TE TUPU NGĀTAHI
SUPPORTING GROWTH

Warkworth Assessment of Ecological Effects

May 2023

Version 1.0

WAKA KOTAHI
NZ TRANSPORT AGENCY

AT

New Zealand Government

Document Status

Responsibility	Name
Author	Michel Jonker & Dannie Cullen
Reviewer	Fiona Davies, Michiel Jonker
Approver	Simon Titter

Revision Status

Version	Date	Reason for Issue
1.0	12/05/2023	Issue for lodgement

Table of Contents

Appendices

Table of Figures

Table of Tables

Abbreviations

Acronym/Term	Description
AEE	Assessment of Effects on the Environment
AT	Auckland Transport
AUP:OP	Auckland Unitary Plan Operative in Part
ED	Ecological District
FUZ	Future Urban Zone
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
SG	Te Tupu Ngātahi Supporting Growth
TAR	Threatened or At Risk
The Council	Auckland Council
Waka Kotahi	Waka Kotahi NZ Transport Agency

Acronym/Term	Description
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.
Ecological Baseline	Means the prevailing ecological state at the time of the assessment.
Likely Future Ecological Environment	The likely future environment informed by the Auckland Unitary Plan (AUP).
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.
Project Area	Area of land that is within the proposed designation boundary.
Project Footprint	Area of land that is within the road design.
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”.
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.”
Rapid Habitat Assessment	The RHA provides a standardised protocol for making a quick, qualitative, site-based assessment of physical stream habitat conditions (Clapcott, 2015).

1 Executive Summary

This Ecological Impact Assessment (EcIA) has been prepared for the Te Tupu Ngātahi Supporting Growth Alliance, Warkworth Package of Notices of Requirement (NORs) for Auckland Transport (AT) and Waka Kotahi NZ Transport Agency (WK) as requiring authorities under the Resource Management Act 1991 (RMA) (Table 1-1). The notices are to designate land for future strategic transport corridors as part of Te Tupu Ngātahi Supporting Growth Alliance to enable the future construction, operation and maintenance of transport infrastructure in the Warkworth area of Auckland.

Table 1-1 Warkworth Package – Notices of Requirement and Projects

Notice	Project
NOR 1	Northern Public Transport Hub and Western Link - North
NOR 2	Woodcocks Road Upgrade (Western Section)
NOR 3	State Highway 1 Upgrade - South
NOR 4	Matakana Road Upgrade
NOR 5	Sandspit Road Upgrade
NOR 6	Western Link - South
NOR 7	Sandspit Link
NOR 8	Wider Western Link – North

As the Warkworth 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), terrestrial fauna (Table 1-3), streams (Table 1-4) and wetlands (Table 1-5).

Table 1-2 Ecological values of terrestrial vegetation types for each NOR

Vegetation Type	Classification *	NOR 1	NOR 2	NOR 3	NOR 4	NOR 5	NOR 6	NOR 7	NOR 8
Brown Field	BF	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Exotic Forest	EF	-	-	-	-	Moderate	-	-	-
Exotic Grassland	EG	Low	Low	Low	Low	Low	Low	Low	Low
Exotic Scrub	ES	Low	Low	Low	-	Low	Low	-	-
Kahikatea Forest	MF4	-	-	-	High	High	-	High	-
Planted Vegetation – Native (recent)	PL.1	-	Moderate	Moderate	Low	Low	Moderate	Low	-
Planted Vegetation - Native (mature)	PL.2	-	Low	Low	Low	-	-	-	Low
Planted Vegetation – Amenity	PL.3	-	Low	Low	Low	Low	-	Low	Low
Treeland – Native-Dominated	TL.1	-	-	Moderate	Low	-	-	Moderate	-
Treeland – Mixed Native/Exotic	TL.2	-	High	Moderate	Moderate	High	-	-	-
Treeland – Exotic-Dominated	TL.3	-	Moderate	Moderate	Moderate	Moderate	Low	Moderate	Low
Kānuka Scrub/Forest	VS2	-	-	Moderate	Moderate	High	-	-	High
Pūriri Forest	WF7	-	-	-	-	-	-	-	High

Vegetation Type	Classification *	NOR 1	NOR 2	NOR 3	NOR 4	NOR 5	NOR 6	NOR 7	NOR 8
Pūriri Forest (alluvial terraces with recent free-draining soils)	WF7.1	-	-	-	-	Very High	-	High	-
Kauri, Podocarp, Broadleaved Forest	WF11	-	High	-	-	High	-	High	-
Tawa, Kohekohe, Rewarewa, Hīnau, Podocarp Forest	WF13	-	-	-	Very High	-	-	-	-

Notes: * = Classification as per Singers et al. (2017).

Table 1-3 Ecological values of terrestrial fauna for each NOR

Fauna Type	Ecological Value	Relevant NOR
Mammals		
Long-tailed bat	Very High	All NORs
Avifauna		
Non-TAR birds	Low	All NORs
New Zealand pipit	High	All NORs
Long-tailed cuckoo	Very High	NOR 2, NOR 4, NOR 5, NOR 7, NOR 8
North Island kākā	High	NOR 2, NOR 4, NOR 5, NOR 7, NOR 8
Black shag, little black shag, pied shag, little shag	High	NOR 2, NOR 7
Australasian bittern	Very High	NOR 1, NOR 3, NOR 4, NOR 5, NOR 6, NOR 7, NOR 8

Fauna Type	Ecological Value	Relevant NOR
Spotless crake	High	NOR 1, NOR 3, NOR 4, NOR 5, NOR 6, NOR 7, NOR 8
Dabchick	Very High	NOR 8
Herpetofauna		
Copper skink	High	All NORs
Ornate skink	High	NOR 2, NOR 4, NOR 5, NOR 7, NOR 8
Elegant gecko	High	NOR 2, NOR 4, NOR 5, NOR 7, NOR 8
Forest gecko	High	NOR 2, NOR 4, NOR 5, NOR 7, NOR 8
Pacific gecko	Moderate	NOR 2, NOR 4, NOR 5, NOR 7, NOR 8
Hochstetter's frog	High	NOR 4, NOR 5, NOR 7

Table 1-4 Ecological values of directly impacted streams for each NOR

Stream ID	NOR 1	NOR 2	NOR 3	NOR 4	NOR 5	NOR 6	NOR 7	NOR 8
WW2-S4	-	Low	-	-	-	-	-	-
WW3-S2a	-	-	Moderate	-	-	-	-	-
WW3-S2b	-	-	Moderate	-	-	-	-	-
WW3-S3a	-	-	Moderate	-	-	-	-	-
WW3-S3b	-	-	Moderate	-	-	-	-	-
WW3-S4a	-	-	Moderate	-	-	-	-	-

Stream ID	NOR 1	NOR 2	NOR 3	NOR 4	NOR 5	NOR 6	NOR 7	NOR 8
WW3-S4b	-	-	Moderate	-	-	-	-	-
WW4-S1	-	-	-	Low	-	-	-	-
WW4-S2	-	-	-	Low	-	-	-	-
WW4-S3	-	-	-	Low	-	-	-	-
WW5-S1	-	-	-	-	High	-	-	-
WW5-S3	-	-	-	-	Low	-	Low	-
WW5-S4	-	-	-	-	Low	-	-	-
WW5-S5	-	-	-	-	Low	-	-	-
WW5-S6	-	-	-	-	Low	-	-	-
WW7-S2b	-	-	-	-	-	-	Low	-
WW7-S3a	-	-	-	-	-	-	Moderate	-
WW7-S5	-	-	-	-	-	-	Low	-
WW8-S1	-	-	-	-	-	-	-	Moderate
WW8-S2	-	-	-	-	-	-	-	Moderate

Table 1-5 Ecological values of directly impacted wetlands for each NOR

Wetland	NPS-FM	NOR 1	NOR 2	NOR 3	NOR 4	NOR 5	NOR 6	NOR 7	NOR 8
WW2-W2	Natural	-	Low	-	-	-	-	-	-

Wetland	NPS-FM	NOR 1	NOR 2	NOR 3	NOR 4	NOR 5	NOR 6	NOR 7	NOR 8
WW3-W3	Natural	-	-	Moderate	-	-	-	-	-
WW3-W4	Natural	-	-	Moderate	-	-	-	-	-
WW3-W5	Natural	-	-	Low	-	-	-	-	-
WW4-W1	Natural	-	-	-	Moderate	-	-	-	-
WW4-W2	Natural	-	-	-	Moderate	-	-	-	-
WW4-W3	Natural	-	-	-	Low	-	-	-	-
WW5-W1	Natural	-	-	-	-	Low	-	-	-
WW5-W3	Natural	-	-	-	-	Low	-	-	-
WW6-O2	Artificial	-	-	-	-	-	Low	-	-
WW7-W3	Natural	-	-	-	-	-	-	Moderate	-
WW7-W4	Natural	-	-	-	-	-	-	Low	-
WW7-W5	Natural	-	-	-	-	-	-	Low	-
WW7-W6	Natural	-	-	-	-	-	-	Low	-
WW7-W7	Natural	-	-	-	-	-	-	Low	-
WW8-W1	Natural	-	-	-	-	-	-	-	Moderate
WW8-W2	Natural	-	-	-	-	-	-	-	Low
WW8-W4	Natural	-	-	-	-	-	-	-	Moderate

Construction Effects

Table 1-6 to Table 1-7 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 an asterisk (*) where they differ. Where the level of effect was assessed to be **Moderate** or higher, then mitigation has been developed.

Construction effect mitigation measures will include:

- A Bat Management Plan (BMP) for NOR 2, NOR 4, NOR 5, NOR 7, and NOR 8 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 bat habitat.
  - Lighting design to reduce light levels and spill from construction areas.
  - Restriction of nightworks around bat habitat.
  - Bat management should be incorporated with any regional consent conditions (i.e., BMPs) that may be required for regional compliance.
- An Avifauna Management Plan (AMP) for all NORs should be developed to include consideration for:
  - New Zealand pipit (all NORs)
    - Pre-construction nesting bird surveys in suitable habitat (EG, ES).
    - Timing consideration for construction works (avoiding breeding season, where practicable).
    - Methods to minimise disturbance if the breeding season cannot be avoided.
  - Spotless crake (all NORs excluding NOR 2)
    - Pre-construction nesting bird surveys at specific wetland habitat.
    - Timing consideration for construction works (avoiding breeding season, where practicable).
    - Methods to protect and buffer nesting birds (if present).
  - Dabchick (NOR 8)
    - Pre-construction nesting bird surveys at wetland WW8-W1.
    - Timing consideration for construction works (avoiding breeding season, where practicable).
    - Methods to protect and buffer nesting birds (if present).

Table 1-6 Summary of ecological effects during construction prior to mitigation for long-tailed bats

	Construction – Long-tailed bats
NOR	**Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust, vibration etc.)**
NOR 1	Low
NOR 2	**Moderate**
NOR 3	Low
NOR 4	**Moderate**

	Construction – Long-tailed bats
NOR 5	**Moderate**
NOR 6	Low
NOR 7	**Moderate**
NOR 8	**Moderate**

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

Table 1-7 Summary of ecological effects during construction prior to mitigation for avifauna

	Construction – Avifauna
NOR	**Disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust, vibration etc.)**
NOR 1	
Non-TAR birds	Very Low
New Zealand pipit	**High** *Very Low
Australasian bittern	Low
Spotless crake	**Moderate**
NOR 2	
Non-TAR birds	Very Low
New Zealand pipit	**High** *Very Low
North Island kākā	Very Low
Long-tailed cuckoo	Low
Black shag, little black shag, little shag, pied shag	Very Low
NOR 3	
Non-TAR birds	Very Low
New Zealand pipit	**High** *Very Low
Australasian bittern	Low
Spotless crake	**Moderate**

	Construction – Avifauna
NOR 4	
Non-TAR birds	Very Low
New Zealand pipit	**High** *Very Low
North Island kākā	Very Low
Long-tailed cuckoo	Low
Australasian bittern	Low
Spotless crake	**Moderate**
NOR 5	
Non-TAR birds	Very Low
New Zealand pipit	**High** *Very Low
North Island kākā	Very Low
Long-tailed cuckoo	Low
Australasian bittern	Low
Spotless crake	**Moderate**
NOR 6	
Non-TAR birds	Very Low
New Zealand pipit	**High** *Very Low
Australasian bittern	Low
Spotless crake	**Moderate**
NOR 7	
Non-TAR birds	Very Low
New Zealand pipit	**High** *Very Low
North Island kākā	Very Low
Long-tailed cuckoo	Low
Black shag, little black shag, little shag, pied shag	Very Low

	Construction – Avifauna
Australasian bittern	Low
Spotless crake	**Moderate**
NOR 8	
Non-TAR birds	Very Low
New Zealand pipit	**High** *Very Low
North Island kākā	Very Low
Long-tailed cuckoo	Low
Australasian bittern	Low
Spotless crake	**Moderate**
Dabchick	**Moderate**

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

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

	Construction – Herpetofauna
NOR	**Disturbance and displacement of individuals (existing) due to construction activities (noise, light, dust, vibration etc.)**
NOR 1	
Copper skink	Low *Very Low
NOR 2	
Copper skink, ornate skink	Very Low
Elegant gecko, forest gecko	Low *Very Low
Pacific gecko	Low *Very Low
NOR 3	
Copper skink	Very Low
NOR 4	

	Construction – Herpetofauna
Copper skink, ornate skink	Very Low
Elegant gecko, forest gecko	Low *Very Low
Pacific gecko	Low *Very Low
Hochstetter's frog	Very Low
NOR 5	
Copper skink, ornate skink	Very Low
Elegant gecko, forest gecko	Low *Very Low
Pacific gecko	Low *Very Low
Hochstetter's frog	Low
NOR 6	
Copper skink	Very Low
NOR 7	
Copper skink, ornate skink	Low *Very Low
Elegant gecko, forest gecko	Low *Very Low
Pacific gecko	Low *Very Low
Hochstetter's frog	Low *Very Low
NOR 8	
Copper skink, ornate skink	Low *Very Low
Elegant gecko, forest gecko	Low *Very Low
Pacific gecko	Low

	Construction – Herpetofauna
	*Very Low

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

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

Operational Effects

Table 1-9 to Table 1-11 provides a summary of district matter ecological effects during operation 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 an asterisk (*) 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 Bat Management Plan (BMP) for NOR 2, NOR 3, NOR 4, NOR 5, NOR 7, and NOR 8 should be developed to include consideration for:
  - Indicative early-stage/mature buffer planting, late-stage buffer planting, and retention of existing mature trees between the road alignment and features with potential for bat roosts as outlined in the indicative bat mitigation in Appendix 12.
  - Light and noise management through design.
  - Future presence of roosts within the alignment (placement of flaps on features with high roost potential).
  - 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.
- An Avifauna Management Plan (AMP) for all NORs should be developed to include consideration for:
  - Spotless crake (all NORs excluding NOR 2)
    - Retention of vegetation near wetland habitat, where practicable.
    - Buffer planting between the road alignment and suitable habitat adjacent to the road.
  - Dabchick (NOR 8)
    - Retention of vegetation near wetland habitat, where practicable.
    - Buffer planting between the road alignment and suitable habitat adjacent to the road.

Table 1-9 Summary of ecological effects during operation prior to mitigation for long-tailed bats

Operation – Long-tailed bats		
NOR	**Disturbance and displacement of (new and existing) roosts and individuals due to the presence of the road (noise, vibration, light etc.)**	**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 1	Low	Low

Operation – Long-tailed bats		
NOR 2	**Moderate**	**High**
NOR 3	Very Low	**Moderate**
NOR 4	Low	**Moderate**
NOR 5	Low	**Moderate**
NOR 6	Low	Low
NOR 7	**Moderate**	**Moderate**
NOR 8	**Moderate**	**Very High** ***High**

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

Table 1-10 Summary of ecological effects during operation prior to mitigation for avifauna

Operation – Avifauna		
NOR	**Disturbance and displacement to nests 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 1		
Non-TAR birds	Very Low	Very Low
New Zealand pipit	Very Low	Very Low
Australasian bittern	Low	Low
Spotless crake	**Moderate**	Very Low
NOR 2		
Non-TAR birds	Very Low	Very Low
New Zealand pipit	Very Low	Very Low
North Island kākā	Very Low	Very Low
Long-tailed cuckoo	Low	Low
Black shag, little black shag, little shag, pied shag	Very Low	Very Low
NOR 3		
Non-TAR birds	Very Low	Very Low

Operation – Avifauna		
New Zealand pipit	Very Low	Very Low
Australasian bittern	Low	Low
Spotless crake	**Moderate**	Very Low
NOR 4		
Non-TAR birds	Very Low	Very Low
New Zealand pipit	Very Low	Very Low
North Island kākā	Very Low	Very Low
Long-tailed cuckoo	Low	Low
Australasian bittern	Low	Low
Spotless crake	**Moderate**	Very Low
NOR 5		
Non-TAR birds	Very Low	Very Low
New Zealand pipit	Very Low	Very Low
North Island kākā	Very Low	Very Low
Long-tailed cuckoo	Low	Low
Australasian bittern	Low	Low
Spotless crake	**Moderate**	Very Low
NOR 6		
Non-TAR birds	Low *Very Low	Very Low
New Zealand pipit	Low *Very Low	Very Low
Australasian bittern	Low	Low
Spotless crake	**Moderate**	Very Low
NOR 7		
Non-TAR birds	Low *Very Low	Low *Very Low
New Zealand pipit	Very Low	Very Low
North Island kākā	Very Low	Very Low

Operation – Avifauna		
Long-tailed cuckoo	Low	Low
Black shag, little black shag, little shag, pied shag	Very Low	Very Low
Australasian bittern	Low	Low
Spotless crake	**Moderate**	Very Low
NOR 8		
Non-TAR birds	Low *Very Low	Very Low
New Zealand pipit	Very Low	Very Low
North Island kākā	Very Low	Very Low
Long-tailed cuckoo	Low	Low
Australasian bittern	Low	Low
Spotless crake	**Moderate**	Low
Dabchick	**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 1-11 Summary of ecological effects during operation prior to mitigation for herpetofauna

Operation – Herpetofauna		
NOR	**Disturbance and displacement of existing and future herpetofauna due to the presence of the road (noise, vibration, light etc.)**	**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 1		
Copper skink	Very Low	Very Low
NOR 2		
Copper skink, ornate skink	Very Low	Very Low
Elegant gecko, forest gecko	Low *Very Low	Very Low
Pacific gecko	Low	Very Low

Operation – Herpetofauna		
	*Very Low	
NOR 3		
Copper skink	Very Low	Very Low
NOR 4		
Copper skink, ornate skink	Very Low	Very Low
Elegant gecko, forest gecko	Very Low	Very Low
Pacific gecko	Very Low	Very Low
Hochstetter's frog	Very Low	Very Low
NOR 5		
Copper skink, ornate skink	Very Low	Very Low
Elegant gecko, forest gecko	Very Low	Very Low
Pacific gecko	Very Low	Very Low
Hochstetter's frog	Very Low	Low *Very Low
NOR 6		
Copper skink	Very Low	Very Low
NOR 7		
Copper skink, ornate skink	Low *Very Low	Low *Very Low
Elegant gecko, forest gecko	Low *Very Low	Low
Pacific gecko	Low *Very Low	Low
Hochstetter's frog	Low *Very Low	Low
NOR 8		
Copper skink, ornate skink	Low *Very Low	Low *Very Low

Operation – Herpetofauna		
Elegant gecko, forest gecko	Low *Very Low	Low *Very Low
Pacific gecko	Low *Very Low	Low *Very Low

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

The residual (post-mitigation) level of effect for all operational effects are considered **Negligible** to **Low**.

2 Introduction

This Ecological Impact Assessment (EcIA) has been prepared for the Te Tupu Ngātahi Supporting Growth Alliance, Warkworth Package of Notices of Requirement (NORs) for Auckland Transport (AT) and Waka Kotahi NZ Transport Agency (WK) as requiring authorities under the Resource Management Act 1991 (RMA). The notices are to designate land for future strategic transport corridors as part of Te Tupu Ngātahi Supporting Growth Alliance to enable the future construction, operation and maintenance of transport infrastructure in the Warkworth area of Auckland.

2.1 Warkworth Growth Area

Warkworth is located at the northernmost extent of the Auckland Region, approximately 60 km from the Auckland city centre, and 30 km north of Orewa. It is identified as a satellite town in the Auckland Unitary Plan: Operative in Part (AUP:OP) and will act as a rural node that serves both the surrounding rural communities as well as connecting to urban Auckland.

The Warkworth growth area will be less than 5 km north-south and east-west and will make a significant contribution to the future growth of Auckland's population. A 1000 ha of currently rural land has been rezoned (Future Urban Zone) to support significant business and residential growth. At full build out it is anticipated to provide for approximately 8,200 new dwellings and employment activities that will contribute to 4,600 new jobs across Warkworth. This growth area will be development ready in the stages outlined below:

- **Stage 1** Warkworth North – Business land is already live zoned and remainder to be development ready by 2022.
- **Stage 2** Warkworth South – To be development ready between 2028 – 2032.
- **Stage 3** Warkworth Northeast – To be development ready between 2033 – 2037.

Furthermore, the Warkworth Structure Plan was adopted by the Council in 2019 and sets out the framework for transforming Warkworth from a rural environment to an urbanised community over the next 15 - 20 years.

It is noted that parts of these areas are experiencing earlier than anticipated growth pressure, with parts of Warkworth South subject to a lodged Private Plan Change, as well as sections of Warkworth Northeast[1].

The Warkworth Assessment Package will provide route protection for the local arterials, which include walking, cycling and public transport linkages needed to support the expected growth in Warkworth. The Warkworth Package of projects is summarised in Section 2.

This report addresses the ecological effects of the Warkworth Package (NOR 1 - NOR 8) identified in Table 2-1 below

Refer to the Assessment of Effects on the Environment (AEE) for a more detailed project description.

[1] https://www.aucklandcouncil.govt.nz/have-your-say/have-your-say-notified-resource-consent/Pages/resource-consent-public-notice.aspx?itemId=194&src=Search

Table 2-1 Warkworth Assessment Package – Notices of Requirement and Projects

Notice	Project
NOR 1	Northern Public Transport Hub and Western Link - North
NOR 2	Woodcocks Road Upgrade (Western Section)
NOR 3	State Highway 1 Upgrade – South
NOR 4	Matakana Road Upgrade
NOR 5	Sandspit Road Upgrade
NOR 6	Western Link - South
NOR 7	Sandspit Link
NOR 8	Wider Western Link – North

2.2 Purpose and Scope of this Report

This ecological assessment forms part of the suite of technical reports prepared to support the assessment of effects (AEE) for the Warkworth Package. Its purpose is to inform the AEE that accompanies the eight Warkworth Network NORs.

This report considers the actual and potential effects associated with the construction, operation, and maintenance of the Warkworth Package on the existing and likely future environment as it relates to ecological effects 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 of the Warkworth Assessment Package area;
b) Identify and describe the actual and potential ecological effects (as they relate to district matters) of each Project corridor within the Warkworth 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 Warkworth Assessment Package; and
d) Present an overall conclusion of the level of actual and potential effects for each Project corridor within the Warkworth Assessment Package after recommended measures are implemented.

This report should be read alongside the AEE, which contains further details on the history and context of the Warkworth project. The AEE also contains a detailed description of works to be authorised within each NOR, 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. Where a description of an activity is necessary to understand the potential effects, it has been included in this report for clarity.

2.3 Report Structure

In order to provide a clear assessment of each NOR, this report follows as appropriate, the structure set out in the AEE. That is, the network as a whole as well as the individual corridors and facilities have their own section, and each section contains an assessment of the actual and potential effects. Where appropriate, measures to avoid, remedy or mitigate effects are recommended.

The sections are arranged starting from the overall network, then by project form starting from Public Transport Hubs, then existing road upgrades, and finally new corridors. Table 2-2 below describes the extent of each corridor, and where the description of effects can be found in this report.

Table 2-2 Warkworth Assessment Package – Report Structure

Sections	Section number
Description of the Project	Section 2
Assessment Approach	Section 3
Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines	Section 4
Ecological Baseline for all Warkworth NORs	Section 5
Positive ecological effects of the Warkworth project	Section 6
Identification and description of the existing and likely receiving ecological environment	Section 3
Assessment of specific ecological matters for Warkworth NOR 1: Northern Public Transport Interchange + Park and Ride and Western Link (Northern Section)	Section 7
Assessment of specific ecological matters for Warkworth NOR 2: Woodcocks Road Upgrade (Western Section)	Section 8
Assessment of specific ecological matters for Warkworth NOR 3: State Highway 1 Upgrade (Southern Section)	Section 9
Assessment of specific ecological matters for Warkworth NOR 4: Matakana Road Upgrade	Section 10
Assessment of specific ecological matters for Warkworth NOR 5: Sandspit Road Upgrade	Section 11
Assessment of specific ecological matters for Warkworth NOR 6: Western Link - South	Section 12
Assessment of specific ecological matters for Warkworth NOR 7: Sandspit Link	Section 13
Assessment of specific ecological matters for Warkworth NOR 8: Wider Western Link (Northern Section)	Section 14
Cumulative ecological effects of the Warkworth project	Section 15
Design and Future Resource Consent Considerations	Section 16
Overall conclusion of the level of potential adverse ecological effects of the Warkworth Project	Section 17

2.4 Warkworth Package Overview

The Warkworth package is a network of planned transport infrastructure with the purpose of responding to planned future growth in the Warkworth growth areas. The transport network is made of eight NORs including public transport interchanges, existing road upgrades, and new corridors.

An overview of the Warkworth NOR package is set out in Table 2-3 and shown in Figure 2-1.

Table 2-3 Warkworth Assessment Package – Notices of Requirement (NORs)

Corridor	NOR	Description	Requiring Authority
Northern Public Transport Hub and Western Link – North	1	New northern public transport hub and associated facilities including a park and ride at the corner of State Highway 1 (SH1) and the new Western Link – North. New urban arterial cross-section with active mode facilities between the intersection of SH1 and Te Honohono ki Tai (Matakana Link Road) to the proposed bridge crossing, enabling a connection for development in the Warkworth Northern Precinct as provided for in the Warkworth North Precinct.	Auckland Transport
Woodcocks Road - West	2	Upgrade of the existing Woodcocks Road corridor between Mansel Drive and Ara Tūhono (Puhoi to Warkworth) to an urban arterial cross-section with active mode facilities.	Auckland Transport
State Highway 1 – South Upgrade	3	Upgrade of the existing SH1 corridor between Fairwater Road and the southern Rural Urban Boundary to an urban arterial cross-section with active mode facilities.	Auckland Transport
Matakana Road Upgrade	4	Upgrade of the existing Matakana Road corridor between the Hill Street intersection and the northern Rural Urban Boundary to an urban arterial cross-section with active mode facilities.	Auckland Transport
Sandspit Road Upgrade	5	Upgrade of the existing Sandspit Road corridor between the Hill Street intersection and the eastern Rural Urban Boundary to an urban arterial cross-section with active mode facilities.	Auckland Transport
Western Link – South	6	New urban arterial cross-section with active mode facilities between the intersection of SH1 and McKinney Road and Evelyn Street.	Auckland Transport
Sandspit Link	7	New urban arterial cross-section with active mode facilities between the intersection of Matakana Road and Te Honohono ki Tai (Matakana Link Road) and Sandspit Road.	Auckland Transport

Corridor	NOR	Description	Requiring Authority
Wider Western Link – North	8	New urban arterial cross-section with active mode facilities between Woodcocks Road and the Mahurangi River.	Auckland Transport

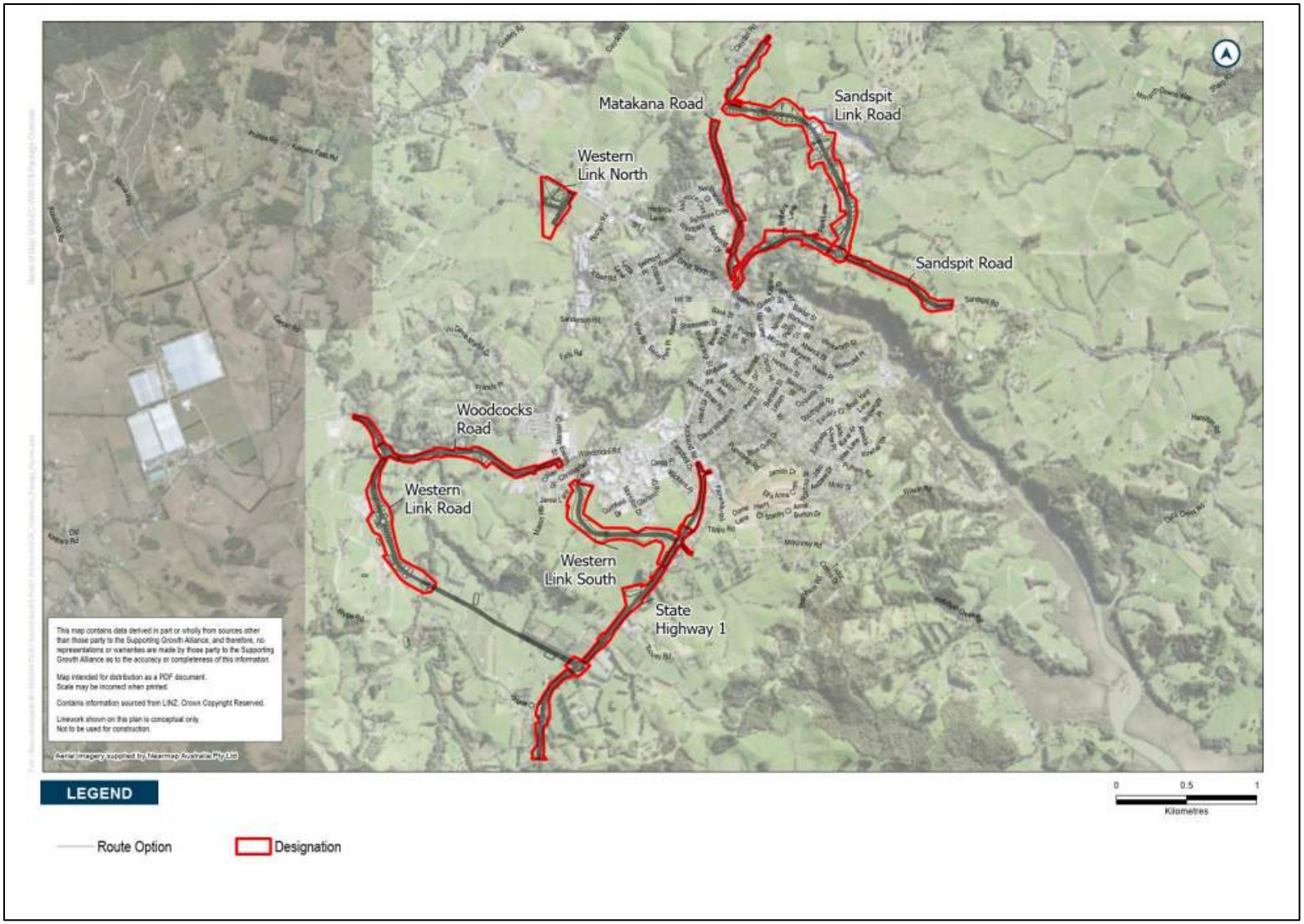

Figure 2-1 Warkworth NOR package overview

3 Assessment Approach

3.1 Existing and Likely Future Environment

The projects encompassing the Warkworth NOR package are likely to be constructed 15-20 years from now. The implementation timeframe for each project will vary and correspond with future land release within the area. Assessing the effects on the environment solely as it exists today (i.e., at the time of assessment) will not provide an accurate reflection of the environment in which some of the effects will be experienced. Accordingly, the assessment of effects considers both the existing environment, and the likely receiving environment in which the effects will likely occur.

The Warkworth NOR package will be constructed and will operate alongside existing urban environments or planned future environments (i.e. what can be built under the existing Auckland Unitary Plan: Operative in Part (AUP:OP) and what is identified in the Warkworth Structure Plan):

1. **Existing environment**: A number of corridors comprising the Warkworth NOR package are partially located within/alongside existing urban areas.

    a) Matakana Road Upgrade – residential land uses (single house zone, mixed housing suburban zone, mixed housing urban zone) comprise the western and north-western extents of the corridor.
    b) Western Link - South – residential land uses are situated to the north and northwest of the corridor and existing industrial land use on the eastern extent of the corridor.
    c) State Highway 1 (Southern Section) – residential land uses are adjacent to the northwest and southeast of the northern extent of the corridor, additionally there are established business land uses to the northeast of the northern extent of the corridor.
    d) Woodcocks Road – the eastern extent of the corridor has existing residential land uses to the north and south.

2. **Future environment**: All the corridors in the Warkworth NOR package will partially or wholly be constructed and implemented on land identified for future growth (future urban zone) and as a result are anticipated to change to urban or industrial land uses.

The likelihood and magnitude of land use change regarding the land use planning context has been identified in Table 3-1 below. This has been used to inform the assumptions made on the likely future environment

Table 3-1 Likelihood and magnitude of land use change

Existing environment	Current AUP:OP Zoning	Likelihood of Change for the environment[2]	Magnitude of potential change	Likely Receiving Environment[3]
Residential[4]	Residential (Mixed Housing Suburban)	Low	Low	Residential

[2] Based on AUP:OP zoning/policy direction
[3] Based on Warkworth Structure Plan and AUP:OP zoning/policy direction

Existing environment	Current AUP:OP Zoning	Likelihood of Change for the environment[2]	Magnitude of potential change	Likely Receiving Environment[3]
	Residential (Mixed Housing Urban)	Low	Low	Residential
	Residential (Single House)	Low	Low	Residential
Business	Business (Mixed Use)	Low	Low	Business (Industrial)
	Business (General Business)			Business (General Business)
	Business (Light Industry)	Low	Low	Business (Industrial)
	Business (Local Centre Zone)	Low	Low	Business (Neighbourhood Centre)
Open Space	Open Space – Conservation Zone	Low	Low	Informal Recreation
Greenfield areas	Future Urban Zone	High	High	Urban
Other	Special Purpose – Quarry Zone	Low	Med	Quarry

3.1.1 Existing and Likely Future Ecological Environment

Refer to the AEE in Volume 2 for a detailed description of the existing and likely receiving environment for the overall Warkworth package.

Table 3-2 below provides a summary of the existing and likely future environment as it relates to each of the NORs.

Table 3-2 Existing and likely future environment for each NOR

Environment today	NOR	Zoning	Likelihood of Change for the Environment	Likely Future Environment	Implications of Future Environment on Ecological Features
Business	1, 3	FUZ	Low	Business	All ecological features are likely to remain similar or the same. Vegetation cover, streams, and wetland features are likely to be relatively unchanged.
Urban	2, 3, 4	FUZ		Urban	
Open Space - Conservation	2, 5, 7	Open Space - Conservation		Open Space - Conservation	
Special Purpose	7	Special Purpose		Special Purpose (Quarry)	
Undeveloped greenfield areas (rural)	1, 2, 3, 6	FUZ	High	Urban	As land is developed, the majority of terrestrial vegetation (such as planted vegetation, forestry and shelterbelts outside riparian and wetland features, but 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.
Undeveloped greenfield areas (rural)	6	Business		Business	
Rural	4, 5, 7, 8	FUZ		Urban	

3.1.2 Permitted Activities and the Likely 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 inland 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 new and upgraded transport corridors are operational (albeit we have assumed they will still be present during construction). Subsequently, our effects assessment has taken this into account.

3.2 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 for the impact management (Stage 3) additional consideration was given to the permitted baseline and the future environment under the AUP.

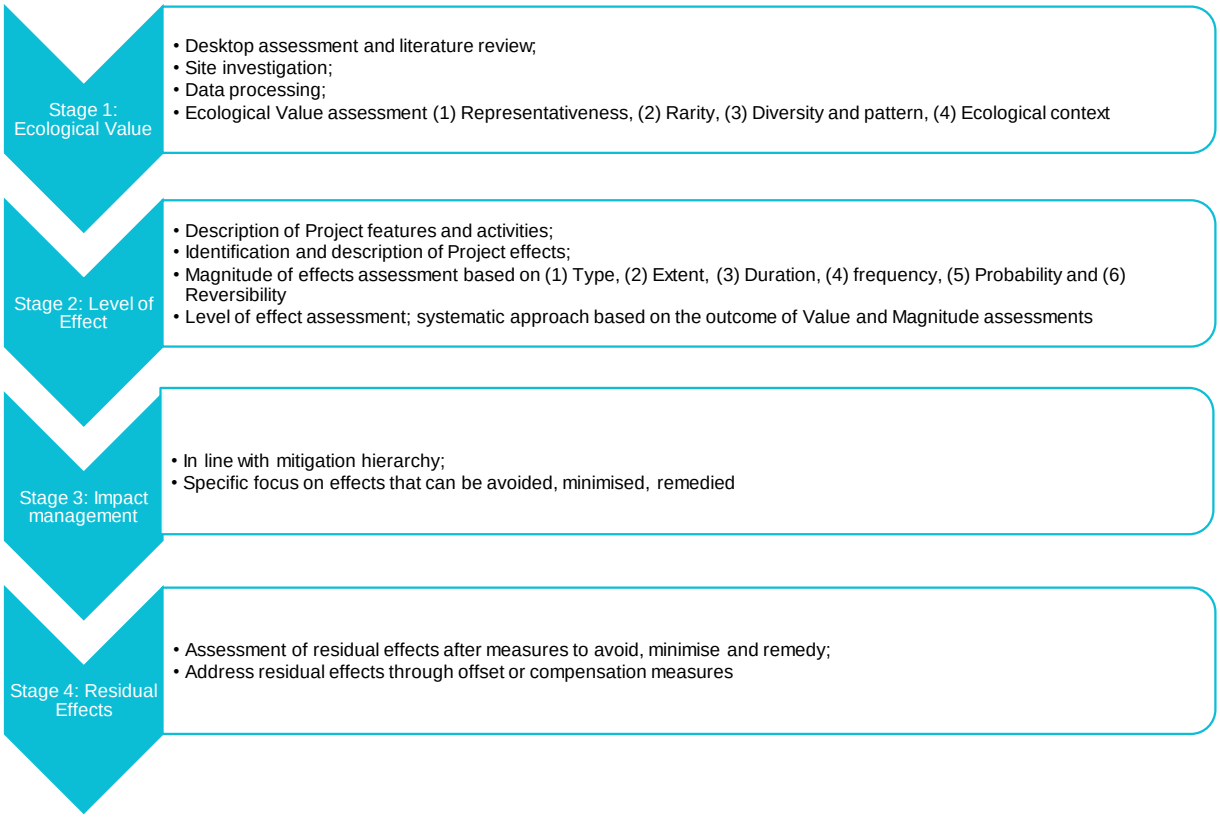

Figure 3-1 Approach process followed for this assessment

3.2.1 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 Warkworth Project Team has advised of the following to inform the assessment of the likely future environment:

- The purpose of the NORs is to protect the transport corridors that will support the future urbanisation of Warkworth. 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.
- 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 Warkworth, 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.

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 Warkworth Assessment Package relates to proposed designation this assessment of ecological effects 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 alternative assessments, designation boundary and the future regional resource consents (presented in Section 16).

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 Section 16. 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 eight NORs. Ecological features within the proposed designation boundary and a distance of approximately 100 m radius[5] of the designation have been mapped and included in this assessment. Terrestrial, 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 operational) on adjacent or connected terrestrial, freshwater, and wetland habitats and associated native species. For example, all Significant Ecological Areas (SEAs) 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 whether the Project ZOI extends out to these SEAs.

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 Project 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 the Project Area, 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 of each of the NORs.

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[6];
- Department of Conservation (DOC) Bioweb records[7];
- Department of Conservation Threat Classification Series[8];

[5] 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).

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

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

[8] 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/

- Ecological Regions and Districts of New Zealand (McEwen, 1987);
- iNaturalist records[9], records within approximately 2-5 km buffer of the NORs;
- Indigenous terrestrial and wetland ecosystems of Auckland (Singers et al., 2017);
- National Institute of Water and Atmospheric Research (NIWA) freshwater fish database[10];
- New Zealand Bird Atlas eBird database[11]; recorded within 10 km^2 grid squares. Results from grid squares W66 and W67;

4.3 Site Investigations

Site investigations[12] 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 2022 and December 2022 by ecologists; to map and describe the habitats present within and adjacent to each of the eight 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 long-tailed bats, avifauna, and herpetofauna.

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.

Common plant names are predominantly used within this report. Maps showing the vegetation cover along the NORs are provided in Appendix 5.1. Terrestrial ecological value assessment methodology is discussed in Section 4.4.

4.3.2 Freshwater Habitat

Where access allowed, streams within the Project Area identified on Auckland Council Geomaps ('Named Streams') were ground-truthed and classified as permanent, intermittent, or ephemeral,

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

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

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

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

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 5.1.2.

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, New Zealand Freshwater Fish Database (NZFFD) records (Stoffels, 2022) were used to inform potential ecological value of streams. Access was restricted at several locations and as such some stream assessments were based solely on desktop information. Freshwater ecological value assessment methodology is discussed in Section 4.4.

4.3.3 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 5.1.2.

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, as the level of design is limited to what is necessary for route protection. It is expected that a detailed design will occur in the future which will confirm actual design and subsequent potential impacts, therefore 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[13] 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 inlands wetlands (assessed for potential exclusion on the basis of being artificial or pasture dominated). 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:

[13] "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"

4.4.1 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)

4.4.2 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

4.4.3 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

4.4.4 Fauna

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, if 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.
- Consideration and adjustment of ecological value may occur dependent on regional threat status and local knowledge (if available). The more conservative of the ecological values should be used.

For the reasons outlined above, the ecological value assessments for individual species are defined by their conservation significance.

5 Ecological Baseline

5.1 Historical Ecological Context

All eight NORs are located within the Rodney Ecological District (ED). This ED is characterised by low altitude, warm humid summers and mild winters, and weakly leached, fertile soils with good drainage formed under hardwood forest (McEwen, 1987). Originally forested, the landscape near the current Warkworth town centre would have been dominated by broadleaved forest with abundant pūriri with occasional tōtara, mataī, kahikatea and titoki. In the surrounding Warkworth area, the landscape would have been dominated by kauri, podocarp, broadleaved forest (Singers et al., 2017).

Presently, most of the ED is highly modified with only 18% indigenous land cover of the native land cover remain in the ED (Lindsay et al., 2009). The extent of remaining native vegetation cover in the Project Area is mostly restricted to Significant Ecological Areas (SEAs) or reduced to fragmented remnant vegetation or regenerating vegetation following historical clearance.

5.2 Terrestrial Habitat and Fauna

5.2.1 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 eight NORs are presented in Appendix 11. 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. Mapping of terrestrial vegetation is presented in Appendix 5.

Table 5-1 Description of the terrestrial vegetation types present within the Project Area

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 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.
Kahikatea Forest	MF4	Mostly remnant Kahikatea swamp forest dominant constrained to SEA_T_6684 and within and adjacent to SEA_T_5440.
Planted Vegetation – Native (recent)	PL.1	Native restoration plantings with <50% exotic biomass. Recently planted native scrub and forest <20 years old.
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.
Treeland – Native-Dominated	TL.1	Tree canopy cover 20-80%: Native-dominated: >75% native tree cover. For the purposes of mapping this includes planted and wilding native vegetation and mature shelterbelts. This includes mature riparian vegetation and scattered or discontinuous canopy of mature trees within gardens, farms, and amenity areas.
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

Habitat	Classification*	Description of Habitat
		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.
Pūriri Forest (alluvial terraces with recent free-draining soils)	WF7.1	Same as WF7 but mostly constrained to alluvial terraces.
Kauri, Podocarp, Broadleaved Forest	WF11	Mostly constrained to specific SEAs, but some remnant patches present outside of SEAs. Exotic species present on canopy margins and understory. No or very few kauri present in remnant patches. Broadleaved species and kahikatea common in the gullies. Generally, only gully component of this ecosystem type remains with few kauri.
Tawa, Kohekohe, Rewarewa, Hīnau, Podocarp Forest	WF13	Tawa and kohekohe most dominant canopy species. exotic species present on canopy margins and understory Kauri absent. Mostly constrained to SEAs.

Notes: * = Classification as per Singers et al. (2017).

Table 5-2 summaries the vegetation types, classification (Singers et al., 2017) and ecological value associated with each NOR.

Appendix 6 presents the detailed ecological value for terrestrial vegetation identified in the Project Area.

District plan vegetation e.g., road trees, open space trees, notable trees have been considered and identified in the Assessment of Arboricultural Effects Report (as defined in Table E26.4.3.1 in Appendix 2). Ecological effects related to the removal of these trees is considered **Negligible** (with the exception of NOR 4) and as such have not been considered any further in this ecological effects assessment. In NOR 4, district plan vegetation located in the southern area of NOR 4, on the western side of the existing Matakana Road may provide low quality habitat to long-tailed bats, elegant, forest, and pacific geckos, and Non-TAR birds. Therefore, this area of district plan vegetation requires vegetation removal mitigation as per Section 16.1.

Additionally, there are three locations (NOR 2, 4, and 5 – refer Appendix 11) where an Open Space overlay (District Plan matter) interacts with a SEA overlay (Regional Plan matter) in the AUP:OP. The ecological effects of the removal of these areas of SEA vegetation are considered to be a regional consenting matter and as such have been considered and discussed further as part of the wider SEA vegetation removal considerations in Section 16.1.

Table 5-2 Terrestrial vegetation types present within the Project Area and their ecological value

Vegetation Type	Classification*	NOR 1	NOR 2	NOR 3	NOR 4	NOR 5	NOR 6	NOR 7	NOR 8
Brown Field	BF	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Exotic Forest	EF	-	-	-	-	Moderate	-	-	-
Exotic Grassland	EG	Low	Low	Low	Low	Low	Low	Low	Low
Exotic Scrub	ES	Low	Low	Low	-	Low	Low	-	-
Kahikatea Forest	MF4	-	-	-	High	High	-	High	-
Planted Vegetation – Native (recent)	PL.1	-	Moderate	Moderate	Low	Low	Moderate	Low	-
Planted Vegetation - Native (mature)	PL.2	-	Low	Low	Low	-	-	-	Low
Planted Vegetation – Amenity	PL.3	-	Low	Low	Low	Low	-	Low	Low
Treeland – Native-Dominated	TL.1	-	-	Moderate	Low	-	-	Moderate	-
Treeland – Mixed Native/Exotic	TL.2	-	High	Moderate	Moderate	High	-	-	-
Treeland – Exotic-Dominated	TL.3	-	Moderate	Moderate	Moderate	Moderate	Low	Moderate	Low
Kānuka Scrub/Forest	VS2	-	-	Moderate	Moderate	High	-	-	High
Pūriri Forest	WF7	-	-	-	-	-	-	-	High

Vegetation Type	Classification*	NOR 1	NOR 2	NOR 3	NOR 4	NOR 5	NOR 6	NOR 7	NOR 8
Pūriri Forest (alluvial terraces with recent free-draining soils)	WF7.1	-	-	-	-	Very High	-	High	-
Kauri, Podocarp, Broadleaved Forest	WF11	-	High	-	-	High	-	High	-
Tawa, Kohekohe, Rewarewa, Hīnau, Podocarp Forest	WF13	-	-	-	Very High	-	-	-	-

Notes: * = Classification as per Singers et al. (2017).

5.2.2 Long-tailed bats

Existing desktop records (Department of Conservation, 2022) confirm the presence of long-tailed bats (*Chalinolobus tuberculatus*) within 5 km of the NORs (Figure 5-1 and Figure 5-2). There are bat records within 3 km to the west of NOR 1, near Dome Valley, and within 1.6 km to the west of NOR 3, within SEA_T_2367 adjacent to Wylie Road. Subsequently, no bat surveys were undertaken for this Project.

The conservation status of this species is 'Threatened - Nationally Critical' (O'Donnell et al., 2017), therefore the ecological value of long-tailed bats is **Very High** if they are likely to be present. Table 5-3 presents the potential bat habitat areas for each NOR based on the results of the desktop review and potential habitat surveys.

Table 5-3 Results of desktop review and potential habitat surveys for long-tailed bats within the Project Area

NOR	Desktop Records within ZOI	Potential bat habitat e.g., bat roost potential, foraging potential
NOR 1	Yes – 3.0 km	N/A
NOR 2	Yes – 2.3 km	Riparian habitat associated with Mahurangi River, and habitat associated with Significant Ecological Area SEA_T_6676.
NOR 3	Yes – 3.5 km	N/A
NOR 4	Yes – 4.3 km	Habitat associated with Significant Ecological Area SEA_T_5440 and SEA_T_2260
NOR 5	Yes – 4.3 km	Habitat associated with Significant Ecological Area SEA_T_6684 and SEA_T_5440. Mature trees on 89 and 163 Sandspit Rd.
NOR 6	Yes – 2.7 km	N/A
NOR 7	Yes – 4.3 km	Mature trees associated with WF11 habitat.
NOR 8	Yes – 1.6 km	Riparian trees associated with Mahurangi River.

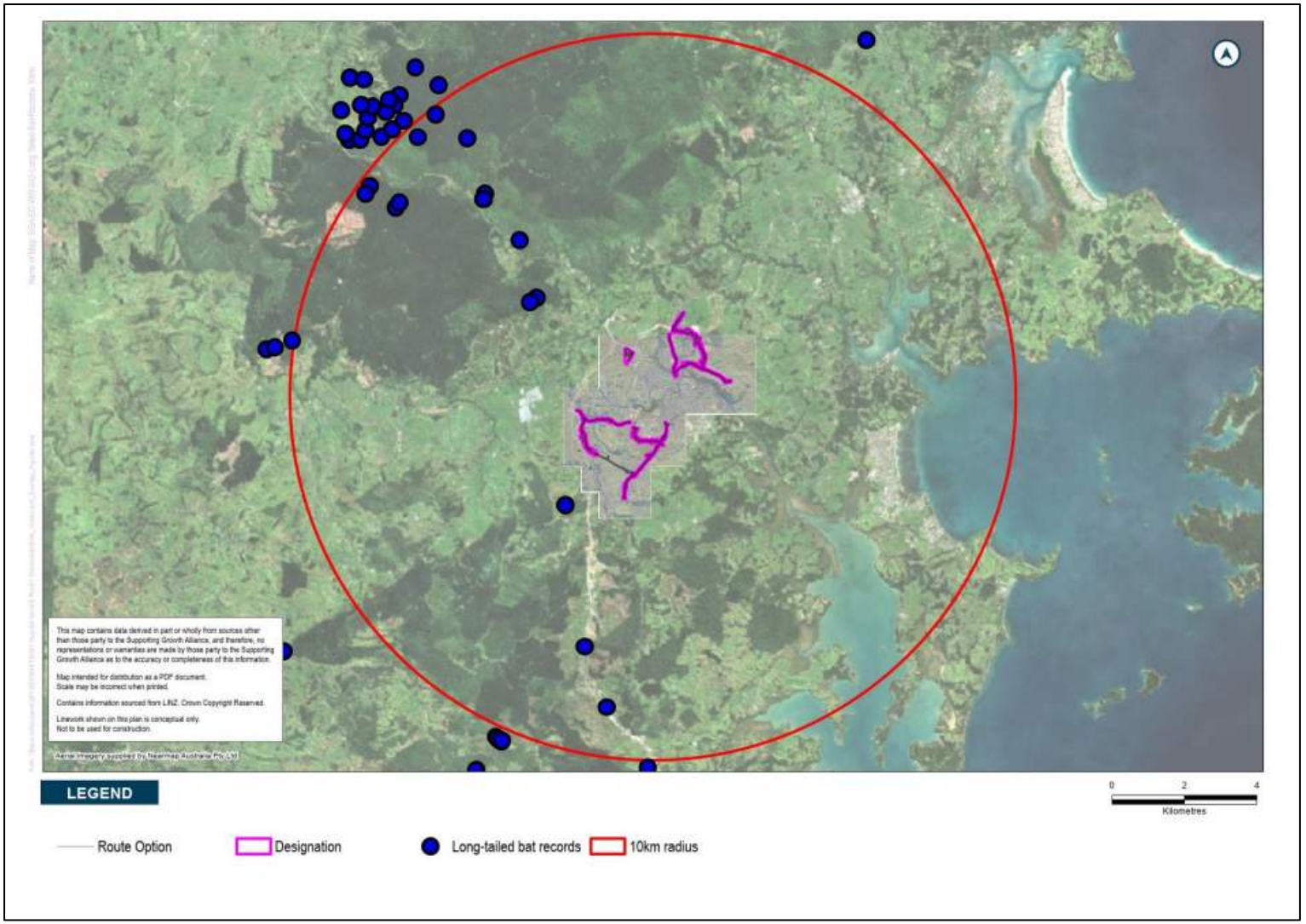

Figure 5-1 Long-tailed bat records within 10 km radius of the Project Area

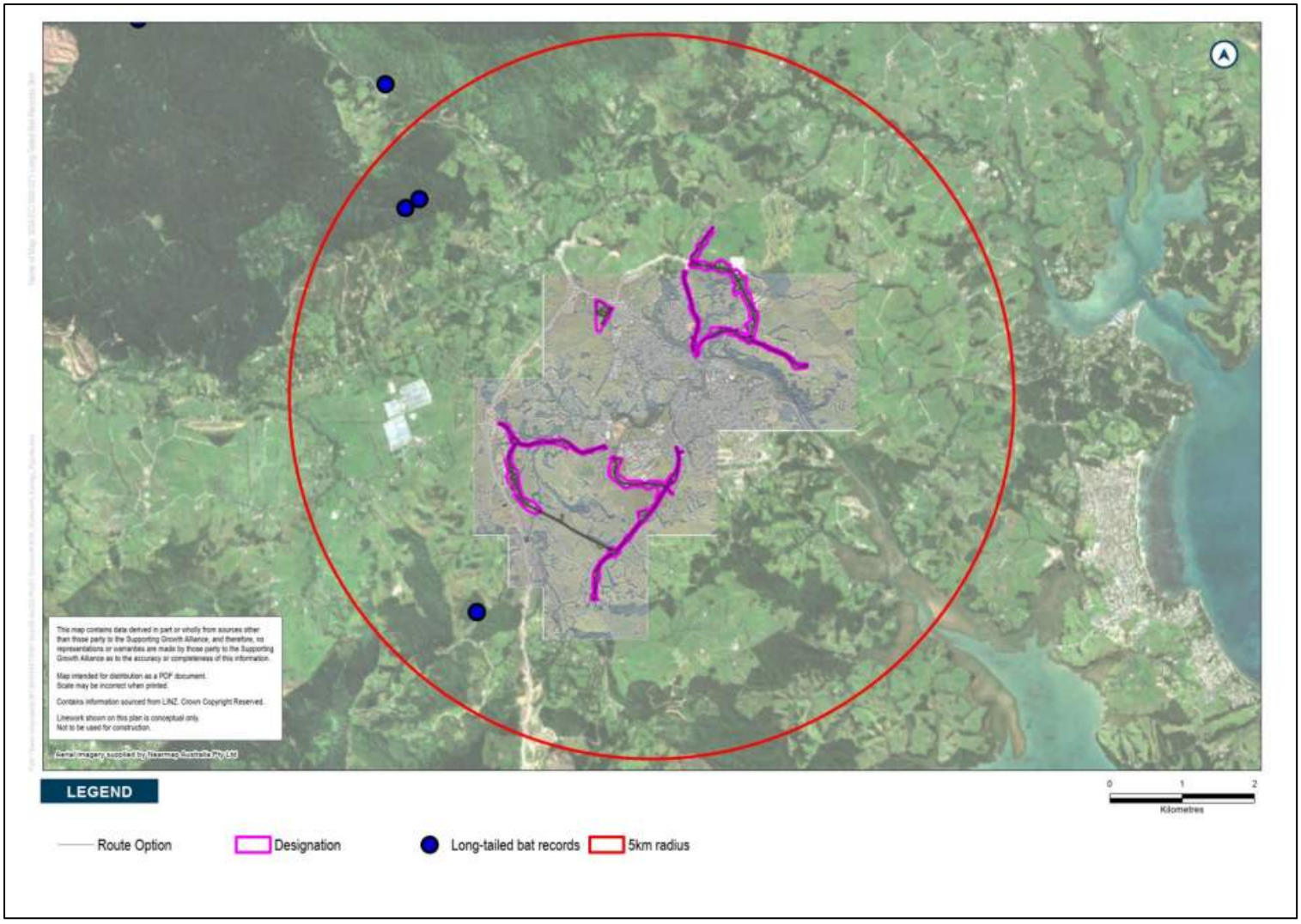

Figure 5-2 Long-tailed bat records within 5 km radius of the Project Area

5.2.3 Avifauna

An area wide desktop review identified 89 forest, freshwater, and coastal bird species (59 of which are native) within a 2 km buffer of the Project Area. A full list of species identified in this desktop review is included in Appendix 4.

No dedicated bird surveys were undertaken for the Project; however, incidental observations of birds were recorded during site visits. A full list of incidental observations is also included in Appendix 4. Additionally, a desktop assessment identified potential habitat for a number a TAR species, which is detailed in Table 5-4.

Table 5-4 details all the observed and potential TAR bird species for each NOR, including the ecological value for each species[14].

[14] Non-threatened native bird species are considered to have a **Low** ecological value. The full list of bird species identified via desktop assessment and incidental observations are included in Appendix 4.

Table 5-4 TAR bird species observed or likely to occur within suitable habitat in the Project Area

Species	Conservation Status (Robertson et al., 2021)	Record Source	Distribution and Habitat	Project Area Habitat	Ecological Value	Relevant NOR
Australasian bittern/Matuku-hūrepo (*Botaurus poiciloptilus*)	Threatened – Nationally Critical	eBird (Bird Atlas)	Found throughout New Zealand and can travel long distances. Commonly use raupō-fringed lakes, spring-fed creeks with cover and areas of rank-grass along paddock/drain edges (Williams, 2013).	Has the potential to utilise wetland habitat in all NORs (excluding NOR 2) for foraging. No breeding or nesting sites observed.	Very High	NOR 1, NOR 3, NOR 4, NOR 5, NOR 6, NOR 7, NOR 8
Black shag/Māpunga (*Phalacrocorax carbo novaehollandiae*)	At Risk - Relict	eBird (Bird Atlas)	Widespread throughout New Zealand (but sparsely so). Utilise habitats such as coastal waters, estuaries, harbours, rivers, streams, lakes and ponds (Powlesland, 2013).	Has the potential to utilise freshwater habitat present in NOR 2 and NOR 7. No breeding or roosting sites observed.	High	NOR 2, NOR 7
Dabchick/Weweia (*Poliocephalus rufopectus)*	Threatened – Nationally Increasing	eBird (Bird Atlas)	Small shallow freshwater lakes and ponds, with dense marginal vegetation. Uncommon but widespread in the Auckland region (Szabo, 2013).	Has the potential to utilise freshwater habitat in the planted wetland (PLW) for foraging and breeding in NOR 8.	Very High	NOR 8

Species	Conservation Status (Robertson et al., 2021)	Record Source	Distribution and Habitat	Project Area Habitat	Ecological Value	Relevant NOR
Little black shag/Kawau tūī (*Phalacrocorax sulcirostris*)	At Risk – Naturally Uncommon	• eBird (Bird Atlas) • iNaturalist	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 freshwater habitat present in NOR 2 and NOR 7. No breeding or roosting sites observed.	High	NOR 2, NOR 7
Little shag/Kawaupaka (*Phalacrocorax melanoleucos brevirostris*)	At Risk - Relict	• eBird (Bird Atlas) • iNaturalist	Widespread across New Zealand. Likely to utilise coastal habitat, lakes, rivers, ponds, and streams (Taylor, 2013).	Has the potential to utilise freshwater habitat present in NOR 2 and NOR 7. No breeding or roosting sites observed.	High	NOR 2, NOR 7
Long-tailed cuckoo/Koekoeā (*Eudynamys taitensis*)	Threatened - Nationally Vulnerable	Assumed present based on suitable habitat present in NOR 2, NOR 4, NOR 5, NOR 7, and NOR 8.	Summer migrant to New Zealand, 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	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.	Very High	NOR 2, NOR 4, NOR 5, NOR 7, NOR 8

Species	Conservation Status (Robertson et al., 2021)	Record Source	Distribution and Habitat	Project Area Habitat	Ecological Value	Relevant NOR
			throughout New Zealand (Gill, 2013).			
New Zealand pipit/Hīoi (*Anthus novaeseelandiae*)	At Risk – Declining	eBird (Bird Atlas)	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 for foraging and breeding in all NORs.	High	All NORs
North Island kākā (*Nestor meridionalis septentrionalis*)	At Risk – Recovering	eBird (Bird Atlas)	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, exotic forest, or mature indigenous forest types. There is no breeding habitat within the NORs, but likely to infrequently utilise exotic trees for seasonal foraging and roosting throughout winter season.	High	NOR 2, NOR 4, NOR 5, NOR 7, NOR 8

Species	Conservation Status (Robertson et al., 2021)	Record Source	Distribution and Habitat	Project Area Habitat	Ecological Value	Relevant NOR
Pied shag/Kāruhiruhi (*Phalacrocorax varius*)	(At Risk – Recovering)	• eBird (Bird Atlas) • iNaturalist	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 freshwater habitat present in NOR 2 and NOR 7. No breeding or roosting sites observed.	High	NOR 2, NOR 7
Spotless crake/Pūweto (*Porzana tabuensis plumbea*)	At Risk – Declining	Assumed present based on suitable habitat present in all NORs.	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 moderate or larger wetland habitat areas (>1000 m2) for foraging and breeding in all NORs (except NOR 2).	High	NOR 1, NOR 3, NOR 4, NOR 5, NOR 6, NOR 7, NOR 8

5.2.4 Herpetofauna

Existing desktop records (Department of Conservation, 2022) confirm the presence of native herpetofauna within 5 km of the Project Area. No dedicated lizard surveys were undertaken for the Project, however opportunistic searches were conducted where possible. Table 5-5 details all of the observed and potential native herpetofauna species for each NOR, including the ecological value for each species.

Table 5-5 Native herpetofauna likely to occur within suitable habitat in the Project Area

Species	Conservation Status (Hitchmough et al., 2021; Burns et al., 2017)	Record Source	Distribution and Habitat (New Zealand Herpetological Society, 2022)	Project Area Habitat	Ecological Value	Relevant NOR
Copper skink *(Oligosoma aeneum)*	At Risk – Declining	DOC Bioweb records	Widespread from just south of the Aupouri Peninsula through to Wellington. Frequently recorded within highly modified habitats such as exotic scrub and rank grassland.	Anticipated to occur within all habitats where there is suitable understorey, excluding Brown Field (BF).	High	All NORs
Elegant gecko *(Oligosoma aeneum)*	At Risk – Declining	DOC Bioweb records	Northern North Island from just south of the Bay of Islands, through to Taranaki, and the Bay of Plenty. Utilise forested habitats, including swamps, scrubland, and mature forest.	Anticipated to occur within areas of MF4, VS2, WF7, WF7.1, WF11, and WF13 that are present in the Project Area.	High	NOR 2, NOR 4 NOR 5, NOR 7, and NOR 8
Forest gecko *(Oligosoma aeneum)*	At Risk – Declining	DOC Bioweb records	Northern North Island from just south of the Bay of Islands, through to Taranaki, and the Bay of Plenty. Also found in the north-western South Island from the Marlborough, Tasman, and West Coast regions. Utilise swamps, scrubland, mature forests (beech, podocarp, and broadleaf), and rock fields.	Anticipated to occur within areas of MF4, VS2, WF7, WF7.1, WF11, and WF13 that are present in the Project Area.	High	NOR 2, NOR 4, NOR 5, NOR 7, and NOR 8

Species	Conservation Status (Hitchmough et al., 2021; Burns et al., 2017)	Record Source	Distribution and Habitat (New Zealand Herpetological Society, 2022)	Project Area Habitat	Ecological Value	Relevant NOR
Ornate skink *(Oligosoma ornatum)*	At Risk – Declining	Assumed present based on suitable habitat present in NOR 2, NOR 4, NOR 5, NOR 7, and NOR 8.	Widespread throughout the North Island, however populations are sparse. Utilise forested areas, shrubland and heavily vegetated coastlines; found amongst leaf litter, in dense low foliage, thick rank grass and under rocks or logs.	Anticipated to occur within all habitats contiguous to native forest or scrub and where there is suitable understorey, excluding Brown Field (BF)	High	NOR 2, NOR 4, NOR 5, NOR 7, and NOR 8
Pacific gecko	Not Threatened	Assumed present based on suitable habitat present in NOR 2, NOR 4, NOR 5, NOR 7, and NOR 8.	Widespread throughout the northwestern North Island. Utilise swamps, scrubland, mature forests, rocky coastlines, back-dunes, rocky islets, and rock outcrops.	Anticipated to occur within areas of MF4, VS2, WF7, WF7.1, WF11, and WF13 that are present in the Project Area.	Moderate[15]	NOR 2, NOR 4, NOR 5, NOR 7, and NOR 8
Hochstetter's frog *(Leiopelma hochstetteri)*	At Risk - Declining	DOC Bioweb records	Restricted to the North Island, occurring in discrete populations. Semi-aquatic species that are typically found in small streams in pine forests, mature podocarp/broadleaf forests, regenerating scrubland, seepages in banks, and in ditches adjacent to forested areas.	Anticipated to occur within specific permanent streams in NOR 4, NOR 5, and NOR 7.	High	NOR 4, NOR 5, and NOR 7

[15] Although the national conservation status for pacific gecko is 'Not Threatened', the species is assigned a Moderate ecological value as the regional conservation status of pacific gecko in Auckland is 'Regionally Declining' (Melzer et al., 2022).

5.2.5 Invertebrates

Kauri snail (*Paryphanta* spp.) (At Risk – Declining) (Mahlfeld et al., 2012) were identified in the desktop review. Five 'research grade' observations of kauri snail were recorded on iNaturalist in Parry Kauri Park, approximately 1 km east of NOR 3. Additionally, suitable habitat has been identified in the Project Area for flax snails (*Placostylus* spp.), large land snails (*Powelliphanta* spp.), and Auckland tree wētā (*Hemideina thoracica*). It is likely that these invertebrate species are present in NOR 2 (Woodcocks Road Upgrade), NOR 4 (Matakana Road Upgrade), and NOR 7 (Sandspit Link) due to the presence of native forest and dense leaf litter in these NORs.

It is considered that Project effects on kauri snail, flax snails, large land snails, and Auckland tree wētā are less than **Negligible**, as it is not anticipated that these invertebrates will respond to noise, light, vibration, and dust, and also due to their very small home range. Therefore, these invertebrate species have not been assessed further in this report. However, impact management will be required under the Wildlife Act to prevent killing or injuring these species. This is detailed further in Section 16.

5.3 Freshwater Habitat and Fauna

5.3.1 Streams

A review of the NZ River Name Lines dataset (LINZ, 2022) indicated that Woodcocks Road Upgrade (NOR 2), and Wider Western Link (Northern Section (NOR 8) will cross named rivers/streams (Table 5-6). Various tributaries of the Mahurangi River, Mahurangi River (Left Branch), and Mahurangi River (Right Branch) will also be crossed in the Project Area (excluding New Western Link - South (6)), and these are detailed further in Table 5-7.

A total of 38 streams within the Project Area designation boundary were identified and assessed. Additionally, all streams that were accessed during site investigations were surveyed using the Rapid Habitat Assessment (RHA), the detailed RHA results are included in Appendix 10. Table 5-8 details streams in the Project Area, and their corresponding ecological value.

Stream mapping is presented in Appendix 5, and Appendix 7 presents the detailed ecological value for streams identified in the Project Area.

Table 5-6 Named rivers/streams that will be crossed Project wide (LINZ, 2022)

Relevant NOR	River/Stream Name
NOR 2: Woodcocks Road Upgrade	Mahurangi River (Left Branch)
	Mahurangi River (Right Branch)
NOR 8: Wider Western Link (Northern Section)	Mahurangi River (Right Branch)

Table 5-7 Unnamed rivers/streams that will be crossed Project wide (LINZ, 2022)

Relevant NOR	River/Stream Name
NOR 1: Northern Public Transport Hub + Park and Ride and Western Link North (Northern Section)	Mahurangi River unnamed tributary
NOR 2: Woodcocks Road Upgrade	Mahurangi River (Left Branch) unnamed tributary
NOR 3: State Highway 1 (Southern Section) Upgrade	Mahurangi River (Right Branch) unnamed tributaries
NOR 4: Matakana Road Upgrade	Mahurangi River unnamed tributaries
NOR 5: Sandspit Road Upgrade	Mahurangi River unnamed tributaries
NOR 7: Sandspit Link	Mahurangi River unnamed tributaries

Table 5-8 Summary of streams identified in the Project Area and their ecological value

Stream Name	Stream ID	Hydroperiod	RHA Category	Ecological Value	Relevant NOR
Unnamed tributary (Mahurangi River catchment)	WW1-S1*	Permanent	N/A	Low	NOR 1
Mahurangi River tributary	WW1-S2*	Permanent	N/A	Moderate	NOR 1
Mahurangi River (Left Branch)	WW2-S1	Permanent	Good	High	NOR 2
Mahurangi River (Left Branch) tributary	WW2-S2^	Permanent	Moderate	Moderate	NOR 2
Mahurangi River (Right Branch)	WW2-S3^	Permanent	Good	High	NOR 2
Unnamed tributary (Mahurangi River catchment)	WW2-S4^	Intermittent	Poor	Low	NOR 2
Unnamed tributary (Mahurangi River catchment)	WW3-S1a^	Permanent	Moderate	Moderate	NOR 3
Unnamed tributary (Mahurangi River catchment)	WW3-S1b^	Permanent	Moderate	Moderate	NOR 3
Unnamed tributary (Mahurangi River catchment)	WW3-S1c^	Permanent	Moderate	Moderate	NOR 3

Stream Name	Stream ID	Hydroperiod	RHA Category	Ecological Value	Relevant NOR
Unnamed tributary (Mahurangi River catchment)	WW3-S2a^	Permanent	Poor	Moderate	NOR 3
Unnamed tributary (Mahurangi River catchment)	WW3-S2b^	Permanent	Poor	Moderate	NOR 3
Unnamed tributary (Mahurangi River catchment)	WW3-S3a^	Permanent	Poor	Moderate	NOR 3, NOR 8
Unnamed tributary (Mahurangi River catchment)	WW3-S3b^	Permanent	Poor	Moderate	NOR 3, NOR 8
Unnamed tributary (Mahurangi River catchment)	WW3-S4a^	Permanent	Moderate	Moderate	NOR 3
Unnamed tributary (Mahurangi River catchment)	WW3-S4b^	Permanent	Poor	Moderate	NOR 3
Unnamed tributary (Mahurangi River catchment)	WW4-S1^	Intermittent	Poor	Low	NOR 4
Unnamed tributary (Mahurangi River catchment)	WW4-S2^	Intermittent	Poor	Low	NOR 4

Stream Name	Stream ID	Hydroperiod	RHA Category	Ecological Value	Relevant NOR
Unnamed tributary (Mahurangi River catchment)	WW4-S3^	Intermittent	Poor	Low	NOR 4
Mahurangi River tributary	WW5-S1	Permanent	Excellent	High	NOR 5
Mahurangi River tributary	WW5-S2^	Permanent	Moderate	Moderate	NOR 5, NOR 7
Unnamed tributary (Mahurangi River catchment)	WW5-S3^	Intermittent	Poor	Low	NOR 5, NOR 7
Unnamed tributary (Mahurangi River catchment)	WW5-S4	Intermittent	Poor	Low	NOR 5
Unnamed tributary (Mahurangi River catchment)	WW5-S5	Intermittent	Poor	Low	NOR 5
Unnamed tributary (Mahurangi River catchment)	WW5-S6	Intermittent	Moderate	Low	NOR 5
Unnamed tributary (Mahurangi River catchment)	WW6-S1	Intermittent	Poor	Moderate	NOR 6
Unnamed tributary (Mahurangi River catchment)	WW6-S2	Intermittent	Moderate	Moderate	NOR 6

Stream Name	Stream ID	Hydroperiod	RHA Category	Ecological Value	Relevant NOR
Unnamed tributary (Mahurangi River catchment)	WW7-S1^	Intermittent	Poor	Low	NOR 7
Unnamed tributary (Mahurangi River catchment)	WW7-S2a	Permanent	Moderate	Moderate	NOR 7
Unnamed tributary (Mahurangi River catchment)	WW7-S2b	Intermittent	Poor	Low	NOR 7
Unnamed tributary (Mahurangi River catchment)	WW7-S3a	Permanent	Moderate	Moderate	NOR 7
Unnamed tributary (Mahurangi River catchment)	WW7-S3b	Intermittent	Poor	Low	NOR 7
Unnamed tributary (Mahurangi River catchment)	WW7-S4	Permanent	Good	High	NOR 7
Unnamed tributary (Mahurangi River catchment)	WW7-S5	Intermittent	Poor	Low	NOR 7
Unnamed tributary (Mahurangi River catchment)	WW7-S6a	Intermittent	Poor	Low	NOR 7

Stream Name	Stream ID	Hydroperiod	RHA Category	Ecological Value	Relevant NOR
Unnamed tributary (Mahurangi River catchment)	WW7-S6b	Intermittent	Poor	Low	NOR 7
Mahurangi River (Right Branch) tributary	WW8-S1	Intermittent	Moderate	Moderate	NOR 8
Mahurangi River (Right Branch) tributary	WW8-S2	Intermittent	Moderate	Moderate	NOR 8
Mahurangi River (Right Branch)	WW8-S3*	Permanent	N/A	High	NOR 8

Notes: ^ = Ecological feature assessed from roadside or adjacent property boundary due to access restrictions. * = Ecological feature assessed at a desktop level due to access restrictions.

5.3.2 Fish

The NZFFD (Stoffels, 2022) was reviewed for native freshwater fish and freshwater invertebrate records within stream catchments associated with the Project Area. Of the freshwater fish recorded, three species are classified as 'At Risk'; īnanga (*Galaxias maculatus*), longfin eel (*Anguilla australis*), and giant bully (*Gobiomorphus gobioides*) (Dunn et al., 2017). Of the freshwater invertebrate records, one species is classified 'At Risk', freshwater mussel (*Echyridella menziesi*) (Grainger et al., 2018). The desktop review results are presented in Table 5-9 and Table 5-10.

Fish surveys were not carried out during site investigations; however, longfin eel (At Risk – Declining) and gambusia (*Gambusia affinis*) (Introduced and Naturalised) were observed onsite at WW2-S2.

Table 5-9 Native freshwater fish species recorded within the catchments associated with the Project Area

Common Name	Scientific Name	Conservation Status (Dunn et al., 2017)	Catchment and Relevant NOR		
			NORs 1, 4, 5, 7	NOR 2	NORs 2, 3, 8
			Mahurangi River	Mahurangi River (Left Branch)	Mahurangi River (Right Branch)
Banded kōkopu	*Galaxias fasciatus*	Not Threatened	✓	✓	
Common bully	*Gobiomorphus cotidianus*	Not Threatened	✓	✓	✓
Crans bully	*Gobiomorphus basalis*	Not Threatened	✓	✓	✓
Giant bully	*Gobiomorphus gobioides*	At Risk – Naturally Uncommon	✓		
Īnanga	*Galaxias maculatus*	At Risk - Declining	✓	✓	
Longfin eel	*Anguilla dieffenbachii*	At Risk - Declining	✓	✓	✓
Redfin bully	*Gobiomorphus huttoni*	Not Threatened	✓	✓	✓
Shortfin eel	*Anguilla australis*	Not Threatened	✓	✓	✓
Unidentified eel	*Anguilla* sp.	N/A	✓	✓	✓
Unidentified bully	*Gobiomorphus* sp.	N/A	✓		✓
Unidentified galaxiid	*Galaxias* sp.	N/A	✓		

Table 5-10 Native freshwater invertebrate species recorded within the catchments associated with the Project Area

Common Name	Scientific Name	Conservation Status (Grainger et al., 2018)	Catchment and Relevant NOR		
			NORs 4, 5, 7, 1	NOR 2	NORs 2, 3, 8
			Mahurangi River	Mahurangi River (Left Branch)	Mahurangi River (Right Branch)
Freshwater mussel	*Echyridella menziesi*	At Risk - Declining		✓	✓
Freshwater shrimp	*Paratya curvirostis*	Not Threatened	✓	✓	✓
Koura	*Paranephrops planifrons*	Not Threatened	✓	✓	✓

5.4 Wetland Habitat

A total of 30 wetlands within the Project Area designation boundary were identified and assessed. Table 5-11 summarises the wetland types and their classification (Singers et al., 2017) associated with the Project Area. Mapping of wetlands is presented in Appendix 5.

Table 5-11 Description of the wetland types present within the Project Area

Habitat	Classification	Description of Habitat
Exotic Wetland	EW	Wetland ecosystems with >50% exotic plant biomass.
Open Water	OW	Open Water (e.g., ornamental ponds, stormwater ponds, stock ponds).
Planted Wetland - Native (recent)	PLW	Native restoration plantings with <50% exotic biomass.
Raupō reedland	WL19	Dominated by abundant raupō, locally with species of pūrua grass, lake clubrush, jointed twig rush, toetoe, pūkio and harakeke. In northern New Zealand, swamp millet can be abundant.

Details regarding the vegetation cover, NPS-FM classification, potential for supporting TAR bird species (further described in Section 5.2.3)[16], and ecological value for each wetland is presented in Table 5-12 and Appendix 8 presents the detailed ecological value for wetlands identified in the Project Area.

[16] Additionally, there is potential for long-tailed bats and native herpetofauna to utilise wetland habitat in the Project Area.

Table 5-12 Summary of wetlands identified in the Project Area and their ecological value

Wetland ID	Vegetation/Wetland Type[17]	NPS-FM Classification	Potential for TAR Species	Ecological Value	Relevant NOR
WW1-W1*	Exotic Wetland (EW)	Natural inland wetland	Foraging habitat for Australasian bittern. Nesting and foraging habitat for spotless crake.	Moderate	NOR 1
WW1-W2*	Exotic Wetland (EW)	Natural inland wetland	Unlikely to support TAR birds.	Low	NOR 1
WW2-W1^	Exotic Wetland (EW)	Natural inland wetland	Unlikely to support TAR birds.	Low	NOR 2, NOR 8
WW2-W2^	Exotic Wetland (EW)	Natural inland wetland	Unlikely to support TAR birds.	Low	NOR 2
WW3-W1^	Exotic Wetland (EW)	Natural inland wetland	Foraging habitat for Australasian bittern. Nesting and foraging habitat for spotless crake.	Moderate	NOR 3, NOR 6
WW3-W2	Exotic Wetland (EW)	Natural inland wetland	Unlikely to support TAR birds.	Low	NOR 3
WW3-W3^	Exotic Wetland (EW)	Natural inland wetland	Foraging habitat for Australasian bittern. Nesting and foraging habitat for spotless crake.	Moderate	NOR 3

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

Wetland ID	Vegetation/Wetland Type[17]	NPS-FM Classification	Potential for TAR Species	Ecological Value	Relevant NOR
WW3-W4^	Exotic Wetland (EW)	Natural inland wetland	Foraging habitat for Australasian bittern. Nesting and foraging habitat for spotless crake.	Moderate	NOR 3
WW3-W5^	Exotic Wetland (EW)	Natural inland wetland	Foraging habitat for Australasian bittern. Nesting and foraging habitat for spotless crake.	Low	NOR 3
WW4-W1^	Exotic Wetland (EW)	Natural inland wetland	Foraging habitat for Australasian bittern and spotless crake.	Moderate	NOR 4
WW4-W2^	Exotic Wetland (EW)	Natural inland wetland	Foraging habitat for Australasian bittern and spotless crake.	Moderate	NOR 4
WW4-W3^	Exotic Wetland (EW)	Natural inland wetland	Foraging habitat for Australasian bittern and spotless crake.	Low	NOR 4
WW5-W1^	Exotic Wetland (EW)	Natural inland wetland	Unlikely to support TAR birds.	Low	NOR 5
WW5-W2^	Exotic Wetland (EW)	Natural inland wetland	Foraging habitat for Australasian bittern. Nesting and foraging habitat for spotless crake.	Low	NOR 5
WW5-W3^	Exotic Wetland (EW)	Natural inland wetland	Foraging habitat for Australasian bittern.	Low	NOR 5

Wetland ID	Vegetation/Wetland Type[17]	NPS-FM Classification	Potential for TAR Species	Ecological Value	Relevant NOR
			Nesting and foraging habitat for spotless crake.		
WW6-O1*	Open Water (OW)	Artificial wetland	Unlikely to support TAR birds.	Low	NOR 6
WW6-O1*	Open Water (OW)	Artificial wetland	Unlikely to support TAR birds.	Low	NOR 6
WW6-W1	Raupō reedland (WL19)	Natural inland wetland	Foraging habitat for Australasian bittern. Nesting and foraging habitat for spotless crake.	Moderate	NOR 6
WW7-W1^	Exotic Wetland (EW)	Natural inland wetland	Unlikely to support TAR birds.	Low	NOR 7
WW7-W2	Exotic Wetland (EW)	Natural inland wetland	Unlikely to support TAR birds.	Low	NOR 7
WW7-W3	Exotic Wetland (EW)	Natural inland wetland	Foraging habitat for Australasian bittern. Nesting and foraging habitat for spotless crake.	Moderate	NOR 7
WW7-W4	Exotic Wetland (EW)	Natural inland wetland	Unlikely to support TAR birds.	Low	NOR 7
WW7-W5	Exotic Wetland (EW)	Natural inland wetland	Unlikely to support TAR birds.	Low	NOR 7

Wetland ID	Vegetation/Wetland Type[17]	NPS-FM Classification	Potential for TAR Species	Ecological Value	Relevant NOR
WW7-W6	Exotic Wetland (EW)	Natural inland wetland	Unlikely to support TAR birds.	Low	NOR 7
WW7-W7^	Exotic Wetland (EW)	Natural inland wetland	Unlikely to support TAR birds.	Low	NOR 7
WW7-W8^	Exotic Wetland (EW)	Natural inland wetland	Unlikely to support TAR birds.	Low	NOR 7
WW8-W1	Planted Wetland (PLW)	Natural inland wetland	Nesting and foraging habitat for dabchick. Foraging habitat for Australasian bittern. Nesting and foraging habitat for spotless crake.	Moderate	NOR 8
WW8-W2	Exotic Wetland (EW)	Natural inland wetland	Unlikely to support TAR birds.	Low	NOR 8
WW8-W3^	Exotic Wetland (EW)	Natural inland wetland	Unlikely to support TAR birds.	Low	NOR 8
WW8-W4^	Exotic Wetland (EW)	Natural inland wetland	Foraging habitat for Australasian bittern. Nesting and foraging habitat for spotless crake.	Moderate	NOR 8

Notes: ^ = Ecological feature assessed from roadside or adjacent property boundary due to access restrictions. * = Ecological feature assessed at a desktop level due to access restrictions.

6 Warkworth Positive Effects

The following section outlines the positive effects of the proposed alignment for each NOR in relation to specific ecological features (Table 6-1). Refer to Appendix 5 for a map showing the location of the ecological features mentioned in Table 6-1. The statement regarding positive effects assumes standard native planting (in accordance with AT guidelines)[18] will occur on the roadsides as part of the landscape management and that margins and banks of stormwater wetlands will be planted with native vegetation.

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).
- Revegetation of sloping berms, batters, and embankments to connect with retained forest remnant/mature trees.
- The proposed bat mitigation in association with the revegetation and stormwater wetlands mentioned above will have positive ecological outcomes for all native fauna. The proposed bat mitigation associated with Mahurangi River (and associated tributaries) are likely to improve ecological connectivity through the FUZ for other native fauna.

Table 6-1 Summary of positive effects associated with each NOR

Relevant NOR	Ecological Feature	Positive Effect
NOR 2	Mahurangi River (WW2-S3), Mahurangi Tributary (WW2-S2)	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 3	Mahurangi Tributary (WW3-S1, WW3, S2, WW3-S4)	
NOR 5	Mahurangi Tributary (WW5-S1, WW5-2S),	
NOR 6	Mahurangi Tributary (WW6-S2) and raupo wetland (WL19)	
NOR 8	Mahurangi Tributary (WW8-S2)	
NOR 2	Mahurangi River (WW2-S3), Mahurangi Tributary (WW2-S2)	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 improved riparian habitat connectivity.
NOR 3	Mahurangi Tributary (WW3-S1)	
NOR 5	Mahurangi Tributary (WW5-S1, WW5-2S),	
NOR 7	Mahurangi Tributary (WW5-S2), and stream WW7-S2	

[18] Landscape planting will be in line with the Urban and Landscape Design Management Plan (ULDMP).

7 NOR 1: Northern Public Transport Hub and and Western Link - North

This section assesses specific ecological matters relating to NOR 1 – Northern Public Transport and Western Link – North.

7.1 Overview and Description of Works

The Northern PT Hub and Park & Ride is located adjacent to the intersection of State Highway 1 and the proposed new Western Link - North.

The ecological features associated with the PT Hub and Park & Ride footprint is mainly characterised by a south-east facing hillslope bordered by two stream wetland complexes; one to east and one to the south of the footprint. The existing design provides a bridge crossing for both stream/wetland complexes. Terrestrial areas mainly consist of exotic pasture species and gorse. Wetland areas are indicated by exotic grass and sedges.

The Project involves:

- Construction of a PT Hub.
- Park and Ride facilities with approximately 228 car park spaces attached to the PT Hub.
- Construction of the new Western Link - North four-lane urban arterial with cycle lanes and footpaths.

Key features of the proposed Northern PT Hub and Park & Ride include the following:

- Construction of a four-lane urban arterial with cycle lanes and footpaths.
- Likely posted speed of 50 kph, design speed (of which effects will be assessed on) is 60 kph.
- Tie-ins with existing roads, stormwater wetland and culverts.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Vegetation removal.
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

Refer to the AEE for a more detailed description of works to be authorised.

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

Section 7.2 assesses the ecological effects of activities which relate to district plan matters under the AUP:OP.

7.2.1 Construction Effects - Terrestrial Ecology

The following potential construction effects to terrestrial fauna within and adjacent to the NOR (i.e. disturbance effects) have been identified:

- Disturbance and displacement to roosts/nests and individual (existing) long-tailed bats, avifauna, and herpetofauna due to construction activities (noise, light, vibration, 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 potential 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 and the 'existing environment' (i.e., allowing for permitted activities).

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

7.2.1.1 Long-tailed bats

Long-tailed bats may utilise the freshwater habitat associated with NOR 1 (streams WW1-S1 and WW1-S2) for foraging (there is no suitable roosting habitat present in the NOR). 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.

Table 7-1 outlines the effect assessment for long-tailed bats due to construction activities related to noise, light, dust, vibration etc.

Table 7-1 Assessment of ecological effects for long-tailed bats and impact management during construction for NOR 1

Effect Description	Disturbance and displacement to roosts and individual bats (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Negligible** 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 **Low** prior to mitigation. As such no impact management is required.	Same as Baseline. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

7.2.1.2 Avifauna

Noise, vibration, and lighting disturbance caused by construction activities could potentially displace native birds from suitable nesting and foraging habitat associated with NOR 1. Table 7-2 details the specific habitat that birds may be utilising in NOR 1.

Table 7-2 Potential habitat for avifauna in NOR 1

Species	Potential Habitat
Non-TAR birds	• All habitats, excluding Brown Field (BF)
New Zealand pipit	• Exotic Grass (EG) • Exotic Scrub (ES)
Australasian bittern	• Exotic Wetland (EW): WW1-W1
Spotless crake	• Exotic Wetland (EW): WW1-W1

Table 7-3 outlines the effect assessment for birds due to construction activities related to noise, light, dust, vibration etc.

Table 7-3 Assessment of ecological effects for avifauna and impact management during construction for NOR 1

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Non-TAR birds**[19] The magnitude of effect is assessed as **Low** due to the relatively short duration and likely probability of construction related effects. 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. **New Zealand pipit** The magnitude of effect was adjusted to **Moderate** to ensure a mitigation control for New Zealand pipit. This is because New Zealand pipit may require specific management during construction to prevent disturbance to nesting birds in the area. The ecological value of this species is **High**, and the overall level of effect is assessed as **High** prior to mitigation. **As such impact management is required**. **Australasian bittern** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Australasian bittern • Spotless crake **Non-TAR birds** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. 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. **New Zealand pipit** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. 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. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

[19] Effect is a function of value and magnitude, and effects that are Moderate or higher require mitigation. As the ecological value of Non-TAR birds is lower than TAR species, the magnitude of effect can increase without resulting in a Moderate or higher effect. Disturbance effects (at the level of the population) for Non-TAR birds are considered unlikely for Baseline and Likely Future Ecological Environment, therefore no additional mitigation is required in terms of the RMA. However, any harm or disturbance to individuals will need to be managed in accordance with the Wildlife Act 1953 (refer Section 16.1.2). This is applicable to all NORs.

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
	Spotless crake The magnitude of effect was adjusted to **Low** to ensure a mitigation control for spotless crake. This is because spotless crake may require specific management during construction to prevent disturbance to nesting birds in the area. The ecological value of this species is **High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. **As such impact management is required**.	
Impact management and residual level of effect	**New Zealand pipit** An Avifauna Management Plan for New Zealand pipit should be developed to include consideration for: • Pre-construction nesting bird surveys in suitable habitat (EG, ES). • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to minimise disturbance if the breeding season cannot be avoided. The residual impact is assessed as **Low** post mitigation. **Spotless crake** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Pre-construction nesting bird surveys at WW1-W1. • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to protect and buffer nesting birds (if present). The residual impact is assessed as **Very Low** post mitigation.	**Spotless crake** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Pre-construction nesting bird surveys at wetland WW1-W1. • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to protect and buffer nesting birds (if present). The residual impact is assessed as **Very Low** post mitigation.

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
Management of residual effect	N/A	N/A

7.2.1.3 Herpetofauna

Noise, vibration, dust, and lighting disturbance caused by construction activities could potentially displace native herpetofauna from suitable habitat associated with NOR 1. Table 7-4 details the specific habitat that herpetofauna may be utilising in NOR 1.

Table 7-4 Potential habitat for herpetofauna in NOR 1

Species	Potential Habitat
Copper skink	• All habitats where there is suitable understorey, excluding Brown Field (BF)

Table 7-5 outlines the effect assessment for herpetofauna due to construction activities related to noise, light, dust, vibration etc.

Table 7-5 Assessment of ecological effects for herpetofauna and impact management during construction for NOR 1

Effect Description	Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	Likely Future Ecological Environment
Level of effect prior to impact management	**Copper skink** The magnitude of effect is assessed as **Low** due to the local extent and likely probability of construction related effects. The ecological value of this species 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.	**Copper skink** The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of this species 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. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

7.2.2 Operational Effects - Terrestrial Ecology

The following potential operational effects to terrestrial vegetation and terrestrial fauna within and adjacent to the NOR (as they relate to district matters) have been identified:

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

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 and the 'existing environment' (i.e., allowing for permitted activities).

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

7.2.2.1 Long-tailed 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 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.

Table 7-6 outlines the operational effects assessment and impact management for bats.

Table 7-6 Assessment of ecological effects for long-tailed bats and impact management during operation for NOR 1

	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 local extent of disturbance and unlikely probability of disturbance occurring. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Low** for the disturbance of individual bats and roosts. As such no impact management is required.	Same as Baseline. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	The magnitude of effect is assessed as **Negligible** due to the unlikely probability of loss in connectivity occurring. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Low** for loss in connectivity. 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

7.2.2.2 Avifauna

Noise, vibration, and lighting disturbance caused by the presence of the road could potentially disturb and displace native birds from suitable nesting and foraging habitat within and adjacent to NOR 1 (refer to Section 7.2.1.2). Additionally, permanent habitat loss and operational noise, vibration, and light may also affect connectivity in the broader landscape.

Table 7-7 outlines the operational effects assessment and impact management for birds.

Table 7-7 Assessment of ecological effects for avifauna and impact management during operation for NOR 1

	Disturbance and displacement to nests 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**[20] The magnitude of effect is assessed as **Low**, due to the local extent of effect and 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. **New Zealand pipit** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Non-TAR birds • New Zealand pipit • Australasian bittern • Spotless crake Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	**Non-TAR birds** The magnitude of effect is assessed as **Low** due to the local extent of effect and likely probability 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 **Very Low** prior to mitigation. As such no impact management is required. **New Zealand pipit** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road.	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • New Zealand pipit • Australasian bittern • Spotless crake **Non-TAR birds** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability 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 **Very Low** prior to mitigation. As such no impact management is required.

[20] Effect is a function of value and magnitude, and effects that are Moderate or higher require mitigation. As the ecological value of Non-TAR birds is lower than TAR species, the magnitude of effect can increase without resulting in a Moderate or higher effect. Disturbance and connectivity effects (at the level of the population) for Non-TAR birds are considered unlikely for Baseline and Likely Future Ecological Environment, therefore no additional mitigation is required in terms of the RMA. However, any harm or disturbance to individuals will need to be managed in accordance with the Wildlife Act 1953 (refer Section 16.1.2). This is applicable to all NORs.

Effect Description	Disturbance and displacement to nests 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**
	noise, light and vibration from the areas of new road. 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>Australasian bittern</u>** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. 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>Spotless crake</u>** The magnitude of effect was adjusted to **Low** to ensure a		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>Australasian bittern</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. 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>Spotless crake</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road.	Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement to nests 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**
	mitigation control for spotless crake. This is because spotless crake may require specific management during operation to prevent disturbance to nesting birds in the area. The ecological value of these species is **High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. **As such impact management is required**.		The ecological value of this species is **High**, 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>Spotless crake</u>** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Retention of vegetation near wetland habitat, where practicable. • Buffer planting between the road alignment and suitable habitat adjacent to the road (specifically wetland WW1-W1). The residual impact is assessed as **Very Low** post mitigation.		N/A	N/A

Effect Description	Disturbance and displacement to nests 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

7.2.2.3 Herpetofauna

Suitable habitat was identified within the NOR boundary which could potentially support herpetofauna. Native herpetofauna 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.

As the majority of NOR 1 will be new infrastructure, it is likely that there will only be some localised lizard disturbance from noise, vibration and lighting and fragmentation of lizard habitat for a short period during operation.

Table 7-8 outlines the operational effects assessment and impact management for herpetofauna.

Table 7-8 Assessment of ecological effects for herpetofauna and impact management during operation for NOR 1

Effect Description	Disturbance and displacement of existing and future herpetofauna 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	**Copper skink** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of this species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required.	**Copper skink** Same as Baseline. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	**Copper skink** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of this species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required.	**Copper skink** Same as Baseline. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
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

7.2.3 Effects Conclusions

The ecological level of effects assessed as **Moderate** or higher for NOR 1 are described in Sections 7.2.3.1 and 7.2.3.2.

7.2.3.1 Construction Effects

New Zealand pipit

- **High** level of effect for disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust, vibration etc) resulting in changes to the population dynamics during construction for the Baseline only.

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

Spotless crake

- **Moderate** level of effect for disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust, vibration etc) resulting in changes to the population dynamics during construction for the Baseline and Likely Future Ecological Environment.

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

7.2.3.2 Operational Effects

Spotless crake

- **Moderate** level of effect for disturbance and displacement to nests and individuals of (new and existing) due to the presence of the infrastructure (noise, light, vibration etc) resulting in changes to the population dynamics during operation for the Baseline and Likely Future Ecological Environment.

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

8 NOR 2: Woodcocks Road Upgrade (Western Section)

This section assesses specific ecological matters relating to NOR 2 - Woodcocks Road Upgrade (Western Section).

8.1 Overview and Description of Works

The Project proposes the upgrade of Woodcocks Road to a two lane urban arterial cross-section with cycle lanes and footpaths on the corridor.

The NOR 2 corridor features an east-west alignment, crossing the right branch of the Mahurangi River and running parallel to the left branch for approximately 800 m. The riparian features associated with the Mahurangi River north of Woodcocks Road constitutes a terrestrial SEA (SEA_T_6676). The SEA is relatively consistent with a Kauri, podocarp broadleaved forest type. However, the portion of the SEA north of the Mahurangi River (left branch) crossing is more consistent with a native and exotic treeland mix. To the south of the crossing the riparian features are generally consistent with kānuka scrub forest. Other ecological features include a permanent stream crossing on the western side of the NOR (a tributary of the Mahurangi River (right branch)), an intermittent stream/wetland crossing north-east of the Mason and Woodcock junction and a small depression wetland on the corner of Wylie and Woodcocks Roads.

Key features of the proposed new corridor include the following:

- Upgrading the corridor to a two-lane urban arterial with walking and cycling facilities on the corridor.
- Likely posted speed of 50 kph, design speed (of which effects will be assessed on) is 60 kph.
- Tie-ins with existing roads, stormwater wetland and culverts.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Vegetation removal along the existing road corridor.
- Upgraded crossing over the Mahurangi River.
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

Refer to the AEE for a detailed description of works to be authorised.

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

Section 8.2 assesses the ecological effects of activities which relate to district plan matters under the AUP:OP.

8.2.1 Construction Effects - Terrestrial Ecology

The following potential construction effects to terrestrial fauna within and adjacent to the NOR (i.e. disturbance effects) have been identified:

- Disturbance and displacement to roosts/nests and individual (existing) long-tailed bats, avifauna, and herpetofauna due to construction activities (noise, light, vibration, 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 potential 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 and the 'existing environment' (i.e., allowing for permitted activities).

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

8.2.1.1 Long-tailed bats

Bats may utilise the terrestrial and freshwater habitats associated with NOR 2 for roosting or foraging. Specifically, streams WW2-S1, WW2-S2, and WW2-S3, and areas of Mixed Native/Exotic Treeland (TL.2), Exotic-Dominated Treeland (TL.3), and Kauri, Podocarp, Broadleaved Forest (WF11). 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.

Table 7-1 outlines the effect assessment for long-tailed bats due to construction activities related to noise, light, dust, vibration etc.

Table 8-1 Assessment of ecological effects for long-tailed bats and impact management during construction for NOR 2

Effect Description	Disturbance and displacement to roosts and individual bats (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	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 and likely probability of the effect occurring. 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. Additionally, some areas of the NOR may also provide bat habitat if construction occurs prior to urbanisation. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
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 TL.2, TL.3, and WF11 habitat. • Lighting design to reduce light levels and spill from construction areas. • Restriction of nightworks around TL.2, TL.3, and WF11 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.	Same as Baseline.
Management of residual effect	N/A	N/A

8.2.1.2 Avifauna

Noise, vibration, and lighting disturbance caused by construction activities could potentially displace native birds from suitable nesting and foraging habitat associated with NOR 2. Table 8-2 details the specific habitat that birds may be utilising in NOR 2.

Table 8-2 Potential habitat for avifauna in NOR 2

Species	Potential Habitat
Non-TAR birds	• All habitats, excluding Brown Field (BF)
New Zealand pipit	• Exotic Grass (EG) • Exotic Scrub (ES)
North Island kākā	• Mixed Native/Exotic Treeland (TL.2) • Exotic-Dominated Treeland (TL.3) • Kauri, Podocarp, Broadleaved Forest (WF11)
Long-tailed cuckoo	• Mixed Native/Exotic Treeland (TL.2) • Exotic-Dominated Treeland (TL.3) • Kauri, Podocarp, Broadleaved Forest (WF11)
Black shag	• Permanent streams and their associated tributaries: - WW2-S1 - WW2-S2 - WW2-S3
Little black shag	• Permanent streams and their associated tributaries: - WW2-S1 - WW2-S2 - WW2-S3
Little shag	• Permanent streams and their associated tributaries: - WW2-S1 - WW2-S2 - WW2-S3
Pied shag	• Permanent streams and their associated tributaries: - WW2-S1 - WW2-S2 - WW2-S3

Table 7-3 outlines the effect assessment for birds due to construction activities related to noise, light, dust, vibration etc,

Table 8-3 Assessment of ecological effects for avifauna and impact management during construction for NOR 2

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Non-TAR birds** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. 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. **New Zealand pipit** The magnitude of effect was adjusted to **Moderate** to ensure a mitigation control for New Zealand pipit. This is because New Zealand pipit may require specific management during construction to prevent disturbance to nesting birds in the area. The ecological value of this species is **High**, and the overall level of effect is assessed as **High** prior to mitigation. **As such impact management is required**. **Long-tailed cuckoo** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **North Island kākā**	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Non-TAR birds • Long-tailed cuckoo • North Island kākā • Black shag • Little black shag • Pied shag • Little shag **New Zealand pipit** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
	The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Black shag, little black shag, pied shag, little shag** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **High**, 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	**New Zealand pipit** An Avifauna Management Plan for New Zealand pipit should be developed to include consideration for: • Pre-construction nesting bird surveys in suitable habitat (EG, ES). • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to minimise disturbance if the breeding season cannot be avoided. The residual impact is assessed as **Low** post mitigation.	N/A
Management of residual effect	N/A	N/A

8.2.1.3 Herpetofauna

Noise, vibration, and lighting disturbance caused by construction activities could potentially displace native herpetofauna from suitable habitat associated with NOR 2. Table 8-4 details the specific habitat that herpetofauna may be utilising in NOR 2.

Table 8-4 Potential habitat for herpetofauna in NOR 2

Species	Potential Habitat
Copper skink	• All habitats where there is suitable understorey, excluding Brown Field (BF)
Ornate skink	• All habitats contiguous to native forest or scrub and where there is suitable understorey, excluding Brown Field (BF)
Elegant gecko	• Kauri, Podocarp, Broadleaved Forest (WF11)
Forest gecko	• Kauri, Podocarp, Broadleaved Forest (WF11)
Pacific gecko	• Kauri, Podocarp, Broadleaved Forest (WF11)

Table 7-3 outlines the effect assessment for herpetofauna due to construction activities related to noise, light, dust, vibration etc.

Table 8-5 Assessment of ecological effects for herpetofauna and impact management during construction for NOR 2

Effect Description	Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Copper skink, ornate skink** The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of these species 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. **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Low** due to the local extent and likely probability of construction related effects. The ecological value of these species 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. **Pacific gecko** The magnitude of effect is assessed as **Low** due to the local extent and likely probability of construction related effects. The ecological value of this species is assessed as **Moderate**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required.	The magnitude of effect and overall level of effect is considered the same as Baseline for the following herpetofauna species: • Copper skink • Ornate skink **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of these species 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. **Pacific gecko** The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of this species is assessed as **Moderate**, 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. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
Impact management and residual level of effect	N/A	N/A

Effect Description	Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	Likely Future Ecological Environment
Management of residual effect	N/A	N/A

8.2.2 Operational Effects - Terrestrial Ecology

Refer to Section 7.2.2.

8.2.2.1 Long-tailed 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 roosts). Lighting spillage from street lighting could also disturb commuting and foraging bats at night and adversely affect insect prey populations.

Table 8-6 outlines the operational effects assessment and impact management for bats.

Table 8-6 Assessment of ecological effects for long-tailed bats and impact management during operation for NOR 2

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 relatively local extent of disturbance and likely probability of disturbance occurring. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Moderate** for the disturbance of individual bats and roosts. **As such impact management is required**.	Same as Baseline due to the retention of vegetation within riparian corridors. Additionally, some areas of the NOR may also provide bat habitat if construction occurs prior to urbanisation. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	The magnitude of effect is assessed as **Moderate** due to the likely probability of loss in connectivity. 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 due to the retention of vegetation within riparian corridors. Additionally, some areas of the NOR may also provide bat habitat if construction occurs prior to urbanisation. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
Impact management and residual level of effect	A Bat Management Plan (BMP) should be developed to include consideration for: • Early-stage/mature buffer planting, late-stage buffer planting, and retention of existing mature trees between	Same as Baseline.	A BMP should be developed with consideration to the indicative bat mitigation in Appendix 12 – [22]. 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	Same as Baseline.

[22] As verified by Dr Ian Davidson-Watts of Davidson-Watts Ecology (Pacific) Limited.

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[21]. • 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.		early planting[23] (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 **Low** post mitigation.	

[21] This may be in addition to the buffer planting proposed in Appendix 12 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
Management of residual effect	N/A	N/A	N/A	N/A

8.2.2.2 Avifauna

Noise, vibration, and lighting disturbance caused by the presence of the road could potentially disturb and displace native birds from suitable nesting and foraging habitat within and adjacent to NOR 2 (refer to Section 8.2.1.2). Additionally, permanent habitat loss and operational noise, vibration, and light may also affect connectivity in the broader landscape.

Table 8-7 outlines the operational effects assessment and impact management for birds.

Table 8-7 Assessment of ecological effects for avifauna and impact management during operation for NOR 2

	Disturbance and displacement to nests 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 local extent of effect and unlikely 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. **New Zealand pipit** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. The ecological value of these species is **High**, and the overall	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Non-TAR birds • New Zealand pipit • Long-tailed cuckoo • North Island kākā • Black shag • Little black shag • Pied shag • Little shag Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	**Non-TAR birds** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability 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 **Very Low** prior to mitigation. As such no impact management is required. **New Zealand pipit** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation.	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Non-TAR birds • New Zealand pipit • Long-tailed cuckoo • North Island kākā • Black shag • Little black shag • Pied shag • Little shag Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement to nests 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 is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Long-tailed cuckoo** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. 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. **North Island kākā** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road.		As such no impact management is required. **Long-tailed cuckoo** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. 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. **North Island kākā** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation.	

Effect Description	Disturbance and displacement to nests 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. **<u>Black shag, little black shag, pied shag, little shag</u>** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. 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.		As such no impact management is required. **<u>Black shag, little black shag, pied shag, little shag</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of this species is **High**, 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	N/A	N/A	N/A	N/A

Effect Description	Disturbance and displacement to nests 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

8.2.2.3 Herpetofauna

Suitable habitat was identified within the NOR boundary which could potentially support herpetofauna. Native herpetofauna 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.

As the majority of NOR 2 is an upgrade of an existing road, it is not expected to result in the additional fragmentation of herpetofauna habitat. Similarly, resident (existing and future) herpetofauna are likely to be habituated to disturbance such as noise, vibration, and lighting and no additional effect on herpetofauna is expected.

Table 8-8 outlines the operational effects assessment and impact management for herpetofauna.

Table 8-8 Assessment of ecological effects for herpetofauna and impact management during operation for NOR 2

Effect Description	Disturbance and displacement of existing and future herpetofauna 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	**Copper skink, ornate skink** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Elegant gecko, forest gecko** 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 these species 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.	The magnitude of effect and overall level of effect is considered the same as Baseline for the following herpetofauna species: • Copper skink • Ornate skink **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Pacific gecko** The magnitude of effect is assessed as **Negligible** due to the unlikely	**Copper skink, ornate skink** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the	The magnitude of effect and overall level of effect is considered the same as Baseline for the following herpetofauna species: • Copper skink • Ornate skink • Elegant gecko • Forest gecko • Pacific gecko Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement of existing and future herpetofauna 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**
	As such no impact management is required. **<u>Pacific gecko</u>** 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 this species is assessed to be **Moderate**, 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.	probability and relatively local extent of disturbance if the effect occurs. The ecological value of this species is assessed to be **Moderate**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NoR.	presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Pacific gecko</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of this species is assessed to be **Moderate**, and the overall level of effect due to the presence of the road 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	N/A	N/A

Effect Description	Disturbance and displacement of existing and future herpetofauna 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**
Management of residual effect	N/A	N/A	N/A	N/A

8.2.3 Effects Conclusions

The ecological level of effects assessed as **Moderate** or higher for NOR 2 are described in Sections 8.2.3.1 and 8.2.3.2.

8.2.3.1 Construction Effects

Long-tailed bats

- **Moderate** level of for disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust, vibration etc) resulting in changes to the population dynamics during construction for the Baseline and Likely Future Ecological Environment.

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

New Zealand pipit

- **High** level of effect for disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust, vibration etc) resulting in changes to the population dynamics during construction for the Baseline only.

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

8.2.3.2 Operational Effects

Long-tailed bats

- **High** level of effect for the loss in connectivity due to the presence of the road resulting in changes to the population dynamics during operation for the Baseline and Likely Future Ecological Environment.
- **Moderate** level of effect for disturbance and displacement to roosts and individuals of (new and existing) due to the presence of the infrastructure (noise, light, vibration etc) resulting in changes to the population dynamics during operation for the Baseline and Likely Future Ecological Environment.

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

9 NOR 3: State Highway 1 Upgrade - South

This This section assesses specific ecological matters relating to NOR 3 - State Highway 1 Upgrade - South.

9.1 Overview and Description of Works

The Project proposes the upgrade of State Highway 1 – South to a two lane urban arterial cross-section with cycle lanes and footpaths on the corridor.

Ecological features associated with NOR 3 mostly include exotic roadside planting, exotic shelterbelt, exotic pasture, several stream crossings (west draining tributaries of the Mahurangi River) and exotic wetlands (notably to the south-west of the State Highway and McKinney junction, as well as to the west of the State highway opposite the driving range).

Key features of the proposed corridor upgrade include the following:

- Upgrading the corridor to a two-lane urban arterial with walking and cycling facilities on the corridor.
- Likely posted speed of 50 kph, design speed (of which effects will be assessed on) is 60 kph.
- Tie-ins with existing roads, stormwater wetland and culverts.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Vegetation removal along the existing road corridor
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

Refer to the AEE for a more detailed description of works to be authorised.

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

Section 9.2 assesses the ecological effects of activities which relate to district plan matters under the AUP:OP.

9.2.1 Construction Effects - Terrestrial Ecology

Refer to Section 7.2.1.

9.2.1.1 Long-tailed bats

Long-tailed bats may utilise the freshwater habitat (all permanent streams) associated with NOR 3 for foraging, and suitable foraging and roosting terrestrial habitat is limited to isolated stands/single trees of Native-Dominated Treeland (TL.1), Mixed Native/Exotic Treeland (TL.2), Exotic-Dominated Treeland (TL.3), and Kānuka Scrub/Forest (VS2) that are adjacent to State Highway 1. 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.

Table 9-1 outlines the effect assessment for long-tailed bats due to construction activities related to noise, light, dust, vibration etc.

Table 9-1 Assessment of ecological effects for long-tailed bats and impact management during construction for NOR 3

Effect Description	Disturbance and displacement to roosts and individual bats (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability 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 due to the retention of vegetation within riparian corridors. Additionally, some areas of the NOR may also provide bat habitat if construction occurs prior to urbanisation. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

9.2.1.2 Avifauna

Noise, vibration, and lighting disturbance caused by construction activities could potentially displace native birds from suitable nesting and foraging habitat associated with NOR 3. Table 9-2 details the specific habitat that birds may be utilising in NOR 3.

Table 9-2 Potential habitat for avifauna in NOR 3

Species	Potential Habitat
Non-TAR birds	• All habitats, excluding Brown Field (BF)
New Zealand pipit	• Exotic Grass (EG) • Exotic Scrub (ES)
Australasian bittern	• Exotic Wetland (EW): - WW3-W1 - WW3-W3 - WW3-W4 - WW3-W5
Spotless crake	• Exotic Wetland (EW): - WW3-W1 - WW3-W3 - WW3-W4 - WW3-W5

Table 9-3 Assessment of ecological effects for avifauna and impact management during construction for NOR outlines the effect assessment for birds due to construction activities related to noise, light, dust, vibration etc.

Table 9-3 Assessment of ecological effects for avifauna and impact management during construction for NOR 3

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Non-TAR birds** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. 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. **New Zealand pipit** The magnitude of effect was adjusted to **Moderate** to ensure a mitigation control for New Zealand pipit. This is because New Zealand pipit may require specific management during construction to prevent disturbance to nesting birds in the area. The ecological value of this species is **High**, and the overall level of effect is assessed as **High** prior to mitigation. **As such impact management is required**. **Australasian bittern** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Spotless crake** The magnitude of effect was adjusted to **Low** to ensure a mitigation control for spotless crake. This is because spotless crake may require specific	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Non-TAR birds • Australasian bittern • Spotless crake **New Zealand pipit** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. 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. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
	management during construction to prevent disturbance to nesting birds in the area. The ecological value of this species is **High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. **As such impact management is required**.	
Impact management and residual level of effect	**New Zealand pipit** An Avifauna Management Plan for New Zealand pipit should be developed to include consideration for: • Pre-construction nesting bird surveys in suitable habitat (EG, ES). • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to minimise disturbance if the breeding season cannot be avoided. The residual impact is assessed as **Low** post mitigation. **Spotless crake** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Pre-construction nesting bird surveys at wetlands WW3-W1, WW3-W3, WW3-W4, and WW3-W5. • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to protect and buffer nesting birds (if present). The residual impact is assessed as **Very Low** post mitigation.	**Spotless crake** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Pre-construction nesting bird surveys at wetlands WW3-W1, WW3-W3, WW3-W4, and WW3-W5. • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to protect and buffer nesting birds (if present). The residual impact is assessed as **Very Low** post mitigation.

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	Likely Future Ecological Environment
Management of residual effect	N/A	N/A

9.2.1.3 Herpetofauna

Noise, vibration, and lighting disturbance caused by construction activities could potentially displace native herpetofauna from suitable habitat associated with NOR 3. Table 9-4 details the specific habitat that herpetofauna may be utilising in NOR 3.

Table 9-4 Potential habitat for herpetofauna in NOR 3

Species	Potential Habitat
Copper skink	• All habitats where there is suitable understorey, excluding Brown Field (BF)

Table 9-5 outlines the effect assessment for herpetofauna due to construction activities related to noise, light, dust, vibration etc.

Table 9-5 Assessment of ecological effects for herpetofauna and impact management during construction for NOR 3

Effect Description	Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	Likely Future Ecological Environment
Level of effect prior to impact management	**Copper skink** The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of this species 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.	**Copper skink** Same as Baseline. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

9.2.2 Operational Effects - Terrestrial Ecology

Refer to Section 7.2.2.

9.2.2.1 Long-tailed 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 roosts). Lighting spillage from street lighting could also disturb commuting and foraging bats at night and adversely affect insect prey populations.

Table 9-6 outlines the operational effects assessment and impact management for bats.

Table 9-6 Assessment of ecological effects for long-tailed bats and impact management during operation for NOR 3

	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 relatively local extent of disturbance and unlikely probability of disturbance occurring. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Very Low** for the disturbance of individual bats and roosts. As such no impact management is required.	Same as Baseline due to the retention of vegetation within riparian corridors. Additionally, some areas of the NOR may also provide bat habitat if construction occurs prior to urbanisation. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	The magnitude of effect is assessed as **Low** due to the unlikely probability of loss in connectivity. 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 due to the retention of vegetation within riparian corridors. Additionally, some areas of the NOR may also provide bat habitat if construction occurs prior to urbanisation. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
Impact management and residual level of effect	N/A	N/A	A BMP should be developed with consideration to the indicative bat mitigation in Appendix 12 – Indicative Mitigation Areas [24]. 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,	Same as Baseline.

[24] As verified by Dr Ian Davidson-Watts of Davidson-Watts Ecology (Pacific) Limited.

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 well as indicating areas where early planting[25] (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

9.2.2.2 Avifauna

Noise, vibration, and lighting disturbance caused by the presence of the road could potentially disturb and displace native birds from suitable nesting and foraging habitat within and adjacent to NOR 3 (refer to Section 9.2.1.2). Additionally, permanent habitat loss and operational noise, vibration, and light may also affect connectivity in the broader landscape.

Table 9-7 outlines the operational effects assessment and impact management for birds.

Table 9-7 Assessment of ecological effects for avifauna and impact management during operation for NOR 3

	Disturbance and displacement to nests 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 local extent of effect and unlikely 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. **New Zealand pipit** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. The ecological value of these species is **High**, and the overall	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Non-TAR birds • New Zealand pipit • Australasian bittern • Spotless crake Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	**Non-TAR birds** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability 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 **Very Low** prior to mitigation. As such no impact management is required. **New Zealand pipit** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation.	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Non-TAR birds • New Zealand pipit • Australasian bittern • Spotless crake Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement to nests 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 is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Australasian bittern</u>** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. 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>Spotless crake</u>** The magnitude of effect was adjusted to **Low** to ensure a mitigation control for spotless crake. This is because spotless crake may require specific management during		As such no impact management is required. **<u>Australasian bittern</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. 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>Spotless crake</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation.	

Effect Description	Disturbance and displacement to nests 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**
	operation to prevent disturbance to nesting birds in the area. The ecological value of these species is **High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. **As such impact management is required**.		As such no impact management is required.	
Impact management and residual level of effect	**<u>Spotless crake</u>** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Retention of vegetation near wetland habitat, where practicable. • Buffer planting between the road alignment and suitable habitat adjacent to the road (specifically wetlands WW3-W1, WW3-W3, and WW3-W5). The residual impact is assessed as **Very Low** post mitigation.	Same as Baseline.	N/A	N/A

Effect Description	Disturbance and displacement to nests 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

9.2.2.3 Herpetofauna

Suitable habitat was identified within the NOR boundary which could potentially support herpetofauna. Native herpetofauna 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.

As the majority of NOR 3 is an upgrade of an existing road, it is not expected to result in the additional fragmentation of herpetofauna habitat. Similarly, resident (existing and future) herpetofauna are likely to be habituated to disturbance such as noise, vibration, and lighting and no additional effect on herpetofauna is expected.

Table 9-8 outlines the operational effects assessment and impact management for herpetofauna.

Table 9-8 Assessment of ecological effects for herpetofauna and impact management during operation for NOR 3

Effect Description	Disturbance and displacement of existing and future herpetofauna 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	**Copper skink** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of this species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required.	**Copper skink** Same as Baseline. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	**Copper skink** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of this species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required.	**Copper skink** Same as Baseline. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
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

9.2.3 Effects Conclusions

The ecological level of effects assessed as **Moderate** or higher for NOR 3 are described in Sections 9.2.3.1 and 9.2.3.2.

9.2.3.1 Construction Effects

New Zealand pipit

- **High** level of effect for disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust, vibration etc) resulting in changes to the population dynamics during construction for the Baseline only.

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

Spotless crake

- **Moderate** level of effect for disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust, vibration etc) resulting in changes to the population dynamics during construction for the Baseline and Likely Future Ecological Environment.

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

9.2.3.2 Operational Effects

Long-tailed bats

- **Moderate** level of effect for the loss in connectivity due to the presence of the road resulting in changes to the population dynamics during operation for the Baseline and Likely Future Ecological Environment.

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

Spotless crake

- **Moderate** level of effect for disturbance and displacement to nests and individuals of (new and existing) due to the presence of the infrastructure (noise, light, vibration etc) resulting in changes to the population dynamics during operation for the Baseline and Likely Future Ecological Environment.

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

10 NOR 4: Matakana Road Upgrade

This section assesses specific ecological matters relating to NOR 4 - Matakana Road Upgrade.

10.1 Overview and Description of Works

The Project proposes the upgrade of Matakana Road to a two lane urban arterial cross-section with cycle lanes and footpaths the corridor.

NOR 4 follows a north south alignment and runs along a watershed of several small catchments draining into the Mahurangi River. The northern section of the NOR is associated with several headwater seep wetlands and intermittent streams in a pasture setting. The central and southern parts of the NOR is associated with a peri-urban landscape, characterised by road side planting and treelands (exotic and native). The southernmost section is flanked by two SEAs; SEA_T_5440 to the east and SEA_T_2260 to the west.

Key features of the proposed upgrade include the following:

- Upgrading Matakana Road to include cycle lanes and footpaths on the corridor.
- Tie-ins with existing roads, stormwater dry ponds, wetlands, and culverts.
- Likely posted speed of 50 kph, design speed (of which effects will be assessed on) is 60 kph.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities.
- Vegetation removal along the existing road corridor.
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

Refer to the AEE for a more detailed description of works to be authorised.

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

Section 10.2 assesses the ecological effects of activities which relate to district plan matters under the AUP:OP.

10.2.1 Construction Effects - Terrestrial Ecology

Refer to Section 8.2.1.

10.2.1.1Long-tailed bats

Bats may utilise the freshwater habitats located adjacent to NOR 4 (WW5-S1 and the permanent stream located in SEA_T_2260 south of the NOR) for foraging. Additionally, bats may utilise the terrestrial habitats for foraging and roosting, specifically areas of Kahikatea Forest (MF4), Native-Dominated Treeland (TL.1), Mixed Native/Exotic Treeland (TL.2), Exotic-Dominated Treeland (TL.3), Kānuka Scrub/Forest (VS2), and Tawa, Kohekohe, Rewarewa, Hīnau, Podocarp Forest (WF13). 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.

Table 10-1 outlines the effect assessment for long-tailed bats due to construction activities related to noise, light, dust, vibration etc.

Table 10-1 Assessment of ecological effects for long-tailed bats and impact management during construction for NOR 4

Effect Description	Disturbance and displacement to roosts and individual bats (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	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 and likely probability 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. Vegetation associated with adjacent Significant Ecological Areas is also anticipated to remain in the Likely Future Ecological Environment, Additionally, some areas of the NOR may also provide bat habitat if construction occurs prior to urbanisation. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
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 MF4, TL.1, TL.2, TL,3 VS2, and WF13 habitat. • Lighting design to reduce light levels and spill from construction areas. • Restriction of nightworks around MF4, TL.1, TL.2, TL,3 VS2, and WF13 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.	Same as Baseline.
Management of residual effect	N/A	N/A

10.2.1.2Avifauna

Noise, vibration, and lighting disturbance caused by construction activities could potentially displace native birds from suitable nesting and foraging habitat associated with NOR 4. Table 10-2 details the specific habitat that birds may be utilising in NOR 4.

Table 10-2 Potential habitat for avifauna in NOR 4

Species	Potential Habitat
Non-TAR birds	• All habitats, excluding Brown Field (BF)
New Zealand pipit	• Exotic Grass (EG)
North Island kākā	• Kahikatea Forest (MF4) • Native-Dominated Treeland (TL.1) • Mixed Native/Exotic Treeland (TL.2) • Exotic-Dominated Treeland (TL.3) • Kānuka Scrub/Forest (VS2) • Tawa, Kohekohe, Rewarewa, Hīnau, Podocarp Forest (WF13)
Long-tailed cuckoo	• Kahikatea Forest (MF4) • Native-Dominated Treeland (TL.1) • Mixed Native/Exotic Treeland (TL.2) • Exotic-Dominated Treeland (TL.3) • Kānuka Scrub/Forest (VS2) • Tawa, Kohekohe, Rewarewa, Hīnau, Podocarp Forest (WF13)
Australasian bittern	• Exotic Wetland (EW): - WW4-W1 - WW4-W2 - WW4-W3
Spotless crake	• Exotic Wetland (EW): - WW4-W1 - WW4-W2 - WW4-W3

Table 10-3 Assessment of ecological effects for avifauna and impact management during construction for NOR outlines the effect assessment for birds due to construction activities related to noise, light, dust, vibration etc.

Table 10-3 Assessment of ecological effects for avifauna and impact management during construction for NOR 4

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Non-TAR birds** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. 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. **New Zealand pipit** The magnitude of effect was adjusted to **Moderate** to ensure a mitigation control for New Zealand pipit. This is because New Zealand pipit may require specific management during construction to prevent disturbance to nesting birds in the area. The ecological value of this species is **High**, and the overall level of effect is assessed as **High** prior to mitigation. **As such impact management is required**. **Long-tailed cuckoo** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **North Island kākā**	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Non-TAR birds • Long-tailed cuckoo • North Island kākā • Australasian bittern • Spotless crake **New Zealand pipit** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
	The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Australasian bittern** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Spotless crake** The magnitude of effect was adjusted to **Low** to ensure a mitigation control for spotless crake. This is because spotless crake may require specific management during construction to prevent disturbance to nesting birds in the area. The ecological value of this species is **High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. **As such impact management is required**.	
Impact management and residual level of effect	**New Zealand pipit** An Avifauna Management Plan for New Zealand pipit should be developed to include consideration for: • Pre-construction nesting bird surveys in suitable habitat (EG, ES). • Timing consideration for construction works (avoiding breeding season, where practicable).	**Spotless crake** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Pre-construction nesting bird surveys at wetlands WW4-W1, WW4-W2, and WW4-W3.

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
	• Methods to minimise disturbance if the breeding season cannot be avoided. The residual impact is assessed as **Low** post mitigation. **<u>Spotless crake</u>** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Pre-construction nesting bird surveys at wetlands WW4-W1, WW4-W2, and WW4-W3. • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to protect and buffer nesting birds (if present). The residual impact is assessed as **Very Low** post mitigation.	• Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to protect and buffer nesting birds (if present). The residual impact is assessed as **Very Low** post mitigation.
Management of residual effect	N/A	N/A

10.2.1.3Herpetofauna

Noise, vibration, and lighting disturbance caused by construction activities could potentially displace native herpetofauna from suitable habitat associated with NOR 4. Table 10-4 details the specific habitat that herpetofauna may be utilising in NOR 4.

Table 10-4 Potential habitat for herpetofauna in NOR 4

Species	Potential Habitat
Copper skink	• All habitats where there is suitable understorey, excluding Brown Field (BF)
Ornate skink	• All habitats contiguous to native forest or scrub and where there is suitable understorey, excluding Brown Field (BF)
Elegant gecko	• Kahikatea Forest (MF4) • Kānuka Scrub/Forest (VS2) • Tawa, Kohekohe, Rewarewa, Hīnau, Podocarp Forest (WF13)
Forest gecko	• Kahikatea Forest (MF4) • Kānuka Scrub/Forest (VS2) • Tawa, Kohekohe, Rewarewa, Hīnau, Podocarp Forest (WF13)
Pacific gecko	• Kahikatea Forest (MF4) • Kānuka Scrub/Forest (VS2) • Tawa, Kohekohe, Rewarewa, Hīnau, Podocarp Forest (WF13)
Hochstetter's frog	• Permanent streams: - WW5-S1 (located east of NOR 4) - Permanent stream in SEA_T_2260 (located south of NOR 4)

Table 10-5 Assessment of ecological effects for herpetofauna and impact management during construction for NOR outlines the effect assessment for herpetofauna due to construction activities related to noise, light, dust, vibration etc.

Table 10-5 Assessment of ecological effects for herpetofauna and impact management during construction for NOR 4

Effect Description	Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Copper skink, ornate skink** The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of these species 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. **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Low** due to the local extent and likely probability of construction related effects. The ecological value of these species 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. **Pacific gecko** The magnitude of effect is assessed as **Low** due to the local extent and likely probability of construction related effects. The ecological value of this species is assessed as **Moderate**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required. **Hochstetter's frog**	The magnitude of effect and overall level of effect is considered the same as Baseline for the following herpetofauna species: • Copper skink • Ornate skink • Hochstetter's frog **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of these species 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. **Pacific gecko** The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of this species is assessed as **Moderate**, 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. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
	The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of this species 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.	
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

10.2.2 Operational Effects - Terrestrial Ecology

Refer to Section 7.2.2.

10.2.2.1Long-tailed 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 roosts). Lighting spillage from street lighting could also disturb commuting and foraging bats at night and adversely affect insect prey populations.

Table 10-6 outlines the operational effects assessment and impact management for bats.

Table 10-6 Assessment of ecological effects for long-tailed bats and impact management during operation for NOR 4

	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 relatively local extent of disturbance and unlikely probability of disturbance occurring. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Low** for the disturbance of individual bats and roosts. As such no impact management is required.	Same as Baseline due to the retention of vegetation within riparian corridors. Vegetation associated with adjacent Significant Ecological Areas is also anticipated to remain in the Likely Future Ecological Environment. Additionally, some areas of the NOR may also provide bat habitat if construction occurs prior to urbanisation. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	The magnitude of effect is assessed as **Low** due to the likely probability of loss in connectivity. 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 due to the retention of vegetation within riparian corridors. Vegetation associated with adjacent Significant Ecological Areas is also anticipated to remain in the Likely Future Ecological Environment. Additionally, some areas of the NOR may also provide bat habitat if construction occurs prior to urbanisation. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
Impact management and residual level of effect	N/A	N/A	A BMP should be developed with consideration to the indicative bat mitigation in Appendix 12 – Indicative Mitigation Areas[26]. The map indicates the location and extent of measures to mitigate	Same as Baseline.

[26] As verified by Dr Ian Davidson-Watts of Davidson-Watts Ecology (Pacific) Limited in Appendix 12 – Indicative Mitigation Areas

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
			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[27] (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	

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 **Very Low** post mitigation.	
Management of residual effect	N/A	N/A	N/A	N/A

10.2.2.2Avifauna

Noise, vibration, and lighting disturbance caused by the presence of the road could potentially disturb and displace native birds from suitable nesting and foraging habitat within and adjacent to NOR 4 (refer to Section 10.2.1.2). Additionally, permanent habitat loss and operational noise, vibration, and light may also affect connectivity in the broader landscape.

Table 10-7 outlines the operational effects assessment and impact management for birds.

Table 10-7 Assessment of ecological effects for avifauna and impact management during operation for NOR 4

	Disturbance and displacement to nests 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 local extent of effect and unlikely 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. **New Zealand pipit** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. The ecological value of these species is **High**, and the overall	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Non-TAR birds • New Zealand pipit • Long-tailed cuckoo • North Island kākā • Australasian bittern • Spotless crake Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	**Non-TAR birds** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability 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 **Very Low** prior to mitigation. As such no impact management is required. **New Zealand pipit** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation.	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Non-TAR birds • New Zealand pipit • Long-tailed cuckoo • North Island kākā • Australasian bittern • Spotless crake Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement to nests 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 is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Long-tailed cuckoo** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. 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. **North Island kākā** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road.		As such no impact management is required. **Long-tailed cuckoo** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. 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. **North Island kākā** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation.	

Effect Description	Disturbance and displacement to nests 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. **<u>Australasian bittern</u>** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. 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>Spotless crake</u>** The magnitude of effect was adjusted to **Low** to ensure a mitigation control for spotless crake. This is because spotless crake may require specific management during		As such no impact management is required. **<u>Australasian bittern</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. 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>Spotless crake</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation.	

Effect Description	Disturbance and displacement to nests 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**
	operation to prevent disturbance to nesting birds in the area. The ecological value of these species is **High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. **As such impact management is required**.		As such no impact management is required.	
Impact management and residual level of effect	**<u>Spotless crake</u>** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Retention of vegetation near wetland habitat, where practicable. • Buffer planting between the road alignment and suitable habitat adjacent to the road (specifically wetlands WW4-W1 and WW4-W2). The residual impact is assessed as **Very Low** post mitigation.	Same as Baseline.	N/A	N/A

Effect Description	Disturbance and displacement to nests 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

10.2.2.3 Herpetofauna

Suitable habitat was identified within the NOR boundary which could potentially support herpetofauna. Native herpetofauna 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.

As the majority of NOR 4 is an upgrade of an existing road, it is not expected to result in the additional fragmentation of herpetofauna habitat. Similarly, resident (existing and future) herpetofauna are likely to be habituated to disturbance such as noise, vibration, and lighting and no additional effect on herpetofauna is expected.

Table 10-8 outlines the operational effects assessment and impact management for herpetofauna.

Table 10-8 Assessment of ecological effects for herpetofauna and impact management during operation for NOR 4

Effect Description	Disturbance and displacement of existing and future herpetofauna 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	**Copper skink, ornate skink** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation.	The magnitude of effect and overall level of effect is considered the same as Baseline for the following herpetofauna species: • Copper skink • Ornate skink • Elegant gecko • Forest gecko • Pacific gecko • Hochstetter's frog Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	**Copper skink, ornate skink** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the	The magnitude of effect and overall level of effect is considered the same as Baseline for the following herpetofauna species: • Copper skink • Ornate skink • Elegant gecko • Forest gecko • Pacific gecko • Hochstetter's frog Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement of existing and future herpetofauna 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**
	As such no impact management is required. **<u>Pacific gecko</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of this species is assessed to be **Moderate**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Hochstetter's frog</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of this species is assessed to be **High**, and the overall level of effect due to the		presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Pacific gecko</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of this species is assessed to be **Moderate**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Hochstetter's frog</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs.	

Effect Description	Disturbance and displacement of existing and future herpetofauna 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**
	presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required.		The ecological value of this species is assessed to be **High**, and the overall level of effect due to the presence of the road 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	N/A	N/A
Management of residual effect	N/A	N/A	N/A	N/A

10.2.3 Effects Conclusions

The ecological level of effects assessed as **Moderate** or higher for NOR 4 are described in Sections 10.2.3.1 and 10.2.3.2.

10.2.3.1Construction Effects

Long-tailed bats

- **Moderate** level of for disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust, vibration etc) resulting in changes to the population dynamics during construction for the Baseline and Likely Future Ecological Environment.

New Zealand pipit

- **High** level of effect for disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust, vibration etc) resulting in changes to the population dynamics during construction for the Baseline only.

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

Spotless crake

- **Moderate** level of effect for disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust, vibration etc) resulting in changes to the population dynamics during construction for the Baseline and Likely Future Ecological Environment.

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

10.2.3.2Operational Effects

Long-tailed bats

- **Moderate** level of effect for the loss in connectivity due to the presence of the road resulting in changes to the population dynamics during operation for the Baseline and Likely Future Ecological Environment.

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

Spotless crake

- **Moderate** level of effect for disturbance and displacement to nests and individuals of (new and existing) due to the presence of the infrastructure (noise, light, vibration etc) resulting in changes to the population dynamics during operation for the Baseline and Likely Future Ecological Environment.

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

11 NOR 5: Sandspit Road Upgrade

This section assesses specific ecological matters relating to NOR 5 - Sandspit Road Upgrade.

11.1 Overview and Description of Works

The Project proposes the upgrade of Sandspit Road to a two lane urban arterial cross-section with cycle lanes and footpaths on both sides of the corridor.

NOR 5 generally follows an east west alignment. The western section crosses over two relatively large Mahurangi River tributaries (order 3 streams). The riparian area associated with both streams represent SEAs (SEA_T_5440 to the western most stream, north of Sandspit Rd and SEA_T_6684 on the second tributary to the south of Sandspit Road). Ecological features to the east of the quarry road include exotic shelterbelt, mature roadside planting and exotic grass within a pasture setting. Several relatively larger (exotic) seep wetlands are located to the south of NOR 5.

Key features of the proposed new road include the following:

- Upgrading Sandspit Road to accommodate a two-lane cross-section with cycle lanes and footpaths.
- Construction of two stream bridges.
- Tie-ins with existing roads, stormwater dry ponds, wetlands, and culverts.
- Likely posted speed of 50 kph, design speed (of which effects will be assessed on) is 60 kph.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities.
- Vegetation removal along the existing road corridor.
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

Refer to the AEE for a more detailed description of works to be authorised.

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

Section 11.2 assesses the ecological effects of activities which relate to district plan matters under the AUP:OP.

11.2.1 Construction Effects - Terrestrial Ecology

Refer to Section 8.2.1.

11.2.1.1Long-tailed bats

Bats may utilise the freshwater habitats located adjacent to NOR 5 (specifically WW5-S1, WW5-S2 and associated tributaries, and the permanent stream located in SEA_T_2260 south of the NOR) for foraging. Additionally, bats may utilise the terrestrial habitats for foraging and roosting, specifically areas of Kahikatea Forest (MF4), Mixed Native/Exotic Treeland (TL.2), Exotic-Dominated Treeland (TL.3), Kānuka Scrub/Forest (VS2), Pūriri Forest (alluvial terraces with recent free-draining soils) (WF7.1), and Kauri, Podocarp, Broadleaved Forest (WF11). 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.

Table 11-1 outlines the effect assessment for long-tailed bats due to construction activities related to noise, light, dust, vibration etc.

Table 11-1 Assessment of ecological effects for long-tailed bats and impact management during construction for NOR 5

Effect Description	Disturbance and displacement to roosts and individual bats (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	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 and likely probability 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. Vegetation associated with adjacent Significant Ecological Areas is also anticipated to remain in the Likely Future Ecological Environment. Additionally, some areas of the NOR may also provide bat habitat if construction occurs prior to urbanisation. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
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 MF4, TL.2, TL.3, VS2, WF7.1, and WF11 habitat. • Lighting design to reduce light levels and spill from construction areas. • Restriction of nightworks around MF4, TL.2, TL.3, VS2, WF7.1, and WF11 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.	Same as Baseline.
Management of residual effect	N/A	N/A

11.2.1.2Avifauna

Noise, vibration, and lighting disturbance caused by construction activities could potentially displace native birds from suitable nesting and foraging habitat associated with NOR 5. Table 11-2 details the specific habitat that birds may be utilising in NOR 5.

Table 11-2 Potential habitat for avifauna in NOR 5

Species	Potential Habitat
Non-TAR birds	• All habitats, excluding Brown Field (BF)
New Zealand pipit	• Exotic Grass (EG) • Exotic Scrub (ES)
North Island kākā	• Kahikatea Forest (MF4) • Mixed Native/Exotic Treeland (TL.2) • Exotic-Dominated Treeland (TL.3) • Kānuka Scrub/Forest (VS2) • Pūriri Forest (alluvial terraces with recent free draining soils) (WF7.1) • Kauri, Podocarp, Broadleaved Forest (WF11)
Long-tailed cuckoo	• Kahikatea Forest (MF4) • Mixed Native/Exotic Treeland (TL.2) • Exotic-Dominated Treeland (TL.3) • Kānuka Scrub/Forest (VS2) • Pūriri Forest (alluvial terraces with recent free draining soils) (WF7.1) • Kauri, Podocarp, Broadleaved Forest (WF11)
Australasian bittern	• Exotic Wetland (EW): - WW5-W2 - WW5-W3
Spotless crake	• Exotic Wetland (EW): - WW5-W2 - WW5-W3

Table 11-3 Assessment of ecological effects for avifauna and impact management during construction for NOR outlines the effect assessment for birds due to construction activities related to noise, light, dust, vibration etc.

Table 11-3 Assessment of ecological effects for avifauna and impact management during construction for NOR 5

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Non-TAR birds** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. 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. **New Zealand pipit** The magnitude of effect was adjusted to **Moderate** to ensure a mitigation control for New Zealand pipit. This is because New Zealand pipit may require specific management during construction to prevent disturbance to nesting birds in the area. The ecological value of this species is **High**, and the overall level of effect is assessed as **High** prior to mitigation. **As such impact management is required**. **Long-tailed cuckoo** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **North Island kākā**	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Non-TAR birds • Long-tailed cuckoo • North Island kākā • Australasian bittern • Spotless crake **New Zealand pipit** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
	The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Australasian bittern** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Spotless crake** The magnitude of effect was adjusted to **Low** to ensure a mitigation control for spotless crake. This is because spotless crake may require specific management during construction to prevent disturbance to nesting birds in the area. The ecological value of this species is **High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. **As such impact management is required**.	
Impact management and residual level of effect	**New Zealand pipit** An Avifauna Management Plan for New Zealand pipit should be developed to include consideration for: • Pre-construction nesting bird surveys in suitable habitat (EG, ES). • Timing consideration for construction works (avoiding breeding season, where practicable).	**Spotless crake** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Pre-construction nesting bird surveys at wetlands WW5-W2 and WW5-W3.

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
	• Methods to minimise disturbance if the breeding season cannot be avoided. The residual impact is assessed as **Low** post mitigation. **<u>Spotless crake</u>** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Pre-construction nesting bird surveys at wetlands WW5-W2 and WW5-W3. • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to protect and buffer nesting birds (if present). The residual impact is assessed as **Very Low** post mitigation.	• Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to protect and buffer nesting birds (if present). The residual impact is assessed as **Very Low** post mitigation.
Management of residual effect	N/A	N/A

11.2.1.3Herpetofauna

Noise, vibration, and lighting disturbance caused by construction activities could potentially displace native herpetofauna from suitable habitat associated with NOR 5. Table 11-4 details the specific habitat that herpetofauna may be utilising in NOR 5.

Table 11-4 Potential habitat for herpetofauna in NOR 5

Species	Potential Habitat
Copper skink	• All habitats where there is suitable understorey, excluding Brown Field (BF)
Ornate skink	• All habitats contiguous to native forest or scrub and where there is suitable understorey, excluding Brown Field (BF)
Elegant gecko	• Kahikatea Forest (MF4) • Kānuka Scrub/Forest (VS2) • Pūriri Forest (alluvial terraces with recent free draining soils) (WF7.1) • Kauri, Podocarp, Broadleaved Forest (WF11)
Forest gecko	• Kahikatea Forest (MF4) • Kānuka Scrub/Forest (VS2) • Pūriri Forest (alluvial terraces with recent free draining soils) (WF7.1) • Kauri, Podocarp, Broadleaved Forest (WF11)
Pacific gecko	• Kahikatea Forest (MF4) • Kānuka Scrub/Forest (VS2) • Pūriri Forest (alluvial terraces with recent free draining soils) (WF7.1) • Kauri, Podocarp, Broadleaved Forest (WF11)
Hochstetter's frog	• Permanent streams: - WW5-S1

Table 11-5 Assessment of ecological effects for herpetofauna and impact management during construction for NOR outlines the effect assessment for herpetofauna due to construction activities related to noise, light, dust, vibration etc.

Table 11-5 Assessment of ecological effects for herpetofauna and impact management during construction for NOR 5

Effect Description	Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Copper skink, ornate skink** The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of these species 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. **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Low** due to the local extent and likely probability of construction related effects. The ecological value of these species 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. **Pacific gecko** The magnitude of effect is assessed as **Low** due to the local extent and likely probability of construction related effects. The ecological value of this species is assessed as **Moderate**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required. **Hochstetter's frog**	The magnitude of effect and overall level of effect is considered the same as Baseline for the following herpetofauna species: • Copper skink • Ornate skink • Hochstetter's frog **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of these species 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. **Pacific gecko** The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of this species is assessed as **Moderate**, 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. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
	The magnitude of effect is assessed as **Low** due to the local extent and highly likely probability of construction related effects. The ecological value of this species 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.	
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

11.2.2 Operational Effects - Terrestrial Ecology

Refer to Section 7.2.2.

11.2.2.1Long-tailed 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 roosts). Lighting spillage from street lighting could also disturb commuting and foraging bats at night and adversely affect insect prey populations.

Table 11-6 outlines the operational effects assessment and impact management for bats.

Table 11-6 Assessment of ecological effects for long-tailed bats and impact management during operation for NOR 5

	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 relatively local extent of disturbance and unlikely probability of disturbance occurring. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Low** for the disturbance of individual bats and roosts. **As such no impact management is required.**	Same as Baseline due to the retention of vegetation within riparian corridors. Vegetation associated with adjacent Significant Ecological Areas is also anticipated to remain in the Likely Future Ecological Environment, Additionally, some areas of the NOR may also provide bat habitat if construction occurs prior to urbanisation. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	The magnitude of effect is assessed as **Low** due to the unlikely probability of loss in connectivity. 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 due to the retention of vegetation within riparian corridors. Vegetation associated with adjacent Significant Ecological Areas is also anticipated to remain in the Likely Future Ecological Environment, Additionally, some areas of the NOR may also provide bat habitat if construction occurs prior to urbanisation. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
Impact management and residual level of effect	N/A	N/A	A BMP should be developed with consideration to the indicative bat mitigation in Appendix 12 – Indicative Mitigation Areas[28]. The map indicates the location and extent of measures to mitigate	Same as Baseline.

[28] As verified by Dr Ian Davidson-Watts of Davidson-Watts Ecology (Pacific) Limited in Appendix 12 – Indicative Mitigation Areas

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
			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[29] (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	

[25]This may be in addition to the buffer planting proposed in Appendix 12 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 **Very Low** post mitigation.	
Management of residual effect	N/A	N/A	N/A	N/A

11.2.2.2Avifauna

Noise, vibration, and lighting disturbance caused by the presence of the road could potentially disturb and displace native birds from suitable nesting and foraging habitat within and adjacent to NOR 5 (refer to Section 11.2.1.2). Additionally, permanent habitat loss and operational noise, vibration, and light may also affect connectivity in the broader landscape.

Table 11-7 outlines the operational effects assessment and impact management for birds.

Table 11-7 Assessment of ecological effects for avifauna and impact management during operation for NOR 5

	Disturbance and displacement to nests 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 local extent of effect and unlikely 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. **New Zealand pipit** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. The ecological value of these species is **High**, and the overall	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Non-TAR birds • New Zealand pipit • Long-tailed cuckoo • North Island kākā • Australasian bittern • Spotless crake Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	**Non-TAR birds** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability 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 **Very Low** prior to mitigation. As such no impact management is required. **New Zealand pipit** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation.	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Non-TAR birds • New Zealand pipit • Long-tailed cuckoo • North Island kākā • Australasian bittern • Spotless crake Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement to nests 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 is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Long-tailed cuckoo** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. 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. **North Island kākā** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road.		As such no impact management is required. **Long-tailed cuckoo** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. 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. **North Island kākā** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation.	

Effect Description	Disturbance and displacement to nests 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. **<u>Australasian bittern</u>** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. 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>Spotless crake</u>** The magnitude of effect was adjusted to **Low** to ensure a mitigation control for spotless crake. This is because spotless crake may require specific management during		As such no impact management is required. **<u>Australasian bittern</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. 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>Spotless crake</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation.	

Effect Description	Disturbance and displacement to nests 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**
	operation to prevent disturbance to nesting birds in the area. The ecological value of these species is **High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. **As such impact management is required**.		As such no impact management is required.	
Impact management and residual level of effect	**Spotless crake** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Retention of vegetation near wetland habitat, where practicable. • Buffer planting between the road alignment and suitable habitat adjacent to the road (specifically wetlands WW5-W2 and WW5-W3). The residual impact is assessed as **Very Low** post mitigation.	Same as Baseline.	N/A	N/A

Effect Description	Disturbance and displacement to nests 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

11.2.2.3Herpetofauna

Suitable habitat was identified within the NOR boundary which could potentially support herpetofauna. Native herpetofauna 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.

As the majority of NOR 5 is an upgrade of an existing road, it is not expected to result in the additional fragmentation of herpetofauna habitat. Similarly, resident (existing and future) herpetofauna are likely to be habituated to disturbance such as noise, vibration, and lighting and no additional effect on herpetofauna is expected.

Table 11-8 outlines the operational effects assessment and impact management for herpetofauna.

Table 11-8 Assessment of ecological effects for herpetofauna and impact management during operation for NOR 5

Effect Description	Disturbance and displacement of existing and future herpetofauna 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	**Copper skink, ornate skink** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation.	The magnitude of effect and overall level of effect is considered the same as Baseline for the following herpetofauna species: • Copper skink • Ornate skink • Elegant gecko • Forest gecko • Pacific gecko • Hochstetter's frog Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	**Copper skink, ornate skink** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the	The magnitude of effect and overall level of effect is considered the same as Baseline for the following herpetofauna species: • Copper skink • Ornate skink • Elegant gecko • Forest gecko • Pacific gecko **Hochstetter's frog** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of this species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required.

Effect Description	Disturbance and displacement of existing and future herpetofauna 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**
	As such no impact management is required. **<u>Pacific gecko</u>** The magnitude of effect is assessed as **Low** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of this species is assessed to be **Moderate**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Hochstetter's frog</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of this species is assessed to be **High**, and the overall level of effect due to the		presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Pacific gecko</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of this species is assessed to be **Moderate**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Hochstetter's frog</u>** 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.	Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement of existing and future herpetofauna 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**
	presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required.		The ecological value of this species 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.	
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

11.2.3 Effects Conclusions

The ecological level of effects assessed as **Moderate** or higher for NOR 5 are described in Sections 11.2.3.1 and 11.2.3.2.

11.2.3.1Construction Effects

Long-tailed bats

- **Moderate** level of for disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust, vibration etc) resulting in changes to the population dynamics during construction for the Baseline and Likely Future Ecological Environment.

New Zealand pipit

- **High** level of effect for disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust, vibration etc) resulting in changes to the population dynamics during construction for the Baseline only.

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

Spotless crake

- **Moderate** level of effect for disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust, vibration etc) resulting in changes to the population dynamics during construction for the Baseline and Likely Future Ecological Environment.

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

11.2.3.2Operational Effects

Long-tailed bats

- **Moderate** level of effect for the loss in connectivity due to the presence of the road resulting in changes to the population dynamics during operation for the Baseline and Likely Future Ecological Environment.

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

Spotless crake

- **Moderate** level of effect for disturbance and displacement to nests and individuals of (new and existing) due to the presence of the infrastructure (noise, light, vibration etc) resulting in changes to the population dynamics during operation for the Baseline and Likely Future Ecological Environment.

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

12 NOR 6: Western Link - South

This section assesses specific ecological matters relating to NOR 6 – New Western Link South.

12.1 Overview and Description of Works

The Project proposes a new two lane urban arterial cross-section with cycle lanes and footpaths on the corridor.

NOR 6 includes a new arterial linking Woodcock Road (through Jamie Lane in the west) to State Highway 1 in the east. The western portion of the road crosses an unnamed first order stream/wetland complex (tributary of the Mahurangi River), while the central and eastern sections align near the hilltop and avoids direct effects to several downslope headwater wetland systems.

Key features of the proposed new corridor include the following:

- The construction of a new two-lane urban arterial with walking and cycling facilities.
- Upgrading of intersection with McKinney Road.
- Likely posted speed of 50 kph, design speed (of which effects will be assessed on) is 60 kph.
- A bridge over the stream/wetland complex.
- Tie-ins with existing roads, stormwater wetland and culverts.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Vegetation removal along the existing road corridor.
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

Refer to the AEE for a more detailed description of works to be authorised.

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

Section 12.2 assesses the ecological effects of activities which relate to district plan matters under the AUP:OP.

12.2.1 Construction Effects - Terrestrial Ecology

Refer to Section 7.2.1.

12.2.1.1Long-tailed bats

Long-tailed bats may utilise the freshwater habitat associated with NOR 6 for foraging, and there is limited suitable roosting habitat present in the NOR (isolated stands/single trees of Exotic-Dominated Treeland (TL.3)). 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.

Table 12-1 outlines the effect assessment for long-tailed bats due to construction activities related to noise, light, dust, vibration etc.

Table 12-1 Assessment of ecological effects for long-tailed bats and impact management during construction for NOR 6

Effect Description	Disturbance and displacement to roosts and individual bats (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability 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. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

12.2.1.2Avifauna

Noise, vibration, and lighting disturbance caused by construction activities could potentially displace native birds from suitable nesting and foraging habitat associated with NOR 6. Table 12-2 details the specific habitat that birds may be utilising in NOR 6.

Table 12-2 Potential habitat for avifauna in NOR 6

Species	Potential Habitat
Non-TAR birds	• All habitats, excluding Brown Field (BF)
New Zealand pipit	• Exotic Grass (EG) • Exotic Scrub (ES)
Australasian bittern	• Exotic Wetland (EW): WW3-W1 • Raupō reedland (WL19): WW6-W1
Spotless crake	• Exotic Wetland (EW): WW3-W1 • Raupō reedland (WL19): WW6-W1

Table 12-3 Assessment of ecological effects for avifauna and impact management during construction for NOR outlines the effect assessment for birds due to construction activities related to noise, light, dust, vibration etc.

Table 12-3 Assessment of ecological effects for avifauna and impact management during construction for NOR 6

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	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 relatively short duration and highly likely probability of construction related effects. 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. **New Zealand pipit** The magnitude of effect was adjusted to **Moderate** to ensure a mitigation control for New Zealand pipit. This is because New Zealand pipit may require specific management during construction to prevent disturbance to nesting birds in the area. The ecological value of this species is **High**, and the overall level of effect is assessed as **High** prior to mitigation. **As such impact management is required**. **Australasian bittern** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Spotless crake** The magnitude of effect was adjusted to **Low** to ensure a mitigation control for spotless crake. This is because spotless crake may require specific	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Australasian bittern • Spotless crake **Non-TAR birds** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. 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. **New Zealand pipit** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. 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. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
	management during construction to prevent disturbance to nesting birds in the area. The ecological value of this species is **High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. **As such impact management is required**.	
Impact management and residual level of effect	**New Zealand pipit** An Avifauna Management Plan for New Zealand pipit should be developed to include consideration for: • Pre-construction nesting bird surveys in suitable habitat (EG, ES). • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to minimise disturbance if the breeding season cannot be avoided. The residual impact is assessed as **Low** post mitigation. **Spotless crake** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Pre-construction nesting bird surveys at wetlands WW3-W1 and WW6-W1. • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to protect and buffer nesting birds (if present). The residual impact is assessed as **Very Low** post mitigation.	**Spotless crake** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Pre-construction nesting bird surveys at wetlands WW3-W1 and WW6-W1. • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to protect and buffer nesting birds (if present). The residual impact is assessed as **Very Low** post mitigation.

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
Management of residual effect	N/A	N/A

12.2.1.3Herpetofauna

Noise, vibration, and lighting disturbance caused by construction activities could potentially displace native herpetofauna from suitable habitat associated with NOR 6. Table 12-4 details the specific habitat that herpetofauna may be utilising in NOR 6.

Table 12-4 Potential habitat for herpetofauna in NOR 6

Species	Potential Habitat
Copper skink	• All habitats where there is suitable understorey, excluding Brown Field (BF)

Table 12-5 outlines the effect assessment for herpetofauna due to construction activities related to noise, light, dust, vibration etc.

Table 12-5 Assessment of ecological effects for herpetofauna and impact management during construction for NOR 6

Effect Description	Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	Likely Future Ecological Environment
Level of effect prior to impact management	**Copper skink** The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of this species 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.	**Copper skink** Same as Baseline. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

12.2.2 Operational Effects - Terrestrial Ecology

Refer to Section 7.2.2.

12.2.2.1Long-tailed 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 roosts). Lighting spillage from street lighting could also disturb commuting and foraging bats at night and adversely affect insect prey populations.

Table 12-6 outlines the operational effects assessment and impact management for bats.

Table 12-6 Assessment of ecological effects for long-tailed bats and impact management during operation for NOR 6

	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 relatively local extent of disturbance and unlikely probability of disturbance occurring. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Low** for the disturbance of individual bats and roosts. As such no impact management is required.	Same as Baseline. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	The magnitude of effect is assessed as **Negligible** due to the unlikely probability of loss in connectivity. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Low** for loss in connectivity. As such no impact management is required.	Same as Baseline. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
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

12.2.2.2Avifauna

Noise, vibration, and lighting disturbance caused by the presence of the road could potentially disturb and displace native birds from suitable nesting and foraging habitat within and adjacent to NOR 6 (refer to Section 12.2.1.2). Additionally, permanent habitat loss and operational noise, vibration, and light may also affect connectivity in the broader landscape.

Table 12-7 outlines the operational effects assessment and impact management for birds.

Table 12-7 Assessment of ecological effects for avifauna and impact management during operation for NOR 6

	Disturbance and displacement to nests 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 local extent of effect and highly 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 **Low** prior to mitigation. As such no impact management is required. **New Zealand pipit** The magnitude of effect is assessed as **Low,** due to the local extent of effect and likely probability of disturbance due to noise, light and vibration from the areas of new road. The ecological value of these species is **High**, and the overall	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Australasian bittern • Spotless crake **Non-TAR birds** The magnitude of effect is assessed as **Low**, due to the local extent of effect and unlikely 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. **New Zealand pipit** The magnitude of effect is assessed as **Negligible,** due to the local	**Non-TAR birds** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability 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 **Very Low** prior to mitigation. As such no impact management is required. **New Zealand pipit** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation.	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Non-TAR birds • New Zealand pipit • Australasian bittern • Spotless crake Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement to nests 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 is assessed as **Low** prior to mitigation. As such no impact management is required. **<u>Australasian bittern</u>** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. 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>Spotless crake</u>** The magnitude of effect was adjusted to **Low** to ensure a mitigation control for spotless crake. This is because spotless crake may require specific management during	extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. 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. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	As such no impact management is required. **<u>Australasian bittern</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. 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>Spotless crake</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation.	

Effect Description	Disturbance and displacement to nests 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**
	operation to prevent disturbance to nesting birds in the area. The ecological value of these species is **High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. **As such impact management is required**.		As such no impact management is required.	
Impact management and residual level of effect	**Spotless crake** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Retention of vegetation near wetland habitat, where practicable. • Buffer planting between the road alignment and suitable habitat adjacent to the road (specifically wetlands WW3-W1 and WW6-W1). The residual impact is assessed as **Very Low** post mitigation.	Same as Baseline.	N/A	N/A

Effect Description	Disturbance and displacement to nests 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

12.2.2.3Herpetofauna

Suitable habitat was identified within the NOR boundary which could potentially support herpetofauna. Native herpetofauna 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.

As the majority of NOR 6 will be new infrastructure, 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.

Table 12-8 outlines the operational effects assessment and impact management for herpetofauna.

Table 12-8 Assessment of ecological effects for herpetofauna and impact management during operation for NOR 6

Effect Description	Disturbance and displacement of existing and future herpetofauna 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	**Copper skink** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of this species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required.	**Copper skink** Same as Baseline. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	**Copper skink** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of this species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required.	**Copper skink** Same as Baseline. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
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

12.2.3 Effects Conclusions

The ecological level of effects assessed as **Moderate** or higher for NOR 6 are described in Sections 12.2.3.1 and 12.2.3.2.

12.2.3.1Construction Effects

New Zealand pipit

- **High** level of effect for disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust, vibration etc) resulting in changes to the population dynamics during construction for the Baseline only.

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

Spotless crake

- **Moderate** level of effect for disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust, vibration etc) resulting in changes to the population dynamics during construction for the Baseline and Likely Future Ecological Environment.

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

12.2.3.2Operational Effects

Spotless crake

- **Moderate** level of effect for disturbance and displacement to nests and individuals of (new and existing) due to the presence of the infrastructure (noise, light, vibration etc) resulting in changes to the population dynamics during operation for the Baseline and Likely Future Ecological Environment.

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

13 NOR 7: Sandspit Link

This section assesses specific ecological matters relating to NOR 7 - Sandspit Link.

13.1 Overview and Description of Works

The Project proposes a new two lane urban arterial cross-section with cycle lanes and footpaths.

NOR 7 connects Matakana Road in the north to Sandspit Road to the south. The northern portion (greenfields) is associated with several seep wetlands, two patches of mature native forest (largely modified podocarp broadleaved forest dominated by totara canopy), mature exotic treeland and exotic grass. The southern portion aligns to the existing quarry road and is mostly associated with existing planting, shelterbelt, and exotic grass. The southern section includes a relatively large bridge extending over most of the floodplain and avoiding permanent impacts on two streams and associated wetlands.

Key features of the proposed new corridor include the following:

- Construction of a two-lane urban arterial with cycle lanes and footpaths.
- Likely posted speed of 50 kph, design speed (of which effects will be assessed on) is 60 kph.
- Tie-ins with existing roads, stormwater wetland and culverts.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Vegetation removal.
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

Refer to the AEE for a more detailed description of works to be authorised.

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

Section 13.2 assesses the ecological effects of activities which relate to district plan matters under the AUP:OP.

13.2.1 Construction Effects - Terrestrial Ecology

Refer to Section 7.2.1.

13.2.1.1Long-tailed bats

Bats may utilise freshwater habitat associated with NOR 7 for foraging (all permanent streams in the NOR). Additionally, bats may utilise terrestrial habitat associated with the NOR for roosting and foraging, specifically areas of Kahikatea Forest (MF4), Native-Dominated Treeland (TL.1), Exotic-Dominated Treeland (TL.3), Pūriri Forest (alluvial terraces with recent free-draining soils) (WF7.1), and Kauri, Podocarp, Broadleaved Forest (WF11). 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.

Table 13-1 outlines the effect assessment for long-tailed bats due to construction activities related to noise, light, dust, vibration etc.

Table 13-1 Assessment of ecological effects for long-tailed bats and impact management during construction for NOR 7

Effect Description	Disturbance and displacement to roosts and individual bats (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	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 and highly likely probability 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**.	Although the probability of construction related effects is considered likely, the magnitude of effect and overall level of effect are anticipated to be same as Baseline due to the retention of vegetation within riparian corridors. Vegetation associated with adjacent Significant Ecological Areas is also anticipated to remain in the Likely Future Ecological Environment, Additionally, some areas of the NOR may also provide bat habitat if construction occurs prior to urbanisation. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
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 MF4, TL.1, TL.3, WF7.1, and WF11 habitat. • Lighting design to reduce light levels and spill from construction areas. • Restriction of nightworks around MF4, TL.1, TL.3, WF7.1, and WF11 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.	Same as Baseline.
Management of residual effect	N/A	N/A

13.2.1.2Avifauna

Noise, vibration, and lighting disturbance caused by construction activities could potentially displace native birds from suitable nesting and foraging habitat associated with NOR 7. Table 13-2 details the specific habitat that birds may be utilising in NOR 7.

Table 13-2 Potential habitat for avifauna in NOR 7

Species	Potential Habitat
Non-TAR birds	• All habitats, excluding Brown Field (BF)
New Zealand pipit	• Exotic Grass (EG)
North Island kākā	• Kahikatea Forest (MF4) • Native-Dominated Treeland (TL.1) • Exotic-Dominated Treeland (TL.3) • Pūriri Forest (alluvial terraces with recent free-draining soils) (WF7.1) • Kauri, Podocarp, Broadleaved Forest (WF11).
Long-tailed cuckoo	• Kahikatea Forest (MF4) • Native-Dominated Treeland (TL.1) • Exotic-Dominated Treeland (TL.3) • Pūriri Forest (alluvial terraces with recent free-draining soils) (WF7.1) • Kauri, Podocarp, Broadleaved Forest (WF11).
Black shag	• Permanent streams and their associated tributaries: - WW7-S2a - WW7-S3a - WW7-S4 - WW5-S2
Little black shag	• Permanent streams and their associated tributaries: - WW7-S2a - WW7-S3a - WW7-S4 - WW5-S2
Little shag	• Permanent streams and their associated tributaries: - WW7-S2a - WW7-S3a - WW7-S4 - WW5-S2
Pied shag	• Permanent streams and their associated tributaries: - WW7-S2a - WW7-S3a - WW7-S4

Species	Potential Habitat
	- WW5-S2
Australasian bittern	• Exotic Wetland (EW): WW7-W3
Spotless crake	• Exotic Wetland (EW): WW7-W3

Table 13-3 Assessment of ecological effects for avifauna and impact management during construction for NOR outlines the effect assessment for birds due to construction activities related to noise, light, dust, vibration etc.

Table 13-3 Assessment of ecological effects for avifauna and impact management during construction for NOR 7

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	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 relatively short duration and highly likely probability of construction related effects. 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. **New Zealand pipit** The magnitude of effect was adjusted to **Moderate** to ensure a mitigation control for New Zealand pipit. This is because New Zealand pipit may require specific management during construction to prevent disturbance to nesting birds in the area. The ecological value of this species is **High**, and the overall level of effect is assessed as **High** prior to mitigation. **As such impact management is required.** **Long-tailed cuckoo** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **North Island kākā**	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Long-tailed cuckoo • North Island kākā • Black shag • Little black shag • Pied shag • Little shag • Australasian bittern • Spotless crake **Non-TAR birds** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. 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. **New Zealand pipit** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **High**, 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 nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
	The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Black shag, little black shag, pied shag, little shag** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Australasian bittern** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Spotless crake** The magnitude of effect was adjusted to **Low** to ensure a mitigation control for spotless crake. This is because spotless crake may require specific management during construction to prevent disturbance to nesting birds in the area. The ecological value of this species is **High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. **As such impact management is required**.	Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
Impact management and residual level of effect	**New Zealand pipit** An Avifauna Management Plan for New Zealand pipit should be developed to include consideration for: • Pre-construction nesting bird surveys in suitable habitat (EG, ES). • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to minimise disturbance if the breeding season cannot be avoided. The residual impact is assessed as **Low** post mitigation. **Spotless crake** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Pre-construction nesting bird surveys at wetland WW7-W3. • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to protect and buffer nesting birds (if present). The residual impact is assessed as **Very Low** post mitigation.	**Spotless crake** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Pre-construction nesting bird surveys at wetland WW7-W3. • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to protect and buffer nesting birds (if present). The residual impact is assessed as **Very Low** post mitigation.
Management of residual effect	N/A	N/A

13.2.1.3Herpetofauna

Noise, vibration, and lighting disturbance caused by construction activities could potentially displace native herpetofauna from suitable habitat associated with NOR 7. Table 13-4 details the specific habitat that herpetofauna may be utilising in NOR 7.

Table 13-4 Potential habitat for herpetofauna in NOR 7

Species	Potential Habitat
Copper skink	• All habitats where there is suitable understorey, excluding Brown Field (BF)
Ornate skink	• All habitats contiguous to native forest or scrub and where there is suitable understorey, excluding Brown Field (BF)
Elegant gecko	• Kahikatea Forest (MF4) • Pūriri Forest (alluvial terraces with recent free-draining soils) (WF7.1) • Kauri, Podocarp, Broadleaved Forest (WF11)
Forest gecko	• Kahikatea Forest (MF4) • Pūriri Forest (alluvial terraces with recent free-draining soils) (WF7.1) • Kauri, Podocarp, Broadleaved Forest (WF11)
Pacific gecko	• Kahikatea Forest (MF4) • Pūriri Forest (alluvial terraces with recent free-draining soils) (WF7.1) • Kauri, Podocarp, Broadleaved Forest (WF11)
Hochstetter's frog	• Permanent streams: - WW7-S4

Table 13-5 Assessment of ecological effects for herpetofauna and impact management during construction for NOR outlines the effect assessment for herpetofauna due to construction activities related to noise, light, dust, vibration etc.

Table 13-5 Assessment of ecological effects for herpetofauna and impact management during construction for NOR 7

Effect Description	Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
Level of effect prior to impact management	**Copper skink, ornate skink** The magnitude of effect is assessed as **Low** due to the local extent and likely probability of construction related effects. The ecological value of these species 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. **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Low** due to the local extent and highly likely probability of construction related effects. The ecological value of these species 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. **Pacific gecko** The magnitude of effect is assessed as **Low** due to the local extent and highly likely probability of construction related effects. The ecological value of this species is assessed as **Moderate**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required. **Hochstetter's frog**	**Copper skink, ornate skink** The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of these species 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. **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of these species 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. **Pacific gecko** The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of this species is assessed as **Moderate**, 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. **Hochstetter's frog**

Effect Description	Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
	The magnitude of effect is assessed as **Low** due to the local extent and likely probability of construction related effects. The ecological value of this species 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.	The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of this species 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. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

13.2.2 Operational Effects - Terrestrial Ecology

Refer to Section 7.2.2.

13.2.2.1Long-tailed 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 roosts). Lighting spillage from street lighting could also disturb commuting and foraging bats at night and adversely affect insect prey populations.

Table 13-6 outlines the operational effects assessment and impact management for bats.

Table 13-6 Assessment of ecological effects for long-tailed bats and impact management during operation for NOR 7

	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 relatively local extent of disturbance and likely probability of disturbance occurring. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Moderate** for the disturbance of individual bats and roosts. **As such impact management is required**.	Same as Baseline due to the retention of vegetation within riparian corridors. Vegetation associated with adjacent Significant Ecological Areas is also anticipated to remain in the Likely Future Ecological Environment. Additionally, some areas of the NOR may also provide bat habitat if construction occurs prior to urbanisation. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	The magnitude of effect is assessed as **Low** due to the likely probability of loss in connectivity. 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 due to the retention of vegetation within riparian corridors. Vegetation associated with adjacent Significant Ecological Areas is also anticipated to remain in the Likely Future Ecological Environment. Additionally, some areas of the NOR may also provide bat habitat if construction occurs prior to urbanisation. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
Impact management and residual level of effect	A Bat Management Plan (BMP) should be developed to include consideration for: • Early-stage/mature buffer planting, late-stage buffer planting, and retention of existing mature trees between	Same as Baseline.	A BMP should be developed with consideration to the indicative bat mitigation in Appendix 12 – Indicative Mitigation Areas[31]. The map indicates the location and extent of measures to mitigate potential connectivity effects and	Same as Baseline.

[31] As verified by Dr Ian Davidson-Watts of Davidson-Watts Ecology (Pacific) Limited in Appendix 12 – Indicative Mitigation Areas.

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[30]. • 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.		includes hop-overs/underpasses, buffer planting and existing mature tree features that will be retained, as well as indicating areas where early planting[32] (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	

[30] This may be in addition to the buffer planting proposed in Appendix 12 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 **Very Low** post mitigation.	
Management of residual effect	N/A	N/A	N/A	N/A

13.2.2.2Avifauna

Noise, vibration, and lighting disturbance caused by the presence of the road could potentially disturb and displace native birds from suitable nesting and foraging habitat within and adjacent to NOR 7 (refer to Section 13.2.1.2). Additionally, permanent habitat loss and operational noise, vibration, and light may also affect connectivity in the broader landscape.

Table 13-7 outlines the operational effects assessment and impact management for birds.

Table 13-7 Assessment of ecological effects for avifauna and impact management during operation for NOR 7

	Disturbance and displacement to nests 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 local extent of effect and highly 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 **Low** prior to mitigation. As such no impact management is required. **New Zealand pipit** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. The ecological value of these species is **High**, and the overall	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • New Zealand pipit • Long-tailed cuckoo • North Island kākā • Black shag • Little black shag • Pied shag • Little shag • Australasian bittern • Spotless crake **Non-TAR birds** The magnitude of effect is assessed as **Negligible**, due to the local extent of effect and unlikely 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	**Non-TAR birds** The magnitude of effect is assessed as **Moderate** due to the local extent of effect and highly likely probability 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. **New Zealand pipit** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation.	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • New Zealand pipit • Long-tailed cuckoo • North Island kākā • Black shag • Little black shag • Pied shag • Little shag • Australasian bittern • Spotless crake **Non-TAR birds** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability 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

Effect Description	Disturbance and displacement to nests 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 is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Long-tailed cuckoo</u>** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. 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>North Island kākā</u>** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road.	level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	As such no impact management is required. **<u>Long-tailed cuckoo</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. 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>North Island kākā</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation.	level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement to nests 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. **<u>Black shag, little black shag, pied shag, little shag</u>** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. 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>Australasian bittern</u>** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to		As such no impact management is required. **<u>Black shag, little black shag, pied shag, little shag</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of this 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>Australasian bittern</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of these species is **Very High**, and the	

Effect Description	Disturbance and displacement to nests 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**
	noise, light and vibration from the areas of new road. 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>Spotless crake</u>** The magnitude of effect was adjusted to **Low** to ensure a mitigation control for spotless crake. This is because spotless crake may require specific management during operation to prevent disturbance to nesting birds in the area. The ecological value of these species is **High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. **As such impact management is required**.		overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **<u>Spotless crake</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required.	
Impact management	**<u>Spotless crake</u>**	Same as Baseline.	N/A	N/A

Effect Description	Disturbance and displacement to nests 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**
and residual level of effect	An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Retention of vegetation near wetland habitat, where practicable. • Buffer planting between the road alignment and suitable habitat adjacent to the road (specifically wetland WW7-W3). The residual impact is assessed as **Very Low** post mitigation.			
Management of residual effect	N/A	N/A	N/A	N/A

13.2.2.3Herpetofauna

Suitable habitat was identified within the NOR boundary which could potentially support herpetofauna. Native herpetofauna 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.

As the majority of NOR 7 will be new infrastructure, 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.

Table 13-8 outlines the operational effects assessment and impact management for herpetofauna.

Table 13-8 Assessment of ecological effects for herpetofauna and impact management during operation for NOR 7

Effect Description	Disturbance and displacement of existing and future herpetofauna 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	**Copper skink, ornate skink** 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 these species 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. **Elegant gecko, forest gecko** 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 these species 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.	**Copper skink, ornate skink** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation.	**Copper skink, ornate skink** 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 these species 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. **Elegant gecko, forest gecko** 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 these species 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.	The magnitude of effect and overall level of effect is considered the same as Baseline for the following herpetofauna species: • Elegant gecko • Forest gecko • Pacific gecko • Hochstetter's frog **Copper skink, ornate skink** The magnitude of effect is assessed as Negligible due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required.

Effect Description	Disturbance and displacement of existing and future herpetofauna 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**
	As such no impact management is required. **<u>Pacific gecko</u>** 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 this species is assessed to be **Moderate**, 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. **<u>Hochstetter's frog</u>** 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 this species is assessed to be **High**, and the overall level of effect due to the	As such no impact management is required. **<u>Pacific gecko</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of this species is assessed to be **Moderate**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Hochstetter's frog</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of this species is assessed to be **High**, and the overall level of effect due to the	As such no impact management is required. **<u>Pacific gecko</u>** 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 this species is assessed to be **Moderate**, 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. **<u>Hochstetter's frog</u>** 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 this species is assessed to be **High**, and the overall level of effect due to the	Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement of existing and future herpetofauna 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**
	presence of the road is assessed as **Low** prior to mitigation. As such no impact management is required.	presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	presence of the road 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
Management of residual effect	N/A	N/A	N/A	N/A

13.2.3 Effects Conclusions

The ecological level of effects assessed as **Moderate** or higher for NOR 7 are described in Sections 13.2.3.1 and 13.2.3.2.

13.2.3.1Construction Effects

Long-tailed bats

- **Moderate** level of for disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust, vibration etc) resulting in changes to the population dynamics during construction for the Baseline and Likely Future Ecological Environment.

New Zealand pipit

- **High** level of effect for disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust, vibration etc) resulting in changes to the population dynamics during construction for the Baseline only.

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

Spotless crake

- **Moderate** level of effect for disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust, vibration etc) resulting in changes to the population

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

13.2.3.2Operation Effects

Long-tailed bats

- **Moderate** level of effect for the loss in connectivity due to the presence of the road resulting in changes to the population dynamics during operation for the Baseline and Likely Future Ecological Environment.
- **Moderate** level of effect for disturbance and displacement to roosts and individuals of (new and existing) due to the presence of the infrastructure (noise, light, vibration etc) resulting in changes to the population dynamics during operation for the Baseline and Likely Future Ecological Environment.

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

Spotless crake

- **Moderate** level of effect for disturbance and displacement to nests and individuals of (new and existing) due to the presence of the infrastructure (noise, light, vibration etc) resulting in changes to the population dynamics during operation for the Baseline and Likely Future Ecological Environment.

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

14 NOR 8: Wider Western Link - North

This section assesses specific ecological matters relating to NOR 8 - Wider Western Link - North.

14.1 Overview and Description of Works

The Project proposes a new two lane urban arterial cross-section with cycle lanes and footpaths the corridor.

NOR 8 aligns south from Woodcocks Road before turning eastward towards State Highway 1. The northern most section incorporates a section of the existing Wyllie Rd, while the rest of this NOR is greenfield. After turning away from Wyllie Road, the NOR crosses over pasture and a native planted wetland. The central portion is associated with exotic pasture while the south-eastern portion crosses a first order stream and floodplain wetlands of the Mahurangi River (left branch). The majority of the floodplain will be bridged. The riparian vegetation associated with the Mahurangi River is generally consistent with semi-mature regenerative forest (kānuka/mānuka).

Key design features of the proposed new corridor include the following:

- Construction of a two-lane urban arterial with walking and cycling facilities the corridor.
- Likely posted speed of 50 kph, design speed (of which effects will be assessed on) is 60 kph.
- Tie-ins with existing roads (intersections with Woodcocks Road and SH1), stormwater wetland and culverts.
- Batter slopes and associated cut and fill activities (earthworks).
- Vegetation removal.
- Crossing of the Mahurangi River.
- Other construction related activities required outside the permanent corridor including construction traffic manoeuvring and construction laydown areas.

Refer to the AEE for a more detailed description of works to be authorised.

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

Section 14.2 assesses the ecological effects of activities which relate to district plan matters under the AUP:OP.

14.2.1 Construction Effects - Terrestrial Ecology

Refer to Section 7.2.1.

14.2.1.1Long-tailed bats

Bats may utilise freshwater habitat associated with NOR 8 for foraging, specifically the Mahurangi River (Right Branch) (WW8-S3) and associated tributaries. Additionally, bats may utilise terrestrial habitat associated with the NOR for roosting and foraging, specifically areas of 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.

Table 14-1 outlines the effect assessment for long-tailed bats due to construction activities related to noise, light, dust, vibration etc.

Table 14-1 Assessment of ecological effects for long-tailed bats and impact management during construction for NOR 8

Effect Description	Disturbance and displacement to roosts and individual bats (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	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 and likely probability 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. Additionally, some areas of the NOR may also provide bat habitat if construction occurs prior to urbanisation. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
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 TL.3, VS2, and WF7 habitat. • Lighting design to reduce light levels and spill from construction areas. • Restriction of nightworks around TL.3, VS2, and WF7 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.	Same as Baseline.
Management of residual effect	N/A	N/A

14.2.1.2Avifauna

Noise, vibration, and lighting disturbance caused by construction activities could potentially displace native birds from suitable nesting and foraging habitat associated with NOR 8. Table 14-2 details the specific habitat that birds may be utilising in NOR 8.

Table 14-2 Potential habitat for avifauna in NOR 8

Species	Potential Habitat
Non-TAR birds	• All habitats, excluding Brown Field (BF)
New Zealand pipit	• Exotic Grass (EG)
North Island kākā	• Exotic-Dominated Treeland (TL.3) • Kānuka Scrub/Forest (VS2) • Pūriri Forest (WF7)
Long-tailed cuckoo	• Exotic-Dominated Treeland (TL.3) • Kānuka Scrub/Forest (VS2) • Pūriri Forest (WF7)
Australasian bittern	• Planted Wetland (PLW): WW8-W1 • Exotic Wetland (EW): WW8-W4
Spotless crake	• Planted Wetland (PLW): WW8-W1 • Exotic Wetland (EW): WW8-W4
Dabchick	• Planted Wetland (PLW): WW8-W1

Table 14-3 Assessment of ecological effects for avifauna and impact management during construction for NOR outlines the effect assessment for birds due to construction activities related to noise, light, dust, vibration etc.

Table 14-3 Assessment of ecological effects for avifauna and impact management during construction for NOR 8

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	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 relatively short duration and highly likely probability of construction related effects. 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. **New Zealand pipit** The magnitude of effect was adjusted to **Moderate** to ensure a mitigation control for New Zealand pipit. This is because New Zealand pipit may require specific management during construction to prevent disturbance to nesting birds in the area. The ecological value of this species is **High**, and the overall level of effect is assessed as **High** prior to mitigation. **As such impact management is required**. **Long-tailed cuckoo** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **North Island kākā**	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • Long-tailed cuckoo • North Island kākā • Australasian bittern • Spotless crake • Dabchick **Non-TAR birds** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. 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. **New Zealand pipit** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
	The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Australasian bittern** The magnitude of effect is assessed as **Negligible** due to the relatively short duration and unlikely probability of construction related effects. The ecological value of this species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. **Spotless crake** The magnitude of effect was adjusted to **Low** to ensure a mitigation control for spotless crake. This is because spotless crake may require specific management during construction to prevent disturbance to nesting birds in the area. The ecological value of this species is **High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. **As such impact management is required**. **Dabchick** The magnitude of effect is assessed as **Low** due to the relatively short duration and likely probability of construction related effects. The ecological value of this species is **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. **As such impact management is required**.	

Effect Description	Disturbance and displacement to nests and individual birds (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
Impact management and residual level of effect	**New Zealand pipit** An Avifauna Management Plan for New Zealand pipit should be developed to include consideration for: • Pre-construction nesting bird surveys in suitable habitat (EG, ES). • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to minimise disturbance if the breeding season cannot be avoided. The residual impact is assessed as **Low** post mitigation. **Spotless crake** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Pre-construction nesting bird surveys at wetlands WW8-W1 and WW8-W4. • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to protect and buffer nesting birds (if present). The residual impact is assessed as **Very Low** post mitigation. **Dabchick** An Avifauna Management Plan for dabchick should be developed to include consideration for: • Pre-construction nesting bird surveys at wetland WW8-W1. • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to protect and buffer nesting birds (if present).	**Spotless crake** An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Pre-construction nesting bird surveys at wetlands WW8-W1 and WW8-W4. • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to protect and buffer nesting birds (if present). The residual impact is assessed as **Very Low** post mitigation. **Dabchick** An Avifauna Management Plan for dabchick should be developed to include consideration for: • Pre-construction nesting bird surveys at wetland WW8-W1. • Timing consideration for construction works (avoiding breeding season, where practicable). • Methods to protect and buffer nesting birds (if present). The residual impact is assessed as **Very Low** post mitigation.

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

14.2.1.3Herpetofauna

Noise, vibration, and lighting disturbance caused by construction activities could potentially displace native herpetofauna from suitable habitat associated with NOR 8. Table 14-4 details the specific habitat that herpetofauna may be utilising in NOR 8.

Table 14-4 Potential habitat for herpetofauna in NOR 8

Species	Potential Habitat
Copper skink	• All habitats where there is suitable understorey, excluding Brown Field (BF)
Ornate skink	• All habitats contiguous to native forest or scrub and where there is suitable understorey, excluding Brown Field (BF)
Elegant gecko	• Kānuka Scrub/Forest (VS2) • Pūriri Forest (WF7)
Forest gecko	• Kānuka Scrub/Forest (VS2) • Pūriri Forest (WF7)
Pacific gecko	• Kānuka Scrub/Forest (VS2) • Pūriri Forest (WF7)

Table 14-5 Assessment of ecological effects for herpetofauna and impact management during construction for NOR outlines the effect assessment for herpetofauna due to construction activities related to noise, light, dust, vibration etc.

Table 14-5 Assessment of ecological effects for herpetofauna and impact management during construction for NOR 8

Effect Description	Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	Likely Future Ecological Environment
Level of effect prior to impact management	**Copper skink, ornate skink** The magnitude of effect is assessed as **Low** due to the local extent and likely probability of construction related effects. The ecological value of these species 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. **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Low** due to the local extent and highly	**Copper skink, ornate skink** The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of these species 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. **Elegant gecko, forest gecko**

Effect Description	Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, light, dust, vibration etc.)	
	Baseline	**Likely Future Ecological Environment**
	likely probability of construction related effects. The ecological value of these species 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. **Pacific gecko** The magnitude of effect is assessed as **Low** due to the local extent and highly likely probability of construction related effects. The ecological value of this species is assessed as **Moderate**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required.	The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of these species 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. **Pacific gecko** The magnitude of effect is assessed as **Negligible** due to the local extent and unlikely probability of construction related effects. The ecological value of this species is assessed as **Moderate**, 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. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
Impact management and residual level of effect	N/A	N/A
Management of residual effect	N/A	N/A

14.2.2 Operational Effects - Terrestrial Ecology

Refer to Section 7.2.2.

14.2.2.1Long-tailed 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 roosts). Lighting spillage from street lighting could also disturb commuting and foraging bats at night and adversely affect insect prey populations.

Table 14-6 outlines the operational effects assessment and impact management for bats.

Table 14-6 Assessment of ecological effects for long-tailed bats and impact management during operation for NOR 8

	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 relatively local extent of disturbance and likely probability of disturbance occurring. The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Moderate** for the disturbance of individual bats and roosts. **As such impact management is required**.	Same as Baseline due to the retention of vegetation within riparian corridors. Additionally, some areas of the NOR may also provide bat habitat if construction occurs prior to urbanisation. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	The magnitude of effect is assessed as **High** due to the highly likely probability of loss in connectivity. 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**.	The magnitude of effect is assessed as **Moderate** due to the likely probability of loss in connectivity. 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**. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
Impact management and residual level of effect	A Bat Management Plan (BMP) should be developed to include consideration for: • Late-stage buffer planting, and retention of existing mature trees between the road	Same as Baseline.	A BMP should be developed with consideration to the indicative bat mitigation in Appendix 12 – Indicative Mitigation Areas[34]. The map indicates the location and extent of measures to mitigate potential connectivity effects and	Same as Baseline.

[34] As verified by Dr Ian Davidson-Watts of Davidson-Watts Ecology (Pacific) Limited in Appendix 12 – Indicative Mitigation Areas

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[33]. • 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.		includes hop-overs/underpasses, buffer planting and existing mature tree features that will be retained, as well as indicating areas where early 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	

[33] This may be in addition to the buffer planting proposed in Appendix 12 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

14.2.2.2Avifauna

Noise, vibration, and lighting disturbance caused by the presence of the road could potentially disturb and displace native birds from suitable nesting and foraging habitat within and adjacent to NOR 8. (refer to Section 14.2.1.2) Additionally, permanent habitat loss and operational noise, vibration, and light may also affect connectivity in the broader landscape.

Table 14-7 outlines the operational effects assessment and impact management for birds.

Table 14-7 Assessment of ecological effects for avifauna and impact management during operation for NOR 8

	Disturbance and displacement to nests 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 local extent of effect and highly 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 **Low** prior to mitigation. As such no impact management is required. **New Zealand pipit** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. The ecological value of these species is **High**, and the overall	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • New Zealand pipit • Long-tailed cuckoo • North Island kākā • Australasian bittern • Spotless crake • Dabchick **Non-TAR birds** The magnitude of effect is assessed as **Negligible**, due to the local extent of effect and unlikely 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.	**Non-TAR birds** The magnitude of effect is assessed as **Low** due to the local extent of effect and likely probability 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 **Very Low** prior to mitigation. As such no impact management is required. **New Zealand pipit** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of these species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation.	The magnitude of effect and overall level of effect is considered the same as Baseline for the following bird species: • New Zealand pipit • Long-tailed cuckoo • North Island kākā • Australasian bittern • Spotless crake • Dabchick **Non-TAR birds** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability 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 **Very Low** prior to mitigation. As such no impact management is required.

Effect Description	Disturbance and displacement to nests 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 is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Long-tailed cuckoo** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. 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. **North Island kākā** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road.	As such no impact management is required. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	As such no impact management is required. **Long-tailed cuckoo** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. 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. **North Island kākā** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of this species is **High**, and the overall level of effect is assessed as **Very Low** prior to mitigation.	Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.

Effect Description	Disturbance and displacement to nests 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. **<u>Australasian bittern</u>** The magnitude of effect is assessed as **Negligible,** due to the local extent of effect and unlikely probability of disturbance due to noise, light and vibration from the areas of new road. 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>Spotless crake</u>** The magnitude of effect was adjusted to **Low** to ensure a mitigation control for spotless crake. This is because spotless crake may require specific management during		As such no impact management is required. **<u>Australasian bittern</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. 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>Spotless crake</u>** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of this species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation.	

Effect Description	Disturbance and displacement to nests 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**
	operation to prevent disturbance to nesting birds in the area. The ecological value of these species is **High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. **As such impact management is required.** **Dabchick** The magnitude of effect is assessed as **Low,** due to the local extent of effect and likely probability of disturbance due to noise, light and vibration from the areas of new road. 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**.		As such no impact management is required. **Dabchick** The magnitude of effect is assessed as **Negligible** due to the local extent of effect and unlikely probability of loss in connectivity from the areas of new road. The ecological value of this species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.	
Impact management and residual	**Spotless crake**	Same as Baseline.	N/A	N/A

Effect Description	Disturbance and displacement to nests 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	An Avifauna Management Plan for spotless crake should be developed to include consideration for: • Retention of vegetation near wetland habitat, where practicable. • Buffer planting between the road alignment and suitable habitat adjacent to the road (specifically wetlands WW8-W1 and WW8-W4. The residual impact is assessed as **Very Low** post mitigation. **<u>Dabchick</u>** An Avifauna Management Plan for dabchick should be developed to include consideration for: • Retention of vegetation near wetland habitat, where practicable. • Buffer planting between the road alignment and suitable habitat adjacent to the road (specifically wetland WW8-W1).			

Effect Description	Disturbance and displacement to nests 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 **Low** post mitigation.			
Management of residual effect	N/A	N/A	N/A	N/A

14.2.2.3Herpetofauna

Suitable habitat was identified within the NOR boundary which could potentially support herpetofauna. Native herpetofauna 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.

As the majority of NOR 8 will be new infrastructure, 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.

Table 14-8 outlines the operational effects assessment and impact management for herpetofauna.

Table 14-8 Assessment of ecological effects for herpetofauna and impact management during operation for NOR 8

Effect Description	Disturbance and displacement of existing and future herpetofauna 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	**Copper skink, ornate skink** 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 these species 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. **Elegant gecko, forest gecko** 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 these species 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.	**Copper skink, ornate skink** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation.	**Copper skink, ornate skink** 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 these species 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. **Elegant gecko, forest gecko** 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 these species 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.	**Copper skink, ornate skink** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **Elegant gecko, forest gecko** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of these species is assessed to be **High**, and the overall level of effect due to the

Effect Description	Disturbance and displacement of existing and future herpetofauna 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**
	As such no impact management is required. **<u>Pacific gecko</u>** 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 this species is assessed to be **Moderate**, 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.	As such no impact management is required. **<u>Pacific gecko</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of disturbance if the effect occurs. The ecological value of this species is assessed to be **Moderate**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.	As such no impact management is required. **<u>Pacific gecko</u>** 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 this species is assessed to be **Moderate**, 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.	presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. **<u>Pacific gecko</u>** The magnitude of effect is assessed as **Negligible** due to the unlikely probability and relatively local extent of loss in connectivity if the effect occurs. The ecological value of this species is assessed to be **Moderate**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. Refer to Table 3-2 for the implications of Future Environment on Ecological Features for this NOR.
Impact management and residual	N/A	N/A	N/A	N/A