

# RiverLink



PROUDLY DELIVERING

New Zealand  
Upgrade  
Programme



## RiverLink

Notices of Requirement for Designations and  
Applications for Resource Consent  
Volume Four: Supporting Technical Reports

# **Technical Report #7**

Terrestrial Ecology

**IN THE MATTER OF**

The Resource Management Act 1991

**AND**

**IN THE MATTER OF**

Resource consent applications under section 88, and Notices of Requirement under section 168, of the Act in relation to the RiverLink project

**BY**

**Waka Kotahi NZ Transport Agency** Requiring Authority

**Greater Wellington Regional Council**  
Requiring Authority

**Hutt City Council**  
Requiring Authority

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**RIVERLINK  
TECHNICAL ASSESSMENT # 7  
TERRESTRIAL ECOLOGY**

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Appendix A – Lizard Technical Assessment (Bioresearches Ltd.)

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# 1. INTRODUCTION

1. My name is Joshua Andrew Markham. I hold the position of Senior Ecologist at Tonkin & Taylor Limited ("T+T") Environmental and Engineering Consultants, and I am the author of this report.
2. I have been providing advice on terrestrial ecology matters related to the proposed RiverLink Project (the Project) to Isthmus and GHD, and ultimately Greater Wellington Regional Council, Hutt City Council and Waka Kotahi since April 2021.
3. My contributions include:
  - i. Overseeing the preparation of the assessment of the Project's effects on terrestrial ecology based on the proposed river and stopbank design and proposed Melling Interchange alignment,
  - ii. Providing recommendations to the project designers to avoid, remedy, and mitigate potential ecological effects, and
  - iii. Stakeholder engagement during the Notices of Requirement ("NoRs") phase of the Project.
4. This report also relies on the results of site investigations undertaken by my colleagues, terrestrial ecologists Dr Liz Curry, Kathryn Longstaff, and Georgia Cummings.
5. Lizard surveys and an assessment of effects of the Project on indigenous lizards is being undertaken by a specialist herpetologist, Chris Wedding (Bioresarches) (refer Appendix A).
6. With my oversight, Georgia Cummings of T+T has also contributed to the preparation of this assessment.

## 1.1 Qualifications and experience

7. I have the following qualifications and experience relevant to this assessment:
  - i. I hold the qualifications of Bachelor of Science (Ecology) and Postgraduate Certificate in Science (Ecology) from Massey University, have recently completed the Ministry for the Environment's Making Good Decisions course and have been certified as an Independent Hearing Commissioner.
  - ii. I hold the position of senior ecologist and Discipline Manager at T+T and have nine years' experience as a professional ecologist. My work experience includes preparing assessments of ecological effects; providing input into statutory and non-statutory policies, plans, and strategies; the design and implementation of biodiversity offset and compensation packages; ecological restoration initiatives, biodiversity monitoring programmes and appearance as an expert witness for various council and environment court hearings. I have been involved in several large infrastructure projects that are similar in technical nature and scale to this Project, including:
    - a. Hamilton and Longswamp Sections of the Waikato Expressway – Provided technical review of terrestrial matters on behalf of Waikato Regional Council (2016 – 2017);

- b. Puhoi to Warkworth Road of National Significance – Led terrestrial fieldwork and offset and compensation components (2017);
- c. Mt Messenger Bypass SH3 – Led terrestrial fieldwork and implementation of the offset and compensation components (2018 – ongoing);
- d. Biodiversity Management Framework for the Peacocke Structure Plan Area – Provided technical review and oversight of the offset and compensation framework (2019);
- e. Te Ahu a Turanga: Manawatū Tararua Highway Project - Led terrestrial ecology and offset and compensation components (2019 - ongoing)

## **1.2 Code of Conduct**

8. I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2014. This assessment has been prepared in compliance with that Code, as if it were evidence being given in Environment Court proceedings. In particular, unless I state otherwise, this assessment is within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

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

9. My assessment addresses the following matters:
- i. Describes the existing terrestrial environment and ecology. For the purposes of this assessment terrestrial ecology covers non-aquatic flora and fauna including lizards, birds and bats, and wetlands
  - ii. Describes and assesses the actual and potential effects on terrestrial ecology expected to result from the construction and operation of the Project. The main components of the project being: river realignment, creation of new stop banks, constructing a new Melling Bridge and upgrading the current Melling interchange
  - iii. Recommends measures to avoid, remedy, mitigate, offset or compensate potential effects on terrestrial ecology, as appropriate, and
  - iv. Presents an overall conclusion on the level of actual and potential ecological effects of the Project after the recommended measures are implemented.

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

10. In the preparation of this assessment, I have relied upon the Project description, RiverLink Urban and Landscape Design Framework (ULDF) along with various Project plans and drawings, and the construction methodology provided in the AEE.
11. Additionally, I have relied on input from other disciplines to inform my assessment of effects on terrestrial ecology. In the preparation of my report, I have reviewed the following assessments of the Project (contained in Volume 4 of the Application):
- i. Riverlink Technical Assessment Report #5 Geomorphology
  - ii. Riverlink Technical Assessment Report #6 Freshwater Ecology
  - iii. Riverlink Technical Assessment Report #8 Marine Ecology, and
  - iv. Riverlink Technical Assessment #15 Landscape and Visual Assessment.

12. Additional to the above I have relied on a range of literature to inform by desktop review of the Project area. The literature relied on is summarised in paragraph 54 and cited throughout the report as appropriate.
13. The following supporting information is attached to this report:
  - i. Appendix A – Lizard Technical Assessment (Bioresearches Ltd.), and
  - ii. Appendix B – Vegetation / Habitat type photo plates.

## **2. EXECUTIVE SUMMARY**

14. The Project encompasses flood protection works within and around Te Awa Kairangi, transport infrastructure reconfiguration and urban revitalisation works. The flood protection works will upgrade the stopbanks on either side of Te Awa Kairangi and re-align, deepen and widen the river channel. The transport infrastructure upgrades include the realignment of SH2 and the Melling Link, the creation of an active modes transport bridge and construction of rail infrastructure. The urban revitalisation works will realign the Lower Hutt city centre with Te Awa Kairangi, with public spaces and upgrades to local roads.
15. This evidence provides an assessment of effects on terrestrial ecology to accompany the resource consent applications for the RiverLink Project.
16. In particular, this assessment:
  - i. Describes the existing terrestrial environment and ecology;
  - ii. Describes and assesses the actual and potential effects on terrestrial ecology (non-aquatic flora and fauna including lizards, birds and bats, and wetlands) expected to result from the construction and operation of the Project;
  - iii. Recommends measures to avoid, remedy, mitigate, offset or compensate potential effects on terrestrial ecology, as appropriate; and
  - iv. Presents an overall conclusion on the level of actual and potential ecological effects of the Project after the recommended measures are implemented.
17. The proposed RiverLink Project is located in the Wellington Ecological District (ED). The Wellington ED covers the strongly faulted ranges surrounding Wellington, and Lower and Upper Hutt, this area was historically dominated by indigenous podocarp-broadleaved forest ecosystems. The Tararua ED is located to the east and north of the Project area. The Tararua ED is also characterised by steep, strongly faulted ranges which are still largely in indigenous forest.
18. The current land use within and adjacent to the RiverLink Project area is dominated by recreational, urban, residential and industrial uses. Indigenous forest and scrubland persist on the northern hillsides on the western side of the Te Awa Kairangi/Hutt River (the River).

19. Multiple areas of ecological significance have been identified in the landscape surrounding the Project area, both in the Proposed Natural Resources Regional Plan (PNRP) and the District Plan, but while two significant natural resources sites<sup>1</sup> (SNR14 and SNR21) occur in close vicinity to the Project area, none of these areas overlap with the proposed designation boundary.
20. My assessment was informed by literature review and site investigations to determine the terrestrial ecological values including:
  - i. Vegetation/habitats and wetlands;
  - ii. Notable terrestrial invertebrates that are recorded in the Project area or may otherwise occur;
  - iii. Avifauna species assemblage and key habitats within the Project area and downstream habitats that could also be impacted;
  - iv. An assessment of habitat value for native bats; and
  - v. The work of Chris Wedding, a specialist herpetologist who was engaged separately to undertake lizard surveys. The detailed lizard assessment is included in Appendix A and is summarised in my evidence.
21. My assessment of effects followed the Ecological Impact Assessment Guidelines (EclA Guidelines), with some adaptation for different fauna and ecosystem types (Roper-Lindsay et al., 2018). Using a standard framework and matrix approach such as this provides a consistent and transparent assessment of effects and is considered to be good industry practice.
22. Eight vegetation/habitat types were identified, these are listed in the table below along with their ecological value assessed using the EclA Guidelines (2018).

**Table 2-1: Vegetation/habitat types and assigned ecological value using the Ecological Impact Assessment Guidelines (Roper-Lindsay et al., 2018)**

Vegetation/habitat type	Ecological Value (assigned using EclA Guidelines, 2018)
Mixed broadleaved forest and scrub	Moderate
Tall stature exotic planting (flood protection)	Low
Native amenity planting	Low
Low stature amenity planting	Low
Constructed wetland	Moderate
Dwellings with associated ornamental gardens	Negligible
Rough grassland / weed field	Low
Gravel beaches	High

<sup>1</sup> Areas of significant indigenous vegetation and significant habitats of indigenous fauna. Defined as Significant Natural Resources (SNR) in the operative District Plan but are also known by the terminology Significant Natural Area (SNA) which has been adopted by other councils across NZ. Such areas deemed to be ecologically significant are required to be protected as a matter of national significance under the RMA.

23. The Project area is located immediately adjacent to Lower Hutt CBD and all of the vegetation/habitat types assessed were subject to varying degrees of modification and degradation (fragmentation, pest plant incursions etc.) resulting from the intensive development in the surrounding area. This degradation is reflected in the Ecological Values summarised in Table 2-1 above.
24. Additional to the vegetation/habitat types listed above, five Threatened and At Risk plant species were identified in the Project area, and several other regionally Threatened or At Risk species could potentially occur in the Project area but were not confirmed during site investigations.
25. The native land snail *Wainui urnula urnula* (not classified) and the peripatus (velvet worm) *Peripatoides novaezealandiae* (Not Threatened) were observed in the exotic-dominated vegetation on the River margin and in the mixed broadleaved forest adjacent to SH2 respectively.
26. A single species of lizard, northern grass skink was detected during comprehensive site investigations (refer to Appendix A). However multiple other species have been recorded in close vicinity to the Project area and may still be present without being detected in surveys. The vegetation/ habitats within the River corridor were assessed as having negligible value for native lizards. Conversely the 'mixed broadleaved forest and scrub' supports 'Not Threatened' northern grass skink as well as potentially supporting other 'Not Threatened' and 'At Risk' species. Hence it was assessed as high value habitat for native lizards; and
27. Numerous Threatened or At Risk bird species are known to use habitat downstream of the Project area and likely disperse along the river corridor, through the Project area, on occasion. Notable species confirmed as regularly using the Project area include red-billed gulls, pied shag, black shag and New Zealand pipit.
28. I have assessed the Project area is very unlikely to be used by native bats. This assessment is based on the following:
  - i. A review of bat observations in the surrounding landscape based on the New Zealand Bat Database (administered by the Department of Conservation “DOC”)
  - ii. The habitat available in the Project area, and
  - iii. The level of anthropogenic disturbance this habitat is subject to.
29. Potential adverse effects on terrestrial values during and after construction of the Project include:
  - i. The removal of approximately 1.65 ha of mixed broadleaved forest and scrub assessed as 'Moderate' ecological value, and an additional loss of 22.25 ha of 'Low' or Negligible' value habitat through vegetation clearance and earthworks;
  - ii. The temporary removal of all 'High' value gravel beach habitat within the Project area, covering approximately a 3.7 km length of Te Awa Kairangi River.
  - iii. The creation of habitat edge effects, altering the composition and health of adjacent vegetation (i.e. habitat degradation), which may affect habitat suitability for flora and fauna. This potential effect primarily applies to the mixed broadleaved forest and scrub adjacent to SH2 as other habitats across the project footprint are fragmented and already highly modified;

- iv. Accidental introductions of pest plants from imported soils associated with construction. Although noting the risk is considered low given the level of development the Project area has already been subject to, and the numerous pest plant incursions observed across the site;
  - v. Direct mortality or injury to species, for example less mobile species (e.g. invertebrates and lizards) that may be harmed during vegetation clearance or earthworks activities;
  - vi. During breeding season, vegetation removal has the potential to result in the destruction of nests, and the mortality of eggs and fledglings;
  - vii. Construction and operations related noise and vibrations or dust effects which can disturb animals, and/or degrade habitat. Noting that operational noise and vibration unlikely to notably increase compared to the baseline conditions;
  - viii. Degradation of habitat quality downstream due to sediment runoff. Key potential habitats affected are the estuarine habitat at the mouth of the River and the Harbour. Both areas are identified as significant under the PNRP;
  - ix. Potential (but unlikely, refer to paragraph 168(ii)) permanent loss of gravel beach habitat resulting from gravel not being deposited as anticipated due to changes in hydrology from the river works;
  - x. Increased disturbance to wildlife, namely birds, resulting from increased connectivity between the CBD and the River corridor, which could potentially result in greater use of the riparian area for recreation.
  - xi. Bird mortality or injury through vehicle strike on the new Melling Bridge and interchange upgrade for some species. But noting that several bridges already cross the River and hence it is likely that birds dispersing along the River corridor will adapt to this change quickly.
30. Various measures are recommended to avoid, minimise, remedy and offset the aforementioned effects. These measures include appropriate construction methodology, revegetation planting, infill planting and weed control, pre-clearance fauna surveys, accidental discovery protocols and sediment controls. The detailed methodology required to implement the recommendations to an appropriate standard will likely require the preparation and certification of management plans.
31. The revegetation programme has been designed in collaboration with the Project landscape architects to address the loss of the 'mixed broadleaved forest and scrub' from the hillslope above SH2 as well as the loss of the 'tall stature exotic planting (flood protection)' from the river corridor. Although the latter vegetation type was only assigned a 'Low' ecological value using the EclA Guidelines, the tall stature exotic vegetation is considered important in the context of providing habitat structure otherwise missing from the heavily deforested floodplain environment.
32. A key aspect of the revegetation programme is to return parts of the floodplain to indigenous forest that would have historically covered the area<sup>2</sup>, improving habitat connectivity across the valley floor between the forested hill slopes that bound the east and the west of the Hutt Valley. The replanting programme includes:

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<sup>2</sup> The planting is shown in the Indicative Landscape Plan, drawing number A16-4381-L201-08 in Volume 5 of the Application.

- i. 7.73 ha of exotic willow planting with an indigenous understory for flood protection adjacent to the active channel along the upper reach of the Project area. There are limitations to using slower-growing native trees immediately adjacent to the active channel. Instead, this area will initially comprise willow plantings that will be underplanted with native species with the aim of facilitating a successional trajectory toward a native riparian vegetation in the long-term. Key native canopy species proposed for the plant mix include kahikatea, pukatea, totara, matai, and swamp maire. These species have been chosen to re-establish the historic vegetation types that previously dominated the floodplain. These being: Tōtara, mataī, ribbonwood forest and Kahikatea, pukatea forest.
  - ii. A further 0.57 ha (approximately 720 trees) of indigenous tree groves proposed in the river corridor. These groves will be maintained as treeland areas without an indigenous understory, but they will provide additional tall stature native vegetation in the river corridor to contribute to replacing the loss of tall stature willows.
  - iii. 10.98 ha of indigenous broadleaved forest and scrub revegetation. This area includes 4.58 ha of a tall stature 'forest' mix and 6.40 ha of a medium stature 'scrub' mix depending on the placement of the plantings relative to the active channel. The proposed widening of the upper reach is designed to decrease the energy of the River when it reaches the lower reach. This means bioengineered flood protection along the lower reach is not required and a resilient riparian 'medium stature' indigenous plant mix can be used instead of willows. Away from the river edge along both reaches the tall stature indigenous forest mix is proposed. It should be noted that the overall composition of these mixes is similar and enrichment planting of the medium stature mix with secondary species such as tōtara, miro and mataī are proposed. Hence it is intended that all the above areas have a successional trajectory towards the historic forest types that originally dominated the floodplain but with different management initially to respond to flood protection constraints.
33. Without mitigation, the level of effects of the Project on the various terrestrial ecology values ranged from High to Very Low. As per the EclA Guidelines (2018), the mitigation hierarchy has been applied to potential effects assessed as Moderate or above, to reduce these effects to Low or Very Low.
34. Replacement of the 'mixed broadleaved forest and scrub' habitat being removed from the hillslope above SH2 with planting in the river corridor has been termed as offset. This is because replacing hillslope vegetation with planting in the alluvial floodplain is not 'like for like' remediation. Instead, the vegetation removed will be replaced with better quality vegetation in a more threatened land environment - the alluvial floodplain as opposed to the hillslope ecosystem. Offset is considered an appropriate approach in this instance for the following reasons:
- i. The majority of the 1.65 ha of mixed broadleaved being removed is in early stages of regeneration and does not reflect the hillslope vegetation that historically covered the area;
  - ii. Unvegetated areas on the western hill slopes are very limited, hence, to achieve the required area of revegetation in this 'like-for-like' environment, the revegetation would need to be undertaken some distance from the point of impact compared to if it replaced in the nearby floodplain; and

- iii. The topography of the hills means that development has been more limited in this area, and it is a less threatened ecosystem type compared to the indigenous forest that once covered the floodplain, which is now almost entirely removed across the developed areas of the Hutt Valley.
- 35. Note that a Biodiversity Offset Accounting Model (BOAM) has not yet been run to determine whether no net loss and preferably net gain has been achieved with the above offset planting areas. However, based on the reasoning above and the area of offset planting proposed comparative to the area and quality of the vegetation removed, it is my professional judgment that the above is likely to achieve no net loss. The BOAM will be run post-lodgement and planting areas will be updated, if necessary, based on the outcome of the modelling.
- 36. I consider the actual and potential effects of the Project on terrestrial ecology will be appropriately addressed if the recommended avoidance, minimisation, mitigation and offset measures outlined in this assessment are implemented. Based on the EclA Guidelines (2018) additional measures are not required to offset residual effects.

## **3. PROJECT DESCRIPTION**

### **3.1 Introduction**

- 37. A full project description is available in the Assessment of Environmental Effects Report (“AEE”). The following section relies on excerpts of the AEE relevant to the assessment of terrestrial ecology impacts/effects.
- 38. The Project is the design, construction, operation and maintenance of RiverLink. Key components of the project are as follows:
  - i. Upgrade and raising of existing and construction of new stopbanks on both sides of Te Awa Kairangi/Hutt River between Ewen Bridge and Mills Street;
  - ii. Instream works between the Kennedy Good and Ewen Bridges to re-align, deepen and widen the active river channel;
  - iii. The replacement of the two signalised at-grade intersections of SH2/Harbour View Road/Melling Link and SH2/Tirohanga Road with a new grade separated interchange;
  - iv. Construction of an approximately 215 m long and up to 7 span road bridge with a direct connection across Te Awa Kairangi from the new interchange to Queens Drive;
  - v. Removal of the existing Melling Bridge;
  - vi. Changes to local roads;
  - vii. Changes to the Melling Line rail network and supporting infrastructure;
  - viii. Construction of an approximately 177 m long and 4 span pedestrian/cycle bridge over Te Awa Kairangi;
  - ix. Construction of a promenade located along the stopbank connecting with future development, running between Margaret Street and High Street. This includes new steps and ramps to facilitate access between the city centre and the promenade;
  - x. Integration of infrastructure works with existing or future mixed-use development; and

- xi. Associated works including construction and installation of culverts, stormwater management systems, signage, lighting, network utility relocations, landscape and street furniture, pedestrian/cycle connections and landscaping within the Project area.

## **3.2 Planning and policy context**

- 39. The following national statutory and non-statutory documents apply to this Project:
  - i. Resource Management Act 1991 (RMA), and
  - ii. Wildlife Act 1953.<sup>3</sup>
- 40. The following regional and district level statutory and non-statutory documents apply to this Project:
  - i. Regional Policy Statement for the Greater Wellington Region;
  - ii. Proposed Natural Resources Plan for the Wellington Region (Appeals version) (PNRP); and
  - iii. City of Lower Hutt District Plan (District Plan).

## **3.3 Ecological context**

### **3.3.1 Landscape context**

- 41. The proposed RiverLink Project is located in the Wellington Ecological District (ED). The Wellington ED covers the strongly faulted ranges surrounding Wellington, and Lower and Upper Hutt, this area was historically dominated by indigenous podocarp-broadleaf ecosystems. Kohekohe (*Dysoxylum spectabile*) forest with emergent rimu (*Dacrydium cupressinum*) and rātā (*Metrosideros robusta*) previously covered the coastal areas with tawa (*Beilschmiedia tawa*) forest occurring at higher elevations. The Tararua ED is located to the east and north of the Project area. The Tararua ED is also characterised by steep, strongly faulted ranges which are still largely in indigenous forest.
- 42. The land use within and adjacent to the RiverLink Project area is dominated by urban, residential and industrial uses. However indigenous forest and scrubland persists on the northern hillsides on the western side of the Te Awa Kairangi/Hutt River (the River), a small amount of which occurs in the Project area. The land within the Project area is expected to have historically been part of the Te Awa Kairangi/Hutt River flood plain.
- 43. The Project area itself is located adjacent to the Lower Hutt CBD to the east and SH2 to the west. Accordingly, it has been extensively developed and the ecological values have been highly modified. The development of the area has resulted in complete removal of indigenous vegetation from the River margins followed by the establishment of willows for flood protection. The remainder of the area that is not developed is now dominated by maintained exotic grassland.
- 44. The majority of the Project area currently comprises recreational parkland either side of the River corridor. The parkland largely comprises:
  - i. Mown grassland interspersed with small patches of rank grass and weed field where active maintenance is not being undertaken;

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<sup>3</sup> The draft National Policy Statement for Indigenous Biodiversity (NPSIB) was also considered for this assessment, but this document is not finalised or in effect.

- ii. Exotic willow-dominated flood protection planting with an understory dominated by extensive pest plant incursions; and
  - iii. Small patches of native amenity planting isolated amongst the maintained grassland. Note there is one larger, more connected, area of indigenous planting that has been established in combination with the newly constructed wetland on the true right bank downstream from Kennedy-Good Bridge. However, this planting is only approximately a year old and hence currently provides limited habitat value.
45. The western extent of the Project area which is located between the western edge of the parkland and the toe of the western hills of the Hutt Valley. This area has also been heavily developed and largely encompasses the existing SH2 alignment as well as residential and industrial land uses. Despite the extensive development there are areas of secondary forest within the Project area along the toe of the western hills. The forest located within the Project area is immediately adjacent to SH2 and has been modified by extensive pest plant incursions. Notwithstanding this, there are pockets of higher-quality vegetation with native trees that appear to be 50+ years old (Figure 1).
46. The River corridor itself has been subject to intensive and ongoing modification by way of flood protection works. These works include beach ripping (loosening deposited beach gravels via dragging a tine across the beaches), scalping (machine clearance of vegetation from gravel beaches), and ongoing gravel extraction from the riverbed.
47. The floor of the Hutt Valley is flat and fertile compared to the surrounding hillslopes. Consequently, it has been extensively developed as described in relation to the Project area above. The eastern and western hillslopes that bound the valley are less developed and are still retain large areas of regenerating indigenous forest.
48. Notable avifauna such as kārearea (NZ falcon) and North Island kākā are highly mobile and known to occur in wider Hutt Valley area. However, habitat connectivity across the floor of the Hutt Valley is limited.

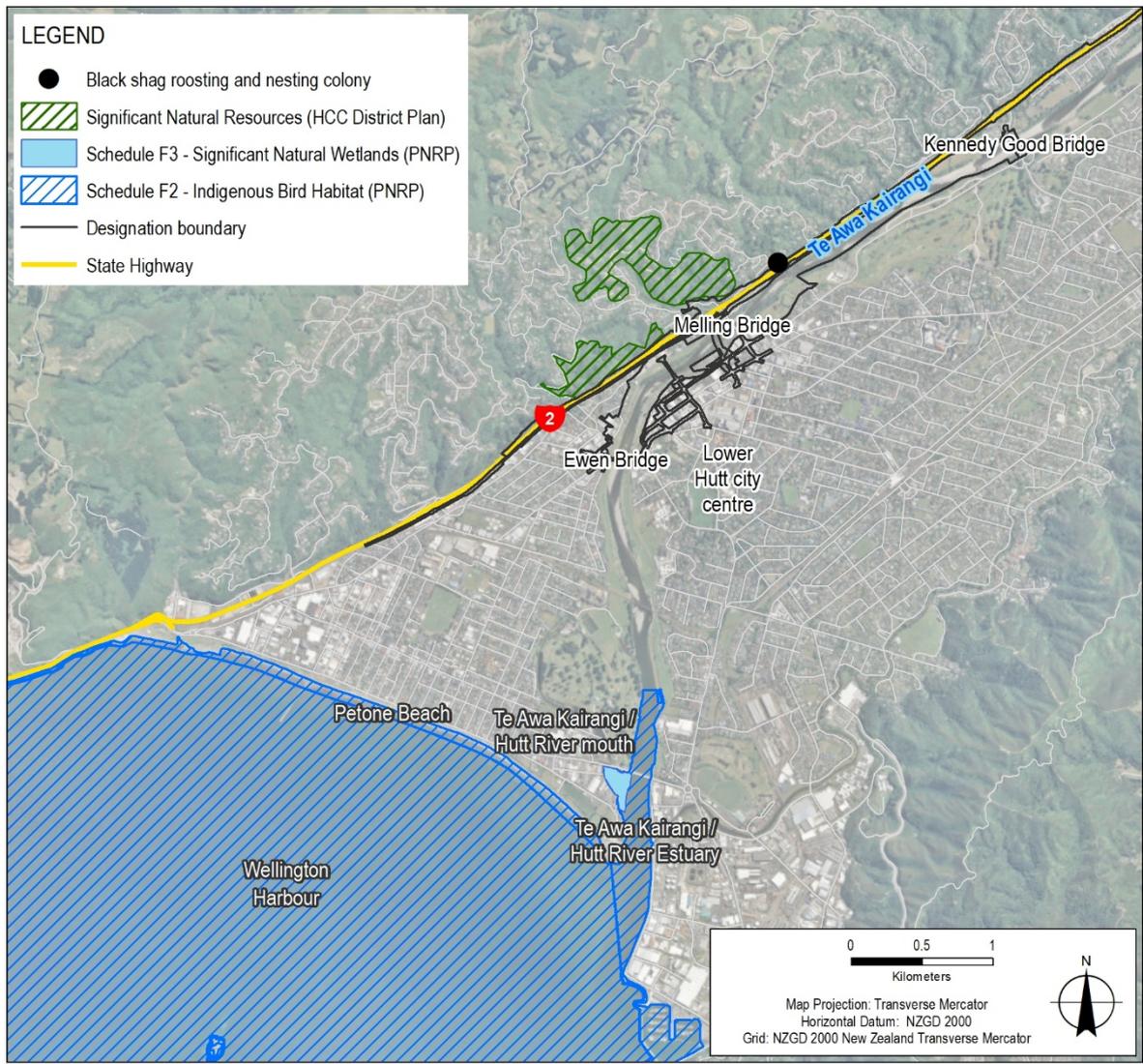


**Figure 1: A large hinu growing in the mixed broadleaved forest and scrub adjacent to SH2. Note the exotic ground cover of Tradescantia and bindweed.**

### **3.3.2 Notable ecological features within the Project area and surrounds**

49. Hutt City Council (HCC) have identified several Significant Natural Resources (SNRs) as part of the District Plan. These are located on the lower western hills that border the true right-hand side of Te Awa Kairangi/Hutt River RiverLink channel and the Belmont Regional Park. Two of these SNRs, Jubilee Park Bush (SNR21) and Harbour View Bush (SNR14), are directly adjacent to the proposed designation boundary (Figure 2 and Figure 3).
50. Downstream of the Project area, Greater Wellington Regional Council (GWRC) has identified the mouth of the Te Awa Kairangi/Hutt River as significant habitat for indigenous birds in the coastal marine area under schedule F2c of the PNRP (Figure 2).
51. A Significant Natural Wetland has also been identified at Te Awa Kairangi / Hutt River mouth, under schedule F3 of the PNRP. This wetland covers 3.24 ha and is located approximately 2.3 km downstream of the project area (Figure 2).

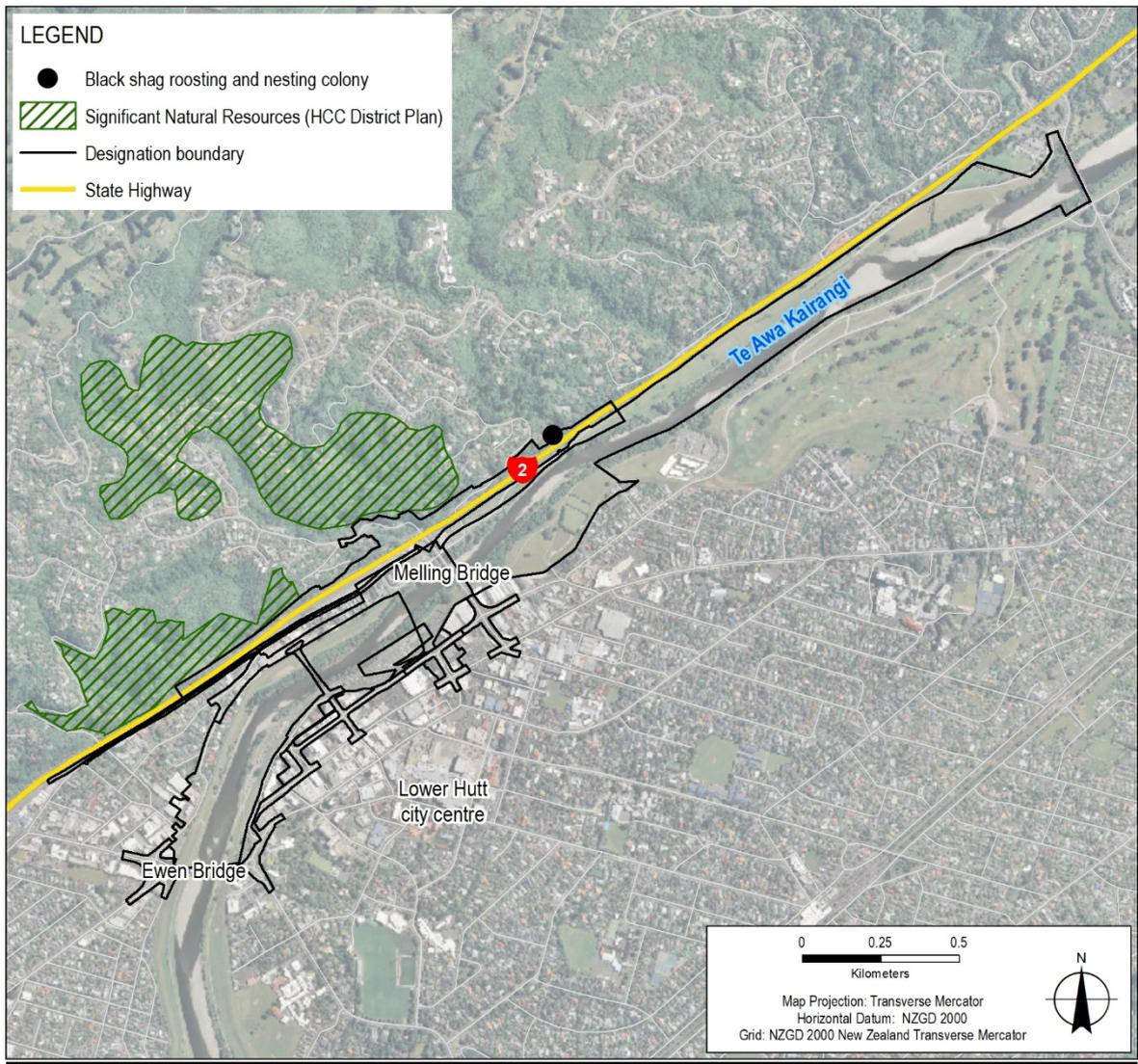
52. While significant indigenous bird habitat has not been identified in the Project area, Te Awa Kairangi/Hutt River is a known movement corridor for riverine birds<sup>4</sup>. These birds also use the open gravel beaches along the river for roosting, including At Risk species such as black shags and red-billed gulls.
53. A roosting and nesting colony of Black Shags is also located in the Project area, adjacent to SH2, approximately 500 m north of the Melling Bridge.



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**Figure 2: Notable ecological features surrounding the RiverLink Project area**

<sup>4</sup> Gibb, J. A. 2000. Activity of birds in the Western Hutt Hills, New Zealand. *Notornis*. 47. 13-35.



Data source: Sourced from the LINZ Data Service and licensed for re-use under the Creative Commons Attribution 4.0 New Zealand licence. Stats NZ, statistical area 2018 Created by nrama

**Figure 3: Significant Natural Resources identified in the District Plan in close vicinity to the RiverLink Project area**

## 4. ASSESSMENT METHODOLOGY

54. A desktop review and a review of the relevant statutory documents was undertaken to inform this assessment of effects. The key information sources of the desktop review are listed below. The relevant statutory documents that have been reviewed are listed in paragraphs 38 and 39.

### 4.1 Desktop review

55. A review of relevant desktop literature and databases was undertaken. Key information sources included:

- i. McArthur N, Small D and Govella S. (2015). Baseline monitoring of the birds of the Ōtaki, Waikanae and Hutt Rivers, 2012-2015. Greater Wellington Regional Council, Publication No. GW/ESCI-T-15/42, Wellington;

- ii. McArthur N, Robertson H, Adams L and Small D. (2015). A review of coastal and freshwater habitats of significance for indigenous birds in the Wellington region. Prepared for Greater Wellington Regional Council;
- iii. McArthur N, Walter J and Ray S. (2018). State and trends in the diversity, abundance and distribution of birds in Upper Hutt City. Prepared by Wildlife Management International Limited for Greater Wellington Regional Council;
- iv. Key Native Ecosystem Plans prepared by GWRC:
  - a. Key Native Ecosystem Plan for Belmont-Korokoro 2016-2019 (Publication no. GW/BD-G-16/60)
  - b. Key Native Ecosystem Operational Plan for Belmont-Speedy's 2018-2021 (Publication no. GW/BD-G-20/6)
  - c. Key Native Ecosystem Operational Plan for Belmont-Dry Creek 2018-2021 (Publication no. GW/BD-G-20/5)
- v. The National Bat Database administered by the DOC (accessed 3 November 2020);
- vi. Ornithological Society of New Zealand (OSNZ) bird records accessed via <https://ebird.org/atlasnz/explore>;
- vii. New Zealand National Vegetation Survey Databank administered by Manaaki Whenua Landcare Research (accessed 2 November 2020); and
- viii. iNaturalist (<https://www.inaturalist.org>)

## **4.2 Site walkover**

- 56. An initial site walkover was undertaken on the 31 October 2019 by two T+T ecologists. The aim of this site walkover was to understand the context of the RiverLink Project area within the wider landscape, establish any ecological and natural character values, and determine the extent of any ecological surveys that may need to be undertaken to inform this assessment.

## **4.3 Field survey methods**

- 57. Three follow-up site visits have been undertaken by T+T ecologists in November 2019, May 2020, and December 2020. The focus of these visits was to compile species lists for vegetation and habitats, undertake bird surveys, and to assess potential lizard and bat habitats.

### **4.3.1 Vegetation**

- 58. Vegetation descriptions and species lists were compiled during the site walkovers. Potential habitat types were mapped using aerial imagery prior to the December 2020 walkover. During the aforementioned walkover the different vegetation/habitat types were ground-truthed where access allowed.

#### **4.3.2 Terrestrial invertebrates**

59. No specific terrestrial invertebrate surveys have been undertaken to inform the Project to date, given that the habitats available in the Project area are highly modified. However, incidental observations of terrestrial invertebrates of note were recorded. These incidental observations occurred during the manual searches for ground dwelling lizards undertaken as part of the lizard surveys.

#### **4.3.3 Lizards**

60. During the vegetation assessments the vegetation/habitat types are also assessed for their potential value for lizard species that may occur in the area.
61. After discussion with GWRC ecology reviewers, it was agreed that lizard surveys should be undertaken to inform the assessment of effects as opposed to relying on habitat assessments and a subsequent Lizard Management Plan. Chris Wedding (Bioresearches Ltd.), a specialist herpetologist was engaged to undertake these surveys. The detailed lizard survey methodology is included in Appendix A.

#### **4.3.4 Birds**

62. Seventeen (17) five-minute bird counts (5MBC) were undertaken across the Project on the 15th and 16th December 2020, following the methodology of Dawson and Bull (1975). Bird counts primarily targeted the river corridor except for one count station on the north western side of SH2. All bird counts were undertaken during fine weather.
63. In addition to the above, a roaming inventory of all birds observed across the three follow-up site visits (November 2019, May 2020, and December 2020) was compiled. All native species observed across the site visits are listed in Table 5-7.
64. There are records of a black shag colony nesting/roosting in the Project area, approximately 400 m north of the Melling interchange. Observational surveys of the roosting site were undertaken during the site visits in November 2019 and December 2020. The goal of these surveys was to ascertain approximate numbers of black shags roosting or nesting at the site.

#### **4.3.5 Bats**

65. During the vegetation assessments the vegetation/habitat types were also assessed for their potential value for native bats.
66. Acoustic bat surveys were not undertaken. The level of anthropogenic disturbance, including heavily lit areas, across the Project area means it is extremely unlikely either native bat species uses the Project area. There is also no known population of long-tailed or short-tailed bats in urban Wellington or Lower Hutt, with the most recent (and sole) record of an unknown bat species over 30 years old.

### **4.4 Assessment of effects methodology**

67. Our assessment of ecological effects for the Project broadly follows the Ecological Impact Assessment Guidelines (EclA Guidelines), with some adaptation for different fauna and ecosystem types (Roper-Lindsay *et al.*, 2018). Using a standard framework and matrix approach such as this provides a consistent and transparent assessment of effects and is considered to be good industry practice.

68. The framework for assessment provides structure but needs to incorporate sound ecological judgement to be meaningful. Deviations or adaptations from the methodology are identified within each of the following sections as appropriate.
69. The EclA Guidelines have been used to ascertain the following:
- i. The level of **ecological value** of the environment
  - ii. The **magnitude** of ecological effect from the proposed activity on the environment, and
  - iii. The **overall level of effect** to determine if mitigation is required.

#### 4.4.1 Assigning ecological value

70. Ecological values are assigned on a scale of 'Low' to 'Very High' based on species, communities and habitats present in the Project footprint and immediate surrounds. Ecological values are assessed in terms of:
- i. Representativeness of the habitat including species assemblages
  - ii. Rarity/distinctiveness, whether the area represents a threatened ecosystem (naturally or induced), rarity of the species the area supports
  - iii. Diversity and pattern, biotic and abiotic diversity, and
  - iv. Ecological context, how the area contributes to ecosystem functioning through its relationship with the surrounding landscape.
71. Table 4-1 and Table 4-2 are adapted from the EclA Guidelines (2018) and outline how ecological values are assigned to vegetation communities and habitats.

**Table 4-1: Attributes to be considered when assigning ecological value or importance to a site or area of vegetation/habitat/community. EclA Guidelines (Roper-Lindsay et al., 2018)**

Value	Attributes to be considered
Representativeness	<p>Criteria for representative vegetation and habitats:</p> <ul style="list-style-type: none"> <li>Typical structure and composition</li> <li>Indigenous species dominate</li> <li>Expected species and tiers are present</li> <li>Thresholds may need to be lowered where all examples of a type are strongly modified</li> </ul> <p>Criteria for representative species and species assemblages:</p> <ul style="list-style-type: none"> <li>Species assemblages that are typical of the habitat</li> <li>Indigenous species that occur in most of the guilds expected for the habitat type</li> </ul>
Rarity/ distinctiveness	<p>Criteria for rare/distinctive vegetation and habitats:</p> <ul style="list-style-type: none"> <li>Naturally uncommon, or induced scarcity</li> <li>Amount of habitat or vegetation remaining</li> <li>Distinctive ecological features</li> <li>National priority for protection</li> </ul> <p>Criteria for rare/distinctive species or species assemblages:</p>

Value	Attributes to be considered
	<p>Habitat supporting nationally Threatened or At Risk species, or locally uncommon species</p> <p>Regional or national distribution limits of species or communities</p> <p>Unusual species or assemblages</p> <p>Endemism</p>
Diversity and Pattern	<ul style="list-style-type: none"> <li>• Level of natural diversity, abundance and distribution</li> <li>• Biodiversity reflecting underlying diversity</li> <li>• Biogeographical considerations – pattern, complexity</li> <li>• Temporal considerations, considerations of lifecycles, daily or seasonal cycles of habitat availability and utilisation</li> </ul>
Ecological context	<ul style="list-style-type: none"> <li>• Site history, and local environmental conditions which have influenced the development of habitats and communities</li> <li>• The essential characteristics that determine an ecosystem’s integrity, form, functioning, and resilience (from “intrinsic value” as defined in RMA)</li> <li>• Size, shape and buffering</li> <li>• Condition and sensitivity to change</li> <li>• Contribution of the site to ecological networks, linkages, pathways and the protection and exchange of genetic material</li> <li>• Species role in ecosystem functioning – high level, key species identification, habitat as proxy</li> </ul>

**Table 4-2: Scoring for sites or areas combining values for four matters in Table 4-1. EcIA Guidelines (Roper-Lindsay et al., 2018)**

Value	Description
Very high	<p>Area rates High for 3 or all of the four assessment matters listed in Table 4-1.</p> <p>Likely to be nationally important and recognised as such.</p>
High	<p>Area rates High for 2 of the assessment matters, Moderate and Low for the remainder, or</p> <p>Area rates High for 1 of the assessment matters, Moderate for the remainder.</p> <p>Likely to be regionally important and recognised as such.</p>
Moderate	<p>Area rates High for one matter, Moderate and Low for the remainder, or</p> <p>Area rates Moderate for 2 or more assessment matters Low or Very Low for the remainder</p> <p>Likely to be important at the level of the Ecological District.</p>
Low	<p>Area rates Low or Very Low for majority of assessment matters and Moderate for one.</p> <p>Limited ecological value other than as local habitat for tolerant native species.</p>
Negligible	<p>Area rates Very Low for 3 matters and Moderate, Low or Very Low for remainder.</p>

72. Table 4-3 is adapted from the EclA Guidelines (2018) and outlines how ecological values are assigned to individual species.

**Table 4-3: Factors to consider in assigning value to terrestrial species adapted from the EclA Guidelines (Roper-Lindsay et al., 2018)**

Value	Determining factors
Very high	Nationally Threatened species, found in the zone of influence (ZOI) either permanently or seasonally
High	Species listed as At Risk – Declining, found in the ZOI, either permanently or seasonally
Moderate	Species listed as any other category of At Risk, found in the ZOI either permanently or seasonally; or Locally (within Ecological District) uncommon or distinctive species
Low	Nationally and locally common indigenous species
Negligible	Exotic species, including pests, species having recreational value

#### 4.4.2 Assessment of magnitude of effects

73. Magnitude of effect is a measure of the extent or scale of the effect of an activity and the degree of change that it will cause. The magnitude of an effect is scored on a scale of 'Negligible' to 'Very High' (Table 4-4) and is assessed in terms of:

- i. Level of confidence in understanding the expected effect
- ii. Spatial scale of the effect
- iii. Duration and timescale of the effect (Table 4-5)
- iv. The relative permanence of the effect, and
- v. Timing of the effect in respect of key ecological factors.

74. The spatial scale for effects is considered in the context of the local and landscape scale effects as appropriate. The magnitude of effects is assessed after measures to avoid, minimise and mitigate are applied.

**Table 4-4: Criteria for describing magnitude of effect. EclA Guidelines (Roper-Lindsay et al., 2018)**

Magnitude	Description
Very high	Total loss of, or very major alteration to, key elements/features/ of the existing baseline <sup>1</sup> conditions, such that the post-development character, composition and/or attributes will be fundamentally changed and may be lost from the site altogether; AND/OR  Loss of a very high proportion of the known population or range of the element/feature.

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

<sup>1</sup> Baseline conditions are defined as 'the conditions that would pertain in the absence of a proposed action' (Roper-Lindsay et al., 2018).

**Table 4-5: Timescale for duration of effects. EclA Guidelines (Roper-Lindsay et al., 2018)**

Timescale	Description
Permanent	Effects continuing for an undefined time beyond the span of one human generation (taken as approximately 25 years).
Long-term	Where there is likely to be substantial improvement after a 25 year period (e.g. the replacement of mature trees by young trees that need > 25 years to reach maturity, or restoration of ground after removal of a development) the effect can be termed 'long term'.
Temporary <sup>1</sup>	Long term (15-25 years or longer – see above) Medium term (5-15 years) Short term (up to 5 years) Construction phase (days or months).

<sup>1</sup> In the context of some planning documents, 'temporary' can have a defined timeframe.

#### 4.4.3 Assessment of the level of effects

75. An overall level of effects (Table 4-6:) is identified for each activity or habitat/fauna type using a matrix approach that combines the ecological values (described in Table 4-2 and Table 4-3) with the magnitude of effects after measures to avoid, minimise and mitigate are applied (Table 4-4).
76. The matrix describes an overall level of effect on a scale of 'Negligible' to 'Very High'. Positive effects are also accounted for within the matrix.
77. The level of effect is then used to guide the extent and nature of further ecological management response required, which may include offsetting or compensation.

**Table 4-6: Criteria for describing overall levels of ecological effects. EclIA Guidelines (Roper-Lindsay et al., 2018)**

Ecological value (Table 4-2 and Table 4-3) Magnitude (Table 4-4)	Very high	High	Moderate	Low	Negligible
Very high	Very high	Very high	High	Moderate	Low
High	Very high	Very high	Moderate	Low	Very low
Moderate	High	High	Moderate	Low	Very low
Low	Moderate	Low	Low	Very low	Very low
Negligible	Low	Very low	Very low	Very low	Very low
Positive	Net gain	Net gain	Net gain	Net gain	Net gain

## 5. TERRESTRIAL ECOLOGICAL VALUES

### 5.1 Vegetation and habitat values

#### 5.1.1 Desktop review

##### *Historic vegetation*

78. A review of the historic extent of ecosystems across New Zealand showed that prior to anthropogenic modification the Hutt Valley area was dominated by several forest types (Singers and Rogers, 2014). Remnants of these forests still occur on the hill slopes either side of the river valley along with large areas of regenerating forest. However, lowland areas were extensively cleared in the early to mid-1900s<sup>5</sup>. The lowland areas immediately bordering the Te Awa Kairangi/Hutt River were historically dominated by kahikatea, pukatea swamp forest interspersed with tōtara (*Podocarpus totara*), mataī

<sup>5</sup> van Meeuwen-Dijkgraaf, A. 2018. Indigenous Biodiversity in Hutt City. Report prepared by Wildlands for Hutt City Council.

(*Prumnopitys taxifolia*), ribbonwood (*Plagianthus regius subsp. regius*) forest on the particularly fertile alluvial substrates. The eastern hill slopes above the river valley were dominated by hard beech (*Fuscospora truncata*) forest while the Western Hutt hills were once covered in tawa, kāmahī (*Weinmannia racemosa*), podocarp forest interspersed with kohekohe, tawa forest in the more coastal areas<sup>6</sup>.

### **Threatened or At Risk flora**

79. The Crisp (2020) report outlining the conservation status of vascular plants in the Wellington Region was reviewed to identify regionally Threatened or At Risk species known to occur in the wider Lower Hutt area. The species listed in Table 5-1 have been assessed as potentially occurring in the Project area based on their habitat preferences and observations in the surrounding area. As outlined in Table 5-1, many of the plants listed as Threatened or At Risk generally have lower threat levels on a national scale.
80. Attention was given to looking for the regionally threatened species listed below during the site walkover undertaken in December 2020. None of the regionally threatened species were observed, however a number of these species are cryptic and may occur in the Project area in low densities. Hence, they have been precautionarily included in the values assessment.
81. Systematic surveys for these threatened plants were not undertaken as the level of modification of the habitats within the Project area suggest there is a low risk of the majority of the species being present. Furthermore, the habitats available in the Project area are fragmented, or are small in extent, and could be effectively surveyed via walkover without the need for systematic sampling, for example using a random plot-based approach.
82. Table 5-1 also includes Nationally Threatened or At Risk species identified during site investigations. See paragraphs 95 and 1 for additional detail.

**Table 5-1: Terrestrial plants identified as Threatened or At Risk in the Wellington Region, and nationally, that may occur in the Project area.**

Species	Regional threat status <sup>1</sup>	National threat status <sup>2</sup>	Habitat preferences <sup>3</sup> and assessment of the likelihood to occur in the Project area.
<b>Nationally Threatened or At risk species <u>observed</u> in the Project area</b>			
Kānuka ( <i>Kunzea robusta</i> )	-	Threatened – nationally vulnerable	Confirmed in the Project area. Very common plant in the Myrtaceae family. Its threat status has increased from Not Threatened due to the risk posed by the plant pathogen myrtle rust as opposed to observed population decline.
Mānuka ( <i>Leptospermum scoparium</i> var. <i>scoparium</i> )	-	At risk - declining	Confirmed in the Project area, primarily planted. Very common plant in the Myrtaceae family. Its threat status has increased from Not Threatened due to the risk posed by the plant pathogen myrtle rust as opposed to observed population decline.

<sup>6</sup> Singers, N., Crisp, P. and Spearpoint, O. 2018. Forest Ecosystems of the Wellington Region. Greater Wellington Regional Council, Publication No. GW/ESCI-G-18-164, Wellington.

Species	Regional threat status <sup>1</sup>	National threat status <sup>2</sup>	Habitat preferences <sup>3</sup> and assessment of the likelihood to occur in the Project area.
Pōhutukawa ( <i>Metrosideros excelsa</i> )	-	Threatened – Nationally Vulnerable	Confirmed in the Project area. Very common plant in the Myrtaceae family. Its threat status has increased from Not Threatened due to the risk posed by the plant pathogen myrtle rust as opposed to observed population decline. Pōhutukawa is not native to the Wellington region.
Northern rātā ( <i>Metrosideros robusta</i> )	-	Threatened – Nationally Vulnerable	Confirmed in the Project area. Common plant in the Myrtaceae family. Its threat status has increased from Not Threatened due to the risk posed by the plant pathogen myrtle rust as opposed to observed population decline.
King fern ( <i>Ptisana salicina</i> )	-	At Risk - Declining	Confirmed in close surrounds of Project area, upslope of SH2. May be in Project area although available shaded gully habitat is limited. As with pōhutukawa, king fern has naturalised in the Wellington Region, but it is south of its native range. Likely to have naturalised from cultivated plants <sup>4</sup> .
<b>Regionally threatened species <u>not observed</u>, but may occur in the Project area</b>			
Sea holly ( <i>Eryngium vesiculosum</i> )	Critical	Threatened – nationally vulnerable	A primarily coastal perennial herb. Also observed in lake margins and riverbeds, but only known to occur inland in Canterbury <sup>7</sup> . Low likelihood of occurring within the Project area.
Turnip-rooted geranium ( <i>Geranium retrorsum</i> )	Critical	Threatened – nationally vulnerable	Perennial herb of open habitats. Unlikely to occur in the Project area as it is sensitive to rabbit browse.
Giant hypolepis ( <i>Hypolepis dicksonioides</i> )	Critical	At risk – naturally uncommon	Occurs in recently disturbed coastal and lowland areas. Has been observed in urban areas (iNaturalist.co.nz) and could occur in the Project area.
Dwarf mistletoe ( <i>Korthalsella salicornioides</i> )	Critical	Threatened – nationally critical	A parasite found in forest and shrublands. Primary host is mānuka and kānuka. Recently observed near the Project area (iNaturalist.nz). Could occur in the regenerating forest in the Project area although only occasional kānuka was observed and mānuka is limited to planted areas.

<sup>7</sup> Allan, H.H. 1961. Flora of New Zealand. Vol. I. Government Printer, Wellington. 1085p.

Species	Regional threat status <sup>1</sup>	National threat status <sup>2</sup>	Habitat preferences <sup>3</sup> and assessment of the likelihood to occur in the Project area.
Red mistletoe ( <i>Peraxilla tetrapetala</i> )	Critical	At risk – declining	Hemiparasite mainly on native beech trees but also found on several other hosts. Recently observed in the Hutt Valley (iNaturalist.nz). Could occur in the regenerating forest in the Project area. However, it is unlikely given no beech were observed aside from the two notable trees discussed below.
Poroporo ( <i>Solanum aviculare</i> var. <i>aviculare</i> )	Vulnerable	Threatened – nationally vulnerable	Coastal, open shrubland can occur as an urban weed. Recently observed in the Hutt Valley (iNaturalist.nz). Could occur in multiple habitats in the Project area.
Bristle fern ( <i>Trichomanes elongatum</i> )	Critical	Not threatened	Generally, occurs on banks or rock overhangs in semi-shaded sites. Could occur in discrete areas of the regenerating forest habitat in the Project area.

<sup>1</sup> Crisp P. (2020). Conservation status of indigenous vascular plant species in the Wellington region. Greater Wellington Regional Council, Publication No. GW/ESCI-G-20/20, Wellington.

<sup>2</sup> de Lange, P.J.; Rolfe, J.R.; Barkla, J.W.; Courtney, S.P.; Champion, P.D.; Perrie, L.R.; Beadel, S.M.; Ford, K.A.; Breitwieser, I.; Schonberger, I.; Hindmarsh-Walls, R.; Heenan, P.B.; Ladley, K. 2018: Conservation status of New Zealand indigenous vascular plants, 2017. New Zealand Threat Classification Series 22. Department of Conservation, Wellington. 82 p.

<sup>3</sup> Habitat preferences sourced from relevant species pages on the New Zealand Plant Conservation Network, <https://www.nzpcn.org.nz/>.

<sup>4</sup> <http://www.nzflora.info/factsheet/Taxon/Ptisana-salicina.html>

### Notable trees

83. Policy 14G 1.1 and 1.2 of the District Plan provide for the protection of notable trees and remnant nikau palms on the valley floor (mapped in Appendix Trees 2 of Amendment 10).
84. Two pōhutukawa trees in the Project area have been classified as notable trees. One of these is a street tree located on Raroa Rd. The other is located on the SH2 roadside opposite Melling Station. These trees are mature, approximately 80 to 100+ years old and likely provide foraging, roosting and potential nesting habitat for common native birds in the area such as tūi. These trees are unlikely to provide habitat for less common avifauna as they are located on the roadside in downtown Lower Hutt. As noted in Table 5-1:, pōhutukawa have naturalised in the Wellington Region but it is south of its native range. There are concerns about the threat it poses to the endangered northern rata (native to the Wellington Region) through hybridisation (McKessar & Sawyer, 1999).
85. Two mature black beech (*Fuscospora solandri*) located on Harbour View Rd have been classified as notable trees. As above, these mature trees likely provide roosting and potential nesting habitat for common native birds in the area. Native beech trees provide limited foraging opportunity for native birds as they are wind pollinated and dispersed.

86. An additional six exotic trees and palms in the proposed designation boundary are also listed as notable trees. These trees are:
- i. Four phoenix palms (*Phoenix canariensis*) on the southern corner of High Street in the CBD;
  - ii. An English Elm (*Ulmus procera*) outside the Toyota dealership on Rutherford Street in the CBD; and
  - iii. A silver fir (*Abies alba*) adjacent to the pōhutukawa on the edge of SH2.
87. The phoenix palms and the English elm are all located in the heart of the Lower Hutt CBD and are more likely to provide habitat for metropolitan exotic fauna such as sparrows, pigeons and rats (in the case of the palms) as opposed to native fauna. Kereru have been observed feeding on phoenix palm fruit, however this can cause the spread of this exotic species which is a pest plant in other areas of the North Island.
88. As with the native trees discussed above, the silver fir tree may provide roosting and nesting habitat for common native bird species but is unlikely to core habitat for any more sensitive species given its location on the side of SH2.
89. Overall, the exotic notable trees in the Project area have been assessed as having limited ecological value.

### **5.1.2 Site observations**

90. During the site walkovers, the habitat types in the Project area were assessed and a vegetation species list compiled. Overall, the area is highly modified and the vegetation that does persist is of limited floristic value. However, there are some areas particularly along the Western hillslopes that contain a more intact indigenous plant community, in secondary stages of regeneration.
91. Eight habitat types were identified (Table 5-2). Some of these habitats, for example gravel beaches and ornamental gardens, have very limited botanical value but can still provide important habitat for riverine birds and lizards respectively.
92. All of the vegetation/habitat types identified in the Project area are heavily modified. The vegetation community has been influenced habitat modification and fragmentation and the corresponding microclimatic shifts resulting from increased sunlight exposure, higher soil temperatures, changes in humidity and, and increased wind (edge effects).
93. One of the major vegetation types in the Project area, the 'tall stature exotic planting (flood protection)' (see Table 5-2) comprises the flood protection planting on the River margins. The vegetation type is also subject to periodic flooding.
94. Most vegetation/habitat types identified are exotic-dominated and large weed incursions were observed even in the more intact mixed broadleaved forest that is located on the lower slopes of the western hills.
95. None of the regionally Threatened or At Risk species known to occur in the wider Lower Hutt area listed in Table 5-1 above were identified in the Project area during the site walkovers. However, some species, such as dwarf mistletoe are cryptic and may occur in the proposed designation boundary without being recorded during site investigations.

96. Five nationally Threatened or At Risk species were confirmed in the Project area or its close surrounds (Table 5-1). Two of these species pōhutukawa and king fern, while listed as nationally Threatened or At Risk, have naturalised in the Wellington region (outside of their native range) and hence are of limited ecological value in the context of this Project.
97. The remaining three species, kānuka, mānuka and Northern rātā (and also pōhutukawa) are common with large, stable populations. They have been precautionarily designated as Threatened or At Risk due to the risk of serious future decline caused by myrtle rust disease. None of the above species have thus far shown serious vulnerability to myrtle rust. The risk posed by myrtle rust is at the landscape scale and is unlikely to be affected by project activity, particularly in the context of the Project area, which is already regularly accessed by people and machinery, both of which are potential vectors of the disease.
98. Table 5-2 summarises the vegetation types identified across the study area including a brief description. These areas are mapped in Appendix B and Table 5-3 details the ecological value of each vegetation/habitat type with reference to the criteria outlined in the EclA Guidelines (2018). The areas set out in Table 5-2 are the spatial extents of each vegetation/ habitat type within the designation boundaries, rather than the areas that will be removed as a result of the Project (refer to section 6 for the area of each habitat type to be removed).

**Table 5-2: Vegetation types occurring in the RiverLink Project area.**

Habitat type and extent across Project area* (ha)	Description
<p>Mixed broadleaved forest and scrub</p> <p>3.7 ha (Comprising &lt; 1% of indigenous forest available in the Ecological District)</p>	<p>This habitat forms part of a wider network of remnant and regenerating forest types occurring along the hill country to the northwest of SH2. It is almost contiguous with Belmont Regional Park further to the west but for the encroachment of various areas of residential housing.</p> <p>The extent of this wider forest complex that occurs within the Project area is edge habitat that occurs immediately adjacent to SH2. The majority of the vegetation within the Project footprint is located on a steep escarpment above SH2 and hence was surveyed from the upslope and downslope. The composition varies across the extent due to differing levels of modification. The differing 'sub-types' within this vegetation type are mapped on Drawing A16-4831-G012-G013 in Volume 5 of the Application and described below.</p> <p>The most intact area within the Project Footprint covers approximately 830 m<sup>2</sup> and is located on the embankment immediately south of the proposed Melling Bridge (Area A on Drawing A16-4831-G012-G013 in Volume 5 of the Application). It comprises a canopy of larger natives including hīnau (<i>Elaeocarpus dentatus</i>), tītoki (<i>Alectryon excelsus</i>), rewarewa (<i>Knightia excelsa</i>), karaka (<i>Corynocarpus laevigatus</i>). The subcanopy and understory are heavily modified by weed incursions but common native species including māhoe (<i>Melicytus ramiflorus</i>), kawakawa (<i>Piper excelsum</i> subsp. <i>excelsum</i>), mamaku (<i>Cyathea medullaris</i>), and red matipo (<i>Myrsine australis</i>) are regenerating. The understory and ground layer are dominated by exotics including, rank exotic grasses, blackberry (<i>Rubus fruticosus</i> agg.), tradescantia (<i>Tradescantia fluminensis</i>), gorse (<i>Ulex europaeus</i>), broom (<i>Cytisus scoparius</i>) and tangier pea (<i>Lathyrus tingitanus</i>) amongst various other exotic species.</p> <p>Japanese honeysuckle (<i>Lonicera japonica</i>) and bindweed (<i>Calystegia</i> sp.) appear to be particular problems. These vines were observed climbing into the canopy and chocking the native trees and shrubs outlines above.</p> <p>Mature tawa and pukatea (<i>Laurelia novae-zelandiae</i>) were also observed in the gully above Tirohanga Rd, but these are outside of the Project footprint.</p> <p>The remainder of the roadside embankment areas (Areas B on Drawing A16-4831-G012-G013 in Volume 5 of the Application) only contain the occasional larger stature native, primarily hīnau, karaka, and naturalised pōhutukawa (including one of the notable trees adjacent to SH2 discussed above). However, the emergent trees in these areas are dominated by exotics namely large pines (<i>Pinus</i> spp.) and sycamore (<i>Acer pseudoplatanus</i>). The silver fir described as one of the notable trees above also occurs here. As above, the subcanopy includes various common native trees and shrubs, namely māhoe, (<i>Brachyglottis repanda</i>) and kawakawa but is compromised by extensive weed incursions. These incursions include the exotics species listed above as well as notable ivy (<i>Hedera helix</i>) and Elaeagnus (<i>Elaeagnus x reflexa</i>). As above, the vines such as ivy, bindweed and Japanese honeysuckle appear to be substantial problems but the native vine pohuehue (<i>Muehlenbeckia australis</i>) is also present. An kānuka and northern rātā were observed very occasionally. No mature individuals of either species were observed in the Project footprint.</p>

Habitat type and extent across Project area* (ha)	Description
	<p>The area set back from the SH2 roadside embankment comprises a planted area that is continuing to naturally regenerate (Area C on Drawing A16-4831-G012-G013 in Volume 5 of the Application) along with discrete areas of exotic infestations (Area E on Drawing A16-4831-G012-G013 in Volume 5 of the Application). The native dominated areas comprise māhoe, rangiora, kawakawa, hangehange (<i>Geniostoma ligustrifolium</i>), red matipo (<i>Myrsine australis</i>), koromiko (<i>Veronica stricta</i>), kohukohu (<i>Pittosporum tenuifolium</i>), lemonwood (<i>P. eugenoides</i>), lancewood (<i>Pseudopanax crassifolia</i>), karamu (<i>Coprosma robusta</i>), korokio (<i>Corokia cotoneaster</i>), kowhai, wharariki (<i>Phormium cookianum subsp. hookeri</i>), Purei (<i>Carex secta</i>), and snow tussock (<i>Chionochloa flavicans</i>).</p> <p>Exotic species emerging through the native regeneration include sycamore, oak (<i>Quercus robur</i>), and pine as well as various exotic shrubs and vines previously mentioned. The western extent of this area impacted by the footprint comprises a stand of exotic false acacia (<i>Robinia pseudoacacia</i>) over a tradescantia-covered bank (Area D on Drawing A16-4831-G012-G013 in Volume 5 of the Application).</p>
<p>Tall stature exotic planting (flood protection)</p> <p>15.89 ha</p>	<p>This vegetation type occurs along the Te Awa Kairangi/the Hutt River margin and have been planted and managed for the purpose of flood protection. The habitat comprises a planted canopy of exotic willow hybrids (<i>Salix × fragilis</i>) interspersed with poplar (<i>Populus</i> spp.) and alder (<i>Alnus</i> spp.) trees. The subcanopy and understory of these areas is generally dominated by exotic pest plants, but these are interspersed with common native trees and shrubs regenerating under the willow canopy.</p> <p>Species include karaka, māhoe, koromiko (<i>Veronica stricta</i> var. <i>stricta</i>), kawakawa, cabbage tree (<i>Cordyline australis</i>), harakeke (<i>Phormium tenax</i>), kōwhai, pōhuehue and a variety of <i>Coprosma</i> species. The groundcover generally comprises exotic species such as ivy, tradescantia, rank exotic grasses, fennel (<i>Foeniculum vulgare</i>), montbretia (<i>Crocasmia x crocosmiiflora</i>), Chinese mugwort (<i>Artemisia verlotiorum</i>), nasturtium and a variety of other herbaceous weeds.</p>
<p>Native amenity planting</p> <p>0.89 ha</p>	<p>Native plantings in the parkland surrounding the River. These appear to have been planted primarily for amenity purposes. An additional small (approx. 450 m<sup>2</sup>) amenity planting area occurs immediately adjacent to SH2.</p> <p>Comprises common species including harakeke, cabbage tree, mānuka, kānuka, akeake (<i>Dodonaea viscosa</i>) kōwhai, koromiko, māhoe, five finger, korokio (<i>Corokia cotoneaster</i>), red matipo, ribbonwood, and various <i>Coprosma</i> and <i>Pittosporum</i> species including karamū (<i>Coprosma robusta</i>), shining karamū (<i>C. lucida</i>), lemonwood (<i>Pittosporum eugenoides</i>), karo (<i>P. crassifolium</i>) and kōhūhū (<i>P. tenuifolium</i>). Some native plantings had been enriched with secondary species such as tōtara, miro (<i>Prumnopitys ferruginea</i>), and mataī.</p> <p>This habitat type generally occurs in small, isolated patches along the public area of the river corridor.</p> <p>Note some of these plantings contain the occasional exotic specimen tree and exotic pest such as Japanese cherry (<i>Prunus serrulata</i>), but these are not the dominant canopy cover. In many of these patches exotic ground covers including blackberry and tradescantia form the ground layer amongst planted native groundcovers.</p>

Habitat type and extent across Project area* (ha)	Description
Low stature amenity planting 0.15 ha	Strips of low stature plantings planted for amenity purposes along the river margin. These plantings comprise species such as harakeke, oioi ( <i>Apodasmia similis</i> ) and <i>Carex</i> species. The areas have also been invaded by the exotic weeds including fennel, pampas, rank grasses, broom ( <i>Cytisus scoparius</i> ) and tree lucerne ( <i>Chamaecytisus palmensis</i> ).
Constructed wetland 1.03 ha	A recently constructed wetland designed to test the feasibility of constructed wetlands within the modified river corridor to provide habitat for indigenous flora and fauna, improve stormwater quality and control, and to understand maintenance requirements over different time periods. It includes the partial diversion of stream flows from the Belmont catchment through the wetland. The constructed wetland includes two forebays comprising open water with sparse patches of kāpūngāwhā ( <i>Schoenoplectus tabernaemontani</i> ) and bamboo spike sedge ( <i>Eleocharis sphacelata</i> ) with <i>Carex</i> species and the occasional harakeke planted around the margins. Various herbaceous weeds are also interspersed through the wetland margin.
Dwellings with associated ornamental gardens 3.40 ha	Primarily residential dwellings and associated gardens that include areas of rank grass and various ornamental plantings. As these areas are on private property they have not been surveyed in detail.
Rough grassland/ weed field 1.93 ha	Unmown grass areas or waste areas that are dominated by rank grass and herbaceous weeds. Some of the more common weed species identified include arum lily ( <i>Zantedeschia aethiopica</i> ), blackberry, buddleia ( <i>Buddleja davidii</i> ), nasturtium, pampas, everlasting pea ( <i>Lathyrus latifolius</i> ) and <i>Tradescantia</i> .
Gravel beaches (not mapped as these areas are subject to regular change depending on flow regimes)	Gravel beaches of various sizes occur along the river corridor. These areas comprise almost solely of bare gravel as they are inundated during high flows and subject to disturbance from ongoing gravel extraction works associated with flood protection. Some small incursions of herbaceous weeds including grasses, clover ( <i>Trifolium</i> sp.), gravel groundsel ( <i>Senecio skirrhodon</i> ), and water celery ( <i>Apium nodiflorum</i> ) were observed but these were all minor. The ongoing flood protection works, including machine clearance of vegetation from gravel beaches, and periodic flooding likely helps to limit weed establishment on the gravel beaches.  Negligible floristic value - included as these areas provide roosting and potentially nesting habitat for riverine birds.
Other habitats (not mapped)	For the purposes of this report, mown grass and individual specimen trees amongst mown grass have not been mapped due to their limited floristic and habitat value. The specimen trees are largely exotic and includes gums ( <i>Eucalyptus</i> spp.), poplar ( <i>Populus</i> sp.) and oak, as well as the occasional pōhutukawa and cabbage tree.

\* The areal extent has not been slope adjusted.

### **5.1.3 Summary of vegetation types**

99. Mown grass is the primary vegetation type across the study area, comprising the parkland in the Te Awa Kairangi/ Hutt River corridor. Interspersed through the maintained grassy areas are patches of native amenity planting and unmaintained areas comprising rough grassland/ weed fields. Immediately bordering the Te Awa Kairangi/ Hutt River are long strips of mature willows, poplars and alders that have been planted to aid flood management.
100. Outside of the parkland area, regenerating native forest and scrub (mixed broadleaved forest and scrub) occurs immediately adjacent to SH2, a thin strip of this habitat type is within the proposed designation boundary. Given the proximity of this area to SH2 and residential housing, it is influenced by edge effects<sup>8</sup> including incursions of various exotic plants.
101. The remainder of the Project area either comprises the largely bare gravel beaches in bed of the Te Awa Kairangi/ Hutt River or built-up areas including roads and commercial and residential dwellings. These residential areas include a number of garden plantings of limited floristic value, but which have the potential to provide habitat for native fauna such as lizards and common birds. Additionally, although the gravel beaches have limited floristic value, they provide important roosting habitat for various coastal and riverine birds (refer to the bird values starting at paragraph 127).
102. The ecological value of each vegetation and habitat type is assessed using EclA Guidelines (2018) criteria in Table 5-3 at the end of this section.

### **5.1.4 Assessment of vegetation/habitat values**

103. Table 5-3 and Table 5-4 below provide an EclA 'Ecological Values' assessment for each vegetation/habitat type and Threatened or At Risk species that are known or likely to be present within the Project footprint.
104. Table 5-3 is only a values assessment, the effects on these values are detailed and assessed in Section 6. Table 5-3 describes how each vegetation/ habitat meets the criteria of representativeness, rarity/ distinctiveness, diversity and Pattern, and ecological context as described in the EclA Guidelines (2018). Refer to Table 4-1 and Table 4-2 in the methodology section for further detail.
105. As there are many Not Threatened native plant species that occur, or potentially occur, within the Project area, the value of every species is not assessed individually. Instead, only Threatened, At Risk or locally uncommon species are summarised. Under the EclA Guidelines (2018), species that are Not Threatened have an ecological value of 'Low'. 'Very High' impacts on 'Low' value species can still result in a 'Moderate' to 'High' overall level of effect that requires mitigation. The potential effects of the Project on common species are covered in the assessment of effects on different vegetation and habitat types.

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<sup>8</sup> Edge effects are ecological alterations linked with development of sudden, artificial edges of forest fragments. Plants growing along edges are exposed to different climatic variables including increased sunlight, greater temperature fluctuations and lower levels of humidity than those growing in the bush interior.

**Table 5-3: 'Ecological Values' assessment (as per EclA Guidelines, 2018) for each habitat present in the Project footprint.**

Habitat type	Value of vegetation/habitats (as per EclA Guidelines, 2018)	'Ecological value' (EclA Guidelines, 2018)
Mixed broadleaved forest and scrub	<p>Representativeness: <b>'Moderate'</b></p> <ul style="list-style-type: none"> <li>• Mixed vegetation types characterised by both indigenous and exotic species. Only small areas within the designation dominated by native canopy trees. Margins are adjacent to SH2 and are dominated by exotic weeds.</li> <li>• Diversity generally representative of the successional stage of the habitat type but lacking the diversity of the old-growth forest.</li> <li>• The flora diversity indicative that the area will support a typical fauna assemblage for the successional stage of the vegetation.</li> <li>• Some of the area was previously planted but is now naturally regenerating. It has a typical canopy assemblage the natural regeneration in the understory is limited.</li> </ul> <p>Rarity/distinctiveness: <b>'High'</b></p> <ul style="list-style-type: none"> <li>• Two SNRs are located directly adjacent to this habitat type, but outside of the proposed designation boundary (Figure 3). There is a very small area of overlap between the proposed designation boundary and one of these SNRs (c. 171.9 m<sup>2</sup>), but the SNR is not impacted by the works footprint. These areas are classified as significant under the District Plan. Most of the habitat in the proposed designation boundary has not been classed as significant.</li> <li>• However, areas of this habitat have been mapped as regionally endangered kohekohe, tawa forest. Additionally, a small area has been mapped as tōtara, matai, ribbonwood forest. Classified as Critically Endangered at a regional level (Singers &amp; Rogers, 2014).</li> <li>• Most of this habitat occurs across land environments where either 20 - 30% or &gt;30% of indigenous cover remains (LENZ Level IV - Walker et al., 2015). A very small portion of this habitat within the proposed designation boundary (c. 111 m<sup>2</sup>) occurs on a land environment where &lt;10% of indigenous cover remains.</li> <li>• No At Risk lizards (both arboreal and ground-dwelling) have been found in this habitat.</li> <li>• The area has connectivity to the high-quality habitat of the upper western hill slopes. Hence more mobile At Risk species such as whitehead birds may use the area on occasion. The size of the area within the proposed designation boundary and its proximity to SH2 mean it is unlikely to provide core habitat for any Threatened or At Risk birds known to occur in the wider Hutt Valley surrounds.</li> <li>• A nesting site of At Risk black shag is located (in a macrocarpa tree) in this habitat.</li> </ul>	<b>Moderate</b>

Habitat type	Value of vegetation/habitats (as per EclA Guidelines, 2018)	'Ecological value' (EclA Guidelines, 2018)
	<p>Diversity and Pattern: <b>'Moderate'</b></p> <ul style="list-style-type: none"> <li>• Diversity generally representative of the successional stage of the habitat type but lacking the diversity of the old-growth forest.</li> <li>• Proximity to anthropogenic influences has contributed to high levels of pest plant incursions particularly along the edges.</li> </ul> <p>Ecological context: <b>'Low'</b></p> <ul style="list-style-type: none"> <li>• This habitat is directly adjacent to a large State Highway (SH2) and is impacted by fragmentation from residential development encroaching into the area.</li> <li>• The above suggest the levels of anthropogenic disturbance and pest animal densities would limit the potential for sensitive fauna to thrive in the habitat.</li> <li>• The area within the proposed designation boundary occurs along a road edge, providing buffer functionality but making the habitat subject to increased edge effects.</li> </ul>	

Habitat type	Value of vegetation/habitats (as per EclA Guidelines, 2018)	'Ecological value' (EclA Guidelines, 2018)
Tall stature exotic planting (flood protection)	<p>Representativeness: <b>'Low'</b></p> <ul style="list-style-type: none"> <li>• Dominated by exotic species.</li> <li>• Prior to clearance and planting with exotic trees for flood protection, these areas would have previously been characterised by kahikatea, pukatea forest and tōtara, mataī, ribbonwood forest.</li> <li>• The modification to these areas has resulted in limited structural diversity and it is unlikely to support the typical native fauna assemblage expected intact native forest habitat.</li> <li>• The areas are not subject to pest control.</li> </ul> <p>Rarity/distinctiveness: <b>'Low'</b></p> <ul style="list-style-type: none"> <li>• The tall stature exotic planting occurs largely within an acutely threatened land environment where &lt;10% of indigenous cover remains (LENZ Level IV - Walker et al., 2015). A very small portion of this habitat within the proposed designation boundary occurs across a land environment where &gt;30% of indigenous cover remains.</li> <li>• No part of this habitat is classed as SNR under the district plan.</li> <li>• The condition of this habitat suggests a low likelihood of it supporting Threatened or At Risk fauna. No shag roosting / nesting has been identified in this habitat.</li> <li>• Diversity and Pattern: <b>'Low'</b></li> <li>• Native component largely limited to a sparse presence in the subcanopy and understory.</li> <li>• Heavily degraded by exotic pest plants across the ground layer, inhibiting regeneration of native plants.</li> </ul> <p>Ecological context: <b>'Moderate'</b></p> <ul style="list-style-type: none"> <li>• These plantings provide important flood protection and buffering for Te Awa Kairangi/the Hutt River.</li> <li>• Although this vegetation type is dominated by exotic trees, the tall stature of the plantings offers a varied habitat structure to a largely deforested area. Hence the exotic plantings potentially provide value to the bird community for foraging, roosting and nesting.</li> </ul>	<b>Low</b>
Native amenity planting	<p>Representativeness: <b>'Low'</b></p> <ul style="list-style-type: none"> <li>• Generally dominated by indigenous species but pest plants encroaching into many of the planted areas.</li> <li>• The age of the plantings means that although the canopy contains a generally representative mix of early to mid-successional species, there is limited complexity, such as ferns, occurring in the ground tier.</li> </ul>	<b>Low</b>

Habitat type	Value of vegetation/habitats (as per EclA Guidelines, 2018)	'Ecological value' (EclA Guidelines, 2018)
	<ul style="list-style-type: none"> <li>• Consequently, the understory and groundcover tiers do not have a representative species assemblage that would be expected of natural regeneration of a similar age.</li> <li>• The small size of the planted patches and lack of habitat complexity suggests that the remnants are unlikely to support the full species assemblage that would be expected for its successional stage.</li> </ul> <p>Rarity/distinctiveness: <b>'Low'</b></p> <ul style="list-style-type: none"> <li>• The native plantings occur largely within an acutely threatened land environment where &lt;10% of indigenous cover remains (LENZ Level IV - Walker et al., 2015). A very small portion of this habitat within the proposed designation boundary occurs across a land environment where &gt;30% of indigenous cover remains.</li> <li>• No part of this habitat is classed as SNR under the district plan.</li> <li>• No part of this habitat is classified as a rare or threatened ecosystem regionally (Singers &amp; Rogers, 2014).</li> <li>• The small size of the planted patches and the early successional stage of the habitat suggests a low likelihood of it supporting Threatened or At Risk fauna.</li> <li>• The planted patches may be used as stepping stone habitat for mobile species but are unlikely to provide important breeding or foraging habitat for threatened or At Risk birds.</li> </ul> <p>Diversity and Pattern: <b>'Low'</b></p> <ul style="list-style-type: none"> <li>• Relatively low native diversity limited to early to mid-successional species with a few later successional saplings having been planted.</li> </ul> <p>Ecological context: <b>'Low'</b></p> <ul style="list-style-type: none"> <li>• A number of small vegetation patches, occurring within a matrix of mown grassland, subject to edge effects.</li> <li>• The planted patches may be used as stepping stone habitat for mobile native fauna moving between the eastern and western hill slopes that border the Hutt Valley.</li> </ul>	
Low stature amenity planting	<p>As described for 'Native amenity planting' above but noting:</p> <ul style="list-style-type: none"> <li>• Less floral diversity and structural complexity.</li> <li>• A long thin strip impacted by edge effects and modified by pest plant incursions.</li> <li>• Limited in spatial extent (&lt;1500 m<sup>2</sup>).</li> </ul>	<b>Low</b>

Habitat type	Value of vegetation/habitats (as per EclA Guidelines, 2018)	'Ecological value' (EclA Guidelines, 2018)
Constructed wetland	<p>As described for 'native amenity planting' above but noting:</p> <ul style="list-style-type: none"> <li>• Less floral diversity and structural complexity.</li> <li>• Limited in spatial extent (&lt;1500 m<sup>2</sup>).</li> <li>• Wetlands contribute to important ecological services including maintaining hydrological regimes by storing and slowly releasing water and filtering runoff. The purpose of the wetland construction was to provide these services.</li> <li>• New Zealand pipit may use the area including nesting amongst the sedges on the margin.</li> </ul>	<b>Moderate</b>
Dwellings with associated ornamental gardens	<p>Representativeness: <b>'Very Low'</b></p> <ul style="list-style-type: none"> <li>• Ornamental gardens with negligible representativeness to the ecosystem types that would have historically covered the area.</li> </ul> <p>Rarity/distinctiveness: <b>'Very Low'</b></p> <ul style="list-style-type: none"> <li>• This habitat type occurs largely within an acutely threatened land environment where &lt;10% of indigenous cover remains (LENZ Level IV - Walker et al., 2015). A very small portion of this habitat within the proposed designation boundary occurs across a land environment where &gt;30% of indigenous cover remains.</li> <li>• A large proportion of this habitat type is characterised by dwellings and associated impervious surfaces with minimal indigenous cover.</li> <li>• No part of this habitat is classified as a rare or threatened ecosystem regionally (Singers &amp; Rogers, 2014).</li> <li>• Very unlikely to support Threatened or At Risk fauna. Assessed as a habitat type because it may provide habitat for common lizard species as well as common native birds.</li> </ul> <p>Diversity and Pattern: <b>'Very Low'</b></p> <ul style="list-style-type: none"> <li>• The very high level of anthropogenic modification apparent in this habitat type means it no longer represents the underlying physical or biological patterns naturally present in the area.</li> <li>• Although these areas have not been surveyed in detail, it is highly likely that these ornamental gardens have low diversity of native flora and fauna compared to less modified habitats in the proposed designation boundary.</li> </ul> <p>Ecological context: <b>'Low'</b></p> <ul style="list-style-type: none"> <li>• The high level of anthropogenic modification means it is unlikely that these areas provide any notable ecosystem services beyond providing stepping stone habitat for common mobile fauna, namely birds.</li> </ul>	<b>Negligible</b>

Habitat type	Value of vegetation/habitats (as per EclA Guidelines, 2018)	'Ecological value' (EclA Guidelines, 2018)
Rough grassland/ weed field	<p>As described for 'Dwellings with associated ornamental gardens' above.</p> <p>The primary reason this habitat type has been included in the assessment is that it may provide habitat for common lizard species such as northern grass skink as well At Risk New Zealand pipit. New Zealand pipit have been observed using this habitat.</p> <p>Rough grassland areas generally contain low insect diversity, but high insect abundance. This is due to high numbers of individuals from a few common species occurring in this habitat<sup>9</sup>. Hence rough grassland and weed field areas can provide food sources for NZ pipit and common insectivorous bird species such as pīwakawaka and welcome swallows.</p>	<b>Low</b>

<sup>9</sup> Bromham, L., Cardillo, M., Bennett, A. F., & Elgar, M. A. (1999). Effects of stock grazing on the ground invertebrate fauna of woodland remnants. *Australian Journal of Ecology*, 24(3), 199–207.

Munro, V. M. W. "Terrestrial invertebrate communities: the effects of successional age, habitat structure and seasonality." Unpublished M. Sc. Thesis, Massey University, New Zealand (1995).

Habitat type	Value of vegetation/habitats (as per EclA Guidelines, 2018)	'Ecological value' (EclA Guidelines, 2018)
Gravel beaches	<p>Representativeness: <b>'High'</b></p> <p>Typical composition expected, with some minor pest plant incursions. These appear to be limited by the disturbance associated with ongoing flood protection works.</p> <p>Rarity/distinctiveness: <b>'High'</b></p> <p>As gravel beaches naturally are not associated with indigenous cover, they have not been modelled under LENZ level IV. However, gravel riverbed habitat is solely associated with braided rivers which are naturally rare in the environment.</p> <p>At Risk red-billed gulls, and multiple shag species have been observed roosting in this habitat. However, no Threatened or At Risk species have been recorded nesting in this habitat within the proposed designation boundary. Potentially due to high levels of anthropogenic disturbance such as dogs having access to the beaches.</p> <p>Diversity and Pattern: <b>'Moderate'</b></p> <p>Naturally low physical and biological diversity associated with river beaches.</p> <p>The natural inundation cycles of these beaches are likely to have been modified by the modification of the River associated with ongoing flood protection works.</p> <p>Ecological context: <b>'Moderate'</b></p> <p>Gravel beaches comprise important roosting and foraging sites for a variety of riverine birds. However, the gravel beaches within the proposed designation boundary have not been identified as significant roosting sites.</p>	<b>High</b>
Other habitats (not mapped)	For the purposes of this report, mown grass, including individual specimen trees amongst mown grass, have not been mapped due to their limited floristic and habitat value.	<b>Negligible</b>

**Table 5-4: Ecological value of Threatened and At Risk terrestrial flora in, or potentially occurring in, the Project area. Value assigned using the EclA Guidelines (2018).**

Plant species	Conservation status	Observed within the Project area	'Ecological Value' of species (as per EclA Guidelines, 2018)
<i>Kunzea robusta</i> (kānuka)	Threatened – nationally vulnerable	Yes	'Very high' (based on a precautionary conservation status assessment - refer to Table 5-1)
<i>Leptospermum scoparium</i> var. <i>scoparium</i> (mānuka)	At risk declining	Yes (planted)	'High' (based on a precautionary conservation status assessment - refer to Table 5-1)
<i>Metrosideros robusta</i> (northern rātā)	Threatened - nationally vulnerable	Yes	'Very high' (based on a precautionary conservation status assessment - refer to Table 5-1)
<i>Eryngium vesiculosum</i>	Threatened – nationally vulnerable	No - habitat assessment indicates that it may occur in the Project area	'Very high'
<i>Geranium retrorsum</i>	Threatened – nationally vulnerable	No - habitat assessment indicates that it may occur in the Project area	'Very high'
<i>Hypolepis dicksonioides</i>	At risk – naturally uncommon	No - habitat assessment indicates that it may occur in the Project area	'Moderate'
<i>Korthalsella salicornioides</i>	Threatened – nationally critical	No - habitat assessment indicates that it may occur in the Project area	'Very high'
<i>Peraxilla tetrapetala</i>	At risk – declining	No - habitat assessment indicates that it may occur in the Project area	'High'
<i>Solanum aviculare</i> var. <i>aviculare</i>	Threatened – nationally vulnerable	No - habitat assessment indicates that it may occur in the Project area	'Very high'
<i>Trichomanes elongatum</i>	Not threatened (locally uncommon)	No - habitat assessment indicates that it may occur in the Project area	'Moderate'

## 5.2 Terrestrial invertebrates

### 5.2.1 Desktop review

106. A review of iNaturalist (<https://inaturalist.nz/>) identified two Threatened or At Risk invertebrates in the Hutt Valley and surrounds, but none were observed in the Project area.
107. The native land snail *Allodiscus pallidus* (At Risk - Naturally Uncommon) which has been observed in Hayward Scenic Reserve in the Eastern Hutt hills, approximately 3 km from the Project area.
108. The katipō spider, *Latrodectus katipo*, (At Risk - Declining) also occurs in multiple coastal dune areas around Wellington. However, given that it is strictly coastal, it would not occur in the Project area.
109. Multiple other species of native land snail known to occur around Wellington<sup>10</sup> have been observed in the surrounds of the Hutt Valley, primarily in the forested Eastern Hutt hills. However, none of these species are classified in the New Zealand Threat Classification System (NZTCS). It should be noted however that terrestrial invertebrates are poorly studied and hence only a small proportion are captured in the NZTCS.

### 5.2.2 Incidental site observations

110. Additional to the species above, two terrestrial invertebrate species classed as Not Threatened, but are of note, were observed on site during the herpetofauna surveys (C Wedding 2021, pers. comm., 1 April).
111. During manually searching for ground dwelling lizards, multiple *Wainuia urnula urnula* snails (hereafter *W. urnula*), both live specimens and predated shells, were observed in a single location. The snails were observed in the modified 'tall stature exotic vegetation (flood protection)' habitat described in the Section above. This habitat occurs immediately adjacent to the River
112. The native land snail *W. Urnula* has not been classified under the New Zealand Threat Classification system (NZCT), but it is considered common in native forest around Wellington and the Hutt Valley<sup>11</sup>. Given the relative lack of mobility of land snails, it is surprising to observe *W. Urnula* in habitat that has been heavily modified in the past and is subject to regular flooding
113. Peripatus (velvet worms) were also observed during spotlighting surveys for lizards in Jubilee Park. Jubilee park is outside, but immediately adjacent, to the Project area and is contiguous with the 'mixed broadleaved forest and scrub' being impacted adjacent to SH2. It is likely that the peripatus observed were the Not Threatened *Peripatoides novaezealandiae* species.

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<sup>10</sup> Land Snails from the Wellington Region. Poster prepared by the Department of Conservation. <https://www.doc.govt.nz/globalassets/documents/conservation/native-animals/invertebrates/land-snail-posters/land-snails-wellington-region-high-res.pdf>

<sup>11</sup> Efford, M. (1998). Distribution and status of native carnivorous land snails in the genera *Wainuia* and *Rhytida*. Science for Conservation 101. Department of Conservation, Wellington, NZ

114. While *P. novaezealandiae* are classified as Not Threatened, it is a species complex that include multiple distinct morphs. Hence, its status is unclear, and a precautionary approach should be applied when assessing potential threats. Furthermore, peripatus are widely regarded as important in evolutionary biology as they comprise an ancient lineage with a Gondwanan distribution.

**Table 5-5: Ecological value of terrestrial invertebrates in, or potentially occurring in, the Project area. Value assigned using the EclA Guidelines (2018)**

Terrestrial invertebrate species	Conservation status	Observed within the Project area	'Ecological Value' of species (as per EclA Guidelines, 2018)
<i>Allodiscus pallidus</i>	At Risk - Naturally Uncommon	No - iNaturalist observation approx. 3 km from the Project area in the extensively forested Eastern Hutt hills.	Moderate
<i>Wainuia urnula urnula</i>	Not classified	Yes - along the riparian margin of the River.	Moderate (considered a 'distinctive species' refer to Table 4-3)
Peripatus ( <i>Peripatoides novaezealandiae</i> )	Not Threatened	No but observed in Jubilee Park which is contiguous with the Project area.	Moderate (considered a 'distinctive species' refer to Table 4-3)

### 5.2.3 Lizards

115. Lizard surveys and an assessment of effects of the Project on lizards have been undertaken by Bioresearches Ltd. The findings are summarised below but see Appendix A for the complete report.

### 5.2.4 Desktop review

116. A review of the Department of Conservation's ARDs (Bioweb) database and iNaturalist indicated the presence of eight lizard species within approximately 5 km of the Project area. Copper skink, northern grass skink, barking gecko, raukawa gecko and ngahere gecko have been the most commonly recorded species around the Project area.
117. Most records in vicinity of the Project area occurred along the western hills of the Hutt Valley, particularly the forested strip that runs through the suburbs of Maungaraki, Normandale, Harbourview, Tirohanga and Belmont.
118. Most records in vicinity of the Project area occurred along the western hills of the Hutt Valley, particularly the forested strip that runs through the suburbs of Maungaraki, Normandale, Harbourview, Tirohanga and Belmont.
119. There are fewer records to the east of the Project area, but copper skink, northern grass skink, raukawa gecko and barking gecko (note Barking gecko records are now older than 20 years) have been recorded.
120. Table 5-6 is adapted from the Bioresearches report (Appendix A) and summarises the lizard values of the Project area and surrounds.

## 5.2.5 Site observations

121. A minimum of six individual Not Threatened northern grass skinks from 12 encounters, were recorded from two artificial refuge (AR) stations at Harbour View, along a weedy grass edge between Jenness Grove and Harbour View Road.
122. Another AR station on the south-eastern edge of Tirohanga Road also recorded a grass skink. Both locations were within the 'mixed broadleaved forest and scrub' adjacent to SH2. Some skinks were observed basking on the AR stations and could not be distinguished from captured animals.
123. A summary of the survey effort is provided in Table 5 (page 12) of Appendix A and a map of the lizard findings are shown in Figure 6 (page 11) of Appendix A.
124. Table 5-6 is adapted from the Bioresearches report (Appendix A) and summarises the lizard values of the Project area and surrounds.

**Table 5-6: Ecological value of lizard species in, or potentially occurring in, the Project area. Lizard data adapted from the Technical Assessment prepared by Bioresearches (2021) included in Appendix A. Value assigned using the EclA Guidelines (2018).**

Lizard species	Conservation status <sup>1</sup>	Observed within the Project area	'Ecological Value' of species (as per EclA Guidelines, 2018)
Copper skink ( <i>Oligosoma aeneum</i> )	Not Threatened	No Closest record < 1 km from the Project area. Few records around the Project area.	Low
Ornate skink ( <i>Oligosoma ornatum</i> )	At Risk - Declining	No Closest record < 1 km from the Project area. One record, west of Project area.	High
Northern grass skink ( <i>Oligosoma polychroma</i> )	Not Threatened	Yes Few records around Project area, including records within 1 km.	Low
Glossy brown skink ( <i>Oligosoma zelandicum</i> )	At Risk - Declining	No One record > 5 km from the Project area	High
Kupe skink ( <i>Oligosoma</i> aff. <i>infrapunctatum</i> 'Southern North Island')	Threatened - Nationally Vulnerable	No No records within 20 km of the Project area.	Very High
Northern spotted skink ( <i>Oligosoma kokowai</i> ) < 2 km 1	At Risk - Relict <sup>2</sup>	No	Moderate

Lizard species	Conservation status <sup>1</sup>	Observed within the Project area	'Ecological Value' of species (as per EclA Guidelines, 2018)
record west of Project older than		One record > 2 km from the Project area (more than 15 years old)	
Whitaker's skink ( <i>Oligosoma whitakeri</i> )	Threatened - Nationally Endangered	No No records within 20 km of the Project area.	Very High
Raukawa gecko ( <i>Woodworthia maculata</i> )	Not Threatened	No Closest record < 1 km from the Project area. Few records around the Project area.	Low
Minimac gecko ( <i>Woodworthia</i> 'Marlborough mini')	Not Threatened	No Closest record > 15 km from the Project area. Coastal in Wellington Region.	Low
Ngahere gecko ( <i>Mokopirirakau</i> 'southern North Island')	At Risk - Declining	No Closest record < 1 km from the Project area. Few records west of the Project area.	High
Pacific gecko ( <i>Dactylocnemis pacificus</i> )	At Risk - Relict	No No records within 20 km of the Project area. Not observed for more than 30 years.	Moderate
Barking gecko ( <i>Naultinus punctatus</i> )	At Risk - Declining	No Closest record < 1 km from the Project area. Several records around the Project area.	High

<sup>1</sup> Hitchmough, R.; Barr, B.; Lettink, M.; Monks, J.; Reardon, J.; Tocher, M.; van Winkel, D.; and Rolfe, J. (2016). Conservation status of New Zealand reptiles, 2015. New Zealand Threat Classification Series 2. Department of Conservation, Wellington.

<sup>2</sup> Melzer, S.; Bell, T.; Patterson, G. 2017. Hidden conservation vulnerability within a cryptic species complex: taxonomic revision of the spotted skink (*Oligosoma lineocellatum*; Reptilia: Scincidae) from New Zealand. Zootaxa 4300(3): 355-379

## 5.2.6 Summary

125. The potential habitats within the Hutt River riparian margin ("tall stature exotic planting (flood protection)) are structurally very good for terrestrial (ground-based) herpetofauna, but very poor quality for arboreal herpetofauna.

126. No native lizard species were recorded from a comprehensive survey effort throughout potential habitats within the River corridor. Given the apparent suitability of potential habitat for skinks, this lack of detection may be a result of a lack of suitable retreats from periodic flooding of the Hutt River.
127. The potential habitats for skinks and geckos within the 'mixed broadleaved forest and scrub' adjacent to SH2 are structurally very good, and the detection of grass skinks at vegetation edges at Harbour View and along the south-eastern side of Tirohanga Road is consistent with their presence throughout the surrounding landscape (Table 5-6). Northern grass skink are 'Not Threatened' and while the species ranks as low ecological value, they are protected under the Wildlife Act (1953).
128. The 'mixed broadleaved forest and scrub within the Project area is largely contiguous with vegetation that supports records for a much greater diversity of skinks and geckos than what was recorded from the current surveys.
129. Large parts of the potential habitat within the Project area could not be surveyed due to the terrain, and species such as Raukawa gecko, which often inhabit exposed and unstable habitats such as steep or rocky banks, may also be present. Records confirm their presence in the surrounding landscape (Table 5-6).
130. Similarly, copper skink (Not Threatened), ornate skink, ngahere gecko and barking gecko (all 'At Risk- Declining' and therefore 'High Value' as per Table 5-6) have been recorded in adjacent habitats and therefore it is likely that, despite not being detected, some of these species are present. This reptile diversity is high, but representative of what would be expected from a natural, regenerating ecosystem in the Wellington Region.

## **5.3 Birds**

### **5.3.1 Desktop review**

#### **Riverine and/or coastal birds**

131. Annual bird surveys have previously been undertaken along the Te Awa Kairangi/ Hutt River which included the Project area (McArthur *et al.*, 2015). These surveys were undertaken between 2012 - 2013 during the spring/summer period. Additional data from a repeat survey in October 2019, following the same methodology as the McArthur *et al.* (2015) report, was also provided by GWRC ecologists. The results of these surveys are summarised below.
132. Notable birds observed within the Project area during the above-described surveys were black shag, little shag, pied stilt and red-billed gull. Notable species observed elsewhere along the River corridor were little black shag, pied shag, royal spoonbill and variable oystercatcher. McArthur *et al.* (2015) also observed black shag nesting in the macrocarpa north of Melling Intersection in 2012 and 2015. Seven active nests were observed in October 2012 and two non-active nests in in January 2015.
133. McArthur *et al.* (2015) identified particular sites of value for native birds along the river corridor based on the results of the above surveys. One of these sites, the Melling black shags nesting colony, is located within the proposed designation boundary approximately 400 m upstream of the current Melling intersection Figure 3.

134. Approximately 1 km downstream of the southern extent of the Project area (downstream of the Ava railway crossing), there is a large gravel island that is exposed at low tide. This island is a roost site for multiple Threatened or At Risk shorebirds including royal spoonbills, black shags, little black shags, pied shags, variable oystercatchers, pied stilts and Caspian terns (McArthur *et al.*, 2015).
135. Further downstream, just over 2 km from the Project area, the estuary at the mouth of the Te Awa Kairangi/ Hutt River also supports Threatened and At Risk bird species observed along the river corridor including red-billed gull, variable oystercatcher, black shag and pied shag. The estuary has been identified as a “site of significance for indigenous birds” and is listed in schedule F2 of the Wellington Proposed Natural Resources Plan (PNRP Appeals version: GWRC, 2019).
136. A review of the New Zealand eBird database<sup>12</sup> (assessed 25 January 2021) identified an additional seven Threatened or At Risk birds have been observed across the lower reaches of the River including the estuary. These species are: bar-tailed godwit, black-billed gull, Caspian tern, shore plover, South Island pied oystercatcher, reef heron, and white heron. Except for the black-billed gull, all observations were made in the saltwater-influenced, lower reaches of the river (<1.5 km from the coast).

#### **Forest and grassland birds**

137. Studies undertaken on behalf of GWRC and Upper Hutt City Council (UHCC) have identified several notable forest birds in the regenerating native forest patches in vicinity of the Project area, but not within the Project area itself. Whitehead (At Risk - Declining) are commonly observed in the forested areas of the Hutt Valley. New Zealand falcon (At Risk - Recovering) are also resident in the wider area. Less commonly observed species include kakariki (red-crowned parakeet), rifleman, long-tailed cuckoo and North Island kākā.
138. The modified parkland surrounding the river corridor, which comprises the majority of the Project area, does not contain high-quality forest of scrub/shrubland habitat that the above species prefer. Whitehead may occasionally occupy the mixed secondary broadleaved forest along the western edge of the Project area. However, the small size of the impacted habitat and the degraded condition of the edge vegetation suggest that the vegetation proposed for removal is unlikely to be a core habitat for whitehead or any of the other aforementioned forest birds. These birds may however move across the Project area on occasion when moving between the forested hill slopes that bound the east and the west of the Hutt Valley. However, there is limited nesting and feeding habitat for forest birds compared to what is available in the surrounding hillslopes. The proximity of the Project area to the Lower Hutt CBD means there are elevated levels of anthropogenic disturbance (e.g., people undertaking recreational activities, dogs, vehicle noise etc.) and it is unlikely these more sensitive species will use the area regularly, if at all.
139. New Zealand pipit (At Risk - Declining), have also been recorded in vicinity of the Project (Unpublished data from GWRC, 2019).

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<sup>12</sup> Note that casual bird watchers can contribute to the eBird database and hence these records are not as verifiable as reports by trained ecologists/ornithologists.

### 5.3.2 Site observations

140. A site walkover was undertaken on three occasions in November 2019, May 2020 and December 2020. During these walkovers opportunistic bird surveys were undertaken where all birds seen and heard were noted. This was supplemented by five-minute birds counts during the December 2020 site visit (paragraph 62).
141. The bird community observed in the study area largely comprised common native and exotic species (refer to Table 5-7 for the full list of native species). Riverine bird species observed during the walkovers include red-billed gull, black shag, little black shag, pied shag, little shag and pied stilt. Many of these species are classified as Threatened or At Risk and these observations largely align with previous observations along the river corridor (paragraphs 127 - 132).
142. The roost site on the gravel island downstream of the Ava railway crossing (approximately 1 km downstream of the southern extent of the Project area) identified in the McArthur *et al.* (2015) report was also visited at low tide in December 2020. At Risk black shags, little black shags and variable oystercatchers were observed, indicating it is still an important roosting area for multiple species.
143. One species not previously recorded was observed on the river, the New Zealand dabchick (At Risk - Recovering). NZ dabchick generally inhabit freshwater lakes and ponds as opposed to rivers. A New Zealand pipit (At Risk - Declining) was also recorded in the grassland habitat along the river corridor. Pipits are open country birds and there is a large amount of grassland habitat available for this species to utilise in the Project area.

### 5.3.3 Summary

144. Notable birds including multiple shag species and red-billed gulls have been observed dispersing along the river corridor, feeding, and roosting on the gravel beaches in the Project area.
145. Significant indigenous bird habitat has been identified downstream of the Project area under Schedule F2 of the PNRP, but none of the gravel beaches within the Project area have been identified as significant.
146. Additionally, a colony of black shag (At Risk - Declining) were observed roosting and nesting in a macrocarpa tree on the escarpment to the west of SH2, approximately 400 m north of the existing Melling Bridge.
147. No riverine birds have been observed nesting on the gravel beaches in the Project area during our site investigations or previous research undertaken in the area. While the gravel habitat appears suitable for braided river birds such as black-billed gulls, the level of anthropogenic disturbance along this section of the River, including people regularly walking dogs along the River, indicates it is very unlikely that sensitive riverine birds will attempt to nest in the Project area.
148. The desktop review also identified six At-Risk forest birds which reside in the general Western Hutt hills which are contiguous with the mixed secondary broadleaved forest adjacent to SH2. While the other At Risk birds discussed in paragraphs 133 - 135 have been recorded from the Dry Creek area north (approximately 3+ km from the Project area), whitehead have been recorded closer to the Project area in the Speedy's Stream catchment of Belmont Regional Park (in the Western Hutt Hills upslope of the upstream boundary of the Project area). While none of these birds were recorded in the Project

area, these birds may move through the area on occasion. Given the level of degradation of the broadleaved forest in the area, it is unlikely to form core habitat for any At Risk forest birds.

149. A New Zealand pipit was recorded in the parkland adjacent to the river corridor. Pipit nest in rough grass and may attempt to nest in the Project area.
150. The 'Native amenity planting' and the 'tall stature exotic planting (flood protection)' in the river corridor offer foraging, roosting and nesting opportunities for the community of common native and exotic birds that are resident in the area. However, the small size of the native plantings suggest they are unlikely to be key habitat compared to the forested hill slopes either side of the Hutt Valley (between 0.5 km and 2 km from the Project area to the west and east respectively).
151. Although the existing riparian planting is dominated by exotic trees namely willow, poplar and alder, the tall stature of the plantings offers a varied habitat structure compared to the lower stature native plantings. Hence the exotic plantings provide value to the bird community for foraging, roosting and nesting. Flood protection plantings such as these occur along the developed reaches of the River between Lower Hutt and Upper Hutt and hence this habitat is not limited along the river corridor outside of the Project area.
152. Table 5-7 summarises the native bird species observed in the project area and surrounds.

**Table 5-7: Summary of bird species observed in the RiverLink Project area and surrounds.**

Species	Threat status +	Habitat	Observed during site investigations	Literature source and where observed (if not observed during site investigations)
<b>Coastal and riverine birds</b>				
Black-billed gull ( <i>Larus bulleri</i> )	Threatened - Nationally Critical	Coastal and riverine. Nest on braided riverbeds.		1 In close vicinity to the Project area - upstream.
Shore plover ( <i>Thinornis novaeseelandiae</i> )	Threatened - Nationally Critical	Coastal. Only breed on offshore islands.		1 In vicinity of the Project area - foreshore near River mouth. A banded individual that was recently translocated to Mana Island.
White heron ( <i>Egretta sacra</i> )	Threatened - Nationally Critical	Primarily coastal, sometimes observed inland at freshwater wetlands and lakes. Only NZ breeding colony located in Westland.		1 In close vicinity to the Project area - downstream near the Hutt River estuary. Two recent observations (2017 and 2020).
Reef heron ( <i>Egretta sacra</i> )	Threatened - Nationally Endangered	Coastal - foreshore and estuarine areas.		1 In close vicinity to the Project area - downstream near the Hutt River estuary. Single recent observation
Caspian tern ( <i>Hydroprogne caspia</i> )	Threatened - Nationally Vulnerable	Coastal and inland lakes and rivers. Occasionally nest on braided riverbeds.		1 In close vicinity to the Project area - downstream.

Species	Threat status +	Habitat	Observed during site investigations	Literature source and where observed (if not observed during site investigations)
Bar-tailed godwit ( <i>Limosa lapponica</i> )	At Risk - Declining	Coastal. Breed in Alaska, migrate to NZ during the northern hemisphere winter.		1 In close vicinity to the Project area - downstream near the Hutt River estuary.
Red-billed gull ( <i>Larus novaehollandiae</i> )	At Risk - Declining	Coastal.	✓ Roosting on gravel beaches.	
South Island pied oystercatcher ( <i>Haematopus finschi</i> )	At Risk - Declining	Coastal.		1 In close vicinity to the Project area - downstream.
White-fronted tern ( <i>Sterna striata</i> )	At Risk - Declining	Coastal, nest on riverbeds as well as coastal sites.		3 In vicinity of the Project area - foreshore near River mouth.
New Zealand dabchick ( <i>Poliocephalus rufopectus</i> )	At Risk - Recovering	Freshwater lakes and ponds.	✓ A single individual observed on the river.	
Pied shag ( <i>Phalacrocorax varius</i> )	At Risk - Recovering	Coastal, occasionally forage in freshwater habitats close to the coast. Nest primarily in trees along coastal cliffs, occasionally inland.	✓ Roosting on gravel beaches.	
Variable oystercatcher ( <i>Haematopus unicolor</i> )	At Risk - Recovering	Coastal, will occasionally nest a short distance inland.		2, 3 In close vicinity to the Project area - downstream.
Black shag ( <i>Phalacrocorax carbo</i> )	At Risk - Naturally Uncommon	Coastal and inland lakes and rivers. Generally nest in trees near aforementioned habitat but also	✓ Roosting/nesting above SH2. Also foraging in the River corridor, and	

Species	Threat status +	Habitat	Observed during site investigations	Literature source and where observed (if not observed during site investigations)
		nest on the ground on escarpments and cliffs.	roosting on gravel beach downstream of the Ava railway crossing (outside of Project area).	
Little black shag ( <i>Phalacrocorax sulcirostris</i> )	At Risk - Naturally Uncommon	Coastal and inland lakes and rivers. Nest in trees overhanging water.	✓ Roosting on gravel beach downstream of the Ava railway crossing (outside of Project area).	
Royal spoonbill ( <i>Platalea regia</i> )	At Risk - Naturally Uncommon	Coastal estuaries and freshwater wetlands. Nest in trees and on the ground in near estuaries, rivers and harbours.		2, 3 In close vicinity to the Project area - downstream.
Little shag ( <i>Phalacrocorax melanoleucos</i> )	Not Threatened	Coastal and freshwater including lakes and rivers. Nest in trees and outcrops overhanging water.	✓ Roosting and foraging along river corridor.	
Pied stilt ( <i>Himantopus himantopus</i> )	Not Threatened	Coastal and inland lakes, wetlands and rivers. Nest in all the above habitats.	✓ Single individual observed on gravel beach.	
Black-backed gull ( <i>Larus dominicanus</i> )	Not Threatened	Common in most habitats other than forest and scrub. Primarily associated with coastal and riverine areas.	✓ Common across the Project area - roosting on gravel beaches and flying across river corridor.	
Black swan ( <i>Cygnus atratus</i> )	Not Threatened	Primarily associated with freshwater lakes and ponds, but also present along rivers and coastal areas.	✓ Associated with the River corridor.	

Species	Threat status +	Habitat	Observed during site investigations	Literature source and where observed (if not observed during site investigations)
Paradise duck ( <i>Tadorna variegata</i> )	Not Threatened	Widely distributed across open grassland areas with associated waterbodies.	✓ Associated with the River corridor and grassland areas.	
Pukeko ( <i>Porphyrio melanotus</i> )	Not Threatened	Widely distributed across open grassland areas with associated waterbodies. Also common along habitat edges such as forest or scrub margins.	✓ Associated with the River corridor and grassland areas.	
Spur-winged plover ( <i>Vanellus miles</i> )	Not Threatened	Widely distributed across open grassland commonly associated with waterbodies.	✓ Associated with the River corridor and grassland areas.	
White-faced heron ( <i>Egretta novaehollandiae</i> )	Not Threatened	A primarily coastal species, but also associated with freshwater including rivers, lakes and ponds.	✓ Associated with the River corridor.	
<b>Forest and grassland birds</b>				
New Zealand pipit ( <i>Anthus novaeseelandiae</i> )	At Risk - Declining	Grassland and rough open areas.	✓ A single individual observed in the parkland adjacent to the river corridor.	
Rifleman ( <i>Acanthisitta chloris</i> )	At Risk - Declining	Mature native forest.		5 In the wider Hutt Valley Surrounds - observed c.8 km north of the Project area.
Whitehead ( <i>Mohoua albicilla</i> )	At Risk - Declining	Forest and shrubland.		5, 6, 7 In the wider Hutt Valley Surrounds - closest

Species	Threat status +	Habitat	Observed during site investigations	Literature source and where observed (if not observed during site investigations)
				observation in Belmont Regional Park
New Zealand falcon ( <i>Falco novaeseelandiae</i> )	At Risk - Recovering	Forest (native and exotic) and open areas including rough pasture in hill country.		5, 6, 7 In the wider Hutt Valley Surrounds - closest observation in Belmont Regional Park.
North Island kākā ( <i>Nestor meridionalis</i> )	At Risk - Recovering	Forest (native and exotic). Resident in Wellington after reintroduction to Zealandia mainland sanctuary.		7 In the wider Hutt Valley Surrounds - observed in Belmont Regional Park.
Kakariki / red-crowned parakeet ( <i>Cyanoramphus novaezealandiae</i> )	At Risk - Relict	Forest, scrub/ shrubland, grassland/ open habitats. Largely restricted to pest-free areas. Likely an occasional visitor from Zealandia mainland sanctuary.		5, 7 In the wider Hutt Valley Surrounds - closest observation in Belmont Regional Park.
Long-tailed cuckoo ( <i>Eudynamys taitensis</i> )	At Risk - Naturally Uncommon	Forest (native and exotic) and scrub/ shrubland. Generally resident only in large forest tracts.		5 In the wider Hutt Valley Surrounds - observed c.8 km north of the Project area.
Bellbird ( <i>Anthornis melanura</i> )	Not Threatened	Forest (native and exotic), scrub/ shrubland, urban parks and gardens.	✓ In the mixed broadleaved forest and scrub adjacent to SH2.	
Fantail ( <i>Rhipidura fuliginosa</i> )	Not Threatened	Occur in a wide variety of habitats including forest (native and exotic)	✓	

Species	Threat status +	Habitat	Observed during site investigations	Literature source and where observed (if not observed during site investigations)
		and scrub/ shrubland, as well as urban parks and gardens.	Common across the Project area, namely in the vegetation alongside the River and in the mixed broadleaved forest and scrub.	
Grey warbler ( <i>Gerygone igata</i> )	Not Threatened	Occur in a wide variety of habitats including forest (native and exotic) and scrub/ shrubland, as well as urban parks and gardens.	✓ Common across the Project area, namely in the vegetation alongside the River and in the mixed broadleaved forest and scrub.	
Kereru ( <i>Hemiphaga novaeseelandiae</i> )	Not Threatened	Occur in a wide variety of habitats including forest (native and exotic) and scrub/ shrubland, as well as well vegetated urban parks and gardens.	✓ Primarily associated with the mixed broadleaved forest and scrub.	
Kotare ( <i>Todiramphus sanctus</i> )	Not Threatened	Occurs in a wide variety of habitats associated with water or open country.	✓ Along the River corridor.	
Shining cuckoo ( <i>Chrysococcyx lucidus</i> )	Not Threatened	Occur in the same habitats as their primary host the grey warbler (see above).	✓ Primarily heard along the River corridor.	
Silvereeye ( <i>Zosterops lateralis</i> )	Not Threatened	Occur in a wide variety of habitats including forest (native and exotic) and scrub/ shrubland, as well as urban parks and gardens.	✓ Common across the Project area, namely in the vegetation alongside the River and in the mixed broadleaved forest and scrub.	
Tomtit ( <i>Petroica macrocephala</i> )	Not Threatened	Forest (native and exotic) and scrub/ shrubland. Less commonly in farmland interspersed with		5, 6, 7 In the wider Hutt Valley Surrounds - closest

Species	Threat status <sup>+</sup>	Habitat	Observed during site investigations	Literature source and where observed (if not observed during site investigations)
		forest patches and well-treed suburban areas.		observation in Belmont Regional Park.
Tui ( <i>Prosthemadera novaeseelandiae</i> )	Not Threatened	Occur in a wide variety of habitats including forest (native and exotic) and scrub/ shrubland, as well as urban parks and gardens.	✓ Common across the Project area, namely in the vegetation alongside the River and in the mixed broadleaved forest and scrub.	
Welcome swallow ( <i>Hirundo neoxena</i> )	Not Threatened	Occur in a wide variety of habitats but generally absent from large tracts of densely forested areas.	✓ Common across the Project area, namely foraging over the River.	

Notes:

+ Robertson H. A., Baird K., Dowding J. E., Elliott G. P., Hitchmough R. A., Miskelly C. 1 M., McArthur N., O'Donnell C. F. J., Sagar P. M, Scofield R. P., and Taylor G. A. (2017). Conservation status of New Zealand birds, 2016. New Zealand Threat Classification Series 19. Department of Conservation, Wellington. 23 p.

1. eBird database NZ: <https://ebird.org/region/NZ>. Accessed 25 January 2021.

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### 5.3.4 Assessment of bird values

153. Table 5-8 below provides an EclA 'Ecological Values' assessment for each Threatened or At Risk bird species that are known or likely to be present within the Project area.
154. As there are many Not Threatened native bird species that occur, or potentially occur, within the Project area (see summary above), the value of every species is not assessed individually. Instead, only Threatened, At Risk or locally uncommon species are summarised.
155. Under the EclA Guidelines (2018), species that are Not Threatened have an ecological value of 'Low'. 'Very High' impacts on 'Low' value species can still result in a 'Moderate' to 'High' overall level of effect that requires mitigation. The potential effects of the Project on common species (for example tūī) are covered in the assessment of effects on different vegetation and habitat types.

**Table 5-8: Ecological value of Threatened and At Risk birds in, or potentially occurring in, the Project area. Value assigned using the EclA Guidelines (2018).**

Bird species	Conservation status	Observed within the Project area	'Ecological Value' of species (as per EclA guidelines, 2018)
<b>Threatened and At Risk coastal and riverine birds</b>			
Black-billed gull ( <i>Larus bulleri</i> )	Threatened - nationally critical	No - observed in close vicinity upstream of the Project area, likely to move through Project area and use gravel beaches on occasion potentially for foraging and roosting.	'Very High'
Shore plover ( <i>Thinornis novaeseelandiae</i> )	Threatened - nationally critical	No - observed along the coast downstream of the of the Project area. Very unlikely to move inland into the Project area.	'Very High'
White heron ( <i>Egretta sacra</i> )	Threatened - nationally critical	No - observed in close vicinity, primarily a coastal species but also use inland wetlands, lakes and lagoons. May move through, forage, and roost along the River corridor within Project area on occasion.	'Very High'
Reef heron ( <i>Egretta sacra</i> )	Threatened - nationally endangered	No - observed along the coast downstream of the of the Project area. Very unlikely to move inland into the Project area.	'Very High'
Caspian tern ( <i>Hydroprogne caspia</i> )	Threatened - nationally vulnerable	No - observed in close vicinity, likely to move through Project area and may use gravel beaches for roosting on occasion.	'Very High'

Bird species	Conservation status	Observed within the Project area	'Ecological Value' of species (as per EclA guidelines, 2018)
<b>Threatened and At Risk coastal and riverine birds</b>			
Bar-tailed godwit ( <i>Limosa lapponica</i> )	At risk - declining	No - observed along the coast downstream of the of the Project area. Very unlikely to move inland into the Project area.	'High'
Red-billed gull ( <i>Larus novaehollandiae</i> )	At risk - declining	Yes - common in the Project area, roosting on gravel beaches, feeding, and moving along the river corridor.	'High'
South Island pied oystercatcher ( <i>Haematopus finschi</i> )	At risk - declining	No - observed in close vicinity, likely to move through Project area and use gravel beaches for roosting on occasion.	'High'
White-fronted tern ( <i>Sterna striata</i> )	At risk - declining	No - observed in close vicinity, likely to move through Project area and use gravel beaches for roosting on occasion.	'High'
Pied shag ( <i>Phalacrocorax varius</i> )	At risk - recovering	Yes - observed roosting on gravel beaches, foraging and moving along the river corridor.	'Moderate'
Variable oystercatcher ( <i>Haematopus unicolor</i> )	At risk - recovering	No - observed in close vicinity, likely to move through Project area and use gravel beaches for roosting on occasion.	'Moderate'
Black shag ( <i>Phalacrocorax carbo</i> )	At risk - naturally uncommon	Yes - common in the Project area, known nest/roost site in the Project area adjacent to SH2. Also observed roosting on gravel beaches, foraging, and moving along the river corridor.	'Moderate'
Little black shag ( <i>Phalacrocorax sulcirostris</i> )	At risk - naturally uncommon	No - observed in close vicinity, likely to move through Project area, forage, and use gravel beaches for roosting on occasion.	'Moderate'
Royal spoonbill ( <i>Platalea regia</i> )	At risk - naturally uncommon	No - observed in close vicinity, may move through Project area using the river corridor and surrounding grassland habitat for foraging and roosting on occasion.	'Moderate'
<b>Threatened and At Risk forest and grassland birds</b>			
New Zealand pipit ( <i>Anthus novaeseelandiae</i> )	At risk - declining	Yes - likely resident in parkland adjacent to the river corridor. Potentially nesting in the Project area.	'High'

Rifleman ( <i>Acanthisitta chloris</i> )	At risk - declining	No - unlikely to occur in the Project area due to lack of mature native forest and the proximity to anthropogenic disturbance, particularly SH2.	'High'
Whitehead ( <i>Mohoua albicilla</i> )	At risk - declining	No - May move through the area and use mixed broadleaved forest and scrub habitat on occasion.	'High'
New Zealand falcon ( <i>Falco novaeseelandiae</i> )	At risk - recovering	No - May move through and forage across the Project area on occasion.	'Moderate'
North Island kākā ( <i>Nestor meridionalis</i> )	At risk - recovering	No - May move through the Project area on occasion.	'Moderate'
Kakariki / red-crowned parakeet ( <i>Cyanoramphus novaeseelandiae</i> )	At risk - relict	No - May move through the Project area on occasion but largely restricted to pest-free areas.	'Moderate'
Long-tailed cuckoo ( <i>Eudynamys taitensis</i> )	At risk - naturally uncommon	No - May move through the area and use mixed broadleaved forest and scrub habitat on occasion.	'Moderate'

## 5.4 Bats

### 5.4.1 Desktop review

156. A review of the national bat database administered by the Department of Conservation (DOC) found a total of 122 bat records collected over the previous 20 years (January 2000 onwards) located within 50 km of the study area.
157. Of the 122 records, 102 were records of lesser short-tailed bats (*Mystacina tuberculata rhyacobia*, At Risk - Declining)<sup>13</sup>, all of these records were concentrated in the extensive tracts of mature native forest covering the Tararua Ranges. The closest record is located 45.7 km to the north of the study area.
158. Monitoring in more recent years has not detected lesser short-tailed bats around the catchment in the southern Tararuas where they were previously detected consistently. Hence this population may be locally extinct, or have moved to another area of the ranges.
159. There are an additional 14 records of long-tailed bats (*Chalinolobus tuberculatus*, Threatened - Nationally Critical) which have been observed in the Tararua Ranges to the north, Kapiti Island to the west, and Aorangi Forest Park to the east. The closest long-tailed bat record to the study area is 33.9 km away.

<sup>13</sup> The Tararua population was originally grouped with the southern lesser short-tailed bat subspecies (*Mystacina tuberculata tuberculata*) but is now grouped with the central lesser short-tailed bat subspecies (*M. t. rhyacobia*) (T Thurley and J Scrimgeour 2021 pers. comm. 6 April).

160. There are two records of an unknown bat species, one occurring in the Tararua Range over 40 km away and another 11.8 km away adjacent to Porirua Scenic Reserve. It should also be noted that there is another record of an unknown bat species 7.4 km from the study area in the forested hills between Lower Hutt and Upper Hut. However, this record was collected in 1980 and is 30 years old.
161. There are an additional 757 records of surveys undertaken within 50 km of the study area that did not record either native bat species. A summary of these records is included in Table 5-9 below.

**Table 5-9: Summary of the records in the national bat database administered by DOC (accessed November 2020) that have been collected in the last 20 years (January 2000 onwards) that occur within 50 km of the RiverLink Project area.**

Bat species	Threat status <sup>1</sup>	Number of observations within 50 km of the study area	Closest record to the study area (km) and date of observation
Long-tailed bat ( <i>Chalinolobus tuberculatus</i> )	Threatened - Nationally Critical	14	33.9 km, Nov 2019
Short-tailed bat (southern subspecies: <i>Mystacina tuberculata rhyacobia</i> )	At Risk - Declining	102	45.7 km, Feb 2014
Both species detected	-	4	46.6 km, Feb 2013
Unknown species	-	2	11.8 km, Sep 2020
No bat species detected	-	757	4.6 km, Jan 2016

<sup>1</sup> O'Donnell C. F. J., Borkin K. M., Christie J. E., Lloyd B., Parsons S. and Hitchmough R. A. (2018). Conservation status of New Zealand bats, 2017. New Zealand Threat Classification Series 21. Department of Conservation, Wellington. 4 p.

#### 5.4.2 Site observations

162. No bat surveys have been undertaken in the study area because it is very unlikely bats are present. Short-tailed bats are obligate old-growth forest dwellers and will not be present in the habitats available in the study area. The mature trees along the river margin have the potential to provide habitat for long-tailed bats. However, the lower extent of the study area is immediately adjacent to the Lower Hutt central city and dense suburban development surrounds the northern extent.
163. Long-tailed bats are sensitive to anthropogenic disturbance, namely light, and it is very unlikely that long-tailed bats will utilise the area in the absence of dark corridors that would facilitate their movement into the area.

#### 5.4.3 Summary of bat values

164. The Project area has negligible value for both native bat species because of the absence of a local population (based on a review of the national bat database) combined with the level of surrounding anthropogenic disturbance.

165. An assessment of bat values using Table 5 of the EclA guidelines (2018) has not been undertaken as it is very unlikely either species occurs in the area, either permanently or on occasion.

## **6. ASSESSMENT OF EFFECTS ON TERRESTRIAL ECOLOGY**

166. Potential effects on terrestrial ecology values that could arise as a result of the construction and operational phases of the Project are summarised below.
167. Key areas of the proposed works that will impact terrestrial ecology include:
- i. Channel reshaping which requires the temporary removal of gravel and vegetation across the full extent of the river corridor between Ewen Bridge and Kennedy-Good Bridge, including between the two existing stopbanks;
  - ii. The channel works required for the Project could result in increased deposition of both fine sediment and gravel materials downstream of the Project area, which could in turn modify the low tide roost site located approximately 1 km downstream of the Project area. This roost site is a gravel island that is exposed at low tide and is used by Threatened or At Risk birds as identified in (McArthur et al., 2015)<sup>14</sup>. Increased fine sediment deposition could modify the substrate characteristics of the gravel roost site while increased gravel deposition would increase the area available to roost.
  - iii. Construction of the Melling Interchange which will require vegetation removal along the lower western hillslopes adjacent to the existing SH2. This is required to accommodate the bridge landing, new on-ramp and off-ramp and a new link road connecting Tirohanga Road to Harbour View Road.
168. Effects on terrestrial ecology due to the operation of the RiverLink Project are likely to be limited. This is because the ongoing flood protection maintenance work will be very similar to the works already undertaken as part of the GWRC global consent. Additionally, the land use will not be changing, and the existing Melling Bridge will be decommissioned meaning there will be the same number of vehicle bridges spanning the River once the Project is completed.
169. A key aspect of the Project is to reconnect the Lower Hutt CBD with the River corridor. Consequently, there is likely to be increased use of the river for recreational activities which will likely lead to increased disturbance of riverine birds roosting along the gravel beaches. However, the area is already regularly accessed for recreation and the birds currently using the area are already subject to regular disturbance. Refer to the AEE for a detailed description of the key aspects of the Project from which the below impacts may arise.

### **6.1 Overview of potential effects**

170. The terrestrial habitat loss has the potential to create a range of adverse effects on ecological values (resulting from direct physical disturbance), during enabling works construction, and on an ongoing basis from flood protection operations that involve habitat disturbance along the gravel beaches in particular.

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<sup>14</sup> Refer to Paragraph 130 for additional detail.

171. Potential adverse effects on terrestrial values during and after construction may include:

- i. Vegetation and habitat loss through vegetation clearance and earthworks, which will contribute direct impacts on habitats and fauna, as well as contributing to cumulative effects of habitat loss at a broader scale;
- ii. The creation of habitat edge effects, altering the composition and health of adjacent vegetation (i.e. habitat degradation), which may affect habitat suitability for flora and fauna;
- iii. Potential introduction of additional weed species via construction machinery and/or imported fill. The extent of development within, and surrounding, the Project area and the prevalence of weeds already established on the site, suggest new pest plants being introduced to the area is unlikely to contribute significant impacts;
- iv. Direct mortality or injury to species, for example all plants and most of the smaller less mobile species (e.g. lizards) that may be harmed during vegetation clearance or earthworks activities;
- v. Outside of bird breeding season, bird mortality would be low though disturbance of roosting birds can still lead to increased energetic demands on the effected birds;
- vi. During breeding season, vegetation removal has the potential to result in the destruction of nests, and mortality of eggs and fledglings;
- vii. Construction and operations related noise and vibrations or dust effects;
- viii. Degradation of habitat quality downstream due to construction-related sediment runoff. Key potential habitats effected are the gravel island bird roost site downstream of the Ava railway crossing, estuarine habitat at the mouth of the River and the Harbour.

172. Potential long-term ongoing adverse effects on terrestrial values may include:

- i. Ongoing habitat degradation associated with edge effects and fragmentation resulting from habitat loss required for construction. Habitat fragmentation can permanently affect movement of some species, with possible effects on meta-population dynamics and increased vulnerability to local extinction. If unmitigated, habitat degradation associated with edge effects will occur along the newly formed edge resulting from vegetation clearance along the lower western hill slopes. However, given that the removal is along an existing edge, and it is a small area of vegetation clearance relative to what is available, it is unlikely to contribute to fragmentation to an extent that it will affect meta-population dynamics;
- ii. There is potential for an unanticipated permanent loss of gravel beach habitat to result from channel modification. This would occur if gravels were not transported and deposited as anticipated due to changes in the River hydrology resulting from channel modification. Effective management of gravel transport and deposition is key to the long-term success of the project and is covered in Technical Assessment No. 5 by Mr Gary Williams and Mr Kyle Christensen. It is unlikely that this potential effect will occur as the Project has been designed to promote deposition along the upper reach and reduce deposition along the lower reach to minimise the need to gravel extraction below the low flow water levels (i.e., inside the wetted channel) where possible.

- iii. Ongoing disturbance effects, particularly on the gravel beaches associated with ongoing gravel extraction as part of the operational flood protection activities. As discussed above, such flood protection works are already being undertaken under GWRC's global river maintenance consent. Hence these operational effects will be limited compared to the existing baseline;
- iv. Noise disturbance associated with the new Melling Bridge and interchange upgrade, particularly on habitat margins/edges, although as discussed above this will be a minor change compared to the existing environment as the current Melling Bridge will be decommissioned;
- v. Mortality or injury through vehicle strike on the new Melling Bridge and interchange upgrade for some species. As above this is unlikely to contribute a significant impact compared to the existing baseline as there are already multiple well-used roads through the area and the existing Melling Bridge will be decommissioned meaning there will not be an increase in the number of vehicle bridges spanning the River as a result of the Project; and
- vi. Sediment runoff associated with ongoing flood protection works degrading downstream habitats. Again, regular flood protection works are already being undertaken under GWRC's global river maintenance consent and hence is unlikely the Project will contribute a notable change to the existing baseline in this regard.

## **6.2 Potential impacts on significant biodiversity and ecosystems identified in the District Plan and the PNRP**

- 173. Two SNRs, Jubilee Park Bush (SNR21) and Harbour View Bush (SNR14), are located adjacent to the proposed designation boundary respectively.
- 174. No vegetation will be removed from either SNR as a result of the Project. However, given the proximity of the SNRs to the works, habitat degradation resulting from edge effects could arise due to adjacent works.
- 175. The extent of the edge effects is likely to be limited as both impacted SNR margins are already near an existing edge, and the works footprint is setback from the SNR margins by a minimum of approximately 10 m. Hence vegetation will be retained between the footprint and the edge of the SNR, and the SNR edge will not be fully exposed. Furthermore the works are occurring downslope so sediment runoff will not be an issue.
- 176. Downstream of the Project area, GWRC has identified the mouth of the Te Awa Kairangi/Hutt River as significant habitat for indigenous birds in the coastal marine area under schedule F2c of the PNRP.
- 177. A Significant Natural Wetland has also been identified at Te Awa Kairangi / Hutt River mouth, under schedule F3 of the PNRP. This wetland covers 3.24 ha and is located approximately 2.3 km downstream of the Project area.
- 178. Both the significant habitat for indigenous birds and the Significant Natural Wetland are located over 1.5 km downstream of the proposed designation and will not be directly impacted by the proposed works. However, without appropriate controls increased sedimentation resulting from the construction and operational maintenance of the River channel could have adverse effects on these habitats.

### 6.3 Magnitude of effects assessment

179. The magnitude of effects on ecological values is assessed based on the extent, intensity, duration and timing of effects associated with the Project both before and after efforts to avoid, minimise, remedied or offset effects.
180. An overview of the potential adverse effects associated with the project and corresponding measures to further avoid, minimise or mitigate effects is provided below, followed by an assessment of the magnitude of effects for each value.

#### 6.3.1 Vegetation

181. A large extent (15.89 ha, refer on Drawing A16-4831-G012-G013 in Volume 5 of the Application) of tall stature exotic planting (flood protection) is required to be removed to facilitate the reshaping of the River. This vegetation type has limited botanical value but provides habitat for common native birds and the native carnivorous land snail *W. urnula* and has been assigned an overall ecological value of 'Moderate'.
182. While not observed in the river corridor except as part of the native amenity planting, the occasional mānuka or kānuka may also be regenerating through these areas. While none of the regionally<sup>15</sup> Threatened or At Risk species listed in Table 5-1 were observed during site investigations, there is potential for cryptic individuals such as dwarf mistletoe and red mistletoe to occur this vegetation type. A known host of dwarf mistletoe, the pest plant tree lucerne was observed in this vegetation type.
183. To facilitate the construction of the new Melling Bridge and associated interchange upgrade, 1.65 ha (Drawing A16-4831-G012-G013 in Volume 5 of the Application) of mixed broadleaved forest and scrub will be removed. The wider western hill slopes contain large areas (approximately 2820 ha<sup>16</sup>) of high quality secondary broadleaved forest. However, the majority of the areas being impacted by the Project occur immediately adjacent to SH2, the areas largely comprise scrub with only the occasional taller stature native tree, they are degraded by associated edges effects and have severe pest plant incursions. Notwithstanding this, a small area (459 m<sup>2</sup> / 0.05 ha) of secondary forest which contains some individual semi-mature native trees including hīnau, tawa, tītoki, and pukatea will be removed. The vegetation removal will also result in the creation of new habitat edges, altering the composition and health of adjacent vegetation.
184. Only small areas of the other vegetation/habitat types will be removed to facilitate the Project (refer to Table 6-1 for area per type). These vegetation types have limited botanical value but are likely to be used by several common native bird which are resident along the River corridor. No lizards were recorded outside of the mixed broadleaved forest and scrub discussed above. Given the limited quality of these habitats (refer to Table 5-2 and Table 5-3) they are likely to provide habitat for common

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<sup>15</sup> This relates only to the regionally threatened species listed in Table 5-1 here, not the nationally Threatened or At Risk such as mānuka or kānuka discussed above.

<sup>16</sup> The area of broadleaved forest occurring across the wider western hillslopes area was calculated using the vegetation layer which delineates the existing forest ecosystems for the Wellington region as mapped by Nick Singers using the national ecosystem classification system developed by Singers and Rogers (2014). This layer can be downloaded from [https://data-gwrc.opendata.arcgis.com/datasets/adc731cf488a4ed09b875c0ee5ed2b84\\_57](https://data-gwrc.opendata.arcgis.com/datasets/adc731cf488a4ed09b875c0ee5ed2b84_57). The area quoted is all vegetation classed as "Broadleaved Indigenous Hardwoods" or "Indigenous Forest" that occurs along the Western Hills of the Hutt Valley, from Upper Hutt (below Akatarawa Forest) in the north to Ngauranga in the south.

Not Threatened fauna, and potentially for sensitive bird species on occasion as they disperse across the Hutt Valley (refer to the 'Birds' Section).

185. Two planted black beech trees, listed as 'Notable Trees' in the District plan are located on the edge of the proposed works on Harbour View Rd. Of the two notable pōhutukawa trees located within the proposed designation boundary, one occurs on the edge of proposed works extent along Raroa Rd. The other tree is located where the new Melling Bridge lands on the north-western side of SH2. Both black beech trees and the pōhutukawa along Raroa Rd will be avoided. Only the pōhutukawa in the Melling Bridge footprint will be removed. As pōhutukawa have naturalised in the Wellington region the ecological effect of the removal of this single notable tree will be low.
186. The effects associated with the removal of the gravel beaches are discussed in relation to avifauna effects below.

**Table 6-1: Extent of vegetation/ habitat clearance<sup>1</sup> relative to area available in proposed designation boundary.**

Vegetation / habitat type	Area within proposed designation boundary (ha)	Area impacted by Project footprint (ha)	Percent of vegetation within proposed designation boundary proposed for removal
Mixed broadleaved forest and scrub	3.7	1.65 <sup>2</sup>	46%
Tall stature exotic planting (flood protection)	15.89	15.89	100%
Native amenity planting	0.89	0.89	100%
Low stature amenity planting	0.15	0.15	100%
Constructed wetland	1.0	0	0%
Dwellings with associated ornamental gardens	3.40	3.40	100%
Rough grassland/ weed field	1.93	1.93	100%
Totals	26.96	23.90	89%

<sup>1</sup> Note that the temporary removal of gravel beach habitat is not included here as the spatial extent of this habitat varies naturally and thus has not been measured. Removal of maintained grassland and individual specimen trees also has not been calculated.

<sup>2</sup> This area includes a buffer of 1 - 2 m around the proposed construction footprint where the Project designers consider additional vegetation clearance may be necessary to facilitate construction.

**Table 6-2: Summary of magnitude of effect on vegetation/ habitat types without mitigation.**

Vegetation/ habitat type	Effects summary		Timescale	Magnitude of effect <u>without</u> mitigation
	Direct effects	Indirect effects		
3.7 ha Mixed broadleaved forest and scrub	<p>Removal of 1.65 ha (c. 46 %) of vegetation available in the Project area.</p> <p>This area of removal totals approximately 0.13% of indigenous forest remaining on the western hills of the Hutt Valley. Furthermore, only a small area (459 m<sup>2</sup> / 0.05 ha) of higher quality broadleaved forest with a canopy of semi-mature native trees will be removed.</p> <p>The small area proposed for removal relative to what is available in the wider landscape, and the fact the habitat impacted is already degraded, suggests the removal will have a limited impact on common native birds resident in the area.</p> <p>Not Threatened northern grass skink and <i>P. novaezealandiae</i> have been observed in this habitat. As these species are less mobile than birds, vegetation removal could have a moderate impact on these populations unless mitigated.</p>	<p>Edge effects will be limited to the mixed broadleaved forest and scrub as the other habitat types are already isolated amongst a highly modified landscape generally characterised by mown grass or developed areas.</p> <p>Reduction in landscape / habitat connectivity will be minimal for the same reason as above.</p>	Permanent	Moderate
15.89 ha Tall stature exotic planting (flood protection)	<p>Removal of 15.89 ha (100 %) of vegetation available in the Project area.</p> <p>A large area of vegetation removal within the Project area. However, large tracts of flood protection planting are planted along the length of the developed River corridor that will not be impacted by the Project.</p> <p><i>W. urnula</i> snails have been observed in this habitat. Given their limited mobility the removal of this habitat will have a discernible</p>		Temporary: long-term	Moderate

Vegetation/ habitat type	Effects summary		Timescale	Magnitude of effect <u>without</u> mitigation
	Direct effects	Indirect effects		
	<p>impact on the population(s) resident in this habitat.</p> <p>The removal of this habitat will result in a discernible change in the immediate landscape for common native birds that are resident in the area. It will likely result in a loss of roosting, foraging, and nesting habitat for these populations.</p>			
0.89 ha Native amenity planting	<p>Removal of 0.89 ha (100 %) of vegetation available in the Project area.</p> <p>A small area of native plantings proposed for removal compared to the similar habitat planted along the length of the developed River corridor that will not be impacted by the Project. A very small extent being removed in the context of the regenerating native forest and scrub available in the surrounding Hutt Valley.</p> <p>Likely to result in a small decrease in foraging habitat for common native birds.</p>		Temporary: medium-term	Low
0.15 ha Low stature amenity planting	<p>Removal of 0.15 ha (100 %) of vegetation available in the Project area.</p> <p>A very small area proposed for removal, unlikely to have a discernible impact on any native fauna resident in the area.</p>		Temporary: short-term	Negligible
1.03 ha Constructed wetland	<p>Removal of 0 ha (0 %) of vegetation available in the Project area.</p> <p>This wetland will be avoided.</p>			Negligible

Vegetation/ habitat type	Effects summary		Timescale	Magnitude of effect <u>without</u> mitigation
	Direct effects	Indirect effects		
3.40 ha Dwellings with associated ornamental gardens	<p>Removal of 3.40 ha (100 %) of vegetation available in the Project area.</p> <p>A very small area of removal in the context of the availability of similar habitat in the surrounding landscape.</p> <p>Ornamental gardens will likely be used by common native birds for roosting, foraging and nesting, but the habitat removal is unlikely to have a discernible effect on the local populations.</p> <p>Not Threatened northern grass skink have been found in the wider area and may be present in this habitat also. Given their limited mobility, habitat removal could have a discernible impact on these population(s) (if present) if unmitigated.</p>		Permanent	Low
1.93 ha Rough grassland/ weed field	<p>Removal of 1.93 ha (100 %) of vegetation available in the Project area.</p> <p>A small area proposed for removal. Although the presence of this habitat type in the wider landscape cannot be easily quantified, it is a habitat type that establishes easily in the absence of management and is unlikely to be limited.</p> <p>A single New Zealand pipit was observed in the Project area. NZ pipits nest in rank grass however the likelihood of pipits nesting here is low given the proximity to human disturbance (being adjacent to Lower Hutt City).</p>		Permanent (not proposing to be reinstated)	Low

Vegetation/ habitat type	Effects summary		Timescale	Magnitude of effect <u>without</u> mitigation
	Direct effects	Indirect effects		
	Not Threatened northern grass skink may also inhabit these areas but none were observed during the herpetofauna surveys.			
Threatened or At Risk species confirmed in the Project area: Kānuka Mānuka Northern rātā	<p>A small number of individuals likely to be removed during vegetation clearance, namely ‘mixed broadleaved forest and scrub’ and planted kānuka, and mānuka individuals in the ‘Native amenity planting’.</p> <p>All of the mānuka observed were in the planted areas and only the occasional kānuka and northern rātā were observed in naturally regenerating areas. No mature trees were observed in the Project area of any of the above species.</p> <p>The loss of a small number of individual plants is unlikely to have a discernible effect on the populations in the wider landscape. None of these species are listed as Threatened in the region (Crisp, 2020). Furthermore, all three species are considered to have large, stable populations nationally and have been classified as Threatened or At Risk due to the lack of data regarding these species’ susceptibility to myrtle rust disease (de Lang <i>et al.</i>, 2017). To date there has been no reports of wide scale infections of any three of these species in the wild.</p>		Temporary: medium-term (none of the plants observed appeared to be more than 25 years old)	Negligible
Regionally Threatened or At Risk plants that have not been confirmed in the	<p>A small number of individuals <u>may possibly</u> be removed during vegetation clearance.</p> <p>The population sizes of these plants in the wider landscape is unknown but likely to be</p>		Permanent (although some species can be propagated and hence included in the	Magnitude of effect could vary but assumed <b>Low</b> to <b>Negligible</b> given these species have not

Vegetation/ habitat type	Effects summary		Timescale	Magnitude of effect <u>without</u> mitigation
	Direct effects	Indirect effects		
Project area but occur in the Hutt Valley: <i>Eryngium vesiculosum</i> <i>Geranium retrorsum</i> <i>Hypolepis dicksonioides</i> <i>Korthalsella salicornioides</i> <i>Peraxilla tetrapetala</i> <i>Solanum aviculare var. aviculare</i> <i>Trichomanes elongatum</i>	<p>limited. Accordingly, the loss of even a small number of individuals could have discernible impacts at a population level.</p> <p>The limited scale of clearance of the broadleaved forest and scrub (the most suitable habitat for the particularly cryptic species), coupled with the level of degradation of the habitat being removed relative the habitat available in the surrounding hills, suggests it is highly unlikely that these species have been overlooked. If they are present, it is very unlikely to be more than the occasional individual.</p> <p>The primary host plants of <i>Peraxilla tetrapetala</i> are beech trees namely black beech and hard beech (<i>Fuscospora truncata</i>) in Wellington. The only beech observed in the Project area is being avoided.</p> <p>Some of the less cryptic species such as poroporo (<i>Solanum aviculare var. aviculare</i>), and giant hypolepis (<i>Hypolepis dicksonioides</i>) inhabit more open disturbed sites and hence could occur in various habitats across the Project area. However, these species are not cryptic and are unlikely to have been overlooked.</p>		proposed revegetation).	previously been identified in the Project area and the reasons outlined in the second column.

### 6.3.2 Terrestrial invertebrates

187. Potential direct impacts on terrestrial invertebrates include mortality and habitat loss during vegetation clearance. Potential indirect effects include displacement into adjacent habitats and habitat degradation resulting from the creation of new edges.
188. Notable invertebrate species were observed in the 'tall stature exotic planting (flood protection)' and in an area contiguous with the 'mixed broadleaved forest and scrub', these being *W. urnula* and *P. novaezealandiae* respectively. Furthermore, other species of native land snail, including the At Risk *Allodiscus pallidus* occur in the forested hillslopes forming the eastern boundary of the Hutt Valley. These species may also occur in habitats on the site, namely the 'mixed broadleaved forest and scrub' which is part of the western hillslopes forming the western boundary of the Hutt Valley.
189. As outlined above, a large extent (15.89 ha, refer to Drawing A16-4831-G012-G013 in Volume 5 of the Application) of 'tall stature exotic planting (flood protection)' is required to be removed to facilitate the reshaping of the River. This vegetation type has limited botanical value but is inhabited by the native carnivorous land snail *W. urnula* which and has been assigned an ecological value of 'Moderate'.
190. Given the limited mobility of *W. urnula* snails, the removal of this habitat will likely result in the mortality of all snails resident in the habitat unless salvage is undertaken. *Wainuia urnula* snails are common across Wellington and are not classified under the NZTCS. Hence it is unlikely that the habitat removal will impact population viability at an Ecological District scale. However, if salvage is not undertaken, the removal of 15.89 ha of potential habitat could result in a loss of a high proportion of individuals from the local population.
191. 1.65 ha of 'mixed broadleaved forest and scrub' is proposed to be removed adjacent to SH2 to facilitate the construction of the new Melling interchange. The habitat within the Project area is contiguous with the area where peripatus were observed (Jubilee Park). Hence it is likely that peripatus are also present in the vegetation proposed for removal.
192. As with *W. urnula*, *P. novaezealandiae* is common across Wellington and is classified as Not Threatened nationally. Thus, the removal of less than 1% of the forested habitat that covers the western hillslopes of the Hutt Valley is unlikely to result in discernible effects on the peripatus population at a local or landscape scale.
193. This 'mixed broadleaved forest and scrub' habitat is the also the most likely habitat to support other terrestrial invertebrates of note such as the At Risk land snail *Allodiscus pallidus*. This is because of the decreased level of habitat disturbance and modification compared other habitats available in the Project area, and because it is at least somewhat contiguous with high value indigenous forest upslope of the Project area which includes Belmont Regional Park.
194. However as outlined above, less than 1% of this forested area is being impacted and hence is unlikely to result in discernible impacts on other native terrestrial invertebrates not identified during site investigations or desktop review. Furthermore, the area impacted is immediately adjacent to SH2, and as such, is modified by edge effects and comprises lower quality habitat than the indigenous forest located upslope of the Project area. Further decreasing the likelihood of the area being a stronghold for undetected terrestrial invertebrates of note.

**Table 6-3: Summary of magnitude of effect on terrestrial invertebrate species in the Project area and surrounds without mitigation.**

Terrestrial invertebrate species	Effects summary	Timescale	Magnitude of effect <u>without</u> mitigation
<i>Wainuia urnula urnula</i>	<p>Removal of 15.89 ha (100%) of habitat available in the Project area. This amounts to a large area of confirmed <i>W. urnula</i> habitat being removed. However, large tracts of equivalent flood protection planting occurs along the length of the developed River corridor that will not be impacted by the Project. Furthermore, <i>W. urnula</i> are common in the less modified habitats in the surrounding landscape, especially the forested areas of the Eastern Hills of the Hutt Valley.</p> <p>Given their limited mobility of <i>W. urnula</i>, the removal of this habitat could result in mortality that would likely have a discernible impact on the local population(s) resident in the Project area.</p> <p>This population is already subject to disturbance associated with riparian maintenance that occurs under the GWRC's global river maintenance consent. Hence it is unlikely that operational effects will be different from the existing baseline.</p>	Temporary: long-term.	<p><b>High</b></p> <p>Considering that without mitigation the removal of the flood protection plantings could result in the mortality of many <i>W. urnula</i> individuals, potentially impacting the viability of the local population(s).</p>
<i>Peripatoides novaezealandiae</i>	<p>Removal of 1.65 ha (c. 46%) of potential habitat available in the Project area.</p> <p>The area proposed for removal totals approximately 0.13% of indigenous forest remaining on the western hills of the Hutt Valley.</p> <p>Given the limited mobility of <i>P. novaezealandiae</i>, the removal of this habitat could result in mortality of some individuals.</p> <p>The vegetation clearance will also create new edges, subjecting adjacent habitat</p>	Permanent	<p><b>Low</b></p> <p>Considering that only a small amount of the habitat is proposed for removal compared to the contiguous habitat available, and given <i>P. novaezealandiae</i> are common in the Wellington Region.</p>

Terrestrial invertebrate species	Effects summary	Timescale	Magnitude of effect <u>without</u> mitigation
	<p>to increased edge effects resulting in habitat degradation resulting from weed and pest invasion, higher levels of exposure to wind and light etc. However, given the limited width of the existing edge being removed (refer on Drawing A16-4831-G012-G013 in Volume 5 of the Application), it is likely that the adjacent habitat is already exposed to edge effects to varying degrees.</p> <p>The small area proposed for removal relative to what is available in the wider landscape, suggests that the removal will have a limited impact on the local population(s).</p>		
<p>Other terrestrial invertebrate species of note that may occur in the Project area including the At Risk land snail <i>Allodiscus pallidus</i>.</p> <p>Most likely to occur in the 'mixed broadleaved forest and scrub' given the decreased level of disturbance compared to other habitats in the Project area and that it is contiguous with high quality indigenous forest along across the western hills of the Hutt Valley.</p>	<p>Effects as outlined for <i>P. novaezealandiae</i>, as such species are most likely to occur in 1.65 ha of 'mixed broadleaved forest and scrub' proposed for removal.</p> <p>No additional species of note have been identified in this habitat, but terrestrial invertebrate surveys have not been undertaken to date.</p>	Permanent	<p><b>Low - Negligible</b></p> <p>Considering that only a small amount of potential habitat is proposed for removal compared to the contiguous habitat available, and that Threatened species (which are more sensitive to even limited habitat removal) have not been identified in the wider Hutt Valley area (based on desktop review).</p>

### 6.3.3 Lizards

195. The Project would require removal of 15.89 ha of 'tall stature exotic planting (flood protection)' and 1.9 ha of 'rough grassland/ weed field' over approximately 3.7 km of the River length within the Project area. While these habitats appeared suitable for ground-dwelling skinks. The lack of observations despite a comprehensive survey effort throughout Project area suggests this area contains negligible herpetofauna values.

196. The riparian margin of the River corridor is similarly highly modified and intermittently vegetated throughout a wider 25 km length of the River between its mouth at Petone, and Harcourt Park in Upper Hutt. North of here, it is more intact where it enters the foothills of the Tararua Ranges.
197. The Project would also require removal of 1.65 ha of 'mixed broadleaved forest and scrub', including some planted areas and weedy grass edges. This equates to approximately 46% of the 3.7 ha of this habitat type available within the Project area, but only 0.13% of the adjacent indigenous forest habitats through which the herpetofauna records occur.
198. Within this context, the effect would represent a minor shift from baseline character and quantum, and therefore a low magnitude impact on herpetofauna populations would likely result.
199. Given the limited mobility of lizards (compared to say birds), the removal of this habitat will likely result in the mortality of lizards resident in the habitat unless salvage is undertaken.
200. Notwithstanding a low magnitude of effect, native lizards are protected under the Wildlife Act 1953 and hence management to minimise mortality during habitat removal will be required to meet statutory obligations under the Act, as well as good practice no net loss biodiversity outcomes.

**Table 6-4: Summary of magnitude of effect on lizards in the Project area and surrounds without mitigation.**

Lizard species	Effects summary	Timescale	Magnitude of effect without mitigation
Northern grass skink confirmed in the 'mixed broadleaved forest and scrub' in the Project area	<p>Removal of 1.65 ha (c. 46%) of potential habitat available in the Project area.</p> <p>The area proposed for removal totals approximately 0.13% of indigenous forest remaining on the western hills of the Hutt Valley. Given the limited mobility of skinks (compared to say birds), the removal of this habitat could result in mortality of some individuals.</p> <p>The vegetation clearance will also create new edges, subjecting adjacent habitat to increased edge effects resulting in habitat degradation resulting from weed and pest invasion, higher levels of exposure to wind and light etc. However, given the limited width of the existing edge being removed (refer on Drawing A16-4831-G012-G013 in Volume 5 of the Application), it is likely that the adjacent habitat is already exposed to edge effects to varying degrees.</p> <p>The small area proposed for removal relative to what is available in the wider landscape, suggests that the removal will have a limited impact on the local population(s).</p>	Permanent	<b>Low</b>

Lizard species	Effects summary	Timescale	Magnitude of effect <u>without</u> mitigation
<p>Other lizard species not observed within the Project area but previously recorded in close surrounds and may be present despite not being detected.</p> <p>Raukawa gecko copper skink ornate skink Ngahere gecko Barking gecko</p>	<p>As above but noting that, with the exception of Raukawa gecko (which often inhabits areas that are difficult to survey), the lack of detections indicate that these species likely occur at lower densities than northern grass skink, if at all.</p>	Permanent	<b>Low</b>

### 6.3.4 Birds

#### Riverine and coastal birds

201. A key aspect of the Project is large scale modification of the River channel as a flood management measure. This largescale channel realignment will require temporary disturbance of the gravel beaches along the entire length of the River corridor within the Project area. River works will be undertaken in an upstream direction starting at Ewen Bridge. Construction will take place over four years in seven separate stages plus enabling works (refer to indicative Construction Methodology for further detail).
202. A key erosion and sediment control principle will be to minimise the area and length of time that particular areas of ground or riverbed are open through staging and sequencing of works and progressively stabilising open earthworks and riverbed disturbance areas to reduce the potential for erosion and sediment generation to occur. Consequently, not all beach habitats will be impacted simultaneously. The channel modification will also result in the suspension of sediment which will affect gravel beaches downstream of the Project area. This is discussed further below in Paragraphs 203 - 207.
203. The temporary disturbance of the gravel beaches will impact several species resident in the area including black shag, little shag, pied shag and red-billed gulls. There are several other riverine species that occur in the wider area and likely roost on the gravel beaches in the Project area on occasion.
204. No nesting has been observed along the beaches in Project area during site investigations or determined through extensive literature review. Roosting activities will primarily be impacted, however it is important to note that the resident birds in the area currently experience regular disturbance including gravel removal from ongoing flood protection works carried out under GWRC's global resource consents relating to flood maintenance works.

205. As noted above the channel modification is proposed to be done in stages and the gravel beaches will be replaced after channel modification is completed in each stage. Unlike vegetation removal, where replacement planting is unlikely to achieve a similar state to the vegetation removed for several years, there is no lag time associated with gravel habitat replacement. Hence this will only be a temporary effect, with the entire Project scheduled over four year(s), and each stage lasting between six and 14 months (refer to Figure 5 in the indicative construction methodology).
206. The spatial extent of the gravel beaches available along the River corridor changes depending on flow regimes so it is not practicable to provide an exact before and after extent of gravel beach area. However, based on the pre- and post- construction median flow models presented in the freshwater ecology assessment (Technical Assessment No. 6) the extent of beach deposition areas outside of the active channel are likely to increase as a result of the Project (refer to the model outputs in Appendix B of the freshwater ecology assessment).
207. Analysis of the sediment particle size composition of the riverbed has demonstrated there are no superfine particles (clay/silt - <0.06 mm) in the riverbed substrate<sup>17</sup>. Hence the transport of fine sediments downstream resulting from construction will be limited to disturbance of older alluvial bank materials comprising gravels with a silt/clay matrix.
208. The size of the materials comprising the riverbed (sand through to large cobbles) suggest these will only be transported in the water column over short distance (depending on flows)<sup>18</sup>. Furthermore, these are the materials that comprise the existing gravel beaches along the River. Hence such deposition will work to enlarge the downstream beaches as opposed to smothering them with fine sediments, likely a positive effect for roosting birds downstream including the Ava railway crossing roost site.
209. Works on the berms outside of the River corridor will involve the removal and replacement of topsoil which comprises fine materials. If erosion and sediment control is not put in place there is potential during rainfall or flood events for such works to result in the movement of fine sediment onto the gravel beaches and potentially into the active channel to be transported downstream. Dry works can be effectively managed through robust erosion and sediment control. Refer to Technical Assessment No. 3 prepared by Ed Breese.
210. It should be noted that the reaches downstream of the Project area are already subject to flood maintenance works undertaken under GWRC's global river maintenance consent. These works include gravel extraction from the riverbed using wet and dry methodologies and mechanical ripping of the riverbed amongst other activities that result in the temporary deposition of fine sediments downstream. Hence the birds currently using the area have been able to adapt to the temporary increased sediment loads during maintenance works. Project activities could contribute to cumulative effects if increase sediment runoff results from the Project, as well as ongoing river maintenance works in other reaches. However, a key objective of the Project is to reduce gravel deposition along the lower reach, and to keep extraction to the gravel bars above low flow water levels along the upper reach. Resulting in a less disruptive sediment

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<sup>17</sup> Refer to the "Sediment Discharges" section of Technical Assessment No. 8.

<sup>18</sup> Refer to the "Potential effects of activities in the active river channel" section of Technical Assessment No. 3.

management regime (reducing the need for gravel extraction in the active channel) once the Project is completed. Refer to Technical Assessment No. 5 for further detail.

211. Consequently, the potential adverse effects resulting from increased sediment transport and deposition on riverine avifauna is likely to be minimal. Note that potential effects on avifauna using in the Coastal Marine Area (CMA), which forms the receiving environment of sediment discharges from the Project, is covered in Technical Assessment No. 8 prepared by Dr Jacqui Bell and Karin Sievwright.
212. The macrocarpa trees comprising the black shag nesting site are located outside of the River corridor on the western hills above SH2. The site is located partially in the proposed designation boundary. The dripline of the macrocarpa trees are outside of the proposed works extent, but in close proximity. Impacts could still occur if the proposed works damages the root system of the macrocarpa trees the shags are roosting and nesting in. This could lead to the eventual death of the tree.
213. Construction could also indirectly impact roosting/nest shags through noise and vibration disturbance. The Noise and Vibration Technical Assessment No. 10 prepared by Christian Vossart modelled existing road noise and worst-case scenario construction noise at several sensitive sites across the Project area. Results from 30 Tirohanga Rd (the property immediately upslope of the nest trees) show and increase from 59 dB  $L_{Aeq(24h)}$  existing road noise to 73 dB  $L_{Aeq(15min)}$  during construction *without* mitigation. Modelling shows that operational road noise will return to 59 dB  $L_{Aeq(24h)}$  at 30 Tirohanga Rd once the Project is operational. Hence there will be an increase in construction related noise in vicinity of the nest site, but this will be temporary. As the nesting site is directly adjacent to SH2 it is likely that the birds using the site are tolerant of the existing high levels of disturbance.

#### **Forest birds**

214. The vegetation removal described in paragraphs 128 - 133 above will impact birds utilising these habitats.
215. The 'tall stature exotic planting (flood protection)' is used by variety of common native birds for roosting, foraging and likely nesting. Such birds include tūī, grey warbler, silvereye, and fantail all of which were regularly observed in this habitat and are assumed resident in the area. The extent and quality of this habitat type suggest it is very unlikely that more sensitive native birds observed in the wider Hutt Valley surrounds are using this habitat regularly.
216. The flood protection planting will be replaced after the completion of river works; thus this will be a temporary effect. It should be noted that the replacement plantings will take 25+ years to reach the stature of the existing willow canopy. However, with an appropriate maintenance regime the understory could be improved considerably compared to the current state in the short term (< 5 years).
217. It should also be noted that the purpose of these plantings is for flood protection and hence they are already actively managed for this purpose under GWRC's global river maintenance consent. Management includes 'layering' and 'tethering' of willows which includes felling willows close the river edge and allowing them to sucker or tethering them in place.

218. A much smaller area of mixed broadleaved forest and scrub will be impacted by the Project, but this is the highest quality habitat available in the Project area for forest birds. As noted above the areas of this habitat that will be directly impacted by the Projects works are all adjacent to existing roads, namely SH2, and are degraded by edge effects. Accordingly, it is likely the bird species most affected will be a similar suite to those described above for the tall stature exotic planting. However, there are more sensitive species known to occur in the wider Hutt Valley that may use this habitat on occasion such as whitehead and NZ falcon.
219. The removal of the mixed broadleaved forest and scrub will be a permanent impact. The area removed constitutes a small portion of the habitat available on the wider western hillslopes.
220. The other habitats available will be subject to a low magnitude of impact and are of limited value to forest birds.
221. Potential direct impacts on birds include habitat loss and risk of injury and mortality if clearance is undertaken during the nesting season. Indirect impacts include disturbance associated with the construction and operation for birds using adjacent habitats. Birds will also be at risk of vehicle strike associated with the operation of the new Melling Bridge. This potential impact will be reduced by the decommissioning of the current Melling Bridge meaning the risk will be similar to baseline conditions.

**New Zealand pipit (grassland birds)**

222. New Zealand pipit inhabit open grassland areas and nest in areas of rank grass there will be minimal impacts on areas of maintained grassland in the Project area relative to the amount of habitat available in the wider landscape. Some areas of rank grass/ weed field will be removed, totalling 1.9 ha. If these areas are cleared during the pipit nesting season without management in place, this could result in the destruction of pipit nests and injury or mortality to eggs or chicks.

**Table 6-5: Summary of magnitude of effect on bird species in the Project area and surrounds without mitigation.**

Vegetation/ habitat type	Effects summary	Timescale	Magnitude of effect <u>without</u> mitigation
<p>Riverine birds confirmed to regularly use the river corridor:</p> <p>Red-billed gull</p> <p>Pied shag</p> <p>Black shag.</p>	<p>Temporary removal of all gravel beach habitat across the approx. 3.7 km reach of the River in the Project area. This equates to the temporary removal of all gravel beach habitat available in the Project area.</p> <p>Disturbance to birds roosting on the gravels during construction and operational maintenance.</p> <p>Potential injury and/or death during river works / gravel extraction for any birds nesting on the gravel beaches (very unlikely).</p> <p>Total removal, and associated disturbance, of 15.89 ha of tall stature exotic vegetation along the river corridor which is potentially used by shags for roosting.</p> <p>Potential for adjacent works to disturb roosting and nesting black shag at the nesting site adjacent to SH2. Potential for long-term damage to the site resulting from root disturbance of the macrocarpa tree that is the site.</p> <p>Potential decrease in habitat quality downstream due to sedimentation effects (refer to Paragraphs 203 - 207 for further detail).</p> <p>Potential mortality from vehicle strike and movement barrier associated with the new Melling Bridge (unlikely given the number of bridges already occurring in the existing environment and that the existing bridge will be removed)</p>	<p>Effects on gravel habitat and sedimentation.</p> <p>Temporary: short-term.</p> <p>Disturbance effects on black shag nesting site.</p> <p>Temporary: short-term.</p> <p>Permanent if root damage causes death of macrocarpa tree that is the roost/nest site.</p> <p>Removal of adjacent tall stature vegetation that shags may roost in:</p> <p>Temporary: long-term.</p>	<p><b>Moderate</b></p> <p>Considering the short-term timescale of most of the effects, the fact that the gravel beaches are already regularly disturbed during routine flood maintenance work, and the amount of gravel beach habitat available across the whole extent of the River.</p> <p><b>High</b> for black shag (given the risk of disturbance or destruction of a confirmed nesting site)</p>
<p>Riverine and coastal birds confirmed to use habitats downstream of the Project area and likely use the Project area on occasion:</p>	<p>Effects as above (excluding black shag-specific impacts) but noting that these species use directly impacted habitats on occasion, if at all.</p> <p>The Ava railway crossing roost site may be impacted during construction by increased sediment mobilisation downstream. As discussed in Paragraphs 203 - 207, the</p>	<p>As above (NB black shag nesting site not applicable).</p>	<p><b>Low</b></p> <p>As per the considerations above but also noting that none of these species have been observed in the Project area and hence are likely to only use directly impacted habitats on occasion, if at all.</p>

Vegetation/ habitat type	Effects summary	Timescale	Magnitude of effect <u>without</u> mitigation
Black-billed gull Shore plover White heron Reef heron Caspian tern Bar-tailed godwit South Island pied oystercatcher White-fronted tern Variable oystercatcher Little black shag Royal spoonbill	<p>resuspension of fine sediments that could smoothen the habitat and reduce visibility for feeding will be limited and short-term in duration. Increased deposition of larger gravels is likely to increase the size of the roost site and could potentially be a positive effect.</p>		<p>NB the impacts of the Project on the coastal environment</p> <p>Note that potential effects on avifauna using in the CMA are covered in Technical Assessment No. 8.</p>
At Risk forest birds confirmed in the surrounding Hutt Valley area that may visit and/or move through the Project area: Rifleman Whitehead New Zealand falcon North Island kākā Kakariki / red-crowned parakeet Long-tailed cuckoo	<p>Loss of 1.65 ha of mixed broadleaved forest and scrub comprising roosting, foraging and nesting habitat for native birds.</p> <p>This area of removal totals approximately 0.13% of indigenous forest remaining on the western hills of the Hutt Valley. Furthermore, only a small area (459 m<sup>2</sup> / 0.05 ha) of higher quality broadleaved forest with a canopy of semi-mature native trees will be removed.</p> <p>The habitat removed is directly adjacent to SH2 and hence it is unlikely that At Risk birds that have not been observed in the Project area (only the surrounding Hutt Valley landscape) will nest in this area. However, they may roost and forage here on occasion. The habitat preferences of these At Risk forest birds suggest it is very unlikely that the other habitat types present in the Project area are of value them.</p> <p>Edge effects degrading adjacent habitat remaining.</p>	<p>Vegetation loss and edge effects</p> <p>Permanent</p> <p>Disturbance effects</p> <p>Temporary: short-term</p> <p>Potential vehicle strike and movement barrier (unlikely, see previous column)</p> <p>Permanent</p>	<p><b>Low</b></p> <p>Considering the extent of clearance compared to what is available in the wider landscape, the quality of the habitat compared to what is available in the wider landscape, and because no At Risk forest birds have been observed regularly using the habitat.</p>

Vegetation/ habitat type	Effects summary	Timescale	Magnitude of effect <u>without</u> mitigation
	<p>Potential, although unlikely, for disturbance, injury and/or death during vegetation clearance for any birds nesting within trees to be cleared.</p> <p>Potential for indirect effects from dust and noise during construction.</p> <p>Potential mortality from vehicle strike and movement barrier associated with the new Melling Bridge and other road upgrades (unlikely to contribute a significant increase in strike incidents or barrier effect due to the high level of road development already present in the existing environment).</p>		
<p>At Risk New Zealand pipit, confirmed in the Project area.</p>	<p>Temporary loss of all mown grassland within the Project area which comprises foraging habitat for NZ pipit.</p> <p>Loss of 1.9 ha of rough grassland / weedfield comprising potential nesting habitat for NZ pipit. While the extent of grassland (both maintained and rank) has not been specifically calculated across the wider landscape. These are highly modified habitat types that are widespread locally, regionally and nationally. Hence it is likely that the removal of both of these habitat types will result in a negligible loss of foraging habitat for NZ pipit. This is supported by the fact that only a single pipit was observed across all four site visits and hence it is unlikely to be core habitat for the individual observed or the wider population.</p> <p>Potential for disturbance, injury and/or death during clearance for any pipit nesting within the grassland / weed field to be cleared. Again this is unlikely given only a single NZ pipit has been observed during site investigations.</p>	<p>Loss of mown grassland</p> <p>Temporary: short-term (will be replaced after stop banks constructed)</p> <p>Loss of rank grassland/ weed field</p> <p>Permanent</p> <p>Disturbance to nests</p> <p>Temporary: short-term (during construction)</p>	<p><b>Low</b></p> <p>Considering the extent of similar habitat available in the wider landscape, and the fact that NZ pipit do not appear to be resident within the Project area.</p>

### 6.3.5 Bats

223. No effects on native bats are anticipated from the Project.

## 6.4 Summary of overall level of effects without mitigation

224. Table 6-6 summarises the overall level of effect for each ecological value without mitigation based on the matrix provided in the EclA Guidelines (2018). Each species of note potentially impacted by the Project is listed individually as their individual threat status determines their 'ecological value'. Conversely species are grouped in Table 6-5 and Table 6-2 based on the magnitude of effect they will likely experience as a result of the Project. For example, riverine birds confirmed to regularly use the river corridor are likely to experience increased impacts compared to species known to inhabit the wider Hutt Valley area but may only use the Project area on occasion, if at all. Refer to section 4 for additional detail.

**Table 6-6: Summary of overall effects without mitigation. Refer to Table 7-3: for the overall level of effect with mitigation.**

Habitat type	Ecological value <sup>19</sup>	Magnitude of effect <u>without</u> mitigation <sup>20</sup>	Overall level of effect <u>without</u> mitigation <sup>21</sup>
<b>Vegetation types</b>			
Mixed broadleaved forest and scrub	Moderate	Moderate	Moderate
Tall stature exotic planting (flood protection)	Low	Moderate	Low
Native amenity planting	Low	Low	Very Low
Low stature amenity planting	Low	Negligible	Very Low
Constructed wetland	Moderate	Negligible	Very Low
Dwellings with associated ornamental gardens	Negligible	Low	Very Low
Rough grassland/ weed field	Low	Low	Very Low
<b>Threatened and At Risk plant species</b>			
Kānuka	Very High	Negligible	Low
Mānuka	High	Negligible	Very Low

<sup>19</sup> Refer to Table 5-1 for descriptions of ecological values.

<sup>20</sup> Refer to Table 6-2 and Table 6-5 for descriptions of magnitude of effect without mitigation.

<sup>21</sup> Refer to Table 4-6 for overall effects methodology.

Habitat type	Ecological value <sup>19</sup>	Magnitude of effect without mitigation <sup>20</sup>	Overall level of effect without mitigation <sup>21</sup>
Northern rātā	Very High	Negligible	Low
<i>Eryngium vesiculosum</i>	Very High*	Low - Negligible	Moderate - Low
<i>Geranium retrorsum</i>	Very High*	Low - Negligible	Moderate - Low
<i>Hypolepis dicksonioides</i>	Moderate*	Low - Negligible	Low - Very Low
<i>Korthalsella salicornioides</i>	Very High*	Low - Negligible	Moderate - Low
<i>Peraxilla tetrapetala</i>	High*	Low - Negligible	Low - Very Low
<i>Solanum aviculare</i> var. <i>aviculare</i>	Very High*	Low - Negligible	Moderate - Low
<i>Trichomanes elongatum</i>	Moderate*	Low - Negligible	Low - Very Low
<b>Terrestrial invertebrates</b>			
<i>Wainuia urnula urnula</i>	Moderate	High	Moderate
<i>Peripatoides novaezealandiae</i>	Moderate	Low	Low
Other terrestrial invertebrate species of note that may occur in the project area including the At Risk land snail <i>Allodiscus pallidus</i> .	Very High - Low*	Low - Negligible	Moderate - Very Low
<b>Lizards</b>			
Northern grass skink	Low	Low	Very Low
Raukawa gecko*	Low	Low	Very Low
copper skink*	Low	Low	Very Low
ornate skink*	High	Low	Low
Ngahere gecko*	High	Low	Low
Barking gecko*	High	Low	Low
<b>Threatened and at risk coastal and riverine birds</b>			
Black-billed gull*	Very High	Low	Moderate
Shore plover*	Very High	Low	Moderate
White heron*	Very High	Low	Moderate
Reef heron*	Very High	Low	Moderate

Habitat type	Ecological value <sup>19</sup>	Magnitude of effect without mitigation <sup>20</sup>	Overall level of effect without mitigation <sup>21</sup>
Caspian tern*	Very High	Low	Moderate
Bar-tailed godwit*	High	Low	Low
Red-billed gull	High	Moderate	High
South Island pied oystercatcher*	High	Low	Low
White-fronted tern*	High	Low	Low
Pied shag	Moderate	Moderate	Moderate
Variable oystercatcher*	Moderate	Low	Low
Black shag	Moderate	High	Moderate
Little black shag*	Moderate	Low	Low
Royal spoonbill*	Moderate	Low	Low
<b>Threatened and at risk forest and grassland birds</b>			
New Zealand pipit	High	Low	Low
Rifleman*	High	Low	Low
Whitehead*	High	Low	Low
New Zealand falcon*	Moderate	Low	Low
North Island kākā*	Moderate	Low	Low
Kakariki / red-crowned parakeet*	Moderate	Low	Low
Long-tailed cuckoo*	Moderate	Low	Low

\* These species were not actually observed in the Project area but may occur in the area at very low numbers (in the case of Threatened and At Risk plants), or may use the area on occasion (in the case of more mobile fauna such as birds). Hence these species are expected to experience minimal adverse effects associated with the Project.

225. The overall level of effect without mitigation on habitat types within the site range from Very Low to Moderate, with the majority being Very Low.
226. The overall level of effect without mitigation on the majority of Threatened and At Risk plant species was considered to be Very Low to Moderate.
227. The overall level of effect without mitigation on terrestrial invertebrate values was considered to be Very Low to Moderate.
228. The overall level of effect without mitigation on lizard values was considered to be Very Low to Low.

229. The overall level of effect without mitigation on coastal birds ranged from Low to High; however, the majority were Low to Moderate.
230. The overall level of effect without mitigation on forest and grassland birds was Low.

## **7. MEASURES TO AVOID, REMEDY OR MITIGATE ACTUAL OR POTENTIAL ADVERSE TERRESTRIAL ECOLOGY EFFECTS**

231. Measures to avoid or minimise potential adverse ecological effects have been developed through the concept design phase of the Project. This section provides a high-level outline of the effects management measures. It is recommended that the detailed methodology, following best practise techniques where available, to achieve the below measures are specified in an Ecological Management Plan (EMP) for the project. I recommend such an EMP would include a: Vegetation Removal Management Plan, Planting Establishment Management Plan, Bird Management Plan, Lizard Management Plan amongst other non-terrestrial ecology sections/plans.

### **Overview**

232. As outlined in the EclA Guidelines (2018), efforts to address potential adverse effects are considered necessary for all habitats and species that are expected to incur 'moderate' or higher level of effects as a result of the project.
233. The overall approach to managing adverse effects of the project on terrestrial ecology values will follow the effects management hierarchy, in accordance with principles outlined in Policy 32 of the PNRP.
234. The hierarchy requires that:
- i. Adverse effects are **avoided** where possible
  - ii. Adverse effects that cannot be demonstrably avoided are **minimised/remedied** where possible
  - iii. Adverse effects that cannot be demonstrably minimised are mitigated, and
  - iv. In relation to adverse effects that cannot be avoided, remedied or mitigated (residual effects), biodiversity **offsetting** is considered.

### **7.1 Measures to avoid, minimise and mitigate effects on terrestrial ecology**

#### **7.1.1 Avoidance measures across the Project Area**

235. The design of the Project footprint, particularly regarding the construction associated with the Melling Interchange, has avoided two areas adjacent to the site that are scheduled as SNRs in the District Plan.

236. The indicative construction methodology for the Melling Interchange avoids the removal of the 'mixed broadleaved forest and scrub' adjacent to the existing SH2 as far as practicable. Construction will occur from the bottom of the hillslope building the proposed on/off ramps from below and limiting the construction footprint to within the final alignment where possible. This is as opposed to building the on/off ramps from above, which would have been beneficial for traffic management along the existing SH2 during construction, but would require the clearance of additional access tracks that do not form part of the final alignment.
237. The 'mixed broadleaved forest and scrub' could not be avoided completely due to spatial constraints. The River alignment is shifting further to the northwest (away from the CBD), hence there is limited space outside of the realigned stopbanks within which to upgrade SH2 without also pushing it further northwest along the toe of the hillslope.
238. The construction methodology was updated to require avoidance of vegetation clearance during the peak bird nesting season (September to January inclusive) for forest bird species likely to nest in the 'mixed broadleaved forest and scrub' habitat. This will reduce potential impacts associated with disturbing nesting birds in highest-quality potential nesting habitat identified in the Project area.
239. The Project footprint also avoids directly impacting the black shag roosting site, however construction is required in close vicinity to the trees (within 15 m of the dripline). To avoid indirect impacts on the trees used for roosting and nesting associated with the construction, it is also recommended that an arborist assesses the two macrocarpa trees and provides advice on the required set-back of works to ensure the root systems are not damaged.

### **7.1.2 Minimisation measures across the Project Area**

#### **During construction of the Project**

240. Recommendations to minimise effects within the Project footprint during construction include:
- i. Minimisation of vegetation loss through site management and appropriate construction methodology. This should include avoidance of unnecessary vegetation clearance through the physical delineation of the footprint boundary and delineation of vegetation to be retained for the entirety of the project footprint;
  - ii. Staged vegetation clearance as construction progresses rather than all vegetation loss occurring prior to the commencement of construction activities (see Construction Methodology in Chapter 5 of the AEE in Volume 2 of the Application for a description of the sequencing of works);
  - iii. An ecologist to survey the black shag roosting/nesting colony monthly while works are being undertaken within 50 m of the roosting colony. I recommend an escalation procedure is put in place to respond to signs of nest abandonment as a result of the works. Such procedures could include placing a buffer around the tree within which works must stop while there are active nests;
  - iv. Revegetation of the site should occur concurrently as stages are completed (see below for revegetation recommendations);
  - v. As outlined above, vegetation clearance of the 'mixed broadleaved forest and scrub' will be timed to avoid the peak bird nesting season for forest birds likely to nest in this

habitat. Vegetation/habitat clearance across the remainder of the Project area is considered lower risk for breeding birds. This is because of lower habitat quality and no records of riverine birds attempting to nest in the Project area, except for the black shag nesting site which will be avoided. In lower risk habitats, pre-clearance nesting surveys are recommended in lieu of blanket seasonal restrictions. Table 7-1: below summarises the different bird groups most likely to attempt to breed across different habitats, and their peak breeding seasons. If vegetation clearance is undertaken during the peak nesting season(s) as listed in Table 7-1 below, pre-clearance nesting surveys should be undertaken;

**Table 7-1: Summary of potential nesting habitat within the Project footprint and the peak breeding season for the bird groups likely to use the different habitats.**

Bird group	Potential breeding habitat types in the Project footprint	Peak nesting season* (if habitat removal cannot be avoided during these periods pre-clearance nesting surveys should be undertaken)
Forest birds e.g. tūī, koromiko, piwakawaka, and whitehead.	<ul style="list-style-type: none"> <li>Tall stature exotic planting (flood protection)</li> <li>Native amenity planting</li> <li>Dwellings with associated ornamental gardens</li> </ul> <p>Note no clearance of mixed broadleaved forest and scrub will occur during the peak nesting season.</p>	September - January <sup>+</sup> inclusive
Riverine birds including red-billed gulls and pied stilt.	<ul style="list-style-type: none"> <li>Gravel beaches</li> </ul>	June - January inclusive
New Zealand pipit	<ul style="list-style-type: none"> <li>Rough grassland/ weed field</li> <li>Constructed wetland</li> </ul>	August - January.

\* Derived from egg laying dates on NZ Birds Online: <http://nzbirdsonline.org.nz>

+ Due to the number of forest bird species potentially nesting in Project Area this has been limited to the peak breeding for most species likely to be found in Project Area.

- vi. If native bird nests are identified during pre-clearance nesting surveys, it is recommended that works do not proceed within 50 m of the active nest in any direction. Works should not proceed until the young birds have fledged or the nest is naturally abandoned. Undertaking vegetation clearance outside of the peak nesting seasons outlined above will decrease the risk of encountering active nests and unforeseen delays in the works programme;
- vii. Minimising potential impacts on lizard populations in the Project area by undertaking pre-vegetation clearance lizard surveys, and salvage and relocation in the 'mixed broadleaved forest and scrub' habitat adjacent to SH2. This would require a Wildlife Act Authority (WAA) from DOC. It is recommended a Lizard Management Plan (LMP) is prepared which will accompany the WAA application, the LMP will outline standard practise survey and relocation methodology. This will also require identifying a relocation site(s) as well as a pest control regime to be implemented in the relocation site prior to salvage commencing. The Lizard Technical Assessment (Appendix A) recommends the adjacent Jubilee Park, owned by HCC, as a potential

lizard release site as it contains similar habitat and has excellent habitat enhancement opportunities;

- viii. It is also recommended that survey and salvage is undertaken for *W. urnula* snails in the 'tall stature exotic planting (flood protection)' prior to clearance of this vegetation. Individuals found should be relocated to Jubilee Park where they will benefit from the habitat enhancement recommended for the lizard relocation site;
- ix. Vegetation clearance in potential lizard habitats should be avoided during colder months (May - August inclusive) when lizards are less active and less likely to be detected or to survive relocation;
- x. Accidental discovery protocols for At Risk and Threatened flora and fauna across the Project area. If Threatened or At Risk flora and fauna not otherwise identified in this assessment are discovered on site, works should stop in that area and the Project ecologist should be alerted. The Project ecologist can assist the construction team in identifying the most appropriate management actions going forward, depending on the species encountered. It is recommended that accidental discovery protocols are detailed in the Ecological Management Plan prepared for the Project;
- xi. The potential effects of increased sedimentation can be minimised through adherence to best practice construction methods and the development and implementation of Erosion and Sediment Control Plans (ESCP); and

241. I recommend the measures summarised above follow industry best-practice methods and are laid out in detail in the EMP.

#### **During operation of the Project**

242. The operational aspects of the Project will be very similar to the existing activities currently occurring across the Project area. The key operational activities will be continued river maintenance work for flood protection. Such works are already being undertaken under GWRC's global river maintenance consent and include activities such as beach ripping, scalping, and ongoing gravel extraction.

243. It is recommended that the minimisation measures outlined in the Code of Practice<sup>22</sup> for the GWRC's global river maintenance consent are adhered to during operational maintenance in the Project area. These measures are similar to measures outlined above for construction and include:

- i. Preferably avoiding works on the gravel beaches during the key nesting period for riverine birds, and implementing pre-clearance nest surveys if this period cannot be avoided; and
- ii. Pre-clearance lizard surveys (and effects management if detected) if more than 100 m<sup>2</sup> of potential lizard habitat is to be disturbed as part of the maintenance activities.

244. The operation of the new Melling Bridge is also unlikely to contribute noticeable effects on terrestrial ecology compared to the existing baseline as the current bridge will be decommissioned and there are already multiple vehicle bridges spanning the river. Accordingly, no additional operational minimisation is proposed.

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<sup>22</sup> Refer to Section 10.3.10 and Appendix 7 of the *Code of Practice for river management activities: Te Awa Kairangi/Wainuiomata Rivers consent version*. 2019. Prepared by GWRC.

245. Roadside planting should be carefully designed to avoid attracting foraging birds such as kereru that appear to be more susceptible to vehicle strike. Planting large-fruited species such as tawa and hīnau, and legumes (both native and exotic) such as kōwhai which attract kereru should be avoided within 10 m of SH2.

### **7.1.3 Mitigation and offset measures across the Project Area**

#### **During construction of the Project**

246. Additional to the minimisation measures outlined above, a revegetation programme has been designed in collaboration with the Project landscape architects to address the loss of the 'mixed broadleaved forest and scrub' from the hillslope above SH2 as well as the loss of the 'tall stature exotic planting (flood protection)' from the river corridor. Although the latter vegetation type was only assigned a 'Low' ecological value using the EclA Guidelines, the tall stature exotic vegetation is considered important in the context of providing habitat structure otherwise missing from the heavily deforested floodplain environment. The replanting programme includes:

- i. 7.73 ha of exotic willow planting with an indigenous understory for flood protection adjacent to the active channel along the upper reach of the Project area. There are limitations to using slower-growing native trees immediately adjacent to the active channel. Instead, this area will initially comprise willow plantings that will be underplanted with native species with the aim of facilitating a successional trajectory toward a native riparian vegetation in the long-term. Key native canopy species proposed for the plant mix include kahikatea, pukatea, totara, matai, and swamp maire. These species have been chosen to re-establish the historic vegetation types that previously dominated the floodplain. These being: Tōtara, mataī, ribbonwood forest and Kahikatea, pukatea forest.
- ii. A further 0.57 ha (approximately 720 trees) of indigenous tree groves proposed in the river corridor. These groves will be maintained as treeland areas without an indigenous understory, but they will provide additional tall stature native vegetation in the river corridor to contribute to replacing the loss of tall stature willows.
- iii. 10.98 ha of indigenous broadleaved forest and scrub revegetation. This area includes 4.58 ha of a tall stature 'forest' mix and 6.40 ha of a medium stature 'scrub' mix depending on the placement of the plantings relative to the active channel. The proposed widening of the upper reach is designed to decrease the energy of the River when it reaches the lower reach. This means bioengineered flood protection along the lower reach is not required and a resilient riparian 'medium stature' indigenous plant mix can be used instead of willows. Away from the river edge along both reaches the tall stature indigenous forest mix is proposed. It should be noted that the overall composition of these mixes is similar and enrichment planting of the medium stature mix with secondary species such as tōtara, miro and mataī are proposed. Hence it is intended that all the above areas have a successional trajectory towards the historic forest types that originally dominated the floodplain but with different management initially to respond to flood protection constraints.
- iv. Revegetation shall include the use of Threatened and At Risk species native to the Wellington Ecological District, and species that provide food sources for native fauna.
- v. Additional to the above, there will be a further 6.18 ha of indigenous ground cover planting, and 1.81 ha of 'signature species' plantings that are proposed to include

weaving resources, wetland species and divaricating shrub mixes. The primary purpose of these planted areas is for amenity and will replace the amenity plantings removed, however they will provide foraging resources for common native birds, and potential habitat for ground-dwelling lizards if they do occur in the River corridor.

- vi. 190 indigenous trees are proposed as street trees to replace the trees removed from the existing streetscape.
  - vii. Roadside planting should be carefully designed to avoid attracting foraging birds such as kereru that appear to be more susceptible to vehicle strike. Planting large-fruited species such as tawa and hīnau, and legumes (both native and exotic) such as kōwhai which attract kereru should be avoided within 10 m of SH2.
247. The condition of the existing vegetation types across the Project area demonstrates that regular maintenance of the plantings will be required to avoid serious pest plants incursions. Two rounds of weed control prior to planting and quarterly weed control for years one and two after each area is planted is recommended. Following this, biannual maintenance including weed control and replacement of failed plants should be undertaken until 80% native canopy closure is achieved, or a minimum of three years. Where native planting does not comprise the canopy, i.e., the underplanting of the bioengineered flood protection planting, maintenance should be undertaken until the native understory reaches a 60% canopy cover or a minimum of three years;
248. Note that replacement of the 1.65 ha of 'mixed broadleaved forest and scrub' being removed from the toe of the western hillslope with indigenous plantings in the floodplain is not 'like for like' remediation. Instead, this has been termed offset as the vegetation removed will be replaced with better quality vegetation in a more threatened land environment - the alluvial floodplain as opposed to the hillslope ecosystem. An offset approach is considered appropriate in this instance for the following reasons:
- i. The majority of the 1.65 ha of mixed broadleaved being removed is in early stages of regeneration and does not reflect the hillslope vegetation that historically covered the area;
  - ii. Unvegetated areas on the western hill slopes are very limited, hence, to achieve the required area of revegetation in this 'like-for-like' environment, the revegetation would need to be undertaken some distance from the point of impact; and
  - iii. The topography of the hills means that development has been more limited in this area, and it is a less threatened ecosystem type compared to the indigenous forest that once covered the floodplain, which is now almost entirely removed across the developed areas of the Hutt Valley.
249. Hence the mixed broadleaved forest and scrub being removed to facilitate construction will be replaced with indigenous vegetation in a more threatened land environment on the alluvial floodplain, but in close proximity to where it is being removed.
250. Note that a Biodiversity Offset Accounting Model (BOAM) has not yet been run to determine whether no net loss and preferably net gain has been achieved with the above offset planting. However, based on the reasoning above and the area of offset planting proposed comparative to the area and quality of the vegetation removed, it is my professional judgment that the above is likely to achieve no net loss. The BOAM will be run post-lodgement and planting areas will be updated, if necessary, based on the outcome of the modelling.

251. I also recommend infill planting and weed control is undertaken in remaining 2 ha of adjacent mixed broadleaved forest and scrub within the Project area. The purpose of this is to minimise edge effects associated with the removal of adjacent habitat and to improve the quality of the immediately surrounding habitat.
252. Gravel beach habitat will be replaced in stages through the project. The exact aerial extents of the gravel habitat being removed versus being replaced have not been calculated due to the inherently variable nature of the beach habitat. However, the Project design the extent of beach deposition areas outside of the active channel are likely to increase as a result of the Project (refer to Paragraph 202).
253. It is recommended that design features are utilised to direct people away from certain sections of river to attract birds back to the gravel beaches in these areas. Limiting human disturbance in these areas will improve the habitat for roosting birds and possibly encourage nesting. I recommend one gravel beach area, a minimum 5000 m<sup>2</sup>, on each side of the River is specifically designed for this purpose. The location of these areas should be chosen to limit potential for anthropogenic disturbance, i.e., away from bridges, public pathways, and development in close vicinity to the river corridor. The location of the roosting beaches should also be informed by hydrological modelling, choosing areas less prone to flooding and in areas of predicted gravel deposition.

#### **During operation of the Project**

254. The operational aspects of the Project will be very similar to the existing activities currently occurring across the Project area. The key operational activities will be continued river maintenance work for flood protection. Such works are already being undertaken under GWRC's global river maintenance consent and include activities such as maintenance of riparian vegetation as well as the works in the active channel outline in Paragraph 18 above.
255. It is recommended that the mitigation measures outlined in the Code of Practise for the GWRC's global river maintenance consent are adhered to during operational maintenance in the Project area. Mitigation for terrestrial ecology includes: "*replanting any high value riparian vegetation removed, or where more than 100 m<sup>2</sup> of any other riparian vegetation is removed*"<sup>23</sup>.
256. As outlined in Paragraph 20, the operational effects of the new Melling interchange are likely to be negligible and hence no operational mitigation is proposed.
257. Table 7-2 summarises how the measures described above fit into the mitigation hierarchy outlined in Policy 32 of the PNRP, and how they will be applied to each terrestrial ecology value to reduce actual and potential effects resulting from the Project.
258. As outlined in Table 7-2 and Table 7-3, the recommended avoidance, minimisation, and mitigation measures will reduce the overall level of effect of the Project on terrestrial ecology values to Low or Very Low.
259. Consequently, additional measures are not required to offset residual effects on terrestrial ecology values.

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<sup>23</sup> Refer to Section 10.3.10 of the *Code of Practice for river management activities: Te Awa Kairangi/ Wainuiomata Rivers consent version*. 2019. Prepared by GWRC.

**Table 7-2: Summary of magnitude of effects with measures from the mitigation hierarchy implemented.**

Ecological feature	Summary of key effects	Magnitude of effect <u>without</u> mitigation	Avoid	Minimise	Mitigate and Offset	Magnitude of effect once mitigation hierarchy applied
3.7 ha Mixed broadleaved forest and scrub	<p>Total removal of 1.65 ha (c. 46%) of vegetation available in the Project area.</p> <p>Edge effects will be limited to the mixed broadleaf forest as the other habitat types are already isolated amongst a highly modified landscape generally characterised by mown grass or developed areas.</p> <p>Reduction in landscape / habitat connectivity will be minimal for the same reason as above.</p>	Moderate	<ul style="list-style-type: none"> <li>Project redesign to avoid the removal of four native trees scheduled as notable trees in the District Plan.</li> <li>Project redesign to avoid the removal of the constructed wetland.</li> <li>Avoiding areas scheduled as SNR in the District Plan, namely SNR14 and SNR21 which are adjacent to the Project area.</li> <li>Decreasing the area of 'mixed broadleaved forest and scrub' required for removal by undertaking the</li> </ul>	<ul style="list-style-type: none"> <li>Physical delineation the works footprint to ensure additional vegetation not unintentionally removed.</li> <li>Staged approach to vegetation/ habitat removal and reinstatement to minimise the time lag between habitat removal and reinstatement.</li> <li>Infill planting and weed control across the 2 ha of 'mixed broadleaved forest and scrub' remaining within the Project area to minimise the edge effects associated with</li> </ul>	<ul style="list-style-type: none"> <li>Replacement of 15.89 ha of exotic dominated flood protection planting and 1.65 ha of 'mixed broadleaved forest and scrub' with a combined 10.98 ha of indigenous forest and shrubland revegetation, and 7.68 ha bioengineered willow planting with an indigenous understory. The revegetation has been specifically designed to promote a successional trajectory towards vegetation types that historically covered the floodplain.</li> <li>The above includes plant maintenance and weed control with the</li> </ul>	<b>Low</b>

Ecological feature	Summary of key effects	Magnitude of effect <u>without</u> mitigation	Avoid	Minimise	Mitigate and Offset	Magnitude of effect once mitigation hierarchy applied
15.89 ha Tall stature exotic planting (flood protection)	Total removal of 15.89 ha (c. 100 %) of vegetation available in the Project area.	Moderate	construction of the Melling Interchange from downslope. This reduces the area of impact required as the interchange will be built up from below working within the final alignment as far as practicable as opposed to creating access tracks upslope outside of the final alignment.	the removal of adjacent vegetation.	<p>objective of improving the quality of revegetated areas over the long term compared to the levels of degradation of the existing vegetation in the Project area.</p> <ul style="list-style-type: none"> <li>• Replacement of gravel beach habitat across the Project area as well as limiting access to discrete beach areas to decrease operational disturbance to roosting birds in these areas.</li> <li>• Removal of other habitats do not require specific mitigation as they are: <ul style="list-style-type: none"> <li>– Small areas; and</li> <li>– are already highly modified and provide limited habitat value.</li> </ul> </li> <li>• Hence the overall level of effect of the removal of these vegetation</li> </ul>	
0.89 ha Native amenity planting	Total removal of 0.89 ha (c. 100%) of vegetation available in the Project area.	Low				
0.15 ha Low stature amenity planting	Total removal of 0.15 ha (c. 100%) of vegetation available in the Project area.	Negligible				
1.03 ha Constructed wetland	This wetland is avoided.	Negligible				
3.40 ha Dwellings with associated ornamental gardens	Total removal of 3.40 ha (c. 100%) of habitat available in the Project area.	Low				
1.93 ha Rough grassland/ weed field	Total removal of 1.93 ha (c. 100%) of habitat available in the Project area.	Low				

Ecological feature	Summary of key effects	Magnitude of effect <u>without</u> mitigation	Avoid	Minimise	Mitigate and Offset	Magnitude of effect once mitigation hierarchy applied
					types without mitigation is 'Low' or 'Very Low'.	
Threatened or At Risk species confirmed in the Project area: Kānuka, mānuka, northern rātā	A small number of naturally occurring (i.e. not planted) individuals likely to be removed during vegetation clearance, namely 'mixed broadleaved forest and scrub'.  The loss of a small number of individual plants will not have a discernible effect on the populations of these common species in the wider landscape.	Negligible		<ul style="list-style-type: none"> <li>Physical delineation the works footprint to avoid unnecessary vegetation clearance.</li> </ul>	<ul style="list-style-type: none"> <li>All of these species to be included in the revegetation planting palette.</li> </ul>	<b>Negligible</b>

Ecological feature	Summary of key effects	Magnitude of effect <u>without</u> mitigation	Avoid	Minimise	Mitigate and Offset	Magnitude of effect once mitigation hierarchy applied
Regionally Threatened or At Risk plants that have not been confirmed in the Project area but occur in the Hutt Valley.	<p>A small number of individuals <u>may possibly</u> be removed during vegetation clearance, however this is very unlikely.</p> <p>The population sizes of these plants in the wider landscape are unknown but likely to be limited. Accordingly, the loss of even a small number of individuals could have discernible impacts at a population level.</p>	Negligible - Low		<ul style="list-style-type: none"> <li>Physical delineation of works footprint to avoid unnecessary vegetation clearance.</li> </ul>	<ul style="list-style-type: none"> <li>Inclusion of Threatened and At Risk plant species native to the Wellington ED.</li> <li>Inclusion of host plants for mistletoe in revegetation areas such as mānuka, kānuka and <i>Coprosma tenuicaulis</i> as host plants for <i>Korthalsella salicornioides</i>.</li> <li>Inclusion of some of these plants which are known to be effectively propagated (e.g. <i>Solanum aviculare</i> var. <i>aviculare</i> and <i>Hypolepis dicksonioides</i>) in the revegetation plantings.</li> <li>Accidental discovery protocols for At Risk and Threatened flora or fauna across the Project area.</li> </ul>	<b>Negligible</b>

Ecological feature	Summary of key effects	Magnitude of effect <u>without</u> mitigation	Avoid	Minimise	Mitigate and Offset	Magnitude of effect once mitigation hierarchy applied
<p><i>Wainuia urnula urnula</i></p> <p>Confirmed in the ‘tall stature exotic planting (flood protection)’</p>	<p>Removal of a large (15.89 ha) area of habitat where the snails have been confirmed resident.</p> <p>Key effects are habitat loss and mortality resulting from habitat removal.</p>	High		<ul style="list-style-type: none"> <li>Pre-clearance surveys and relocation outside of works extent, including enhancement of the relocation site.</li> </ul>	<ul style="list-style-type: none"> <li>The revegetation along the river corridor including both willow plantings (similar to the habitat being removed) and native revegetation will provide a larger area of higher-quality habitat compared to what is being removed in the long-term. Snails from adjacent (unimpacted) reaches of the River can naturally recolonise these areas.</li> </ul>	<b>Low</b>
<p><i>Peripatoides novaezealandiae</i></p> <p>Confirmed in habitat contiguous with ‘mixed broadleaved forest and scrub’</p>	<p>Removal of 1.65 ha (c. 46% of habitat available in the Project area but only 0.13% of contiguous habitat available across the western hills) of habitat where peripatus are likely resident.</p>	Low		<ul style="list-style-type: none"> <li>Opportunistic relocation of <i>P. novaezealandiae</i> if observed during lizard survey and salvage in this area, including enhancement of the relocation site.</li> </ul>	<ul style="list-style-type: none"> <li>Infill planting and weed control across the 2 ha of ‘mixed broadleaved forest and scrub’ remaining within the Project area will improve the quality of the remaining habitat and mitigate for the habitat removal.</li> <li>The habitat enhancement including</li> </ul>	<b>Negligible</b>

Ecological feature	Summary of key effects	Magnitude of effect <u>without</u> mitigation	Avoid	Minimise	Mitigate and Offset	Magnitude of effect once mitigation hierarchy applied
	Key effects are habitat loss, mortality and edge effects resulting from habitat removal.				weed and pest control recommended in Jubilee Park for the relocation of lizards will benefit the <i>P. novaezealandiae</i> confirmed resident here.	
Other terrestrial invertebrate species of note that may occur in the project area including the At Risk land snail <i>Allodiscus pallidus</i> .  Most likely to occur in the 'mixed broadleaved forest and scrub' given the decreased level of disturbance compared to other habitats in the Project area and that it is contiguous with high quality indigenous forest along across the western hills of the Hutt Valley.	As above (but noting these species are not confirmed in the Project area)	Low		<ul style="list-style-type: none"> <li>Opportunistic relocation of other notable terrestrial invertebrates if observed during lizard survey and salvage in this area, including enhancement of the relocation site.</li> </ul>	<ul style="list-style-type: none"> <li>Accidental discovery protocols for At Risk and Threatened flora or fauna across the Project area.</li> <li>The habitat enhancement including weed and pest control recommended in Jubilee Park for the relocation of lizards will benefit any other terrestrial invertebrates resident in the area.</li> <li>Infill planting and weed control across the 2 ha of 'mixed broadleaved forest and scrub' remaining within the Project area will</li> </ul>	<b>Negligible</b>

Ecological feature	Summary of key effects	Magnitude of effect <u>without</u> mitigation	Avoid	Minimise	Mitigate and Offset	Magnitude of effect once mitigation hierarchy applied
					improve the quality of the remaining habitat and mitigate for the habitat removal.	
Lizards	<p>Removal of 1.65 ha (c. 46% of habitat available in the Project area but only 0.13% of contiguous habitat available across the western hills) of habitat where northern grass skink is confirmed resident and other At Risk lizard species may also be present.</p> <p>Key effects are habitat loss, mortality, displacement, and edge effects resulting from habitat removal.</p>	Low		<ul style="list-style-type: none"> <li>Salvage and relocation of lizards in the 'mixed broadleaved forest and scrub', including enhancement of the relocation site.</li> </ul>	<ul style="list-style-type: none"> <li>Infill planting and weed control across the 2 ha of 'mixed broadleaved forest and scrub' remaining within the Project area will improve the quality of the remaining habitat and mitigate for the habitat removal.</li> </ul>	<b>Negligible</b>

Ecological feature	Summary of key effects	Magnitude of effect <u>without</u> mitigation	Avoid	Minimise	Mitigate and Offset	Magnitude of effect once mitigation hierarchy applied
<p>Riverine birds confirmed to regularly use the river corridor:</p> <p>Red-billed gull</p> <p>Pied shag</p> <p>Black shag</p>	<p>Temporary removal of all gravel beach habitat available in the Project area across multiple stages of construction.</p> <p>Disturbance to birds roosting on the gravels during construction.</p> <p>Potential injury and/or death during river works / gravel extraction for any birds nesting on the gravel beaches.</p> <p>Potential for adjacent works to disturb roosting and nesting black shag at the nesting site adjacent to SH2. Potential for long-term damage to the site resulting from root</p>	<p>Moderate (considering the short-term timescale of most of the effects and the amount of gravel beach habitat available across the whole extent of the River)</p> <p>High for black shag (given the risk of disturbance or damage of a confirmed nesting site)</p>	<p>The Project footprint avoids directly impacting the black shag roosting and nesting site identified above SH2.</p>	<ul style="list-style-type: none"> <li>• Pre-clearance nest surveys across the gravel beaches prior to disturbance, if disturbance required in the nesting season. If nests identified works will not proceed within 50 m of the nest until chicks have fledged or nest is naturally abandoned. This will decrease disturbance to nesting birds and avoid injury/mortality of eggs and unfledged chicks.</li> <li>• Sediment control to reduce the effects on downstream habitat.</li> <li>• Arborist assessment required to minimise root disturbance in known black shag nesting site (macrocarpa).</li> <li>• Monitoring of black shag roosting/nesting</li> </ul>	<ul style="list-style-type: none"> <li>• Replacement of gravel beach habitat across the Project area as well as limiting access to discrete beach areas to decrease operational disturbance to roosting birds in these areas.</li> </ul>	<p><b>Low</b></p>

Ecological feature	Summary of key effects	Magnitude of effect <u>without</u> mitigation	Avoid	Minimise	Mitigate and Offset	Magnitude of effect once mitigation hierarchy applied
	<p>disturbance of the macrocarpa tree that is the site.</p> <p>Potential decrease in habitat quality downstream due to sedimentation effects.</p>			<p>site and adaptive management implemented if disturbance deemed to be having an effect on the roosting/nesting shags.</p>		
<p>Riverine and coastal birds confirmed to use habitats downstream of the Project area and likely use the Project area on occasion.</p>	<p>Effects as above (except for black shag-specific impacts) but noting that these species use directly impacted habitats on occasion, if at all.</p>	<p>Low</p>	<ul style="list-style-type: none"> <li>Mitigation as above (excluding black shag specific mitigation)</li> </ul>			<p><b>Negligible</b></p>
<p>At Risk forest birds confirmed in the surrounding Hutt Valley area that may visit and/or move through the Project area.</p>	<p>Loss of 1.65 ha of mixed broadleaved forest and scrub comprising potential roosting, foraging and nesting habitat for native birds. The habitat preferences of these At Risk</p>	<p>Low</p>		<ul style="list-style-type: none"> <li>Avoiding clearance of the 'mixed broadleaved forest and scrub' during the peak nesting season of forest bird species most likely to nest in this habitat. This will minimise disturbance to nesting birds and avoid</li> </ul>	<ul style="list-style-type: none"> <li>The habitat replacement outlined for "vegetation/habitats" above will mitigate for the effects of habitat removal and provide improved habitat in the long-term.</li> </ul>	<p><b>Negligible</b></p>

Ecological feature	Summary of key effects	Magnitude of effect <u>without</u> mitigation	Avoid	Minimise	Mitigate and Offset	Magnitude of effect once mitigation hierarchy applied
	<p>forest birds suggest it is very unlikely that the other habitat types present are of value them.</p> <p>Edge effects degrading adjacent habitat remaining.</p> <p>Potential, although unlikely, for disturbance, injury and/or death during vegetation clearance for any birds nesting within trees to be cleared.</p>			injury/mortality of eggs and unfledged chicks.	<ul style="list-style-type: none"> <li>Infill planting and weed control across the 2 ha of 'mixed broadleaved forest and scrub' remaining within the Project area will improve the quality of the remaining habitat and mitigate for the habitat removal.</li> </ul>	
Grassland birds (At Risk New Zealand pipit)	<p>Temporary loss of mown grassland comprising foraging habitat for NZ pipit.</p> <p>Loss of 1.9 ha of rough grassland / weedfield potential</p>	Low		<ul style="list-style-type: none"> <li>Pre-clearance nest surveys across the rough grassland / weedfield areas prior to disturbance, if disturbance required in the nesting season. If nests identified works will not proceed within</li> </ul>		<b>Negligible</b>

Ecological feature	Summary of key effects	Magnitude of effect <u>without</u> mitigation	Avoid	Minimise	Mitigate and Offset	Magnitude of effect once mitigation hierarchy applied
	<p>nesting habitat for NZ pipit.</p> <p>Potential for disturbance, injury and/or death during clearance for any pipit nesting within the above habitats.</p>			<p>50 m of the nest until chicks have fledged or nest is naturally abandoned. This will decrease disturbance to nesting birds and avoid injury/mortality of eggs and unfledged chicks.</p> <ul style="list-style-type: none"> <li>• Also option to use nesting deterrence methods including the mowing of rank grass. NB Lizard management may be required prior to removal of rank grass.</li> </ul>		

**Table 7-3: Summary of overall effects of the Project on ecological features with the recommended measures from the mitigation hierarchy applied.**

For brevity only ecological features that had a moderate or higher level of effect without minimisation or mitigation are summarised. This Table should be viewed in combination with Table 7-2 above.

Ecological Feature	Ecological value <sup>24</sup>	Without mitigation		WITH mitigation	
		Magnitude of effect <sup>25</sup>	Overall level of effect <sup>26</sup>	Magnitude of effect	Overall level of effect
<b>Vegetation types</b>					
Mixed broadleaved forest and scrub	Moderate	Moderate	Moderate	Low	<b>Low</b>
Tall stature exotic planting (flood protection)	Low	Moderate	Low	Low	<b>Very Low</b>
<b>Threatened and At Risk plant species</b>					
<i>Eryngium vesiculosum</i>	Very High	Low - Negligible	Moderate - Low	Negligible	<b>Low</b>
<i>Geranium retrorsum</i>	Very High	Low - Negligible	Moderate - Low	Negligible	<b>Low</b>
<i>Hypolepis dicksonioides</i>	Moderate	Low - Negligible	Low - Very Low	Negligible	<b>Very Low</b>

<sup>24</sup> Refer Table 6 for descriptions of ecological values.

<sup>25</sup> Refer to Table 13 for descriptions of magnitude of effect without mitigation.

<sup>26</sup> Refer to Table 5 for overall effects methodology.

Ecological Feature	Ecological value <sup>24</sup>	Without mitigation		WITH mitigation	
		Magnitude of effect <sup>25</sup>	Overall level of effect <sup>26</sup>	Magnitude of effect	Overall level of effect
<i>Korthalsella salicornioides</i>	Very High	Low - Negligible	Moderate - Low	Negligible	<b>Low</b>
<i>Peraxilla tetrapetala</i>	High	Low - Negligible	Low - Very Low	Negligible	<b>Very Low</b>
<i>Solanum aviculare</i> var. <i>aviculare</i>	Very High	Low - Negligible	Moderate - Low	Negligible	<b>Low</b>
<i>Trichomanes elongatum</i>	Moderate	Low - Negligible	Low - Very Low	Negligible	<b>Very Low</b>
<b>Terrestrial invertebrates</b>					
<i>Wainuia urnula urnula</i>	Moderate	High	Moderate	Low	<b>Low</b>
<i>Peripatoides novaezealandiae</i>	Moderate	Low	Low	Negligible	<b>Very Low</b>
Other terrestrial invertebrate species of note that may occur in the project area including the At Risk land snail <i>Allodiscus pallidus</i> .	Variable (Very High - Low)	Low	Moderate - Very Low	Negligible	<b>Low - Very Low</b>
<b>Lizards (refer to Appendix A for additional detail)</b>					
Northern grass skink	Low	Low	Very Low	Negligible	<b>Very Low</b>
Raukawa gecko	Low	Low	Very Low	Negligible	<b>Very Low</b>
Copper skink	Low	Low	Very Low	Negligible	<b>Very Low</b>

Ecological Feature	Ecological value <sup>24</sup>	Without mitigation		WITH mitigation	
		Magnitude of effect <sup>25</sup>	Overall level of effect <sup>26</sup>	Magnitude of effect	Overall level of effect
Ornate skink	High	Low	Low	Negligible	<b>Very Low</b>
Ngahere gecko	High	Low	Low	Negligible	<b>Very Low</b>
Barking gecko	High	Low	Low	Negligible	<b>Very Low</b>
<b>Threatened and At Risk coastal and riverine birds</b>					
Black-billed gull	Very High	Low	Moderate	Negligible	<b>Low</b>
Shore plover	Very High	Low	Moderate	Negligible	<b>Low</b>
White heron	Very High	Low	Moderate	Negligible	<b>Low</b>
Reef heron	Very High	Low	Moderate	Negligible	<b>Low</b>
Caspian tern	Very High	Low	Moderate	Negligible	<b>Low</b>
Red-billed gull	High	Moderate	High	Low	<b>Low</b>
Pied shag	Moderate	Moderate	Moderate	Low	<b>Low</b>
Black shag	Moderate	High	Moderate	Low	<b>Low</b>

## 8. CONCLUSION

260. The Project area encompasses approximately a 3.7 km reach of the Te Awa Kairangi / Hutt River and extends to the northwest outside of the River corridor to the toe of the Western Hutt Hills. The Project area is located adjacent to the Lower Hutt CBD and the existing environment is characterised largely by recreation, urban, residential, and industrial land uses.
261. Accordingly, the existing environment has been heavily modified by development, and the indigenous fauna inhabiting the area are robust to such modification including habitat degradation and fragmentation, and disturbance associated with urban development including the presence of SH2.
262. Very little native vegetation occurs naturally (i.e., not planted) within the River corridor itself and the regeneration across the lower slopes of the adjacent Western Hutt Hills has been degraded by weed incursions associated with prior clearance, and fragmentation associated with residential developments and roads.
263. Notwithstanding the above, various terrestrial ecology values were identified across the Project area and the wider surrounds. These values included:
- i. Eight distinct vegetation or habitat types. These habitats are all generally modified and degraded by pest plant incursions and have been assessed as having ecology value varying from High (gravel beaches) to Negligible (dwellings with associated ornamental gardens and mown grass);
  - ii. Two notable invertebrate species were observed in, or in very close vicinity, to the Project area. These being the native land snail *W. urnula* and the velvet worm *P. novaezealandiae*. While neither species is classified as 'Threatened' or 'At Risk' they are both locally distinctive species and hence were assessed as having Moderate ecological value in this context. The paucity of information available on native terrestrial invertebrates means other species of note could occur in the Project area. However, the most likely habitat for such species to occur would be the 'mixed broadleaved forest and scrub' adjacent to SH2. The level of impact of this habitat type resulting from the Project is minimal in comparison to the remaining indigenous forest covering the western hill slopes of the Hutt Valley.
  - iii. A single species of lizard, northern grass skink was detected during comprehensive site investigations (refer to Appendix A). However multiple other species have been recorded in close vicinity to the Project area and may still be present without being detected in surveys. The vegetation/ habitats within the River corridor were assessed as having negligible value for native lizards. Conversely the 'mixed broadleaved forest and scrub' supports 'Not Threatened' northern grass skink as well as potentially supporting other 'Not Threatened' and 'At Risk' species. Hence it was assessed as high value habitat for native lizards; and
  - iv. At Risk birds: red-billed gull, black shag, pied shag, and New Zealand pipit were confirmed using the Project area, as well as several additional species that are known to occur in the surrounding area and may use the Project area on occasion.
264. While the project will not result in a change in the existing land use of the area, it will require the removal of approximately 1.65 ha of vegetation / habitats assessed as having 'Moderate' or above ecological value (this does not include temporary removal of gravel beaches).

265. An additional 22.25 ha of 'Low' or 'Negligible' value habitat is also proposed to be removed (this does not include mown grass or individual specimen trees). The considerable majority of this habitat removal (15.89 ha) is the 'tall stature exotic plantings (flood protection)' along the river corridor. While this habitat type has minimal value regarding a representative indigenous community composition, it has ecological value in that there is very little native tall stature vegetation remaining in the floodplain of the Hutt Valley. Consequently, such vegetation is important on a landscape scale, providing connectivity between the forested hill slopes bordering the valley to the east and west.
266. This habitat will be replaced with 19.28 ha of forest, scrub, and treeland plantings<sup>27</sup> that will have improved ecological value in the medium to long term. However, the habitat removal will result in a loss of available habitat while revegetation areas are establishing and could result in injury or mortality of native fauna, as well as the other indirect impacts of associated with habitat modification, and increased disturbance.
267. Without the mitigation hierarchy applied, the level of effects of the Project on the various terrestrial ecology values ranged from High to Very Low. As per the EclA Guidelines (2018), the mitigation hierarchy has been applied to potential effects assessed as Moderate or above, to reduce these effects to Low or Very Low.
268. Various measures have been recommended to avoid, minimise and remedy and offset potential effects as described in the section above. The detailed methodology required to implement the recommendations to an appropriate standard will likely require the preparation and certification of management plans.
269. I consider the actual and potential effects of the Project on terrestrial ecology will be appropriately addressed if the recommendations above are implemented. Based on the EclA Guidelines (2018) additional measures are not required to compensate residual effects.

**23 July 2021**  
**Joshua Markham**

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<sup>27</sup> Planting typologies 01 - 03 as shown in A16-4381-L200 series.

**Appendix A** – Lizard Technical Assessment  
(Bioresearches Ltd.)

# RIVERLINK PROJECT

## NATIVE LIZARD SURVEY AND ASSESSMENT OF EFFECTS



# RIVERLINK PROJECT

## Native Lizard Survey and Assessment of Effects

### DOCUMENT APPROVAL

<b>Document title:</b>	RiverLink: Native Lizard Survey and Assessment of Effects
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**COVER ILLUSTRATION:** NORTHERN GRASS SKINK (*OLIGOSOMA POLYCHROMA*), WELLINGTON.

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## 1 INTRODUCTION

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### 1.1 BACKGROUND

The Hutt City Council (HCC), Greater Wellington Regional Council (GWRC) and Waka Kotahi are working together with Ngāti toa Rangitira and Taranaki Whānui ki te Upoko o te Ika to deliver The RiverLink project (RiverLink). RiverLink will provide for flood protection and improved lifestyle and transport links in Lower Hutt.

The Project area is comprised of designation boundaries that encompass the Hutt River and its riparian margins (GWRC new designation) and State Highway 2 (Waka Kotahi designations) from Fairway Drive in the North, to Railway Avenue at the southern end of the project. HCC designations provide for some road corridors and a new crossing over Hutt River at Margaret Street (Figure 1).

This report presents the results of a formal survey of the potential habitats within the Project Area (Figure 1) and details an assessment of effects of the Project on any areas identified as having potential habitat value. Specifically, this report:

- Identifies herpetological actual and potential values
- assesses the actual and potential effects of the Project those values,
- presents recommendations to avoid, remedy, mitigate, offset or compensate for those effects where appropriate.

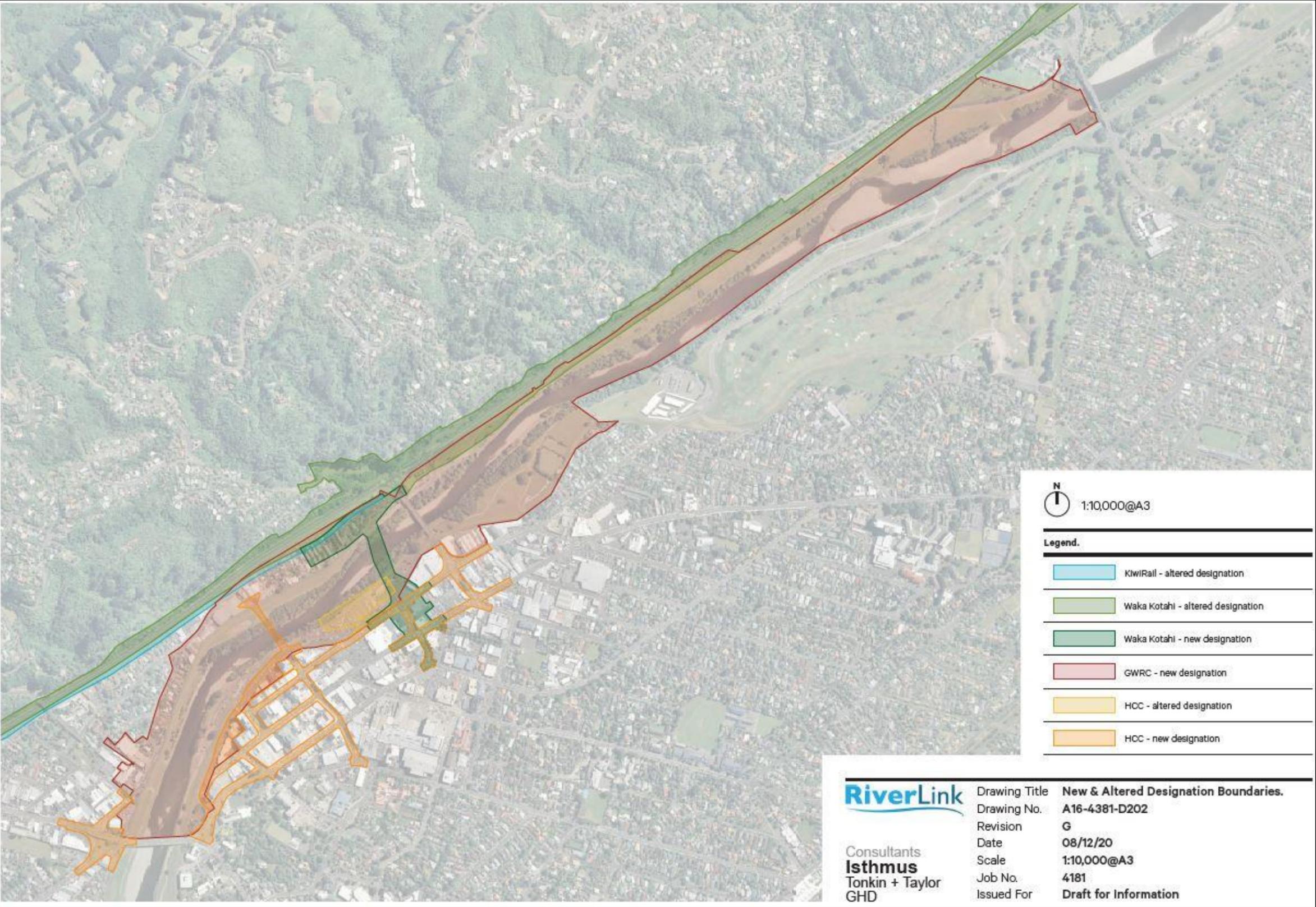


Figure 1. RiverLink Designations. Combined, the designations represent the 'Project Area' (Figure provided by Tonkin & Taylor).

## 2 METHODS

### 2.1 ASSESSMENT METHOD

The overarching approach of the survey and reporting method was to ascertain the existing herpetological values within the Project Area (presence, threat status, diversity and habitat quality); to establish the magnitude of the proposed effects on those values, and to establish, as per the EIANZ Ecological Impact Assessment guidelines for use in New Zealand (Roper-Lindsay et al. 2018), the level of adverse effects. That analysis then leads to an effects management regime comparable to the level of adverse ecological effect using the mitigation hierarchy. This results in an outcome for herpetological values that provides for a “no net loss” in the condition and future potential for the herpetological values either at the site or where management is directed.

The values and effects assessments undertaken in this report are consistent with the EIANZ guidelines for undertaking ecological impact assessments (Roper-Lindsay et al. 2018), however are specific to herpetofauna. Herpetological values are assigned for species as per Table 1.

**Table 1. Factors to be considered in assigning value to species (Roper-Lindsay et al. 2018).**

Determining factors	Assigned Value
Nationally threatened species, found in the ZOI either permanently or seasonally	Very High
Species listed as ‘At Risk’ – declining, found in the ZOI, either permanently or seasonally	High
Species listed as any other category of ‘At Risk’ found in the ZOI either permanently or seasonally	Moderate
Locally (ED) uncommon or distinctive species	Moderate
Nationally and locally common indigenous species	Low
Exotic species, including pests, species having recreational value	Negligible

The level of effect can then be determined through combining a description of the magnitude of effect (Appendix I) to create a criterion for describing the level of effect. The cells in bold italics in Table 2 represent a ‘significant’ effect.

Cells with low or very low levels of effect represent low risk to ecological values rather than low ecological values per se. A moderate level of effect requires careful assessment and analysis of the individual case.

For moderate levels of effects or above, measures need to be introduced through design, or appropriate mitigation (Roper Lindsay et al. 2018).

**Table 2. Criteria matrix for describing level of effects (Roper-Lindsay et al. 2018)**

Ecological Value → Magnitude ↓	Very High	High	Moderate	Low	Negligible
Very High	<i>Very High</i>	<i>Very High</i>	<i>High</i>	<i>Moderate</i>	<b>Low</b>
High	<i>Very High</i>	<i>Very High</i>	<i>Moderate</i>	Low	Very Low
Moderate	<i>High</i>	<i>High</i>	<i>Moderate</i>	Low	Very Low
Low	<i>Moderate</i>	Low	Low	Very Low	Very Low
Negligible	Low	Very Low	Very Low	Very Low	Very Low
Positive	Net gain	Net gain	Net gain	Net gain	Net gain

## 2.2 DESKTOP ASSESSMENT

Desktop investigations involved a review of the Department of Conservation’s Amphibian and Reptile Distribution Scheme (ARDS) database (accessed March 2021) and iNaturalist (<https://inaturalist.nz/>; submitted images reviewed for confirmation), as well as an analysis of aerial and topographic imagery for the presence of tracks and vegetation cover, within the Project Area, to plan survey design and spatial coverage.

All vegetated areas or potential habitat features, such as logs or rocky substrates, were considered to have potential to support lizard habitat and were visited in March 2021 to undertake a qualitative habitat determination, and where habitat was identified, survey methods were applied (Section 2.3).

## 2.3 SURVEY METHODS

The survey aspect of this assessment was completed by Chris Wedding, acting under Wildlife Act Authority 37604-FAU. The survey was undertaken over March and April 2021, within the most active period of native lizards.

The Wellington Region is within the potential distribution of at least twelve lizard species that occur on the mainland (not restricted to islands) (van Winkel et al. 2018; Hitchmough et al. 2016)

**Table 3. Threat classification of native lizards from the mainland Wellington Region. Threat category as per Hitchmough et al (2016).**

Common name	Species name	Threat Category	Threat Status
Copper skink	<i>Oligosoma aeneum</i>	Not Threatened	Not Threatened
Ornate skink	<i>Oligosoma ornatum</i>	At Risk	Declining
Northern grass skink	<i>Oligosoma polychroma</i>	Not Threatened	Not Threatened
Glossy brown skink	<i>Oligosoma zelandicum</i>	At Risk	Declining
Kupe skink	<i>Oligosoma aff. infrapunctatum</i> "southern North Island"	Threatened	Nationally Vulnerable
Northern spotted skink	<i>Oligosoma kokowai</i>	At Risk	Relict *
Whitaker's skink	<i>Oligosoma whitakeri</i>	Threatened	Nationally Endangered
Raukawa gecko	<i>Woodworthia maculata</i>	Not Threatened	N/A
Minimac gecko	<i>Woodworthia</i> "Marlborough mini"	Not Threatened	Not Threatened
Ngahere gecko	<i>Mokopirirakau</i> "southern North Island"	At Risk	Declining
Pacific gecko	<i>Dactylocnemis pacificus</i>	At Risk	Relict
Barking gecko	<i>Naultinus punctatus</i>	At Risk	Declining

\*Melzer et al. 2017

Where potential habitats supported logs or other debris that could be lifted, hand searches were undertaken and survey equipment (being artificial lizard retreats, (ARs), or funnel traps) was installed.

Where possible, systematic searches were undertaken in areas supporting dense ground cover and logs throughout the designation.

Where some habitats were less accessible for ARs and systematic searches (such as steep or unstable terrain, particularly along SH2), baited funnel traps were lowered into potential habitats, and adjacent representative habitats were hand searched.

Potential habitat for arboreal geckos was searched by way of nocturnal Visual Encounter Surveys (VES).

### 2.3.1 Artificial Retreat (AR) Surveys

The AR surveys were undertaken in accordance with Department of Conservation best practice (Lettink, 2012). ARs are suitable for surveying skinks and geckos that use ground habitats, particularly vegetated edges with sunlight exposure, where ARs can retain heat and enable lizards to maintain elevated body temperatures relative to their surrounding habitats during use (Lettink & Cree 2007 2015).

A total of 40 AR stations were installed over 22 and 23 March 2021. Stations consisted of a cluster of four ARs (40 stations = 160 ARs), and were placed in locations that were considered to represent the most likely places for native lizard encounters. These areas supported dense leaf litter, vegetation mats or edge vegetation that would provide suitable cover for terrestrial lizards, especially skinks or *Woodworthia* geckos (Table 3).

ARs were left *in situ* to acclimatise for four weeks to allow time for resident lizards to habituate to and use them. A minimum of four inspections were undertaken for all ARs over the week of 22 April 2021, during which the weather was fine and settled.

### 2.3.2 Funnel trap surveys

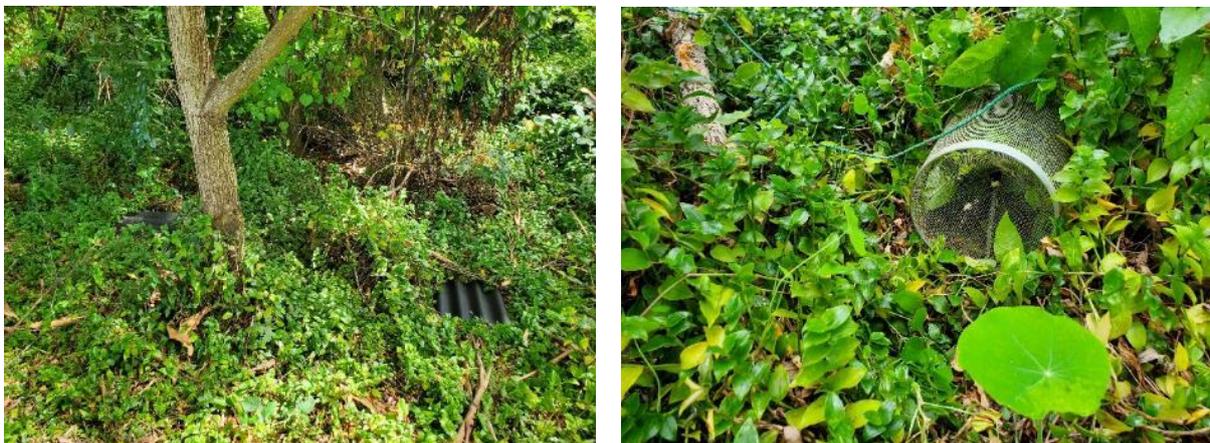
The funnel trap surveys were undertaken in accordance with the Department of Conservation best practice (Hare, 2012a). Funnel traps are suitable for capturing terrestrial lizards where the traps can be embedded in dense ground cover vegetation or lowered down into vegetation on steep or unstable terrain.

Ten funnel traps were set for four days over the week of 22 April 2021. Funnel traps were used to maximise survey coverage of the Project area, and were primarily used where use of ARs or systematic searches were difficult due to steep banks- particularly along SH2. Funnel traps also provided an opportunity to attract native lizards with bait.

Funnel traps were baited with a small piece of banana, set in dense vegetation or shaded environments and furnished with grass to provide protection for any captured lizards. Banana was refreshed after the second of four checks.

### 2.3.3 Systematic searches

Systematic habitat searches involved lifting logs, debris or vegetation mats in a systematic manner, working from one end to another of a searched area. Systematic searches were undertaken opportunistically, where potential habitats were considered searchable. For example, dense mats of tradescantia were lifted and rolled back and around old logs, which were in turn, lifted and rolled from a given search area as well.



**Figure 2.** Left, ARs installed along Hutt River Right: a funnel trap imbedded in dense vegetation



**Figure 3.** Ground cover vegetation such as tradescantia was 'rolled back' during systematic searches

#### **2.3.4 Nocturnal visual encounter searches (VES)**

Powerful headlamps, (LED Lenser™ H19R), aided by Nikon Monarch™ 8 x 42 binoculars, were used to search for geckos on the ground, on tree branches and in foliage (Hare 2012b). Geckos are generally easier to detect at night by slowly scanning potential habitat with a focused light beam, while searching for the lizards' distinctive body shapes and reflective eye-shine (Whitaker, 1994). Two searches were undertaken, on 22 and 24 April 2021. Searches began after dusk, during settled and dry weather and targeted vegetation edges along the SH2 side of the Project area.

### 3 RESULTS

A review of the Department of Conservation’s ARDs (Bioweb) database and iNaturalist indicated the presence of eight lizard species within approximately 5 km of the Project area. Copper skink, Northern grass skink, barking gecko, raukawa gecko and ngahere gecko have been the most commonly recorded species around the Project area.

Nearby records to the west of the Project are generally all associated with the strip of vegetation that runs through the suburbs of Maungaraki, Normandale, Harbourview, Tirohanga and Belmont. To the east of the Project, there are fewer records, but copper skink, common skink, raukawa gecko and barking gecko (note barking gecko records are now older than 20 years) have been recorded. While there are no records associated with the Hutt River riparian margin itself, copper skink, common skink, and raukawa gecko have been recorded from around the main urban areas of Lower Hutt to Petone, east of the river.

**Table 4. Species recorded from ARDs database and iNaturalist review.**

Common name	Species name	Closest Distance to Project Area	Notes
Copper skink	<i>Oligosoma aeneum</i>	< 1 km	Few records around Project
Ornate skink	<i>Oligosoma ornatum</i>	< 1 km	One record, west of Project
Northern grass skink	<i>Oligosoma polychroma</i>	< 1 km	Few records around Project
Glossy brown skink	<i>Oligosoma zelandicum</i>	> 5 km	1 record
Kupe skink	<i>Oligosoma aff. infrapunctatum</i> 'Southern North Island	> 20 km	
Northern spotted skink	<i>Oligosoma kokowai</i>	< 2 km	1 record west of Project older than 15 years)
Whitaker’s skink	<i>Oligosoma whitakeri</i>	> 20 km	
Raukawa gecko	<i>Woodworthia maculata</i>	< 1 km	Few records around Project
Minimac gecko	<i>Woodworthia “Marlborough mini”</i>	> 15 km	Coastal in Wellington Region
Ngahere gecko	<i>Mokopirakau “southern North Island”</i>	< 1 km	Few records west of Project
Pacific gecko	<i>Dactylocnemis pacificus</i>	> 20 km	Not observed in > 30 years
Barking gecko	<i>Naultinus punctatus</i>	< 1 km	Several records around Project

#### 3.1 HABITAT DESCRIPTIONS

Potential habitats within the Project are associated with two main areas, being the Hutt River riparian margins (Hutt River) and more diverse and indigenous-dominated regenerating forest to the west of SH2 (SH2).

The area of potential habitat along the Hutt River is identified in Figure 1 as ‘GWRC – new designation’. Parts of Waka Kotahi – new designation, HCC altered and new designations also cross this space.

The area of potential habitat along SH2 is identified in Figure 1 as ‘Waka Kotahi – altered designation’.

### 3.1.1 Hutt River riparian margins (GWRC – new designation)

The potential habitats along the Hutt River are dominated by exotic vegetation. The ground cover throughout is largely comprised of *Tradescantia fluminensis* and nasturtium (*Tropaeolum speciosum*), with occasional fallen logs and beneath a canopy of planted willow (*Salix* spp.) poles. Blackberry (*Rubus fruticosus*) has formed occasional patches at the outer edges. Structurally, this vegetation cover provides **very good potential habitat value for skinks**, with dappled sunlight, dense vegetation mats and log fall retreats. Some indigenous vegetation is naturally regenerating, with kawakawa (*Piper excelsum*), mahoe (*Melicactus ramiflorus*) and karamu (*Coprosma robusta*) occasionally observed (but see Tonkin & Taylor 2021 for a complete botanical assessment). The substrate beneath the vegetation was very silty, and it is uncertain whether occasional flooding would prevent native lizards from permanently residing in this area, as the river corridor largely runs within flood protection stop banks.

The planted pole willows have **negligible potential habitat value for arboreal geckos** due to their limited structural complexity. The trees are relatively young, do not support any epiphytic vegetation or dense foliage for retreats. Foliage would be absent through parts of the year, during which there would be higher wind exposure and temperature fluctuations.

While this riparian margin provides some connectivity as a potential ecological corridor, this function is probably very limited for less mobile fauna such as lizards, due to its isolation within the landscape, where it runs between major roadways along almost the entirety of its length through Lower Hutt to Petone. Raukawa geckos, which are typically coastal and saxicolous, may extend up the stony margins of the Hutt River.



Figure 4. Typical vegetation within the Hutt River Riparian margins showing pole willow and weedy ground cover.

### 3.1.2 SH2 Regenerating forest (Waka Kotahi – altered designation)

The forest to the immediate west of SH2 is a mixture of exotic and regenerating native forest (see Tonkin & Taylor for a more complete botanical description). The vegetation and potential habitats within the Project designation are mostly confined to steep banks, parts of which are maintained as short grass. Weedy ground cover along these vegetated edges provides **very good potential habitat value for skinks**, particularly avid sunbaskers, such as grass skinks, and beyond the edges, occasionally

deep leaf litter and log fall is present which provides additional habitat complexity for species that are more secretive (e.g. copper skink, ornate skink and glossy brown skink).

Most of the vegetation within the designation is relatively short stature (up to 4 m tall) and comprised of regenerating broadleaved trees and shrubs. Arboreal gecko species such as ngahere gecko and barking gecko could be present within this vegetation, and both species occur in contiguous habitats throughout this edge, including around Harbour View and Jubilee Park. While kanuka / manuka scrub is more commonly associated with arboreal gecko habitat, broadleaved species scrub still provides **potentially good habitat value to geckos**. An area of amenity planting at Harbour View



**Figure 5.** Dense weedy vegetation edge at Harbour View, and typical understorey within SH2 regenerating forest

### **3.2 SURVEY RESULTS**

A minimum of six individual Northern grass skinks from 12 encounters, were recorded from two AR stations at Harbour View, along a weedy grass edge between Jenness Grove and Harbour View Road (Figure 6). Another AR station on the south-eastern edge of Tirohanga Road also recorded a grass skink. Both locations were within the SH2 project area. Some skinks were observed basking on the AR retreats and could not be distinguished from captured animals. Survey effort summary is provided in Table 5.



Figure 6. Survey coverage and results for lizard survey of RiverLink Project. Note designations shown as one shaded area.

**Table 5. Survey effort and results from lizard survey of RiverLink Project.**

Location	Survey type	Survey effort	Results
Hutt River	Artificial Retreats	512 inspections of 128 ARs at 32 stations	No lizards
Hutt River	Funnel traps	8 trap days from 4 inspections of two traps	No lizards
Hutt River	Systematic searches	8 person search hours	No lizards
SH2 regenerating forest	Artificial Retreats	176 inspections of 44 ARs at 11 stations	Northern Grass skink at 3 stations
SH2 regenerating forest	Funnel traps	28 traps days from 4 inspections of seven traps	No lizards
SH2 regenerating forest	Systematic searches	Four person search hours (Jubilee Park)	No lizards
SH2 regenerating forest	Nocturnal VES	10 person search hours	No lizards



**Figure 7. Northern Grass skink, RiverLink Project.**

### 3.2.1 Other findings

Systematic searches undertaken of representative habitat at Jubilee Park (Fern Garden area) identified peripatus (*Peripatus novaehelandiae*). Peripatus (also known as ‘velvet worms’) are ‘Not Protected’ (i.e., they are not listed under Schedule 7 of the WA) and they are also ‘Not Threatened’ (Trewick et al. 2018). However, they are of scientific interest because they are relatively unchanged in 500 million years and share characteristics common to both arthropods (joint-legged invertebrates such as insects) and annelids (e.g. worms). The Department of Conservation considers that the species known from the Wellington Region and other areas could be a complex that includes several undescribed, and potentially rarer species.

Systematic searches of Hutt River ground cover identified three Rhytida snails (*Wainuia urnula urnula*). This species is a small-medium sized carnivorous land snail that has a restricted range within the lower half of the North Island (Efford, 1998). The species is ‘Not Protected’ (i.e., they are not listed under

Schedule 7 of the WA) and a recent conservation status could not be found, however habitat loss and predation by introduced birds and mammals are acknowledged threats.



Figure 8. Velvet worm, *Periptatus novaezelandiae*, Jubilee Park, Lower Hutt.



Figure 9. Land snail, *Wainuia urnula urnula*, Hutt River.

## 4 HERPETOFAUNA VALUES

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### 4.1 HUTT RIVER

The potential habitats within the Hutt River riparian margin are structurally very good for terrestrial (ground-based) herpetofauna, but very poor quality for arboreal herpetofauna. No native lizard species were recorded from a comprehensive survey effort throughout potential habitats within the Project area. Given the apparent suitability of potential habitat for skinks, this lack of detection may be a result of a lack of suitable retreats from periodic flooding of the Hutt River.

Overall, the herpetofauna values within the Project area along the Hutt River are **Negligible**.

### 4.2 SH2 REGENERATING FOREST

The potential habitats for skinks and geckos within the SH2 regenerating forest are structurally very good, and the detection of grass skinks at vegetation edges at Harbour View and along the south-eastern side of Tirohanga Road is consistent with their presence throughout the surrounding landscape (Table 4). Northern grass skink are 'Not Threatened' and while the species ranks as low ecological value, they are protected under the Willdife Act (1953).

The area of vegetation and habitats within the Project are largely contiguous with vegetation that supports records for a much greater diversity of skinks and geckos than what was recorded from the current surveys. In particular, large parts of the potential habitat within the Project area to the North-west of SH2 could not be surveyed due to the terrain, and species such as raukawa gecko, which often inhabit exposed and unstable habitats such as steep or rocky banks, may be present in these areas, as records confirm their presence in the surrounding landscape (Table 4, Figure 10). Similarly, copper skink (Not Threatened), ornate skink, ngahere gecko and barking gecko (all 'At Risk- declining' and therefore 'High Value' as per Table 1) have been recorded in adjacent habitats and therefore, it is likely that despite not being detected, some of these species are present.

Overall, this assessment weighs heavily on existing records that demonstrate a high diversity (at least six species) of native lizards in adjacent habitats, and in close proximity (< 1 km) to the Project. These include three species that rate as 'High' value (Table 1). This reptile diversity is high, but representative of what would be expected from a natural, regenerating ecosystem in the Wellington Region. Therefore, while 'High' value species were not detected, the lizard habitat value is conservatively ranked as **High**.

## 5 ASSESSMENT OF EFFECTS

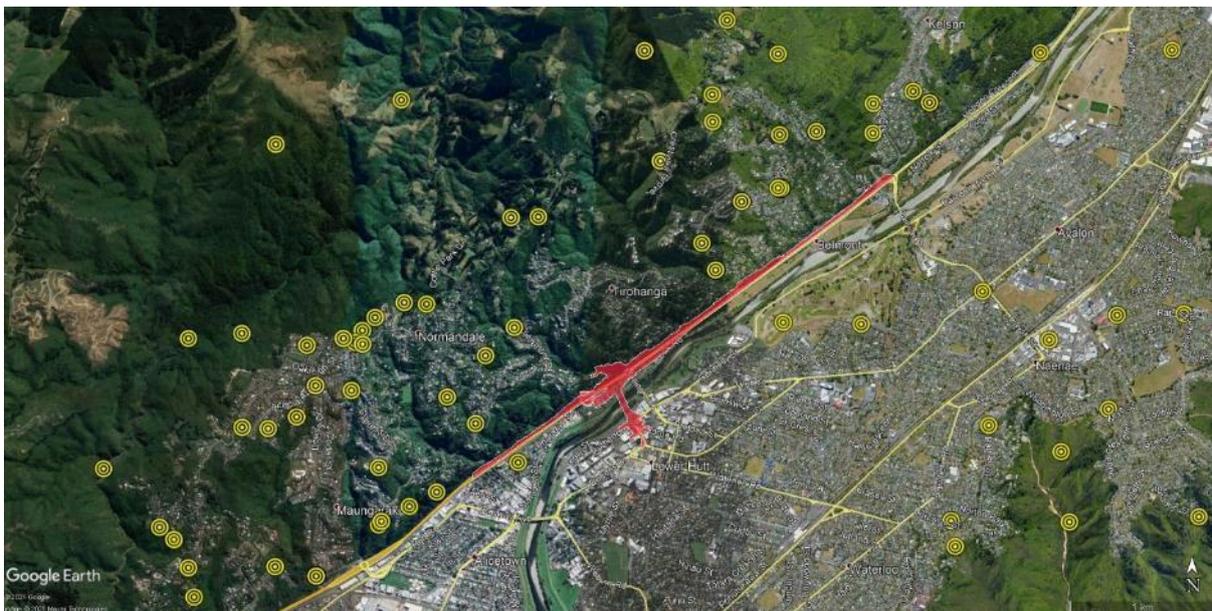
### 5.1 HUTT RIVER

The Project would require removal of 17.8 ha of exotic and weed dominated riparian and weed field vegetation over some 3.7 km of the Hutt River length within the Project area. The riparian margin along this area is similarly highly modified and intermittently vegetated throughout a wider 25 km length between its mouth at Petone and Harcourt Park in Upper Hutt. North of here, it is more intact where it enters the foothills of the Tararua Ranges. The magnitude of vegetation removal in this context is considered moderate, and with negligible herpetofauna values, the proposed removal of this vegetation would represent an overall **Very Low level effect** on herpetofauna.

### 5.2 SH2 REGENERATING FOREST

The Project would require removal of some 1.7 ha of mixed native and exotic regenerating broadleaved scrub, including some amenity planting and weedy grass edges. This equates to approximately 45% of the 3.7 ha of natural and planted vegetation and habitats within the Project area on the SH2 side, but less than 1% of the adjacent habitats through which the herpetofauna records occur (Figure 10). Within this context, the effect would represent a minor shift from baseline character and quantum, and therefore, a low magnitude impact on herpetofauna populations would likely result. A low magnitude effect to potentially high herpetofauna value resource results in a **Low level effect**.

While such levels of effect do not typically require any mitigation or offset, an overall net loss of habitat for protected and potentially high value species should be recognised through management actions as detailed in a site-specific lizard management plan (LMP).



**Figure 10.** Screen grab (species information removed) showing herpetofauna records through a large area to the immediate north-west of the Project area alongside SH2. Waka Kotahi designations within the Project area indicated in red.

### 5.2.1 Direct effects

Permanent removal would result in injury or direct mortality to common native grass skinks in the Harbour View and Tirohanga Road areas, and potentially other lizard species (including high value 'At Risk' species) that were not detected from surveys. This effect could be minimised through capture and relocation in accordance with details of a LMP.

### 5.2.2 Indirect effects

#### 5.2.2.1 Displacement

Permanent vegetation removal may result in some lizards, within the project area or adjacent to it, being displaced into adjacent habitats. Displaced lizards have a lower likelihood of survival where the carrying capacity of adjacent habitats is stressed through increased competition for fewer resources. Further, displaced animals have a higher probability of risk of predation and a rapid increase in lizard numbers in a given area is likely to result in a corresponding increase in predators.

The effects of displacement on native lizards is poorly understood, however habitat enhancement measures, such as pest control, buffer planting and provision of additional retreats may provide increased population capacity.

#### 5.2.2.2 Edge effects

Almost all of the affected vegetation, including where northern grass skinks were recorded, is within some 10 – 20 m of an existing edge. Therefore, edge effects created by the proposal are not considered to have any significant long-term effects on lizards.

Edge vegetation, while typically considered to have lower ecological value compared to forest interiors due to 'edge effects', (e.g. weed and pest invasion, higher levels of environmental exposure- light, wind, temperatures, desiccation), may positively influence native reptile habitat values where light and temperatures provide warmer microclimates for more efficient body temperature regulation. Dense edge vegetation, such as thick grass cover or vegetation mats (e.g. Figure 5) are often important lizard habitats, particularly for skinks, and therefore newly created edges should be provided with appropriate buffer planting.

## 6 CONCLUSIONS AND RECOMMENDATIONS

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Removal of negligible value lizard habitat from the Hutt River riparian margins would represent a very low-level effect, and no specific recommendations for lizard management are considered necessary.

However, potentially high value habitats, including the presence of protected Northern grass skink, would require specific management to meet statutory obligations under the Wildlife Act (1953) as well as good practice 'no net loss' outcomes. Overarching ecological management recommendations, including revegetation and general maintenance, are provided for in the main ecology effects assessment and positive outcomes of such management are likely to benefit indigenous lizards.

Specific lizard management requirements should be detailed in a LMP, parts of which would require implementation under a valid Wildlife Authority, issued by Department of Conservation.

The LMP should address, as a minimum:

- A summary of the affected habitat and species covered by the plan;
- Lizard capture and relocation procedures and timeframes;
- A summary of the recommended release site (see below);
- Enhancement measures and triggers (see below);
- Post works management and monitoring (where required).

### 6.1 POTENTIAL LIZARD RELEASE SITES

#### 6.1.1 Jubilee Park

Opportunities for lizard relocation are generally limited in the immediate landscape, due much of the designation being alongside residential parcels. Survey coverage for the current assessment included parts of Jubilee Park, which supported excellent opportunities for habitat enhancement, including weed removal, and potentially, pest control. Jubilee Park supports similar, broadleaved scrub- type habitats that are contiguous with the Project area, including suitable dense ground cover grass mats around clearing edges. Jubilee Park would provide a suitable release site for grass skinks, and any other potentially present skinks and geckos.

### 6.2 ENHANCEMENT MEASURES AND TRIGGERS

Previously, some management approaches to indigenous lizards have considerably underestimated species abundances within affected habitats. This has resulted in inadequate preparedness to effectively manage species populations where management plans are designed on assumptions. The grass skinks detected from the Project area have potential to represent a more extensive population and therefore the LMP should provide for triggers to enable appropriate release site management. Triggers should respond to lizard numbers and diversity, and require commensurate management responses, such as:

- Supplementary refuges: type and quantum
- Pest management: intensity and term
- Additional buffer planting
- Back up receptor / relocation sites
- Post management monitoring

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## 8 APPENDICES

### APPENDIX I. CRITERIA FOR DESCRIBING MAGNITUDE OF EFFECT

**Table 1. Criteria matrix for describing magnitude of effects (Roper-Lindsay et al. 2018)**

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

## **Appendix B** – Vegetation / Habitat type photo plates

**Mixed broadleaved forest and scrub**



*Figure 1: Mixed broadleaved forest and scrub above SH2, mature hīnau with understory dominated by Tradescantia.*



*Figure 2: top of the escarpment above SH2. Exotic weeds dominate the margin with mature natives such as a tītoki and karaka present in the background.*



*Figure 3: Mature karaka being smothered by ivy and Japanese honeysuckle.*



*Figure 4: Mixed broadleaved planting comprising native species including māhoe, kawakawa, kōwhai, kōhūhū, rangiora and hangehange. Note exotic sycamore trees beginning to emerge above the canopy.*

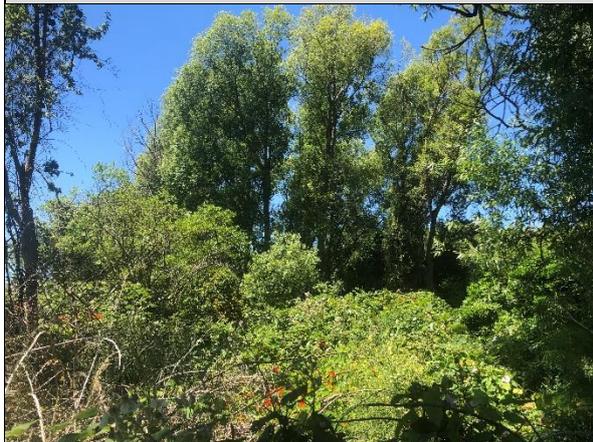


*Figure 5: View west along the margin of SH2 mixed native and exotic trees and shrubs being smothered by bindweed.*



*Figure 6: View from Harbour View Rd back down towards SH2. Broadleaved forest and scrub dominated by exotic plants including large Acacia trees. Blackberry in the foreground.*

### Tall stature exotic planting with mixed understory



*Figure 7: A willow canopy with koromiko growing in a light gap in the understory. Ground layer dominated by exotic plants including bindweed, nasturtium, blackberry, and rank grasses.*



*Figure 8: Willow canopy over and exotic ground layer comprising primarily nasturtium and rank grass.*



*Figure 9: Willow canopy over a sparse mixed understory which includes māhoe, kawakawa and exotic sycamore. Exotic dominated ground layer comprising bindweed, montbretia, Tradescantia and nasturtiums.*



*Figure 10: Willow canopy over native kawakawa understory and a ground layer primarily comprised of rank grass and fennel.*

### Native scrub/ shrubland plantings



Figure 11: Native planting comprising kānuka, lemonwood, karaka with fennel and rank grass in the understory.



Figure 12: Native planting comprising kōhūhū, lemonwood, kānuka, harakeke, and karamū with some exotic weeds primarily in the understory.



Figure 13: Native planting comprising akeake, lemonwood, tōtara, and karamū.



Figure 14: A recent native planting comprising karamū, harakeke, red māpou, and mānuka.



Figure 15: A sparse native planting with and exotic-dominated ground cover.



Figure 16: Native planting comprising kōhūhū, lemonwood, koromiko, and kōwhai with an exotic-dominated groundcover.

### Low stature planting



Figure 17: Low stature planting on the river edge, dominated by harakeke.



Figure 18: Looking upstream from the Ewen Bridge. Low stature planting on true left bank and a gravel beach in the foreground.

### Constructed wetland



Figure 19: The recently constructed wetland on the true right bank of the river downstream of Kennedy-Good Bridge. View away from the river towards SH2.



Figure 20: The recently constructed wetland on the true right bank of the river downstream of Kennedy-Good Bridge. View east towards the river.



Figure 21: Recently planted *Carex* sp. on the constructed wetland margin.



Figure 22: A bund separating the pond areas from the outlet that drains to the River.

### Rough grassland/ weed field



Figure 23: View upstream toward Ewen Bridge. Rough grassland on the river edge where mower cannot access.



Figure 24: Weed field area downstream of the Kennedy-Good Bridge on the true right bank of the River.

### Gravel beaches



Figure 25: View upstream across a gravel beach area.



Figure 26: View upstream towards Ewen Bridge from the true left bank. Rank grassland on the river margin with a gravel beach in the background.



Figure 27: View downstream with a gravel beach in the foreground and tall stature exotic planting (flood protection) on both river margins.



Figure 28: View upstream towards Melling Bridge. A large gravel beach in the foreground, largely unvegetated but with the occasional herbaceous weed establishing.

**Table 1: Vascular plant species observed during site investigations in the RiverLink Project area and close surrounds.**

Common name	Scientific Name	Threat Status <sup>1</sup>
Agapanthus	<i>Agapanthus sp.</i>	Exotic
Akeake*	<i>Dodonaea viscosa</i>	Not Threatened
Arum lily	<i>Zantedeschia aethiopica</i>	Exotic
Batchelor's button	<i>Cotula coronopifolia</i>	Not Threatened
Bears breeches	<i>Acanthus mollis</i>	Exotic
Blackberry	<i>Rubus fruticosus agg.</i>	Exotic
Black beech*	<i>Fuscospora solandri</i>	Not Threatened
Black nightshade	<i>Solanum nigrum</i>	Exotic
Brassica sp.	<i>Brassica sp.</i>	Exotic
Broadleaf*	<i>Griselinia littoralis</i>	Not Threatened
Buddleia	<i>Buddleja davidii</i>	Exotic
Cabbage tree	<i>Cordyline australis</i>	Not Threatened
Carex spp.*	<i>Carex spp.</i>	-
Chinese mugwort	<i>Artemisia verlotiorum</i>	Exotic
Climbing asparagus	<i>Asparagus scandens</i>	Exotic
Clover sp.	<i>Trifolium sp.</i>	Exotic
Cocksfoot	<i>Dactylis glomerata</i>	Exotic
Common alder	<i>Alnus glutinosa</i>	Exotic
Common ivy	<i>Hedera helix</i>	Exotic
Crack willow	<i>Salix x fragilis</i>	Exotic
Creeping buttercup	<i>Ranunculus repens</i>	Exotic
Cupressus sp.	<i>Cupressus sp.</i>	Exotic
Darwin's barberry	<i>Berberis darwinii</i>	Exotic
Elaeagnus	<i>Elaeagnus x reflexa</i>	Exotic
Eucalyptus sp.	<i>Eucalyptus sp.</i>	Exotic
False acacia	<i>Robinia pseudoacacia</i>	Exotic
Fennel	<i>Foeniculum vulgare</i>	Exotic
Five finger*	<i>Pseudopanax arboreus</i>	Not Threatened
Foxglove	<i>Digitalis purpurea</i>	Exotic
Gorse	<i>Ulex europaeus</i>	Exotic
Gravel groundsel	<i>Senecio skirrhodon</i>	Exotic
Great bindweed	<i>Calystegia silvatica subsp. disjuncta</i>	Exotic
Gully bindweed	<i>Pneumatopteris pennigera</i>	Not Threatened
Harakeke*	<i>Phormium tenax</i>	Not threatened
Hebe (cultivars)*	<i>Veronica spp.</i>	-
Pink bindweed	<i>Calystegia sepium subsp. roseata</i>	Not threatened
Hangehange	<i>Geniostoma ligustrifolium</i>	Not threatened
Hīnau	<i>Elaeocarpus dentatus</i>	Not threatened
Holly	<i>Ilex aquifolium</i>	Exotic
Hounds tongue	<i>Zealandia pustulata subsp. pustulata</i>	Not Threatened
Houpara*	<i>Pseudopanax lessonii</i>	Not Threatened
Japanese cherry	<i>Prunus serrulata</i>	Exotic
Japanese honeysuckle	<i>Lonicera japonica</i>	Exotic
Kahikatea	<i>Dacrycarpus dacrydioides</i>	Not Threatened
Kahili ginger	<i>Hedychium gardnerianum</i>	Exotic
Kaikomako	<i>Pennantia corymbosa</i>	Not Threatened
Kānuka	<i>Kunzea robusta</i>	Threatened – Nationally Vulnerable
Kāpūngāwhā*	<i>Schoenoplectus tabernaemontani</i>	Not Threatened
Karaka	<i>Corynocarpus laevigatus</i>	Not Threatened

Common name	Scientific Name	Threat Status <sup>1</sup>
Karamu*	<i>Coprosma robusta</i>	Not Threatened
Karo	<i>Pittosporum crassifolium</i>	Not Threatened
Kawaka	<i>Libocedrus plumosa</i>	Not Threatened
Kawakawa	<i>Piper excelsum subsp. excelsum</i>	Not Threatened
Kiekie	<i>Freycinetia banksii</i>	Not Threatened
King fern	<i>Ptisana salicina</i>	At Risk – Declining
Kohekohe	<i>Dysoxylum spectabile</i>	Not Threatened
Kōhūhū*	<i>Pittosporum tenuifolium</i>	Not Threatened
Korokio*	<i>Corokia cotoneaster</i>	Not Threatened
Koromiko	<i>Veronica stricta var. stricta</i>	Not Threatened
kōwhai	<i>Sophora microphylla</i>	Not Threatened
Lacebark*	<i>Hoheria populnea</i>	Not Threatened
Lancewood*	<i>Pseudopanax crassifolius</i>	Not Threatened
Lemonwood	<i>Pittosporum eugenioides</i>	Not Threatened
Lombardy poplar*	<i>Populus nigra</i>	Exotic
Macrocarpa	<i>Cupressus macrocarpa</i>	Exotic
Magellan fuchsia	<i>Fuchsia magellanica</i>	Exotic
Māhoe	<i>Melicytus ramiflorus</i>	Not threatened
Makomako	<i>Aristolelia serrata</i>	Not threatened
Mamaku	<i>Cyathea medullaris</i>	Not threatened
Mānuka*	<i>Leptospermum scoparium</i>	At Risk – Declining
Marlborough rock daisy*	<i>Pachystegia insignis</i>	Not Threatened
Matai*	<i>Prumnopitys taxifolia</i>	Not Threatened
Mexican daisy	<i>Erigeron karvinskianus</i>	Exotic
Mingimingi*	<i>Coprosma propinqua var. propinqua</i>	Not Threatened
Miro*	<i>Pectinopitys ferruginea</i>	Not Threatened
Monkey apple	<i>Syzygium smithii</i>	Exotic
Montbretia	<i>Crocsmia x crocosmiiflora</i>	Exotic
Montpellier broom	<i>Genista monspessulana</i>	Exotic
Nasturtium	<i>Tropaeolum majus</i>	Exotic
Ngaio*	<i>Myoporum laetum</i>	Not Threatened
Nīkau	<i>Rhopalostylis sapida</i>	Not Threatened
Northern rātā	<i>Metrosideros robusta</i>	Threatened – Nationally Vulnerable
Oak*	<i>Quercus robur</i>	Exotic
Oioi*	<i>Apodasmia similis</i>	Not Threatened
Old man's beard	<i>Clematis vitalba</i>	Exotic
Pampas	<i>Cortaderia selloana</i>	Exotic
Parataniwha	<i>Elatostema rugosum</i>	Not Threatened
Patē	<i>Schefflera digitata</i>	Not Threatened
Pea sp.	<i>Lathyrus sp.</i>	Exotic
Perennial rye grass	<i>Lolium perenne</i>	Exotic
Periwinkle	<i>Vinca major</i>	Exotic
Pigeonwood	<i>Hedycarya arborea</i>	Not Threatened
Plantain spp.	<i>Plantago spp.</i>	Exotic
Pohuehue	<i>Muehlenbeckia australis</i>	Not Threatened
Pōhutukawa	<i>Metrosideros excelsa</i>	Threatened – Nationally Vulnerable
Ponga	<i>Cyathea dealbata</i>	Not Threatened
Poplar*	<i>Populus sp.</i>	Exotic
Pukatea	<i>Laurelia novae-zelandiae</i>	Not Threatened
Pūrei*	<i>Carex secta</i>	Not Threatened
putaputawētā	<i>Carpodetus serratus</i>	Not Threatened
Radiata pine	<i>Pinus radiata</i>	Exotic

Common name	Scientific Name	Threat Status <sup>1</sup>
Rangiora	<i>Brachyglottis repanda</i>	Not Threatened
Red mapou*	<i>Myrsine australis</i>	Not Threatened
Rengarenga lily* (likely <i>A. cirratum</i> cultivar)	<i>Arthropodium sp.</i>	Not Threatened
Rewarewa	<i>Knightia excelsa</i>	Not Threatened
Ribbonwood*	<i>Plagianthus regius subsp. regius</i> Exotic	Not Threatened
Rice-paper plant	<i>Tetrapanax papyrifer</i>	Exotic
Scott's broom	<i>Cytisus scoparius</i>	Exotic
Shining karamu*	<i>C. lucida</i>	Exotic
Shining spleenwort	<i>Asplenium oblongifolium</i>	Not Threatened
Silver birch*	<i>Betula pendula</i>	Exotic
Silver fir*	<i>Abies alba</i>	Exotic
Slender tree fern	<i>Cyathea cunninghamii</i>	Not Threatened
Spike sedge*	<i>Eleocharis sp.</i>	Not Threatened
Small-leaved pōhuehue*	<i>Muehlenbeckia complexa var. complexa</i>	Not Threatened
Snow tussock*	<i>Chionochloa flavicans f. flavicans</i>	Not Threatened
Sycamore	<i>Acer pseudoplatanus</i>	Exotic
Taupata*	<i>Coprosma repens</i>	Not Threatened
Tawa	<i>Beilschmiedia tawa</i>	Not Threatened
Thread fern	<i>Icarus filiformis</i>	Not Threatened
Tītoki	<i>Alectryon excelsus</i>	Not Threatened
Tradescantia	<i>Tradescantia fluminensis</i>	Exotic
Toetoe*	<i>Austroderia sp.</i>	Not Threatened
Tōtara*	<i>Podocarpus totara var. totara</i>	Not Threatened
Tree lupin	<i>Lupinus arboreus</i>	Exotic
Tutu	<i>Coriaria arborea var. arborea</i>	Not Threatened
Umbrella sedge	<i>Cyperus eragrostis</i>	Exotic
Velvety nightshade	<i>Solanum chenopodioides</i>	Exotic
Vetch sp.	<i>Vicia sp.</i>	Exotic
Water celery	<i>Apium nodiflorum</i>	Exotic
Water pepper	<i>Persicaria hydropiper</i>	Exotic
Wattle sp.	<i>Acacia sp.</i>	Exotic
Wharariki*	<i>Phormium cookianum subsp. hookeri</i>	
Whekī	<i>Dicksonia squarrosa</i>	Not Threatened
Yorkshire fog	<i>Holcus lanatus</i>	Exotic

<sup>1</sup> de Lange, P.J.; Rolfe, J.R.; Barkla, J.W.; Courtney, S.P.; Champion, P.D.; Perrie, L.R.; Beadel, S.M.; Ford, K.A.; Breitwieser, I.; Schonberger, I.; Hindmarsh-Walls, R.; Heenan, P.B.; Ladley, K. 2018: Conservation status of New Zealand indigenous vascular plants, 2017. New Zealand Threat Classification Series 22. Department of Conservation, Wellington. 82 p.

\* Denotes species that were only observed as planted specimens.