological effects for bats and impact management during construction for NoR S4

Effect Description	Disturbance and displacement to roosts and individual bats (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Mortality or injury to bats	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Negligible** due to an unlikely probability, local extent if impact occurs and relatively short period of construction related effects. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.	***Loss of foraging habitat*** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. ***Mortality or injury to bats*** The magnitude of effect is assessed as **Low** due to a likely probability and local extent if impact occurs. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required.	It is assumed that urbanisation (and the associated tree removal) may not have occurred at the time of road construction. As such the level of effects for both impacts will be the same as the Baseline.

Effect Description	Disturbance and displacement to roosts and individual bats (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Mortality or injury to bats	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Impact management and residual level of effect	N/A	N/A	A BMP should be developed to include consideration for: • Timing of vegetation removal. • Vegetation removal protocols including pre-felling surveys. The residual impact is assessed as **Very Low** post mitigation.	Same as Baseline.
Management of residual effect	N/A	N/A	N/A	N/A

11.3.1.3 Birds

Noise, vibration and lighting disturbance caused by construction activities could potentially displace native birds from suitable nesting and foraging habitat within and adjacent to NoR S4. Additionally, birds may be impacted by removal of district plan vegetation through the following effects:

- Disturbance and displacement to existing individuals due to construction activities (noise, light, dust etc.)
- Loss of foraging habitat
- Nest loss
- Mortality or injury to birds

Table 11-7 outlines the effect assessment for birds due to construction activities related to noise and light, and removal of district plan vegetation.

Table 11-7 Assessment of ecological effects for birds and impact management during construction for NoR S4

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Non-TAR birds** The magnitude of effect is assessed as **Moderate** due to definite presence of native birds associated with several habitat features of the NoR. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Negligible** due to unlikely probability, short duration, and local extent of effect if disturbance occurs. The ecological value of these species is **Very High**, and the overall level of effect is assessed as	Same as Baseline.	**Non-TAR birds** ***Nest loss & Mortality or injury to birds*** The magnitude of effect is assessed as **Moderate** due to definite presence of native birds associated with district plan vegetation. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required. **Non-TAR birds** ***Loss of foraging habitat*** The magnitude of effect is assessed as **Low** due to a likely probability and local extent if impact occurs. The ecological value of birds in the context of habitat features are	Same as Baseline.

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	Low prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (New Zealand pipit)</u>** The magnitude of effect is assessed as **Negligible** due to unlikely probability, short duration, and local extent of effect if disturbance occurs. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (North Island kākā)</u>** The magnitude of effect is assessed as **Negligible** due to unlikely probability, short duration, and local extent of effect if disturbance occurs. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very**		assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (long-tailed cuckoo)</u>** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (New Zealand pipit)</u>** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of these species is **High**, and the overall	

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	Low prior to mitigation. As such no impact management is required.		level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Terrestrial TAR birds (North Island kākā)</u>** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent if impact occurs. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required.	
Impact management and residual level of effect	N/A	N/A	Impact management will be required under the Wildlife Act to prevent killing or injuring of native birds. As part of this management, timing of vegetation removal should be constrained to avoid the key nesting period (September to February) or pre-clearance inspections should be undertaken prior to vegetation removal.	Same as Baseline.

	Disturbance and displacement to roosts and individual birds (existing) due to construction activities (noise, light, dust etc.)		Effects due to removal of district plan vegetation: - Loss of foraging habitat - Nest loss - Mortality or injury to birds	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Management of residual effect	N/A	N/A	N/A	N/A

11.3.1.4 Lizards

Construction effects on lizards associated with noise, light and vibration are presented in Table 11-8. Construction activity relates to the upgrade of an existing road and as such lizards are likely to be habituated to noise and vibration from the existing road. Regional matters as they relate to vegetation removal and lizards are further discussed in Section 11.4.4.

Table 11-8 Assessment of ecological effects for lizards and impact management during construction for NoR S4

Effect Description	Disturbance and displacement of individuals (existing) due to construction activities (noise, dust etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Negligible** due to unlikely probability of lizard disturbance due to construction related noise and vibration. The ecological value of copper skink is assessed as **High**, and the overall level of effect due to construction disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required.	Same as Baseline.
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

11.3.2 Operational Effects - Terrestrial Ecology

The Project involves the upgrading of an existing road in a rural landscape and future urban environment; therefore, although some impacts may increase from the current baseline, many operational effects such as fragmentation and noise and lighting are likely to be pre-existing. In general, potential operational effects from the Project that relate to District plan matters are summarised below.

- Loss in connectivity to indigenous fauna (e.g., bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road, leading to fragmentation of habitat; and
- Disturbance and displacement of indigenous fauna and their nests/roosts (e.g., bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road

The following sections detail the magnitude of effect and subsequent level of effect on ecological features (further detail regarding how these were determined are provided in Appendix 1). The effects assessment has considered two scenarios – the current ecological baseline (refer Section 11.2.2 and the 'existing environment' (i.e., allowing for permitted activities) (refer Section 11.2.1).

Impact management and residual effects are also presented where the level of effect is assessed to be **Moderate** or higher.

11.3.2.1 Bats

The loss of connectivity through permanent habitat loss and disturbance such as operational noise/vibration and light can lead to an overall reduction in size and quality of bat foraging habitat and can impact on bat movement in the broader landscape. Lighting spillage from street lighting could also disturb commuting and foraging bats at night and adversely affect insect prey populations. The level of effect on bats due to operational impacts associated with loss in connectivity should be assessed in the context of confirmed (but low frequency) bat activity in the broader landscape, the existing degree of fragmentation and that of the future urban environment.

Table 11-9 outlines the effect assessment for:

- Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to additional fragmentation of terrestrial habitat due to the presence of the infrastructure.
- Disturbance and displacement of bats due to light, noise and vibration from the road.

Table 11-9 Assessment of ecological effects for bats and impact management during operation for NoR S4

	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration		Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape	
Effect Description	**Baseline**	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Low** due to the unlikely probability and relatively local extent of disturbance. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Moderate** disturbance of individual bats and roosts. As such impact management is required.	It is assumed that urbanisation (and the associated tree removal) may not have occurred at the time of road construction. As such the level of effects will be the same as the Baseline.	The magnitude of effect is assessed as **Low** due to relatively low likelihood and existing fragmentation. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Moderate** for loss in connectivity. As such impact management is required.	Same as Baseline stream riparian corridor likely to be present in the FUZ.
Impact management and residual level of effect	A BMP should be developed to include consideration for: • Buffer planting and retention of existing mature trees between the road alignment and features with potential for bat roosts[44]. • Light and noise management through design.	Same as Baseline.	A BMP should be developed as outlined in Appendix 14. The map indicates the location and extent of measures to mitigate potential connectivity effects and includes hop-overs/underpasses, buffer planting and existing mature tree features that will be retained, as well as indicating areas where early	Same as Baseline.

[44] This may be in addition to the buffer planting proposed in Appendix **Error! Reference source not found.** and will depend on the presence and location of roosts at the time of construction. The requirement for planting mature trees (as buffer) to mitigate roost disturbance, will depend on the future context such as the location of known roosts, the presence of existing buffer and the feasibility of including other design consideration that can control disturbance effects.

Effect Description	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration		Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	• Future presence of roosts within the alignment (placement of flaps on features with high roost potential). The residual impact is assessed as **Negligible** post mitigation.		planting[45] (or planting of mature trees) will occur. The BMP should also have additional consideration for: • Lighting design to minimise light levels and light spill along the road corridor. • As an alternative to early restoration planting, restoration planting can make use of mature trees to achieve the same goal as early restoration planting. • Assumptions in the efficacy of the proposed mitigation will be addressed through an adaptive management framework that will outline bat activity thresholds, robust monitoring and potential corrective action. The implementation of the proposed impact management measures will reduce the level of effect to **Very Low**.	

Effect Description	Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration		Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape	
	Baseline	Likely Future Ecological Environment	Baseline	Likely Future Ecological Environment
Management of residual effect	N/A	N/A	N/A	N/A

11.3.2.2 Birds

Noise, vibration and lighting disturbance caused by the presence of the road could potentially displace native birds from suitable nesting and foraging habitat within and adjacent to NoR S4, while noise, light and vibration may also affect connectivity in the broader landscape.

Table 11-10 outlines the operational effect assessment and impact management for birds.

Table 11-10 Assessment of ecological effects for birds and impact management during operation for NoR S4

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Non-TAR birds** The magnitude of effect is assessed as **Low** due to the likely probability and local effect. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent of effects. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.		**Non-TAR birds** The magnitude of effect is assessed as **Low** due to the likely probability and local effect. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (long-tailed cuckoo)** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent of effects. The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline with the exception of: **Non-TAR birds** ***Loss in connectivity*** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and local effect. The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required.

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
	Terrestrial TAR birds (New Zealand pipit) The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent of effect. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (North Island kākā)** The magnitude of effect is assessed as **Negligible** due to an unlikely probability and local extent of effect. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required.		**Terrestrial TAR birds (New Zealand pipit)** The magnitude of effect is assessed as **Low** due to an unlikely probability and regional extent of effect. The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Terrestrial TAR birds (North Island kākā)** The magnitude of effect is assessed as **Low** due to an unlikely probability and regional extent of effect. The ecological value of these species is **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	
Impact management and residual	N/A	N/A	N/A	N/A

Effect Description	Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)		Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	Likely Future Ecological Environment	Baseline	Likely Future Ecological Environment
level of effect				
Management of residual effect	N/A	N/A	N/A	N/A

11.3.2.3 Lizards

Suitable habitat (EG, ES, PL.1, PL.2, PL.3 and TL.3) was identified within the NoR boundary which could potentially support native lizards. Native lizards require vegetated corridors to facilitate natural dispersal, although they are considered to be relatively resident species and do not require migration or large-scale movement to support reproduction, refuge and feeding.

NoR S4 corridor includes upgrading the existing Access Road. The proposed upgrade is therefore not expected to result in the additional fragmentation of lizard habitat. Similarly, resident (existing and future) lizards are likely to be habituated to disturbance such as noise, vibration and lighting and no additional effect on lizards is expected, provided that the post-upgraded road will not result in higher levels of noise and vibration.

Table 11-11 outlines the operational effect assessment and impact management for lizards.

Table 11-11 Assessment of ecological effects for lizards and impact management during operation for NoR S4

Effect Description	Disturbance and displacement of existing and future lizards due to light, noise and vibration effects from the presence of the road		Loss in connectivity due to permanent habitat loss, light and noise/vibration effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure	
	Baseline	**Likely Future Ecological Environment**	**Baseline**	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Low** as the Project is not expected to further exacerbate existing disturbance adjacent to the NoR. The ecological value of copper skinks is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.	The magnitude of effect is assessed as **Low** as the Project is not expected to further exacerbate existing and future restrictions on lizard dispersal adjacent to the NoR. The ecological value of copper skinks is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Low** prior to mitigation. As such no impact management is required.	Same as Baseline.
Impact management and residual level of effect	N/A	N/A	N/A	N/A
Management of residual effect	N/A	N/A	N/A	N/A

11.3.3 Effects Conclusions

The ecological level of effects assessed as **Moderate**, **High** or **Very High** for NoR S4, and therefore require impact management, include:

- **Moderate** level of effect for mortality or injury to long-tailed bats due to the removal of district plan vegetation during construction for the Baseline only.
- **Moderate** level of effect for loss in connectivity for long-tailed bats due to the presence of the road during operation for the Baseline and Future Environment.

The post mitigation level of effect is considered to be **Negligible** to **Very Low** for construction and operational effects.

11.4 Design and Resource Consent Considerations

Ecological effects associated with activities that require regional consents and consideration under the NPS-FM are briefly discussed in the following sections to inform design and alignment options for NoR S4. Wildlife Act Authority permits are also discussed in relation to the potential killing or injuring of native fauna associated with the Project activities.

11.4.1 Terrestrial Ecology

Construction of the Project will result in temporary and permanent loss of vegetation within the NoRs, including suitable habitat that is potentially being used by native fauna (bats, birds and lizards). Loss of vegetation that is subject to district plan controls is discussed in Section 11.3.1. The amounts and types of all[46] terrestrial habitat and vegetation (including habitat used by native fauna) that could be lost as a result of the Project is presented in Table 11-12 under the Footprint column.

The terrestrial vegetation to be lost (temporary and permanent) is comprised of both native and exotic vegetation which ranges from **Negligible** to **Very High** ecological value (Section 11.2.3.3). Some of these areas are likely to provide habitat to native fauna, as discussed in Sections 11.3.1.2 to 11.4.4 below.

Table 11-12 Potential area of permanent terrestrial vegetation loss within the road footprint for NoR S4

Feature	Classification*	Footprint (m²)
Exotic Grassland	EG	#
Exotic Scrub	ES	2,541
Planted Vegetation – Native	PL.1	205
Planted Vegetation – Mixed	PL.2	102
Planted Vegetation – Exotic	PL.3	12,519
Exotic-Dominated Treeland^	TL.3	13,370

[46] Includes vegetation that is subject to district and regional plan controls as well as vegetation that can be removed as a permitted activity.

Notes: * = Classification from Singers et al. (2017). ^ = Includes district plan vegetation. # = Not mapped due to the extent.

As the design develops and resource consent applications are prepared, more detailed habitat and fauna surveys may be required to inform an EcIA (in line with the EIANZ Guidelines) which will be used to support future regional resource consent (for example, removal of vegetation in the riparian setback) and wildlife permit applications (if required).

11.4.2 Bats

Mature trees in suitable habitat areas (TL.3) may provide potential habitat for bat roosts and facilitate bat movement in the broader landscape. The presence of bats should be re-assessed prior to obtaining any regional resource consents for vegetation removal and to support an application for a wildlife permit. The loss of some of this habitat is already assessed because they are district plan trees.

11.4.3 Birds

Native birds are likely to be present within the NoR and utilise all identified terrestrial habitats (excluding Brown Fields). Vegetation clearance required for construction could result in the loss of these habitats of local value to native birds. The value of these habitats ranges from **Low** to **Very High** value and any vegetation clearance within the bird nesting season (September – February) will need to be managed in accordance with the Wildlife Act 1953. The loss of some of this habitat is already assessed because they are district plan trees.

11.4.4 Lizards

Native lizards are likely to be present within vegetation impacted by the Project. Therefore, there is potential that site clearance required for construction could kill or injure native lizard species and result in the removal of their habitat. Any vegetation clearance where lizards are likely to occur will also need to be managed in accordance with the Wildlife Act 1953.

11.4.5 Wetland Ecology

The construction of NoR S4 will impact one **Low** value wetland (S4-W1). Approximately 317 m^2 of wetland loss will be required to accommodate the Project works in NoR S4. It is expected that details regarding the offset/compensation requirements will be addressed during the future regional resource consent application.

12 Conclusion

Construction Effects

Table 12-1 to Table 12-4 provides a summary of district matter ecological effects during construction prior to any mitigation. The summary represents the level of effect for the baseline and the likely future ecological environment as one where they are the same and with a * where they differ. Where the level of effect was assessed to be **Moderate** or higher, then mitigation has been suggested and will be conditioned through an Ecological Management Plan. Construction effect mitigation measures will include:

- A BMP for NoR S1, NoR S3, NoR HS, NoR KS, and NoR S4. Details of the BMP will depend on bat habitat within the future ecological environment and is likely to include bat habitat surveys prior to construction, siting of compounds and laydown areas to avoid bat habitat, lighting design to reduce light levels and spill from construction areas and restriction of nightworks around treeland bat habitat.
- Bird management will be required for brown teal and dabchick at NoR S1, NoR S2, NoR S3, NoR HS, and NoR KS. Considerations for bird management will include a bird survey prior to construction to confirm Threatened or At Risk (TAR) species are not present and to provide guidance if TAR species are present, including the avoidance of the bird breeding season (September to February) during construction (as it relates to the existing stormwater pond).

Table 12-1 Summary of ecological effects during construction prior to mitigation for district plan terrestrial vegetation

Construction - Terrestrial vegetation (district plan vegetation only)	
NoR	**Permanent loss of habitat/ecosystem, fragmentation, and edge effects due to vegetation removal (district plan vegetation only)**
NoR S1	Very Low (EF), Low (TL.2 & TL.3)
NoR S2	Very Low (TL.3, WF8, & Unitary Plan notable tree)
NoR S3	Very Low (TL.3, WF8, Unitary Plan notable tree, Unitary Plan open space trees)
NoR HS	Very Low (TL.3)
NoR KS	N/A
NoR S4	Low (TL.3)

Table 12-2 Summary of ecological effects during construction prior to mitigation for bats

Construction - Bats			
NoR	**Disturbance and displacement to roosts and individuals (existing) due to**	**Loss of foraging habitat due to removal of district plan vegetation**	**Mortality or injury to bats due to removal of district plan vegetation**

Construction - Bats			
	construction activities (noise, light, dust etc.)		
NoR S1	**Moderate**	Low	**Moderate**
NoR S2	Low	Low	Low
NoR S3	**Moderate**	Low	Low
NoR HS	**Moderate**	Low	Low
NoR KS	**Moderate**	N/A	N/A
NoR S4	Low	Low	**Moderate** *Low

Notes: * = Indicates a level of effect associated with the Likely Future Ecological Environment that is different from the baseline level of effects.

Table 12-3 Summary of ecological effects during construction prior to mitigation for birds

Construction - Birds				
NoR	**Disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust etc.)**	**Loss of foraging habitat due to removal of district plan vegetation**	**Nest loss due to removal of district plan vegetation**	**Mortality or injury to birds due to removal of district plan vegetation**
NoR S1				
Non-TAR Birds	Low	Low	Low	Low
Long-tailed cuckoo	Low	Very Low	Very Low	Very Low
New Zealand pipit	Very Low	Very Low	Very Low	Very Low
North Island kākā	Very Low	Very Low	Very Low	Very Low
Brown teal, dabchick	**Moderate**	N/A	N/A	N/A
North Island fernbird, banded rail, spotless crake	Low	N/A	N/A	N/A
Little black shag, pied shag	Low	N/A	N/A	N/A
NoR S2				
Non-TAR Birds	Low	Very Low	Low	Low

Construction - Birds				
Long-tailed cuckoo	Low	Low	Low	Low
New Zealand pipit	Very Low	Very Low	Very Low	Very Low
North Island kākā	Very Low	Very Low	Very Low	Very Low
Brown teal, dabchick	**Moderate**	N/A	N/A	N/A
North Island fernbird, banded rail, spotless crake	Low	N/A	N/A	N/A
Little black shag, pied shag	Low	N/A	N/A	N/A
NoR S3				
Non-TAR Birds	Low	Very Low	Low	Low
Long-tailed cuckoo	Low	Low	Low	Low
New Zealand pipit	Very Low	Very Low	Very Low	Very Low
North Island kākā	Very Low	Very Low	Very Low	Very Low
Brown teal, dabchick	**Moderate**	N/A	N/A	N/A
North Island fernbird, banded rail, spotless crake	Low	N/A	N/A	N/A
Little black shag, pied shag	Very Low	N/A	N/A	N/A
NoR HS				
Non-TAR Birds	Low	Very Low	Low	Low
Long-tailed cuckoo	Low	Low	Low	Low
New Zealand pipit	Very Low	Very Low	Very Low	Very Low
North Island kākā	Very Low	Very Low	Very Low	Very Low
Brown teal, dabchick	**Moderate**	N/A	N/A	N/A
North Island fernbird, banded rail, spotless crake	Low	N/A	N/A	N/A
Little black shag, pied shag	Low	N/A	N/A	N/A
NoR KS				
Non-TAR Birds	Low	N/A	N/A	N/A

Construction - Birds				
Long-tailed cuckoo	Low	N/A	N/A	N/A
New Zealand pipit	Very Low	N/A	N/A	N/A
North Island kākā	Very Low	N/A	N/A	N/A
Brown teal, dabchick	**Moderate**	N/A	N/A	N/A
North Island fernbird, banded rail, spotless crake	Low	N/A	N/A	N/A
Little black shag, pied shag	Low	N/A	N/A	N/A
NoR S4				
Non-TAR Birds	Low	Very Low	Low	Low
Long-tailed cuckoo	Low	Low	Low	Low
New Zealand pipit	Very Low	Very Low	Very Low	Very Low
North Island kākā	Very Low	Very Low	Very Low	Very Low

Table 12-4 Summary of ecological effects during construction prior to mitigation for lizards

Construction – Lizards	
NoR	**Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, dust etc.)**
NoR S1	Low
NoR S2	Very Low
NoR S3	Very Low
NoR HS	Very Low
NoR KS	Very Low
NoR S4	Very Low

Overall comment

The residual (post-mitigation) level of effect for all construction effects are considered **Negligible** or **Very Low**.

Operational Effects

Table 12-5 to Table 12-7 provides a summary of district plan matter ecological effects during operation due to the presence of the road resulting in disturbance or loss in connectivity to bats, birds and lizards. The summary represents the level of effect for the baseline and the likely future ecological environment as one where they are the same and with a * where they differ. Where the level of effect was assessed to be **Moderate** or higher, then mitigation has been developed.

Operational effect mitigation measures will include:

- A BMP for all NoRs. The BMP should include the retention of mature trees, buffer planting, hop-overs and unders at strategic locations as outlined in Appendix 14. In addition, the BMP should consider lighting design along strategic location of the road (stream crossings).
- Bird management will be required for long-tailed cuckoo at NoR S1 and S3. Bird management will also be required for brown teal and dabchick at NoR S1, S3, and HS. Considerations for bird management will include retention of vegetation near wetland habitat (where practicable), buffer planting between the road alignment and suitable habitat adjacent to the road, and installation of vegetation hop-overs in key areas.

Table 12-5 Summary of ecological effects during operation prior to mitigation for bats

Operation - Bats		
NoR	**Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration**	**Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape**
NoR S1	**High**	**Very High**
NoR S2	Low	**Moderate**
NoR S3	**High**	**High**
NoR HS	**Moderate**	**Moderate**
NoR KS	**Moderate**	**Moderate**
NoR S4	**Moderate**	**Moderate**

Table 12-6 Summary of ecological effects during operation prior to mitigation for birds

Operation - Birds		
NoR	**Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)**	**Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure**

Operation - Birds		
NoR S1		
Non-TAR Birds	Low	Low
Long-tailed cuckoo	Low	**Moderate**
New Zealand pipit	Very Low	Low
North Island kākā	Very Low	Low
Brown teal, dabchick	**Moderate**	**Moderate**
North Island fernbird, banded rail, spotless crake	Low	Low
Little black shag, pied shag	Very Low	Very Low
NoR S2		
Non-TAR Birds	Very Low	Very Low
Long-tailed cuckoo	Low	Low
New Zealand pipit	Very Low	Very Low
North Island kākā	Very Low	Very Low
Brown teal, dabchick	Low	Low
North Island fernbird, banded rail, spotless crake	Very Low	Very Low
Little black shag, pied shag	Very Low	Very Low
NoR S3		
Non-TAR Birds	Very Low	Very Low
Long-tailed cuckoo	Low	**Moderate**
New Zealand pipit	Very Low	Low
North Island kākā	Very Low	Low
Brown teal, dabchick	**Moderate**	**Moderate**
North Island fernbird, banded rail, spotless crake	Low	Low
Little black shag, pied shag	Very Low	Low
NoR HS		
Non-TAR Birds	Low	Low
Long-tailed cuckoo	Low	Low

Operation - Birds		
New Zealand pipit	Low	Low
North Island kākā	Low	Low
Brown teal, dabchick	**Moderate**	Low
North Island fernbird, banded rail, spotless crake	Low	Low
Little black shag, pied shag	Low	Low
NoR KS		
Non-TAR Birds	Low	Low
Long-tailed cuckoo	Low	Low
New Zealand pipit	Low	Low
North Island kākā	Low	Low
Brown teal, dabchick	Low	Low
North Island fernbird, banded rail, spotless crake	Low	Low
Little black shag, pied shag	Low	Low
NoR S4		
Non-TAR Birds	Very Low	Very Low
Long-tailed cuckoo	Low	Low
New Zealand pipit	Very Low	Low
North Island kākā	Very Low	Low

Table 12-7 Summary of ecological effects during operation prior to mitigation for lizards

Operation - Lizards		
NoR	**Disturbance and displacement of existing and future lizards due to light, noise, and vibration effects from the presence of the road**	**Loss in connectivity due to permanent habitat loss, light and noise/vibration effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure**
NoR S1	Low	Low
NoR S2	Low	Low
NoR S3	Low	Low

Operation - Lizards		
NoR HS	Low	Low
NoR KS	Low	Low
NoR S4	Low	Low

Overall comment

The residual (post-mitigation) level of effect for all operational effects are **Negligible, Very Low** or **Low**.

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1 Appendix 1 – Ecological Impact Assessment Methodology

The standard by which this EcIA was undertaken follows the guidelines published by the Environment Institute of Australia and New Zealand (EIANZ Guidelines) (Roper-Lindsay et al., 2018).

1.1 Assessment of Ecological Value

The first step in the EcIA approach is to assess the value of ecological features in terms of Representativeness, Rarity, Diversity and Pattern, and Ecological context. Details on each matter and its associated considerations are provided in Table 13-1 for terrestrial ecological value and Table 13-2 aquatic ecological value

Table 13-1 Matters and considerations for the assessment of terrestrial ecological value

Representativeness
Typical structure and composition
Indigenous representation
Rarity/distinctiveness
Species of conservation significance
Range restricted or endemic species
Distinctive ecological values
Diversity and pattern
Habitat diversity
Species diversity
Patterns in habitat use
Ecological context
Size, shape and buffering
Sensitivity to change
Ecological networks (linkages, pathways, migration)

Table 13-2 Matters and considerations for the assessment of aquatic ecological value

Representativeness (including SEV, RHA and ecological integrity)
Extent to which site/catchment is typical of characteristic
Instream habitat modification

Representativeness (including SEV, RHA and ecological integrity)
Riparian habitat modification
Hydrological modification
Catchment conditions
Geomorphological modification
Water quality modification
Presence of alien and invasive species
Invertebrate assemblage representation
Fish assemblage representation
Rarity/descriptiveness
Pool characterisation
Species of conservation significance
Range restricted or endemic species
Stream type (rare or distinctive)
Diversity and pattern
Distinctive ecological values
Level of natural diversity
Diversity metrics
Complexity of community
Ecological context (Ecosystem services, importance sensitivity)
Stream order
Catchment size
Hydroperiod
Sensitivity to flow modification
Sensitivity water quality modification
Sensitivity to sedimentation/erosion
Connectivity and migration

1.2 Assessment of Ecological Effects

The ecological effects assessment includes several steps that collectively assess the way the Project will interact with elements of the physical and biological, environment to produce effects to habitat and receptors. The method for determining the level of effect are outlined in the following sections.

Basic impact characteristic terminology and respective descriptors are incline with the EIANZ Guidelines and are provided in Table 13-3.

Table 13-3 Magnitude of effect assessment terminology

Characteristic	Definition	Designations
Type	A descriptor indicating the relationship of the impact to the Project (in terms of cause and effect)	Direct
		Indirect
Extent	The "reach" of the impact (e.g., confined to a small area around the Project Footprint, projected for several kilometres, etc.)	Local
		Regional
		National
Duration	The time period over which a resource/receptor is affected	Temporary (days or months)
		Short-term (<5 years)
		Long-term (15-25 years)
		Permanent (>25 years)
Frequency	A measure of the constancy or periodicity the receptor will be affected	Infrequently
		Periodically
		Frequently
		Continuously
Likelihood	The probability of an effect occurring if it is unplanned	Highly Unlikely
		Unlikely
		Likely
		Highly Likely
		Definite
Reversibility	The degree to which the ecological effect can be reversed in a reasonable time scale through natural processes or mitigation	Totally
		Partially
		Irreversible
		Not applicable

Based on the above-mentioned descriptors, the characteristics of each effect are used to assign a magnitude to the specific effect. Magnitude designations are provided in Table 13-4.

Table 13-4 Magnitude of effect descriptions

Magnitude	Description
Very High	Total loss of, or very major alteration to, key elements/features of the existing baseline conditions, such that the post-development character, composition and or attributes will be fundamentally changes and may be lost from the site altogether; and/or loss of very high proportion of the known population or range of the elements/features
High	Major loss or major alteration to key elements/features of the existing baseline such that the post-development character, composition and/or attributes will be fundamentally changed; and/or loss of a high proportion of the known population or range of the element/feature
Moderate	Loss or alteration to one or more key elements/features of the existing baseline such that the post-development character, composition and/or attributes will be partially changed; and/or loss of a moderate proportion of the known population or range of the element/feature
Low	Minor shift away from the existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline conditions will be similar or pre-development circumstances or patterns; and or having a minor effect on the known population or range of the element/feature
Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; and/or having negligible effect on the known population or range of the element/feature

The magnitude of an effect is considered in relation to the ecological value of the habitat or receptor to be impacted on. The ecological value of habitat or receptors are the primary focus of the ecological assessment. The ecological value of habitat or receptors are typically expressed on a local, district, regional or national scale. The ecological value designations are provided in Table 13-5.

Table 13-5 Ecological value descriptions

Value	Description
Very high	Area rates High for three or all the four assessment matters. Likely to be of National importance and recognised as such
High	Area rates High for two of the assessment matters, Moderate and Low for the remainder or Area rates High for 1 so the assessment matters, moderate for the remainder. Likely to be regionally important and recognised as such
Moderate	Area rates High for one matter, Moderate and Low Dortha 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
Low	Area rates Low or Very low for most assessment matters and Moderate for one. Limited ecological value other as local habitat for tolerant species
Negligible	Area rates Very low for three matters and Moderate, Low or Very low for the remainder

Once magnitude of effect and the ecological value of the habitat or receptor have been determined, the level of effect can be assigned for each effect using the matrix shown in Table 13-6.

Table 13-6 Ecological effect matrix

		Ecological Values				
		Very High	High	Moderate	Low	Negligible
Magnitude	Very High	Very High	Very High	High	Moderate	Low
	High	Very High	Very High	Moderate	Low	Very Low
	Moderate	High	High	Moderate	Low	Very Low
	Low	Moderate	Low	Low	Very Low	Very Low
	Negligible	Low	Very Low	Very Low	Very Low	Very Low
	Positive	Negligible	Negligible	Negligible	Negligible	Negligible

From Table 13-6, the level of effect designations are defined below:

- **Negligible**: An effect of negligible consequence is one where habitat or receptors will not be affected in any meaningful way by a Project activity or the predicted effect is indistinguishable from natural background variations;
- **Low**: An effect of minor consequence is one where habitat or receptors will experience a noticeable effect, but the effect magnitude is sufficiently small (with or without mitigation) and/or the resource/receptor is of low ecological value. In either case, the magnitude should be well within applicable standards;
- **Moderate**: An effect of moderate consequence has an effect magnitude that is within applicable standards but higher than that of a minor effect. The emphasis for moderate effects is to show that the effect has been reduced or minimised in line with the mitigation hierarchy;
- **High**: A high level of effect of is one where an accepted limit or standard may be exceeded, or moderate magnitude of effect will occur to moderate or high value habitat or receptors;
- **Very High**: A very high level of effect will occur when the magnitude and value of effects are assessed as high or very high. Typically, very high level of effects notably exceeds standard limits.

1.3 Impact Management

Informed by the level of effects suitable impact management measures are provided consistent with the mitigation hierarchy. The priority in mitigation is to first apply mitigation measures to the source of the impact (avoid) and then to address the resultant effects (reduce or minimise) of the impact.

1.4 Residual Impacts

Once mitigation measures are declared, the next step in the effect assessment process was to assign residual impact significance. This is a repeat of the impact assessment steps discussed above, considering the assumed implementation of the additional recommended mitigation measures.

1.5 Managing Uncertainty

Biophysical impacts are difficult to predict with certainty, but uncertainty stemming from on-going development of the Project design and implementation is inevitable, and the environment is variable over time. If uncertainties are relevant to the effect assessment, they were stated and approached conservatively, to identify a range of likely residual effects and relevant mitigation measures.

1.6 Cumulative Effects

Cumulative impacts and effects are those that arise because of an impact and effect from the Project interacting with those from another activity to create an additional impact and effect. These are termed cumulative impacts and effects. No structured methods were employed to assess cumulative impacts, but where relevant descriptions of potential cumulative effects have been provided.

2 Appendix 2 – Auckland Unitary Plan Activities

Auckland Unitary Plan – E26 Infrastructure

Table E26.4.3.1 below is relevant for considering effects and recommending mitigation in relation to tree removal. Note that, except for Trees in Roads, in Open Space Zones and Notable Trees, trees are not protected under the AUP.

Table E26.4.3.1 Activity table - Network utilities and electricity generation – Trees in roads and open space zones and the Notable Trees Overlay

Activity	Activity Status			Permitted Standards or Matters of Discretion / Control
	Trees in roads [dp]	Open space zones [dp]	Notable trees [dp]	
(A89) Tree removal of Notable Trees	N/A	N/A	D	N/A
(A90) Tree trimming, alteration or removal on roads adjoining rural zones and on roads adjoining the Future Urban Zone	P	N/A	N/A	N/A
(A91) Tree alteration or removal of any tree less than 4m in height and/or less than 400mm in girth	P	P	RD	N/A
(A92) Tree alteration or removal of any tree greater than 4m in height and/or greater than 400mm in girth	RD	RD	N/A	N/A
(A93) Tree trimming, alteration and removal not otherwise provided for	D	D	D	N/A

Auckland Unitary Plan – E26 Infrastructure

The table below is relevant for considering effects and recommending mitigation in relation to vegetation clearance. Also refer to Table E15.4.1.

Table E26.3.3.1 Activity table – Network utilities and electricity generation and vegetation management

Activity	Activity Status						Permitted Standards
	Rural zones, coastal areas and riparian areas [rp]	SEA [rp]	ONF [dp]	HNC [dp]	ONL [dp]	ONC [dp]	
(A76) Vegetation alteration or removal	P	P	P	P	P	P	Refer to E26.3.5.4. Vegetation alteration or removal for Permitted Activity Standards
(A77) Vegetation alteration or removal that does not comply with Standards E26.3.5.1 to E26.3.5.4	RD	RD	RD	RD	RD	RD	
(A78) Vegetation alteration or removal not otherwise provided for	D	D	D	D	D	D	

Note: Greyed-out boxes relate to Regional Activities which are not considered as part of the NoR and will be relevant for future Regional Resource Consents.

Auckland Unitary Plan – E15 Vegetation management and biodiversity

Table E15.4.1 below is relevant for considering effects of activities over and above those that are permitted and recommending mitigation in relation to vegetation clearance in urban and FUZ zones, and adjacent to riparian areas.

Table E15.4.1 Activity table - Auckland-wide vegetation and biodiversity management rules

Activity	Activity Status	Permitted Standards
Riparian areas (as described below)		
(A16) Vegetation alteration or removal within 20m of rural streams, other than those in Rural – Rural Production Zone and Rural – Mixed Rural Zone	RD	N/A
(A17) Vegetation alteration or removal within 10m of rural streams in the Rural – Rural Production Zone and Rural – Mixed Rural Zone	RD	N/A

Activity	Activity Status	Permitted Standards
(A18) Vegetation alteration or removal within 20m of a natural wetland, in the bed of a river or stream (permanent or intermittent), or lake	RD	N/A
(A19) Vegetation alteration or removal within 10m of urban streams	RD	N/A
All other zones and areas not covered above (i.e. Urban Zones and FUZ)		
(A22A) Vegetation alteration or removal	P	Refer to E15.6. Vegetation alteration or removal for Permitted Activity Standards
All areas		
(A23) Permitted activities in Table E15.4.1 that do not comply with one or more of the standards in E15.6	RD	N/A

Auckland Unitary Plan – E26 Infrastructure - Earthworks

The table below is relevant for considering effects of activities over and above those that are permitted and recommending mitigation in relation to earthworks.

Table E26.5.3.1 Activity table - Earthworks all zones and roads [dp]

Activity	Activity Status	Permitted Standards
(A95) Earthworks up to 2500m2 other than for maintenance, repair, renewal, minor infrastructure upgrading	P	Refer to E26.5.5.2. General standards (District)
(A96) Earthworks up to 2500m3 other than for maintenance, repair, renewal, minor infrastructure upgrading	P	Refer to E26.5.5.2. General standards (District)
(A97) Earthworks greater than 2500m2 other than for maintenance, repair, renewal, minor infrastructure upgrading	RD	N/A
(A97A) Earthworks greater than 2500m3 other than for maintenance, repair, renewal, minor infrastructure upgrading	RD	N/A

3 Appendix 3 – Regional Plan, District Plan and Wildlife Act Matters

Table 13-7 Ecological effects of road infrastructure construction broken down into AUP:OP Regional and District Plan matters, and Wildlife Act (1953)

Ecological feature	Activity	Ecological Effect	AUP:OP District Plan provisions	AUP:OP Regional Plan provisions	Wildlife Act (1953)
Construction					
Terrestrial habitat	Vegetation removal (including trees) outside of roads and public spaces in: a) a rural zone b) riparian margins c) coastal areas d) SEAs This also includes other terrestrial habitat of value identified in the EcIA.	Permanent loss of habitat/ecosystem, fragmentation and edge effects.		✓	
	Vegetation removal (including trees) in: a) Roads b) Public spaces c) ONFs d) ONLs e) HNCs f) ONCs	Permanent loss of habitat/ecosystem, fragmentation and edge effects.	✓		
	Earthworks – leading to invasion of bare earth surfaces with weeds and transfer of weeds (seeds and fragments) between earthworks areas.	Weed dispersal to previously unaffected areas of indigenous vegetation, reduction in terrestrial biodiversity.		✓	
Bats	Vegetation removal.	Roost loss.		✓	✓
	Vegetation removal.	Kill or injure individual.			✓
	Vegetation removal.	Loss of foraging habitat.		✓	
	Construction activities (Noise, light, dust etc.).	Disturbance and displacement to roosts and to individuals (existing).	✓		✓
Birds (native)	Vegetation removal.	Nest loss.		✓	✓
	Vegetation removal.	Kill or injure individual.			✓
	Vegetation removal.	Loss of foraging habitat.		✓	

Ecological feature	Activity	Ecological Effect	AUP:OP District Plan provisions	AUP:OP Regional Plan provisions	Wildlife Act (1953)
	Construction activities (noise, light, dust etc).	Disturbance and displacement of roosts and individuals (existing).	✓		✓
Herpetofauna (native)	Vegetation removal.	Lizard habitat loss		✓	
	Vegetation removal.	Kill or injure individual			✓
	Construction activities (noise, light, dust etc).	Disturbance and displacement of individuals (existing).	✓		✓
	Reclamation/culvertin g/other structures e.g., bank armouring.	Permanent loss/modification of habitat/ecosystem.		✓	
Freshwater habitat – wetland or stream (including riparian margins)	Vegetation removal.	Permanent loss of habitat/ecosystem, fragmentation and edge effects.		✓	
	Construction activities – earthworks (leading to sediment discharge), machinery use and chemical storage (leading to leaks/spills).	Uncontrolled discharge leading to habitat and water quality degradation.		✓	
	Diversion, abstraction or bunding of watercourses and water level/flow/ periodicity changes.	Detrimental effects on habitats including plant composition and fauna.		✓	
Fish (native)	Reclamation/diversion /other structures e.g., bank armouring.	Loss of aquatic habitat.		✓	
	Reclamation/diversion /culverting/other structures e.g., bank armouring.	Kill or injure individual.			✓
Operation					
Terrestrial habitat	Presence of the road - use of road edges as dispersal corridors by invasive plant species.	Weed dispersal to previously unaffected areas of indigenous vegetation, reduction in terrestrial biodiversity.		✓	
	Road maintenance - increased use of herbicides.	Increased weed incursion, unintentional spray of indigenous vegetation.		✓	
Bats	Vehicle movement.	Kill or injure individual.			✓

Ecological feature	Activity	Ecological Effect	AUP:OP District Plan provisions	AUP:OP Regional Plan provisions	Wildlife Act (1953)
	Presence of the road.	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat.	✓		✓
	Lighting and noise/vibration.	Disturbance and displacement of (new and existing) roosts and individuals.	✓		✓
Birds (native)	Vehicle movement.	Kill or injure individual.			✓
	Presence of the road.	Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat.	✓		✓
	Lighting and noise/vibration.	Disturbance and displacement of (new and existing) nests and individuals.	✓		✓
Herpetofauna (native)	Vehicle movement.	Kill or injure individual.			✓
	Presence of the road.	Loss in connectivity due to permanent habitat loss, light and noise/vibration effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat.	✓		✓
	Lighting.	Disturbance of nocturnal lizard behaviour.	✓		✓
Freshwater habitat – wetland or stream (including riparian margins)	Vehicle (cartage) movement - risk of spills of potential toxins (oil, milk, chemicals).	Temporary degradation of instream/wetland habitat and water quality.		✓	
	Presence of bridge.	Shading leading to change in ecosystem structure.		✓	
	Gradual change in hydrology from presence of the road/stormwater, including reclamations.	Effect on downstream habitat (including erosion/sediment discharge) due to change in hydrology (increase or decrease).		✓	

Ecological feature	Activity	Ecological Effect	AUP:OP District Plan provisions	AUP:OP Regional Plan provisions	Wildlife Act (1953)
	Stormwater discharges - pollutants (such as heavy metals and herbicides).	Permanent degradation of wetland or instream habitat and water quality.		✓	
Fish (native)	Presence of culvert.	Loss of connectivity due to culvert preventing fish passage up and downstream.		✓	

4 Appendix 4 - Desktop Bird Records

Table 13-8 Desktop bird records within 2 km of the Project Areas

Common Name	Māori Name	Scientific Name	Conservation Status	Record Source
Banded rail	Mioweka	*Gallirallus philippensis assimilis*	At Risk - Declining	iNaturalist
Bar-tailed godwit	Kuaka	*Limosa lapponica bauer*	At Risk - Declining	eBird (Bird Atlas), iNaturalist
Black shag	Kawau	*Phalacrocorax carbo novaehollandiae*	At Risk - Naturally Uncommon	eBird (Bird Atlas), iNaturalist
Black-billed gull	Tarāpuka	*Larus bulleri*	Threatened - Nationally Critical	iNaturalist
Blackbird	Manu pango	*Turdus merula*	Introduced and Naturalised	eBird (Bird Atlas)
Brown teal	Pāteke	*Anas chlorotis*	At Risk - Recovering	iNaturalist
Canada goose	-	*Branta canadensis*	Introduced and Naturalised	eBird (Bird Atlas), iNaturalist
Caspian tern	Taranui	*Hydroprogne caspia*	Threatened - Nationally Vulnerable	iNaturalist
Chaffinch	Pahirini	*Fringilla coelebs*	Introduced and Naturalised	eBird (Bird Atlas), iNaturalist
Common pheasant	Peihana	*Phasianus colchicus*	Introduced and Naturalised	eBird (Bird Atlas), iNaturalist
Dabchick	Weweia	*Poliocephalus rufopectus*	Threatened – Nationally Increasing	eBird (Bird Atlas)
Eastern rosella	-	*Platycercus eximius*	Introduced and Naturalised	eBird (Bird Atlas)
Fantail	Pīwakawaka	*Rhipidura fuliginosa placabilis*	Not Threatened	eBird (Bird Atlas), iNaturalist
Goldfinch	-	*Carduelis carduelis*	Introduced and Naturalised	eBird (Bird Atlas)
Greenfinch	-	*Carduelis chloris*	Introduced and Naturalised	eBird (Bird Atlas)

Common Name	Māori Name	Scientific Name	Conservation Status	Record Source
Grey duck x mallard hybrid	-	*Anas platyrhynchos x superciliosa*	Not Threatened	eBird (Bird Atlas)
Grey warbler	Riroriro	*Gerygone igata*	Not Threatened	eBird (Bird Atlas)
House sparrow	Tiu	*Fringilla coelebs*	Introduced and Naturalised	eBird (Bird Atlas), iNaturalist
Kingfisher	Kōtare	*Todiramphus sanctus vagans*	Not Threatened	eBird (Bird Atlas)
Laughing kookaburra	-	*Dacelo novaeguineae*	Introduced and Naturalised	eBird (Bird Atlas)
Little black shag	Kawau tūī	*Phalacrocorax sulcirostris*	At Risk - Naturally Uncommon	iNaturalist
Little shag	Kawau paka	*Phalacrocorax melanoleucos*	Not Threatened	eBird (Bird Atlas)
Long-tailed cuckoo	Koekoeā	*Eudynamys taitensis*	Threatened – Nationally Vulnerable	Assumed present based on suitable habitat present in the Project Area.
Magpie	Makipae	*Gymnorhina tibicen*	Introduced and Naturalised	eBird (Bird Atlas), iNaturalist
Mallard	-	*Anas platyrhynchos*	Introduced and Naturalised	eBird (Bird Atlas), iNaturalist
Muscovy duck	-	*Cairina moschata*	Introduced, not established	eBird (Bird Atlas)
Myna	-	*Acridotheres tristis*	Introduced and Naturalised	eBird (Bird Atlas)
New Zealand pigeon	Kereru	*Hemiphaga novaeseelandiae*	Not Threatened	eBird (Bird Atlas), iNaturalist
New Zealand pipit	Hīoi	*Anthus novaeseelandiae*	At Risk - Declining	iNaturalist
North Island fernbird	Mātātā	*Poodytes punctatus*	At Risk – Declining	Assumed present based on suitable habitat present in the Project Area.
North Island kākā	Kākā	*Nestor meridionalis septentrionalis*	At Risk – Recovering	SEA_T_6381 and SEA_T_6382
North Island kōkako	Kōkako	*Callaeas wilsoni*	At Risk - Recovering	iNaturalist

Common Name	Māori Name	Scientific Name	Conservation Status	Record Source
Northern New Zealand dotterel	Tūturiwhatu	*Charadrius obscurus aquilonius*	At Risk - Recovering	iNaturalist
Paradise shelduck	Pūtangitangi	*Tadorna variegata*	Not Threatened	eBird (Bird Atlas), iNaturalist
Peafowl	Pīkao	*Pavo cristatus*	Introduced and Naturalised	eBird (Bird Atlas)
Pied shag	Kāruhiruhi	*Phalacrocorax varius*	At Risk – Recovering	Assumed present based on suitable habitat present in the Project Area.
Pied stilt	Poaka	*Himantopus himantopus leucocephalus*	Not Threatened	eBird (Bird Atlas)
Pūkeko	Pūkeko	*Porphyrio melanotus*	Not Threatened	eBird (Bird Atlas), iNaturalist
Red junglefowl (chicken)	Heihei	*Gallus gallus domesticus*	Introduced and Naturalised	eBird (Bird Atlas)
Red-billed gull	Tarāpunga	*Larus novaehollandiae scopulinus*	At Risk - Declining	eBird (Bird Atlas)
Rock pigeon	-	*Columba livia*	Introduced and Naturalised	eBird (Bird Atlas)
Silvereye	Tauhou	*Zosterops lateralis*	Not Threatened	eBird (Bird Atlas), iNaturalist
Skylark	Kaireka	*Alauda arvensis*	Introduced and Naturalised	eBird (Bird Atlas)
Song thrush	-	*Turdus philomelos*	Introduced and Naturalised	eBird (Bird Atlas)
Southern black-backed gull	Karoro	*Larus dominicanus*	Not Threatened	eBird (Bird Atlas)
Southern Diving-Petrel	-	*Pelecanoides urinatrix chathamensis*	At Risk - Relict	iNaturalist
Spotless crake	Pūweto	*Zapornia tabuensis*	At Risk – Declining	Assumed present based on suitable habitat present in the Project Area.

Common Name	Māori Name	Scientific Name	Conservation Status	Record Source
Spotted dove	-	*Streptopelia chinensis tigrina*	Introduced and Naturalised	eBird (Bird Atlas), iNaturalist
Spur winged plover	-	*Vanellus miles novaehollandiae*	Not Threatened	eBird (Bird Atlas), iNaturalist
Starling	-	*Sturnus vulgaris*	Introduced and Naturalised	eBird (Bird Atlas), iNaturalist
Sulphur-crested Cockatoo	-	*Cacatua galerita*	Introduced and Naturalised	iNaturalist
Swamp Harrier	Kāhu	*Circus approximans*	Not Threatened	eBird (Bird Atlas), iNaturalist
Tūī	Tūī	*Prosthemadera novaeseelandiae*	Not Threatened	eBird (Bird Atlas), iNaturalist
Welcome swallow	Warou	*Hirundo neoxena*	Not Threatened	eBird (Bird Atlas), iNaturalist
White-faced heron	Matuku moana	*Egretta novaehollandiae*	Not Threatened	eBird (Bird Atlas), iNaturalist
White-fronted tern	Tara	*Sterna striata*	At Risk - Declining	iNaturalist
Wild turkey	Korukoru	*Meleagris gallopavo*	Introduced and Naturalised	eBird (Bird Atlas)
Yellowhammer	-	*Emberiza citrinella*	Introduced and Naturalised	eBird (Bird Atlas)