| | |
|---|---|
| **IN THE MATTER OF** | the Fast-track Approvals Act 2024 ("FTAA") |
| **AND** | |
| **IN THE MATTER OF** | an application for approvals by **NZ Transport Agency Waka Kotahi** to construct, operate and maintain the State Highway 1 Wellington Improvements project |

# STATE HIGHWAY 1 WELLINGTON IMPROVEMENTS PROJECT
# TECHNICAL REPORT #11
# FRESHWATER AND WETLAND ECOLOGY ASSESSMENT

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# 1. INTRODUCTION

1. My full name is Joshua Andrew Markham. I have prepared this technical assessment with the support and collaboration of Samuel Mulcock (Ecological Consultant, Tonkin + Taylor, Auckland), Jamie MacKay (Senior Ecologist, Tonkin + Taylor, Auckland), David Pickett (Senior Terrestrial Ecologist, Tonkin + Taylor, Wellington), Shaun Morgan (Environmental Scientist, Tonkin + Taylor, Auckland), and Bex Diederichsen (Ecologist, Tonkin + Taylor, Wellington). This technical assessment addresses the freshwater and wetland ecology aspects of the SH1 Wellington Improvements Project.

## Qualifications and experience

2. I am a Principal Ecologist with Tonkin + Taylor Ltd, based in Auckland, where I have been employed since 2016 to present.

3. I hold a Bachelor of Science (Ecology) and Postgraduate Certificate from Massey University of Palmerston North.

4. I have 15 years' experience in the field of ecology. In this time, I have worked across New Zealand in a wide variety of environments on projects for both the private and public sectors. From 2011 to 2013, I worked for Horizons Regional Council as a Freshwater Field Ecologist; 2013 to 2015, I worked for Auckland Council as a Freshwater Ecologist advising on stream work resource consent applications; 2015 to 2016, and I worked for Golder Associates (now WSP) as a Senior Freshwater Ecologist.

5. As an ecologist I focus on Landscape Ecology combining both Freshwater and Terrestrial Ecological aspects and have undertaken lead ecologist roles on the following transport infrastructure projects: Petone to Grenada, Northland Corridor (Ara Tūhono), State Highway 25A (SH25A), Hawkes Bay Expressway (HBEX), Transport Rebuild East Coast (TREC), O Mahurangi (Penlink), Te Awa Kairangi (Riverlink), Te Ahu a Turanga (Manawatū Tararua Highway), Te Ara o Te Ata (Mt Messenger Bypass Project), and Puhoi to Warkworth Motorway Project.

6. I am familiar with the site and have visited it on many occasions.

## Code of conduct

7. I confirm that I have read the code of conduct for expert witnesses contained in the Environment Court Practice Note 2023. 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.

## Project description

8. The State Highway 1 (SH1) Wellington Improvements project (the Project) is a Road of National Significance (RoNS) which improves SH1 in Wellington City. The proposal includes the construction of improvements to SH1 within Wellington City, extending over 5 km through the city. The Project will provide for more efficient and reliable access on SH1 and includes duplicate tunnels at The Terrace and Mount Victoria, a new layout at the Basin Reserve as well as improvements along the remainder of the SH1 corridor from north of the Terrace Tunnel to the intersection of Cobham Drive and Evans Bay Parade. The Project aims to attract

traffic onto SH1, reduce traffic on other key routes, unblock critical bottlenecks on the state highway, maintain access for local movements and enable public transport growth.

9. This section gives a description of the Project and should be read in conjunction with the General Arrangement Drawings (SH1WI-DES-00-GEN-DRG-00010_00030). Project features and associated description works are addressed below.

10. The information provided in this section and in the drawings describe the Indicative Design for the Project. Any numbers, area or dimensions outlined in this section are approximate and may change as a result of detailed design. The final alignment of the Project (including the designs and locations) will be refined and confirmed at the detailed design stage following consenting.

## Scope of assessment

11. This assessment addresses the following matters:

    i. The methodology I have used to assess the effects of the Project

    ii. The existing environment relating to freshwater and wetland ecology

    iii. Effects of the Project during operation

    iv. Effects of the Project during construction

    v. Recommended measures to avoid, remedy or mitigate adverse effects

12. The ‘Project area’ as discussed in this report is defined as all land within the Project Designation, including existing and proposed extensions to the designation, where works are proposed. An overview of these areas is provided in Figure 1 below. Refer to the General Arrangement Drawings (SH1WI-DES-00-GEN-DRG-00010_00030) for detailed extent of works. Where effects to ecological values extend beyond the Project Designation (i.e., the ‘Zone of Influence’; ZOI), these have been discussed within the relevant report sections.

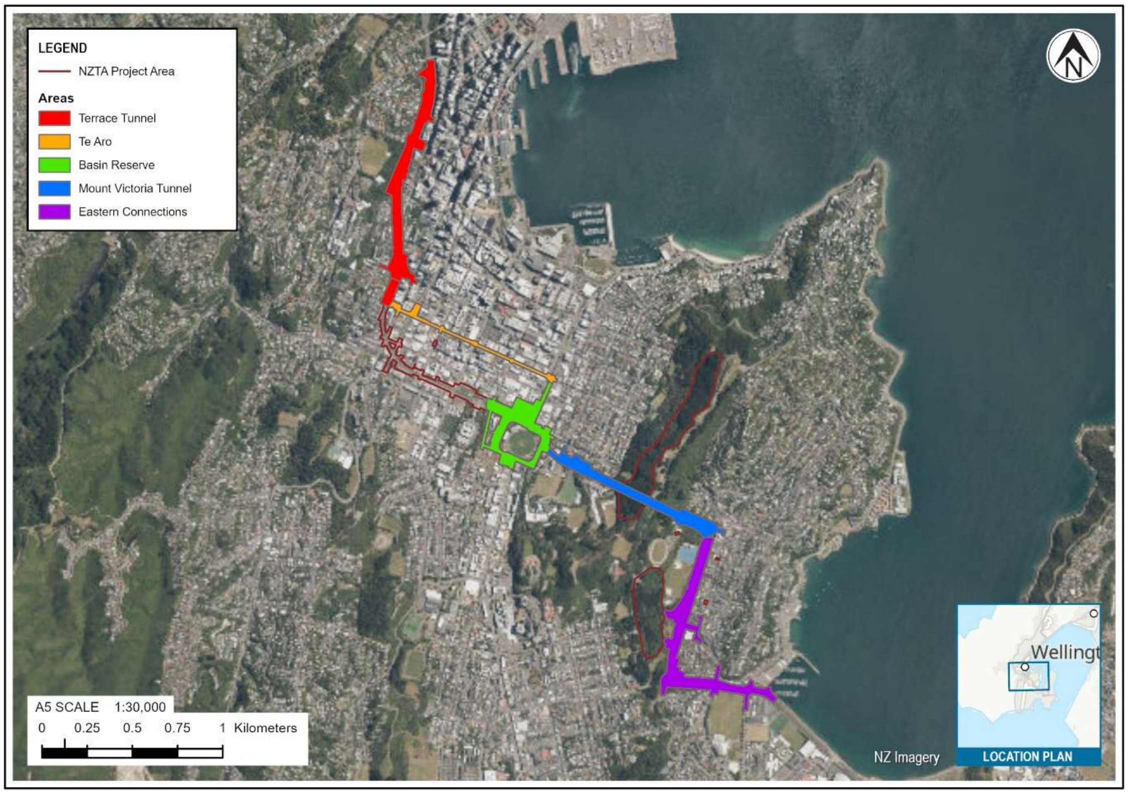


**Figure 1 - Overview of Project area**

# 2. EXECUTIVE SUMMARY

## Existing environment

13. The State Highway 1 Wellington Improvements Project sits across or in close proximity to numerous freshwater and wetland ecological features including six piped awa / streams and 4 natural inland wetlands. The piped awa identified in this assessment include:

    i. Kumutoto Awa

    ii. Waikoukou Awa

    iii. Waimapihi Awa

    iv. Moturoa Awa

    v. Waitangi Awa

    vi. Waipapa Awa

14. The natural inland wetlands, all within the Town Belt to the west of Ruahine Street, are highly degraded and contain mostly exotic vegetation across small areas.

## Potential adverse effects without mitigation

15. Without efforts to avoid, minimise, or remediate effects to freshwater and wetlands, the Project would result in:

    i. An increase in the quantity of contaminants discharged to waterways

    ii. The permanent loss of up to 885 $m^2$ of natural inland wetland

16. As discussed below, a number of mitigation measures have been incorporated into the Project's design. In particular, proprietary stormwater treatment devices are proposed to be installed in various locations that are expected to reduce contaminant loading across the Project area and improve water quality of stormwater discharges.

17. There are residual effects on wetlands, however, which I recommend be addressed.

## Proposed measures to avoid, remedy or mitigate adverse effects, including conditions

18. In order to address the Project's residual adverse effects in terms of the loss of wetland extent, I recommend that the NZTA implement offsetting or compensation. I have identified a compensation option which takes into consideration information provided by Greater Wellington Regional Council (GWRC), Wellington City Council (WCC), and Mana Whenua through consultation. The compensation approach identified will implement restoration and enhancement actions across a terrestrial gulley system at Matai Moana Reserve. Alternatives to that scheme could include restoration and enhancement actions at another site, or some form of financial contribution (as a form of compensation).

# 3. ASSESSMENT FRAMEWORK

## Planning context

19. The following statutory documents, frameworks and plans are relevant to this EcIA:

    i. National Policy Statement for Freshwater Management 2020, as amended in December 2025 (Ministry for the Environment, 2025) (NPS-FM) including the definitions for ‘effects management hierarchy’ and ‘aquatic compensation” in relation to natural inland wetland and rivers

    ii. The Greater Wellington Natural Resources Plan, including how that plan refers to the effects management hierarchy and aquatic compensation

    iii. Wellington Town Belt Management Plan, in particular in terms of the support in that management plan for ecological values and outcomes

## Industry best practice or management guidance

20. My assessment has been informed by professional judgement and guided by the following best practice guidelines:

    i. Ecological Impact Assessment Guidelines – EIANZ Guidelines for use in New Zealand: Terrestrial and freshwater ecosystems (Roper-Lindsay et al., 2018)

    ii. Wetland delineation hydrology tool for Aotearoa New Zealand (MfE, 2021)

    iii. Essential Freshwater 2022: Wetland delineation protocols (MfE, 2022)

# 4. ASSESSMENT METHODOLOGY

## Desktop review of available information

21. Publicly available information and databases were reviewed in October 2025 to inform the methodology and approach to the ecological assessment and to establish the ecological context of the site. This included a review of the following available information:

   i. Greater Wellington Regional Council geographic information system (**GIS**) layers:

      (a) Natural Resources Plan layers

      (b) Current Ecosystem Extent layers

   ii. Wellington City Council GIS: WCC District Plan Schedule 7: Sites and Areas of Significance to Māori

   iii. iNaturalist database (accessed 12 October 2025, https://iNaturalist.org)

   iv. eBird New Zealand Bird Atlas (accessed 12 October 2025) (https://ebird.org/atlasnz/home)

   v. New Zealand Plant Conservation Network Checklists (**NPZCN**, accessed 12 October 2025)

   vi. Manaaki Whenua | Landcare Research: Maps » Our Environment

   vii. Historic aerial imagery (Retrolens (https://retrolens.co.nz/) and Google Earth Pro historical imagery tool)

22. Ongoing consultation with Taranaki Whānui ki Te Upoko o te Ika and Ngāti Toa Rangatira, the mana whenua of Te Whanganui-a-Tara (Wellington), is being undertaken in regard to multiple components of this report, including the recommended residual effects management measures.

## Specific field and assessment methods

23. As noted above, I am very familiar with the site. Specific site visits to assess ecological values within the Project area were conducted by me and/or my colleagues from Tonkin + Taylor on the below dates:

   i. 30 September 2025

   ii. 20 October 2025

   iii. 10 November 2025

   iv. 11 November 2025

   v. 17 November 2025

   vi. 18 December 2025

   vii. 20 May 2026

### Assessment of piped awa / streams

24. Present-day freshwater awa within urban Wellington are predominantly piped, with only a limited number of open channel reaches or tributaries remaining in the urban landscape. As a result, the freshwater system now comprises a highly modified, catchment-wide stormwater drainage network, for which ecological information is limited.

25. Assessment of ecological values associated with the piped awa has been informed by the following reports:

   i. Ecosystem health in Wellington City Urban streams: Stage one summary report. E Harrison, Greater Wellington City Council (November 2019)

   ii. Freshwater Ecology of Piped Streams in Wellington: Pilot Study Final Report. Dr Alex James, EOS Ecology (April 2020; GRE-01-17087-02)

## Wetlands

26. The following resources guided the assessment and delineation of natural inland wetlands within and around the Project area:

   i. NPS-FM

   ii. National Environmental Standards for Freshwater Management 2020 (NES-FM)

   iii. Defining ‘natural wetlands’ and ‘natural inland wetlands’ guidance document (MfE, 2021a)

   iv. Wetland delineation protocols (MfE, 2022)

   v. Wetland delineation hydrology tool (MfE, 2021b)

   vi. A vegetation tool for wetland delineation in New Zealand (Clarkson, 2013)

   vii. New Zealand wetland indicator status ratings (Clarkson et al., 2021)

   viii. Wetland types in New Zealand. Department of Conservation (Johnson & Gerbeaux 2004)

27. An initial site walkover was undertaken to determine the location of potential wetland areas that should be assessed using the Wetland Delineation Protocols (WDP) (MfE, 2022). The WDP, excluding assessment of hydric soils (soils showing evidence of recent or historical saturation), was applied across all potential wetland areas within the Project area to identify areas of wetland as defined in the Resource Management Act 1991 (RMA). Historic aerial images were considered, and on-site notes were also made on any factors (e.g. evidence of construction) that could apply to the exclusions for natural inland wetlands within the NPS-FM.

28. The process for determining whether wetland habitat is present in an area is outlined in ‘*Defining ‘Natural Wetlands’ and ‘Natural Inland Wetlands*’’ (MfE, 2021) and includes a two-stage vegetation assessment, including the ‘Rapid Test’ (Step 2), ‘Dominance Test’ and ‘Prevalence Index’ (Step 3), after which the wetland hydrology assessment (Step 4) may be undertaken where the vegetation tests are, or may be, inconclusive based on field observations. The vegetation assessments require an understanding of each vegetation species’ tolerance of wetland environments. The categories used to describe a plant species’ dependence on wetland environments (set out in Clarkson et al., 2013 and subsequent updates) are:

   i. Obligate (OBL): plant species that almost always occur in wetlands (estimated probability greater than 99% in wetlands)

   ii. Facultative Wetland (FACW): plant species that occur usually in wetlands (67% to 99%)

   iii. Facultative (FAC): plant species equally likely to occur in wetlands or non-wetlands (34% to 66%)

   iv. Facultative Upland (FACU): plant species that occur occasionally in wetlands (1% to 33%)

v. Upland (UPL): plant species that rarely occur in wetlands (less than 1%)

29. Delineating the extent of each wetland area and vegetation type was undertaken by using a combination of aerial photographs, hand-held GPS co-ordinates, and direct observations of vegetation type.

30. For wetland delineation assessments to be considered accurate, wetland delineation is recommended to be undertaken during the growing season. The growing season for the Wellington area is from approximately 11 August to 13 June in any given year (MfE, 2021). As the site visits were undertaken within the growing season, the assessment is considered to provide a confident delineation of wetland extent.

31. Greater Wellington Regional Council maintains an open-data portal of rainfall recordings within the Wellington Region. Rainfall data for Hataitai Park was used to assess rainfall in the month leading up to the assessment of wetland areas (GRWC, 2025). 118.2 mm of rainfall was recorded within the month leading up to the assessment which exceeds the monthly rainfall norms for the region (Chappell, 2014). This exceedance can be attributed to approx. 60 mm of rainfall between the 21st and 23rd of September 2025. Following this rainfall event, only 57.6 mm of rainfall was recorded, with the preceding three days of the assessment recording only 0.8 mm of rain.

## Approach to assessing effects

32. As noted above, my assessment has been informed by professional judgement and guided by various best-practice guidelines. The method applied to this EcIA broadly follows the Ecological Impact Assessment Guidelines 2018 (EcIAG) published by the Environmental Institute of Australia and New Zealand (Roper-Lindsay et al., 2018). The guidelines provide a standardised framework and matrix allowing a consistent and transparent assessment of ecological effects.

33. The guidelines were used to establish the following (Refer to Annexure B for the criteria and tables used in this assessment):

    i. The ecological values of freshwater and wetland areas within the sites (Annexure B Table 1 to Annexure B Table 4)

    ii. The magnitude of effect (Annexure B Table 5) on ecological values from the proposed Project works in the absence of any controls

    iii. The overall level of effects to determine whether avoidance, minimisation or remediation is required (Annexure B Table 7)

    iv. The magnitude of effect and overall level of effect, taking into consideration any additional measures to avoid, minimise or remedy effects

    v. Where an overall level of effect is moderate or higher, after applying proposed measures to avoid, minimise and remediate effects, then additional effects management in the form of offset and/or compensation is recommended to achieve a no net loss of biodiversity values

    vi. Details how these residual effects are approached within this EcIA are outlined below

34. The EcIAG states that practitioners may deviate from the guidelines framework where it is considered ecologically relevant and justifiable to do so. While the assessment criteria for terrestrial values is fairly well defined in the EcIAG (Annexure B Table 1 to Annexure B Table 3), the freshwater values are less so. For the purpose of this assessment, we have adapted freshwater values criteria based on the EcIAG (Annexure B Table 4) which assigns ecological

value based on biodiversity and ecological function values of the freshwater stream/water systems.

35. I also note that the NPS-FM requires consideration of the loss of 'potential' value of freshwater systems. As such, an ecological impact assessment has been completed on the potential value of freshwater systems (rivers/streams and wetlands) within the relevant sections of this EcIA.

## Residual effects approach

36. The EcIAG states that if, after all efforts to avoid, minimise, and remedy effects, there remains an overall effect of **moderate** or higher, then consideration of further efforts to address these residual adverse effects in the form of offset and/or compensation is recommended so that at least no net loss of biodiversity value occurs (and, if the residual effects are in the 'very high' category, then a net biodiversity gain may be appropriate).[1]

37. The NPS-FM also directs that the loss of natural inland wetlands is generally to be avoided, but may be acceptable for 'specified infrastructure' and if the effects of the activity are managed through applying the effects management hierarchy.[2] This hierarchy requires adverse effects to be avoided where practicable, then minimised where practicable, then remedied where practicable, and then "where more than minor residual adverse effects cannot be avoided, minimised, or remedied, aquatic offsetting is provided where possible", failing which, compensation may be considered.

38. 'Aquatic offset' is defined in the NPS-FM as '…*a measurable conservation outcome resulting from actions that are intended to:*

> *(a) redress any more than minor residual adverse effects on a wetland or river after all appropriate avoidance, minimisation, and remediation, measures have been sequentially applied; and*
>
> *(b) achieve no net loss, and preferably a net gain, in the extent and values of the wetland or river, where: (i) no net loss means that the measurable positive effects of actions match any loss of extent or values over space and time, taking into account the type and location of the wetland or river; and (ii) net gain means that the measurable positive effects of actions exceed the point of no net loss."*

39. 'Aquatic compensation' is defined in the NPS-FM as '…*a conservation outcome resulting from actions that are intended to compensate for any more than minor residual adverse effects on a wetland or river after all appropriate avoidance, minimisation, remediation, and aquatic offset measures have been sequentially applied.'*

40. Having regard to both of the above guidance, it is my opinion that where the Project will have moderate or higher residual adverse effects, it is appropriate to consider offset or compensation measures that will achieve at least no net loss, if not a net gain outcome. The scale of offset or compensation to be provided is a matter of professional judgement, having regard to the particular values of the wetland to be lost and the outcome of feedback and consultation on draft offset and compensation approaches. The approach to addressing residual effects is discussed in Section 8.

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[1] Page 84.

[2] I understand that the Project is 'specified infrastructure' in terms of the NPS-FM. More broadly, the Project AEE addresses the application of the NPS-FM and other policy instruments to the Project and effects on streams and wetlands.

# 5. EXISTING ENVIRONMENT

## Site description

41. The following piped awa / streams have been considered and are shown in Annexure A and Figure 2 below:

    i. Kumutoto awa which is located near the northern Terrace Tunnel portal

    ii. Waikoukou awa which is located near the southern Terrace Tunnel portal

    iii. Waimapihi awa which flows beneath sections of Karo Drive and Vivian Street

    iv. Moturoa awa which flows beneath Taranaki Street towards Lambton Harbour

    v. Waitangi awa which flows under the Basin Reserve and beneath Kent/Cambridge Terrace

    vi. Waipapa awa which flows under the suburb of Hataitai and beneath Moxham Ave

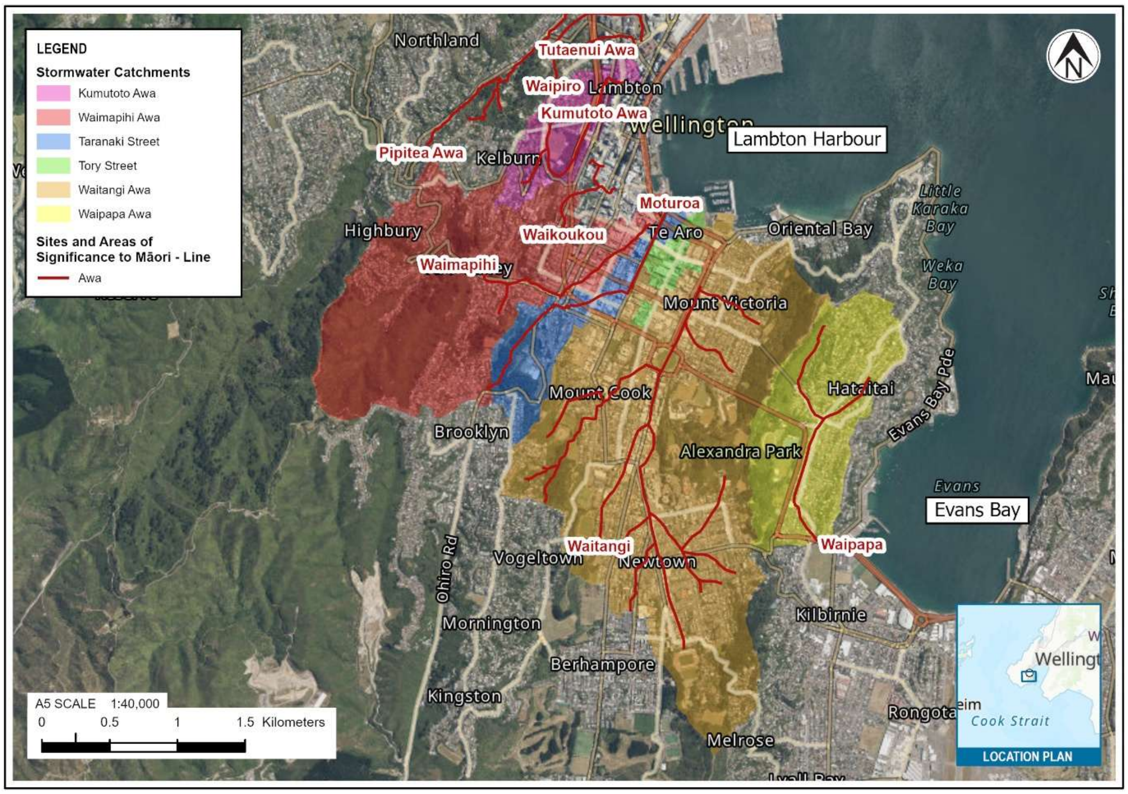


**Figure 2 - Overview of piped awa, stormwater catchments, and road catchments associated with the Project**

## Terrace Tunnel

### Kumutoto Awa

42. The Kumutoto Awa encompasses piped and un-piped portions of stream that receives catchment flow/runoff from Pukehinau Ridge, flowing south alongside Salamanca Road, with an additional inflow from Kelburn Parade. The awa intersects the Project designation where it turns northwards away from Salamanca Road and flows northward adjacent to the existing SH1 from the Northern portal of the Terrace Tunnel towards Lambton Harbour. The awa

intersects the designation for ~670 m, before veering eastward to discharge near Waring Taylor Street.

43. Kumutoto awa has been recognised on the New Zealand Heritage List/Rārangi Kōrero as wāhi tupuna, holding importance to Māori for its ancestral significance and associated cultural value (List no. 9078).

44. A natural portion of the Kumutoto Awa within the Kumutoto Forest, 50m upstream of the Project area, has undergone restorative efforts and surveying associated with the Kumutoto Forest Restoration Group (Predator Free Wellington). Reportedly, freshwater fish species including banded kōkopu (*Galaxias fasciatus*; 'At Risk – Naturally Uncommon), kōaro (*Galaxia brevipinnis*; 'At Risk – Declining), and eel species, have been identified within this natural portion. The presence of these species indicates suitable fish passage through the Kumutoto Awa, including through piped portions of this awa located within the Project area. Due to the ongoing restoration activities and natural features recorded within the natural portion of the Kumutoto Awa, the awa has been assigned an ecological value of **moderate**.

### Waikoukou Awa

45. The Waikoukou Awa is a piped stream that receives catchment flow/runoff from its headwaters south of Ghuznee Street between Willis Street and The Terrace. The awa intersects the Project designation in three short sections (10, 50, 15 m) along Ghuznee Street and crossing SH1, before flowing northward beyond the western extent of the designation adjacent to Terrace Tunnel section of SH1. The awa crosses eastward through the designation again midway through the Terrace Tunnel for ~65 m, passing though Terrace Gardens to Boulcott Street and on to its outlet beyond Bond Street.

46. Limited historical records are available for Waikoukou Awa, though it has been described as previously a small stream that ran freely where Wellington's Boulcott Street declines and curves into the city centre, with a small pool near the intersection of Boulcott Street and Manners Street. As no known natural portions of the Waikoukou Awa remain, and the stream runs through a network of stormwater infrastructure/piped awa, the ecological value has been assigned as **low.**

## Te Aro

### Waimapihi Awa

47. The Waimapihi Awa encompasses piped and un-piped portions of stream which begins as an open stream in the forested headwaters of Waimapihi Reserve. The awa flows north-eastward through the reserve before being channelled to a pipe where it meets Aro Street. At this point, the awa turns eastward through Aro Valley, flowing alongside Aro Street. Beyond Willis Street, the awa turns north-eastward, passing through the designation along Karo Drive (SH1), Abel Smith Street, and Victoria Street (~90 m), and again across Vivian Street (~20 m). The awa continues through piped infrastructure north-eastward beyond the Project designation to its outlet near Taranaki Street.

48. eDNA records for the natural portion of the Waimapihi Stream identified the presence of banded kōkopu (WilderLab Job Number: 606601), which suggests suitable fish passage is present across the Waimapihi Stream, potentially through piped portions of the awa across the Project area.

49. While the Waimapihi Awa within the Project area currently runs through a network of piped stormwater infrastructure, the connection to natural portions within the Waimapihi Reserve

and presence of ‘At Risk’ banded kōkopu indicates moderate stream function remains despite the intensive modification of the catchment. As such the ecological value of the piped awa has been assigned as **moderate**.

### Moturoa Awa

50. The Moturoa Awa encompasses piped and un-piped portions of stream which begins as an open stream through the forested Central Park in the suburb of Brooklyn. The natural portion of the stream enters the stormwater network where Central Park ends and continues beneath Te Aro, where it receives stormwater flow from the Taranaki Street Project Road Catchment, carrying flow down Taranaki Street towards Lambton Harbour.

51. Few online records of freshwater fish within the Moturoa Awa are available. However, kōura (*Paranephrops spp.*), banded kōkopu and kōaro were observed during a community spotlighting session undertaken across the natural portion/un-piped stream portion within Central Park (Mountains to Sea Wellington). While not identified to the species level, the kōura species is expected to be *Paranephrops planifrons* (Not Threatened) based on the geographical distribution of indigenous kōura species.

52. While the Moturoa Awa within the Project area runs through a network of piped stormwater infrastructure, the connection to natural portions within Central Park and presence of ‘At Risk’ kōaro and banded kōkopu indicates moderate stream function remains despite the intensive modification of the catchment. As such the ecological value of the piped awa has been assigned as **moderate**.

## Basin Reserve

### Waitangi Awa

53. The Waitangi Awa encompasses an extensive network of predominantly piped stream sections that receives catchment flow/runoff from the Newtown, Mount Cook, and Mount Victoria suburbs. The headwaters include a number of short branching piped sections joining a central pipeline along Riddiford Street, flowing northwards onto Adelaide Road. A side branch draining north-eastwards from Prince of Wales Park joins this pipeline at the northern end of Adelaide Road where it intersects Rugby Street. At this point, the awa passes northwards through the Project designation beneath Basin Reserve, and remains within the designation as it continues alongside Kent Terrace for a total length of ~570 m. The awa continues on to Lambton Harbour at the outlet near Waitangi Park.

54. As there are few natural portions of the Waitangi Awa with limited records of information on ecological features, an assessment has been made based on the expected stream condition within the Project area. As the stream runs through a network of stormwater infrastructure/piped awa, the ecological value has been assigned as **low.**

## Mount Victoria Tunnel & Eastern Connections

### Waipapa Awa

55. The Waipapa Awa is a piped stream that receives catchment flow/runoff from its headwaters north of Wellington Road, through the suburb of Hataitai. The awa intersects the designation at Taurima Street and runs parallel to SH1 between Moxham Ave and Ruahine Street for approximately 600m. The awa continues to flow south between Moxham Ave and Hamilton Road, where it eventually drains beneath Wellington Road through the Evans Bay Outfall.

56. Ecological features of the Waipapa Awa are detailed in the report titled Freshwater Ecology of Piped Streams in Wellington (EOS, 2020). Surveys undertaken for this report occurred within the first 90m of the Waipapa Awa, upstream from the Evans Bay Outfall. The following features were noted across this reach of piped awa:

    i. Limited or no mobile substrate across a brick-lined streambed
    ii. Shallow water flow beyond 90m from the Evans Bay outfall and a lack of suitable cover for fish presence further up the catchment
    iii. High water velocities associated with a fully brick-lined streambed
    iv. Limited macroinvertebrate community
    v. Fish presence comprised long-fin eel (Anguilla dieffenbachia; 'At Risk – Declining' (Dunn et al., 2023)), shortfin eel (Anguilla australis; 'Not Threatened'), and an unidentified eel species only within the first 90m of the stream reach from Evans Bay Outfall, with unsuitable conditions for fish presence assessed further upstream

57. While comprising a highly modified extent, limited macroinvertebrate and fish species diversity, and high-water velocities, the Waipapa Awa has been assigned a **moderate** ecological value, according to the findings of the Freshwater Ecology of Piped Streams in Wellington (EOS, 2020) report.

## Wetlands

58. Three natural inland wetland areas have been identified within the Project area (Wetlands 1, 2 and 4), and a fourth natural inland wetland (Wetland 3) area has been identified within 100 m of the Project area as shown in Figure 3 below.


Figure 3 - Overview of natural inland wetland areas

59. These wetlands, all of which are in the area to the west of Ruahine Street, include:

i. **Wetland 1:** A small (75 $m^2$) depression located on the western side of State Highway 1 composed of entirely exotic *Juncus* and wetland grass species, such as floating sweet grass *(Glyceria fluitans;* OBL*)* and fool's watercress *(Helosciadium nodiflorum;* OBL*)*. Primary hydrological indicators including standing water and saturated soils were observed at the time of the assessment

ii. **Wetland 2:** A larger (730 $m^2$) depression located at the toe of a hillslope between Harbour City Gymnastics and an access road. This wetland consists primarily of floating sweetgrass and onion weed (*Allium triquetrum*; FAC). Standing water and saturated soils were observed at the time of the assessment

iii. **Wetland 3:** A small (55 $m^2$) terraced wetland consisting of mostly exotic species outside of the Project Designation, upslope of the proposed works. This wetland likely collects runoff from upslope, forming part of a natural flow path for the area

iv. **Wetland 4:** A small (81 $m^2$) wetland located adjacent to Ruahine Street, positioned at the base of a small gully, containing a mix of exotic Yorkshire fog (*Holcus lanatus;* FAC), creeping buttercup (*Ranunculus repens;* FAC), giant rush (*Juncus pallidus*; FACW), and Rautahi (*Carex geminata;* FACW). Saturated soils were observed at the time of the assessment

60. A small intermittent stream has been identified from Wetland 3 leading to a culvert behind the Badminton Wellington Centre. The stream will not be impacted as part of the Project.

61. All areas of natural inland wetlands constitute a similar composition of highly degraded exotic herbland, grassland, and rushland, with dominant species including *Juncus articulatus*, floating sweet grass and fools watercress. The location of these wetlands corresponds to low areas at the toe of hillslopes with assumed low permeability soils where surface run-off collects and does not immediately drain away. In consideration of the criteria for ecological values, the following applies:

i. Representativeness: Low. The composition is sub-typical of indigenous wetlands with expected species absent. Indigenous species absent or present in low numbers

ii. Rarity/distinctiveness: Moderate. Wetlands are small in size and dominated by non-indigenous herbs, grasses, and rushes, however, wetland ecosystems have regional and national scarcity

iii. Diversity and pattern: Low. The wetlands are dominated by exotic vegetation

iv. Ecological context: Low. Provides minor infiltration services. Provides potential foraging habitat for common indigenous wetland birds such as pūkeko and spur-winged plover, but these species are not reliant on this and have not been observed on site

62. As such, the wetland areas have been assigned an overall ecological value of **low.** Details of species composition, hydrological assessments, and other considerations assessed under the Wetland Delineation Protocol are outlined in Annexure C. The value and extent of wetland areas has been summarised in Table 1 below according to the ID's assigned in Annexure A.

**Table 1: Wetland, vegetation type, and total**

| Wetland Area ID | Vegetation Type | Area ($m^2$) | Ecological value |
|---|---|---|---|
| Wetland 1 | Exotic herbland, grassland, and rushland | 75 | Low |
| Wetland 2 | | 730 | |
| Wetland 3 | | 55 | |
| Wetland 4 | | 81 | |

## Summary of ecological values

**Table 2: Summary of ecological values**

| Ecological Value | Ecological value (as per Annexure B Table 4) |
|---|---|
| Wetlands | Low |
| Kumutoto Awa | Moderate |
| Waikoukou Awa | Low |
| Waimapihi Awa | Moderate |
| Moturoa Awa | Moderate |
| Waitangi Awa | Low |
| Waipapa Awa | Moderate |

# 6. ASSESSMENT OF CONSTRUCTION EFFECTS

63. The following section summarises the actual and potential effects resulting from Project construction on the ecological features and values discussed in Section 5. Recommended measures to address effects are included within the relevant section and conclusions are drawn as to the overall effect considering those ecological values.

64. The potential construction effects of the Project have been identified as follows:

    i. Temporary discharge of contaminants to waterways

    ii. Permanent loss of wetlands

65. A summary of the potential effects is provided at the end of this report section. This assessment has been informed based on information provided in Technical Report #15 Stormwater.

## Temporary discharge of contaminants to waterways

66. Earthworks runoff, stormwater, and spills during construction may contain suspended sediments, fine particulates, nutrients, hydrocarbons, concrete leachate, and heavy metals, which may enter piped awa via the connected drainage networks during the lifetime of the Project. These physical and chemical stressors may reduce the water quality within the piped awa and cause injury, loss of life and declines in freshwater fish and macroinvertebrate species richness within the piped awa network. This is considered to result in a short-term **high** magnitude of effect on piped awa. Based on **low** to **moderate** ecological value this results in a **moderate** level of unmitigated effect.

67. Proposed mitigation measures for the temporary discharge of contaminants to waterways are discussed in the Technical Report #17 Erosion and Sediment Control Assessment and include industry standard erosion and sediment and spills controls as well as materials and plant management. The proposed mitigation measures include details on construction discharge monitoring and contingency measures if trigger levels are exceeded.

68. With the proposed mitigation measures in place, construction discharges effects are considered to have a **negligible** magnitude of effect resulting in a **very low** overall level of effect. No further effects management is considered necessary beyond these mitigation measures.

## Permanent loss of wetlands

69. The proposed design directly impacts three natural inland wetlands (Wetland 1, Wetland 2 and Wetland 4). It is expected the full extent of Wetland 1 and Wetland 4 will be lost, while up to 80% of Wetland 2 will be impacted by changes to groundwater conditions resulting in dewatering. For the purposes of this assessment, it is assumed on a conservative basis that the full extent of Wetland 2 will be lost because of the Project. As such, the Project will result in the permanent loss of 885 $m^2$ of wetland.

70. While considered to have **low** ecological value, the loss of wetland extent is considered to have a **very high** magnitude of effect as these wetland areas will be permanently lost and the presence of wetland ecosystems in the wider environment is generally rare.

71. Considering the above, a **low** ecological value combined with a **very high** magnitude of effect results in an overall level of effect to be **moderate.** These effects cannot be mitigated, therefore, ecological offsetting or compensation is recommended to address the residual effects identified, and this is discussed in Section 8.

72. Wetland 3 is outside the Project footprint and will not be adversely affected by the construction of the Project.

# 7. ASSESSMENT OF OPERATIONAL EFFECTS

73. The following section summarises the actual and potential operational effects resulting from Project activities on the ecological features and values discussed in Section 5. Recommended measures to address effects are included within the relevant section and conclusions are drawn as to the overall effect considering those ecological values.

74. The potential operational effects of the Project have been identified as follows:

    i. Effects on water quality resulting from changes to discharged pollutants

    ii. Effects on base-flow water levels resulting from changes to stormwater infrastructure designs

75. A summary of the potential effects is provided at the end of this report section. This assessment has been informed by Technical Report #15 Stormwater, and the operational stormwater management / treatment measures recommended in that assessment. Those measures, which are reflected in the Project design, are part of the 'baseline' for my assessment of operational effects on freshwater and wetland ecology.

## Effects on water quality resulting from changes to discharged contaminants

76. Following Project completion, changes to the overall road area (and subsequently road catchment) could result in an increase in the quantity of discharged contaminants into piped awa across the Project area, associated with increased traffic use and increased impermeable surface area.

77. Waikoukou Awa is not expected to receive altered stormwater discharge (contaminants and volume) as a result of the Project works. As a result, effects to the Waikoukou Awa are not considered further.

78. Contaminant load modelling results detailed in the Stormwater Assessment are summarised in Table 3 for stormwater discharges from the Project footprint that will enter piped awa via stormwater discharge. The modelled stormwater discharges will contribute to the total stormwater discharged from the wider catchment. The data indicates expected proportional changes in contaminant loads generated from the Project areas for each catchment as a result of Project works. These changes are compared against both baseline present day traffic conditions (2026) and predicted future traffic conditions (2033).

**Table 3: Summary of stormwater contaminant load modelling results**

| Project catchments | Project awa | Present Day (2026) | | | | Do Minimum (2033) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | TSS | Zn | Cu | TPH | TSS | Zn | Cu | TPH |
| Kumutoto Awa | Kumutoto Awa | -24% | -2% | -8% | -15% | -25% | -3% | -9% | -16% |
| Waimapihi Awa | Waimapihi Awa | -19% | 4% | -1% | -9% | -22% | 0% | -6% | -14% |
| Taranaki Street | Moturoa Awa | -2% | 20% | 18% | 10% | -5% | 17% | 15% | 7% |
| Tory Street | N/A (Stormwater network only) | 9% | 35% | 32% | 23% | 6% | 31% | 28% | 20% |
| Waitangi Awa | Waitangi Awa | -46% | -26% | -34% | -37% | -50% | -28% | -38% | -41% |
| Waipapa Awa | Waipapa Awa | -59% | -18% | -42% | -54% | -60% | -20% | -43% | -55% |
| **Total** | | **-39%** | **-12%** | **-23%** | **-31%** | **-41%** | **-15%** | **-26%** | **-33%** |

79. For both the 2026 and 2033 baseline scenarios, the modelling data presented in Table 3 indicates substantial proportional load reductions for contaminants following mitigation across most piped awa and Project catchments. Changes are similar between 2026 and 2033 traffic conditions. TSS and TPH are the most effectively reduced contaminants, whilst zinc loads show more limited reductions across Project catchments.

80. Within the context of the contaminant data presented in Table 3, impermeable surface area is expected to be the primary determinant of heavy metal and TPH contamination in an urban catchment's stormwater. The increased Project road area represents a relatively small percentage of the overall road area of the wider catchment, which also does not account for other stormwater contaminant sources such as building surfaces.

81. With the use of mitigation/treatment devices, small increases to the discharge of Zinc contaminants (approx. 4% and 0% Zn increase in Present Day and Do Minimum scenarios, respectively) are expected to occur within the Waimapihi Awa, entering through stormwater pipes across Ghuznee Street. Additionally, Zinc, Copper, and TPH contaminants are expected to increase by up to 20% across the Moturoa Awa. Although representing a small increase in contaminant loading when compared to the total catchment area, these contaminants can impact the health and diversity of freshwater fish and macroinvertebrate communities.

82. While more notable increases in these contaminants are expected across the Moruroa Awa, these increases noted in Table 3 represents only the proportional increase within the modelled road catchment area and is likely to result in a negligible increase in the overall stormwater catchment area. The remaining modelled contaminants, including TSS, Copper, and TPH, will experience a proportional reduction in deposition across both scenarios as a result of the Project. However, due to the localised increase in contaminant loads, the magnitude of effect has been assessed as **low.**

83. While Waimapihi Awa is likely to benefit from reductions in contaminant loading for TSS, Copper, and TPH, small (or no) increase in Zinc under present day scenarios (4%) and Do Minimum scenarios (0%) have been considered. As a conservative assessment, the magnitude of effect is considered to be **negligible** for Waimapihi Awa.

84. The remaining piped awa are likely to benefit from the Project through a modelled reduction in contaminant deposition across most contaminants. The magnitude of effect is therefore considered to be **positive**, resulting in an overall **Net Gain**.

## Effects on base-flow water levels resulting from changes to impervious surfaces and stormwater design

85. In general, base-flow water levels across the piped awa of the Project are unknown. Effects to base-flow water levels have been inferred based on the below assessment of changes to impervious surfaces within the Project area, and a comparison of these changes to estimates of catchment wide impervious surface percentages.

86. Changes to the total road area within the Project corresponds to an increase in impervious surface area at a catchment scale. Changes to impervious surface area can influence the flow regime of stormwater during rainfall events and potentially alter or reduce the base-flow of piped awa by altering groundwater discharge to un-piped portions of the piped awa. Changes to impervious surface areas resulting from the Project are outlined in Table 4 below.

**Table 4: Summary of changes to road area across the Project, including catchment information**

| Project catchments | Project awa | Catchment Area ($m^2$) | Catchment road area ($m^2$) | Existing Project road area ($m^2$) | Proposed Project road area ($m^2$) | Existing road area/catchment road area (%) | Proposed road area / catchment road area (%) | Increased impervious surface resulting from the Project (%) |
|---|---|---|---|---|---|---|---|---|
| Kumutoto Awa | Kumutoto Awa | 520,000 | 138,000 | 12,003 | 12,430 | 8.7 | 9.0 | 0.3 |
| Waimapihi Awa | Waimapihi Awa | 2,584,000 | 451,000 | 11,245 | 12,145 | 2.5 | 2.7 | 0.2 |
| Taranaki Street | Moturoa Awa | 5,830,000 | 183,000 | 4,840 | 4,840 | 2.6 | 2.6 | 0 |
| Tory Street | N/A (Stormwater network only) | 155,000 | 70,000 | 120 | 120 | 0.2 | 0.2 | 0 |
| Waitangi Awa | Waitangi Awa | 4,603,000 | 728,000 | 40,881 | 40,881 | 5.6 | 5.6 | 0 |
| Waipapa Awa | Waipapa Awa | 1,320,000 | 275,000 | 22,297 | 40,161 | 8.1 | 14.6 | 6.4 |

87. Overall, small increases in impervious surfaces at a catchment level will occur across the Kumutoto Awa, Waimapihi Awa, and Waipapa Awa catchment. The remaining stormwater catchments, including the Moturoa awa and Waitangi awa catchment, will experience no change to impervious surface cover as a result of the Project.

88. Small changes to impervious surface cover at a catchment scale are unlikely to impact the base-flow rates of piped awa across the Project area. While the Waipapa Awa records the largest increase of 6.4%, effect to the base-flow rates are expected to be proportional to the change in impervious surface cover across the catchment area. As the bulk of the increase in impervious surface cover occurs in the southern portion of the piped awa catchment, any resulting changes to the base-flow rates are expected to occur downstream of the proposed road upgrades and are considered unlikely to affect the piped awa upstream of the Project area. Given the small percentage increase in impervious surface cover and the relative location of this increase across the piped awa catchment, the unmitigated magnitude of effect is considered **low**.

89. Continued updates to detailed design, including to proposed stormwater upgrades, may reduce the total area of new impervious surfaces across the Project area. Additional mitigation measures relating to effects on base-flow water levels across the Project are not proposed in this report. Therefore, the overall level of effect is considered **very low** to **low** for piped awa across the Project.

## Summary of effects

Freshwater and wetland ecological values of the Project range from **low** to **moderate**. Table 5 below summarises the freshwater and wetland ecological values of the Project, potential adverse effects, magnitude and overall level of effect following the implementation of management measures. These measures are further detailed in the relevant Technical Assessment Reports for Stormwater and Erosion and Sediment Control, with residual adverse effects to wetlands addressed in Section 8.

**Table 5: Summary of effects on freshwater and wetland ecology values, magnitude of effect, and overall level of effect following measures to avoid, minimise or remedy effects**

| | Effect | Feature | Location Details | Ecological value | Magnitude of effect (unmitigated) | Proposed effects management (avoid, remedy, minimise) | Magnitude of effect (mitigated) | Overall level of effect (mitigated) | Comment |
|---|---|---|---|---|---|---|---|---|---|
| Wetland | Permanent loss of wetland extent | Wetland 1 | Eastern Connections | Low | Very High | Wetland 3 is outside of the Project footprint and not impacted but within 100 m. The remaining impacted wetlands are unlikely to be avoided due to design constraints. | Very High | Moderate | Mitigation is not practicable; compensation is recommended to address the loss of wetland extent and values. |
| | | Wetland 2 | | Low | Very High | | Very High | Moderate | |
| | | Wetland 3 | | Low | Low | | Negligible | Very low | |
| | | Wetland 4 | | Low | Very High | | Very High | Moderate | |
| Freshwater | Temporary discharge of contaminants to waterways | Kumutoto Awa | Terrace Tunnel | Moderate | High | Mitigation will include the implementation of industry standard erosion and sediment, and spills controls as well as materials and plant management, as detailed in the Technical Report #17 –Erosion and Sediment Control Assessment. | Negligible | Very Low | |
| | | Waikoukou Awa | Terrace Tunnel | Low | | | | | |
| | | Waimapihi Awa | Te Aro | Moderate | | | | | |
| | | Moturoa Awa | Te Aro | Moderate | | | | | |
| | | Waitangi Awa | Basin Reserve | Low | | | | | |
| | | Waipapa Awa | Mount Victoria Tunnel & Eastern Connections | Moderate | | | | | |
| | Effects on water quality resulting from changes to discharged contaminants | Kumutoto Awa | Terrace Tunnel | Moderate | Positive | The Project design includes the implementation of stormwater treatment devices at specific locations within the Project area are expected to mostly reduce contaminant loading via stormwater to piped awa. Further detail can be found in the Technical Report #15 - Stormwater Assessment. As such, no additional mitigation is required. | Positive | Net Gain | |
| | | Waikoukou Awa | Terrace Tunnel | Low | Positive | | Positive | Net Gain | |
| | | Waimapihi Awa | Te Aro | Moderate | Negligible | | Negligible | Very Low | |
| | | Moturoa Awa | Te Aro | Moderate | Low | | Low | Low | |
| | | Waitangi Awa | Basin Reserve | Low | Positive | | Positive | Net Gain | |
| | | Waipapa Awa | Mount Victoria Tunnel & Eastern Connections | Moderate | Positive | | Positive | Net Gain | |
| | Effects on base-flow water levels resulting from changes to impervious surfaces and stormwater design | Kumutoto Awa | Terrace Tunnel | Moderate | Low | To the extent practicable in the context of the Project, impervious surface areas have been reduced through design, and temporary access areas required during the construction of the Project will be returned via landscape design to natural landscapes. No additional mitigation measures are proposed for this effect. | Low | Very Low to Low | |
| | | Waikoukou Awa | Terrace Tunnel | Low | | | | | |
| | | Waimapihi Awa | Te Aro | Moderate | | | | | |
| | | Moturoa Awa | Te Aro | Moderate | | | | | |
| | | Waitangi Awa | Basin Reserve | Low | | | | | |
| | | Waipapa Awa | Mount Victoria Tunnel & Eastern Connections | Moderate | | | | | |

# 8. RESIDUAL EFFECTS MANAGEMENT

90. As a result of residual effects associated with the permanent loss of wetlands in and adjacent to the Town Belt (within the Eastern Connections Project area), further measures are recommended to address these effects. In accordance with the effects management hierarchy (as referenced in the NPS-FM and Wellington Natural Resources Plan), aquatic offsetting has been considered and determined not feasible, therefore a compensation[3] approach has been applied. By implementing the residual effects management recommendations detailed in this section, residual adverse effects are considered to be addressed.

## Background

91. To address the effects resulting from the permanent loss of wetlands, the effects management hierarchy has been followed to determine a feasible and appropriate management approach. Adherence to the effects management hierarchy represents the first principle outlined in Appendix 6 (Principles for aquatic offsetting) and Appendix 7 (Principles for aquatic compensation) and has been addressed at various stages throughout the report. In summary:

   i. **Avoidance** of impacts to natural inland wetlands has been considered, however through consent design it is not feasible to avoid impacts to the wetlands identified in Section 6

   ii. **Minimisation** of the effects to natural inland wetlands has similarly been considered, including reducing the design footprint and the extent of impact for Wetland 2. However, due to concerns raised in the hydrogeology assessment, a conservative assessment of permanent loss has been employed

   iii. **Remediation** is not considered possible as the final design footprint does not return any wetland extent following the completion of construction, thus, the wetlands impacted will be permanently lost

92. Aquatic offsetting was subsequently considered, with options for aquatic offsetting devised both within the Project designation and outside of the Project area in the wider environment. The below aquatic offsetting options were considered in sequential order as options to address residual effects, however, were unable to be implemented for the respective reasons discussed.

   i. **Biodiversity wetland creation within Project designation:** A concept was initially developed to create a 'biodiversity wetland' within the Eastern Connections Project area to replace the permanently lost wetlands with a wetland of equivalent extent and higher ecological value. The proposed wetland was designed to connect to an existing intermittent watercourse and include a 20 m terrestrial buffer, which was considered sufficient to address the wetland loss. However, groundwater and surface hydrogeological investigations confirmed that the site was unsuitable due to groundwater dewatering needed to increase the stability of the downslope cut face and the small catchment size not providing enough surface water to maintain the wetland. These issues made the wetland construction unfeasible. The assessment also determined that no other locations within the Project designation were suitable for a constructed wetland

   ii. **Aquatic offsetting outside the Project designation:** Investigation of possible sites for wetland offset was undertaken. Due to the highly urbanised nature of the Project corridor and the absence of suitable offset opportunities within or adjacent to the designation, the closest feasible site is a degraded wetland complex found near Pencarrow Head, approximately 8 km from the Project area. This proposed aquatic offset focused on restoring and enhancing existing wetland habitat through restoration planting, fencing and stock exclusion, weed

[3] Or 'biodiversity compensation in Wellington Natural Resources Plan terms.

management, and pest animal control. Biodiversity Offset Accounting Models (BOAMs; Maseyk et al., 2014) were prepared to determine the restoration area required to achieve no net loss or net gain outcomes, with the preferred approach seeking to deliver ecological benefits across a larger wetland system connected to higher-value habitat. However, following consultation with WCC, GWRC, and Iwi, the Pencarrow Head offset proposal was not preferred due to the significant distance from the location at which the impact occurs

93. Through further consultation with WCC, GWRC, and Iwi, there was general consensus that aquatic offsetting opportunities close to the Project designation are extremely limited, and as such, a compensation approach is preferred, as to enable biodiversity gains to be realised closer to the location of impact. Through discussion, a preferred approach has been identified which outlines a compensation approach focussed on the restoration of terrestrial gulley habitats at Matai Moana Reserve.

94. For the purpose of this EcIA, I have developed a recommended compensation approach having regard to the principles for aquatic compensation as outlined in the NPS-FM, the principles for biodiversity compensation in the Wellington Natural Resources Plan, and relevant guidance in the EcIAG. An assessment of the proposed compensation against the NPS-FM principles for aquatic compensation is provided in Annexure D. It is expected that these compensation measures will be confirmed in collaboration with Iwi/Mana Whenua stakeholders, and GWRC and WCC.

## Terrestrial gulley habitat restoration at Matai Moana

95. Terrestrial gulley habitat restoration at Matai Moana Reserve is proposed as compensation for the permanent loss of wetlands from within the Project area. This approach would involve the implementation of restoration planting, including additional compensation actions such as pest mammal management and weed control to support the establishment of vegetation, across areas of pasture or exotic vegetation within a gulley system at Mātai Moana Reserve.

96. A Biodiversity Compensation Model (BCM, Baber et al. 2021) has been utilised to determine an appropriate quantum of compensation planting to achieve a modelled net gain biodiversity outcome. The BCM provides a decision support framework to inform expert opinion in situations where biodiversity or aquatic offsetting is not tenable. The approach to compensation is in this context considered ‘trading out’, whereby the suggested approach intends to compensate for the permanent loss of wetlands through the restoration of a different ecosystem type (i.e., terrestrial forest within a gulley system).

97. The ‘trading out’ approach has been identified as the preferred approach on the basis that biodiversity values are being lost across the corridor which encompasses the Wellington Town Belt, Zealanadia and Matai Moana Reserve. As such, biodiversity values should be uplifted across this ecological landscape. While no restoration or enhancement of wetlands is proposed, the restoration of terrestrial gulley habitats is expected to provide catchment scale ecological gains to Matai Moana Reserve, with restoration and enhancement of wetter areas across the reserve expected to provide some (although contextually different) benefits to local hydrology and native ecosystem functions.

98. The results of the BCM are provided in Annexure D. To achieve a net gain in biodiversity outcome, a total restoration area of 0.5 ha is proposed. This restoration will be implemented within Matai Moana Reserve across the area shown in Figure 4 below.

99. As outlined in Annexure D, values used in the BCM for both impact and compensation actions encompass a conservative approach to modelling an expected net gain in biodiversity outcome. The following considerations have influenced the BCM:

   i. **Impact risk contingency:** This variable takes into consideration the ecological feature of the impacted ecosystem type as has been assigned in Section 5 of this report. Exotic dominated wetlands have been assigned a low ecological value, however in recognition of the rarity of wetlands as an ecosystem type at a regional and national scale, this has been elevated to a score of 'Moderate' within the BCM

ii. **Impact uncertainty contingency:** This variable considers the risk of permanent or irreplaceable loss when impacting on complex habitats. As the smaller wetland areas identified in this report will be permanently lost, a high uncertainty input value has been used to account for the permanent loss and 'trade out' approach employed in this compensation approach

iii. **Value score prior to impact:** Following the guidance document for the use of the BCM (Baber et al., 2021), a value of between 1-<2 equates to a biodiversity attribute/type of low ecological value. In recognition of the rarity of wetlands at a regional and national scale, this value has been increased to 2.1, which sits within the 'Moderate' value category. While this assessment has identified these wetlands as 'Low' ecological value, a 'Moderate' value category within the BCM based on the "trading out" approach has been used

iv. **Value score after compensation**: The proposed restoration planting and compensation actions are expected to improve the ecological/biodiversity values of the compensation area after a period of 10 years. However, as the area is relatively small in extent, and will take many years to achieve maturity and provide more advanced ecological benefits, a conservative value score has been assigned to the restored area, representing approximately 30% value compared to a benchmark ecosystem

100. The recommended approach is subject to landowner approval, and generally to confirming implementation details. If the approach is ultimately not workable, there will be other ways to offset or compensate for the residual effects on wetland values: either through restoration activities at an alternative identified site (with the BOAM or BCM applied as a decision support tool), or through an appropriate financial contribution to existing restoration project benefiting local biodiversity (as a form of compensation).

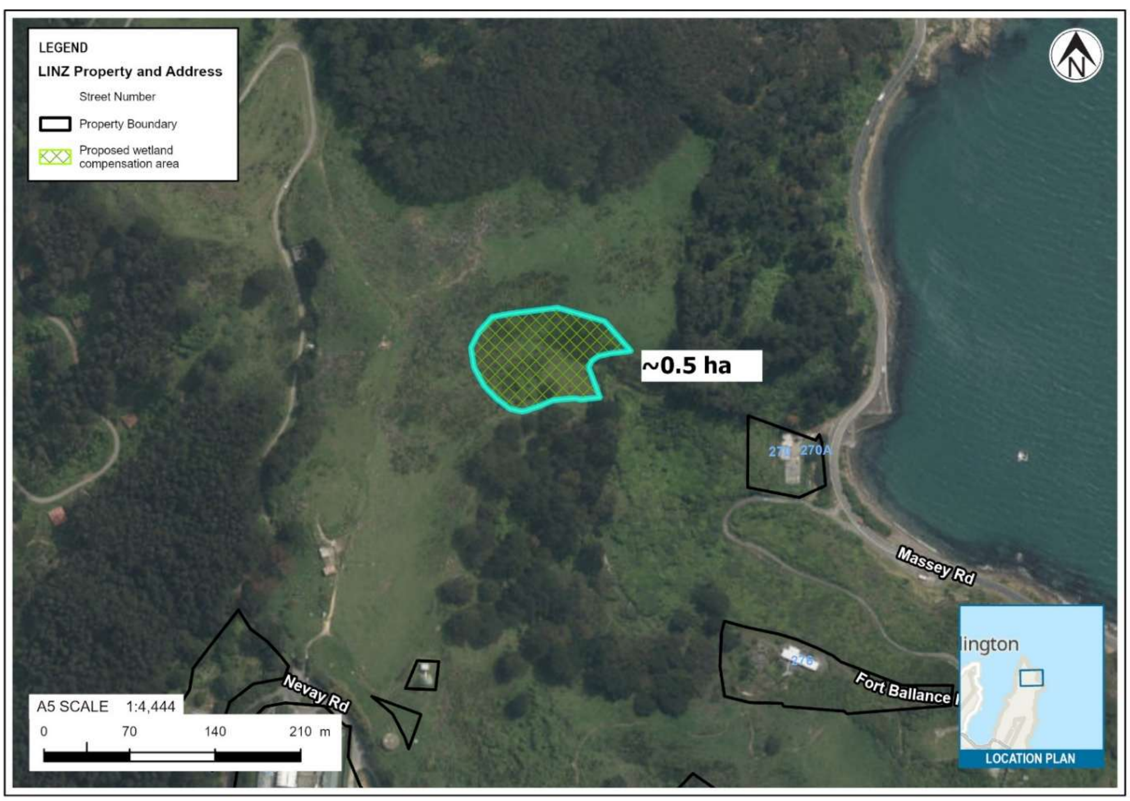


**Figure 4 - Overview of wetland compensation area at Matai Moana Reserve**

# 9. CONSULTATION

101. I understand that NZTA has engaged in community consultation in developing the Project, seeking feedback on the proposed design through a community engagement survey. This survey was developed to get community feedback to help future project development and has addressed general themes relating to freshwater and wetland ecology across the Project areas.

102. Community consultation relating to freshwater and wetland ecology identified key concerns around effects to streams/awa, which have been identified as ecological features within the Project area that may be impacted by the proposed works. Impacts to the Kumutoto Stream within the Terrace Tunnel Project area were raised as key concerns. The effects to the Kumutoto Stream range from negligible to positive following the mitigation measures recommended in the Stormwater Assessment and included in the Project design. Particularly, the installation of proprietary stormwater treatment devices are expected to reduce contaminant loads by between 2 and 25 percent (as detailed in Table 3).

103. A previous version of this report was provided to (GWRC, Department of Conservation (DOC) and WCC for an initial review. Review comments were made in relation to the following:

   i. GWRC sought clarification on effects to Wetland 2 and to ensure alignment of this assessment and the hydrogeology assessment. This assessment has been updated to assume the complete loss of Wetland 2 due to groundwater issues and to avoid underestimating the extent of wetland loss, the full extent of Wetland 2 has been accounted for in the proposed compensation

   ii. DOC identified a need to incorporate fish presence in the valuation of streams, where rarity is included as an assessment criterion. In response, valuation of all streams/piped awa was updated to reflect fish presence

104. In a previous version of this report, the construction of a biodiversity wetland within the designation to offset the loss of wetland extent and values was proposed. However, subsequent design investigations determined that this was not feasible due to limited hydrogeological connectivity. An alternative offset option involving the enhancement of a large area of degraded wetland at Pencarrow Head was then developed. Following further consultation with GWRC and Mana Whenua, it was determined that, given the distance between the impact site and the proposed offset location (approximately 8 km), a compensation approach focused on achieving biodiversity uplift in closer proximity to the Project was preferred. A detailed assessment of landscape surrounding the Project area did not identify any feasible aquatic offset or compensation opportunities. Consequently, a biodiversity compensation approach has been proposed, focussed on the restoration and enhancement of terrestrial gully habitat within Matai Moana, as described in Section 8.

# 10. CONCLUSION AND RECOMMENDATIONS

105. The proposed upgrades and improvements to SH1 infrastructure will involve construction extending over 5 km through the city. The Project will provide for more efficient and reliable access on SH1 and includes duplicate tunnels at The Terrace and Mount Victoria, a new layout at the Basin Reserve as well as improvements along the remainder of the SH1 corridor from north of the Terrace Tunnel to the intersection of Cobham Drive and Evans Bay Parade. As a result of the Project, removal of up to 885 $m^2$ of natural inland wetland is required, and changes to stormwater design may result in unmitigated effects to piped awa across the Project area.

106. The installation of proprietary stormwater treatment devices are expected to result in improvements to the quality of discharged contaminants to most waterways. Potential impacts to piped awa as a result of changes to impervious surface areas within Project awa catchments have been identified and are considered unlikely to result in adverse effects (such as changes to base-flow water levels) due to the small proportional change in impervious surface cover across the Project area.

107. Residual effects following efforts to avoid, minimise, and remedy have been identified for the permanent loss of wetlands. It is recommended these residual effects are addressed through compensation, in the form of restoration and enhancement actions across a terrestrial gulley habitat within Matai Moana Reserve.

# References

Baber, M, Christensen, M, Quinn, J, Markham, J, Ussher, G and Signal-Ross, R. (2021b): The use of modelling for terrestrial biodiversity offsets and compensation: a suggested way forward. Resource Management Journal, Resource Management Law Association (April 2021).

Baber, M, Dickson, J, Quinn, J, Markham, J, Ussher, G, Heggie-Gracie, S, and Jackson, S. (2021a). A Biodiversity Compensation Model for New Zealand – A User Guide (Version 1). Prepared by Tonkin & Taylor Limited. Project number 1017287.0000P.

Baber, M, Dickson, J, Quinn, J, Markham, J, Ussher, G, Heggie-Gracie, S, and Jackson, S. (2021c). Biodiversity Compensation Model for New Zealand– Excel Calculator Tool (Version 1). Prepared by Tonkin & Taylor Limited. Project number 1017287.0000P.

Clarkson B.R. (2013). A vegetation tool for wetland delineation in New Zealand. Landcare Research Contract Report LC1793. 70 pp.

de Lange, P. J., Gosden, J., Courtney, S.P., Fergus, A.J., Barkla, J. W., Beadel, S. M., Champion, P. D., Hindmarsh-Walls, R., Makan, T., & Pascal, M. (2024). Conservation status of New Zealand indigenous vascular plants 2023. New Zealand Threat Classification Series 43. 105 p.

Dunn, N.R.; Closs, G.P.; Crow, S.K.; David, B.O.; Goodman, J.M.; Griffiths, M.; Hicks, A.S.; Hickford, M.J.H.; Jack, D.C.; Kitson, J.C.; Ling, N.; Waters, J.M.; Wylie, M.J.; Hitchmough, R.A.; Makan, T. 2025: Conservation status of New Zealand freshwater fishes, 2023. New Zealand Threat Classification Series 46. Department of Conservation, Wellington. 66 p

Fact sheet prepared for NZPCN by: P.J. de Lange (4 January 2004). Description adapted from Allan (1961)

Greater Wellington Regional Council (GWRC; 2022). Managing adverse effects on indigenous biodiversity in the Wellington Region: A guide implementing the effects management hierarchy in the Natural Resources Plan.

de Lange, P.J.; Glenny, D.; Frogley, K.; Renner, M.A.M.; von Konrat, M.; Engel, J.J.; Reeb, C.; Rolfe, J.R. (2020). Conservation status of New Zealand hornworts and liverworts, 2020. New Zealand Threat Classification Series 31. Department of Conservation, Wellington. 30 p.

Hare, K. (2012). Department of Conservation inventory and monitoring toolbox: Herpetofauna: systematic searches. (DOCDM- 725787.). Department of Conservation.

Hitchmough, R.A., Barr, B., Knox, C., Lettink, M., Monks, J.M., Patterson, G.B., Reardon, J.T., van Winkel, D., Rolfe, J., & Michel, P. (2021). Conservation status of New Zealand reptiles, 2021. New Zealand Threat Classification Series 35. Department of Conservation, Wellington. 15 p.

Lettink, M (2012). Department of Conservation Inventory and Monitoring Toolbox: Herpetofauna: artificial retreats. (DOCDM- 797638). Department of Conservation.

Maseyk, F., Maron, M., Seaton, R., & Dutson, G. (2014). A Biodiversity Offsets Accounting Model for New Zealand. *User Manual*, 72.

Ministry for the Environment (2021). Wetland delineation hydrology tool for Aotearoa New Zealand. Ministry for the Environment, July 2021.

Ministry for the Environment (2022). Essential Freshwater 2022: Wetland delineation protocols. Ministry for the Environment, December 2022.

Robertson, H.A., Baird, K.A., Elliott, G.P., Hitchmough, R.A., McArthur, N.J., Makan, T.D., Miskelly, C.M., O'Donnell, C.F.J., Sagar, P.M., Scofield, R.P., Taylor, G.A., & Michel, P. (2021). *Conservation status of birds in Aotearoa New Zealand, 2021.* New Zealand Threat Classification Series 36. Department of Conservation, Wellington. 43 p

Roper-Lindsay, J., Fuller, S. A., Hooson, S., Sanders, M. D., and Ussher, G. T. (2018). Ecological Impact Assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition.

Thiele, A. (2025). Factors affecting the distribution and nesting of urban birds. Master's Thesis submitted in fulfilment of the requirements for the degree of Master of Science in Ecology at The University of Canterbury.

van Heezik, Y., Ludwig, K., Whitwell, S., & McLean, I. G. (2008). Nest survival of birds in an urban environment in New Zealand. New Zealand Journal of Ecology, 155-165.

# ANNEXURE A: Ecology Maps

# ANNEXURE B: Ecological Impact Assessment Guidelines

# ANNEXURE C: Wetland Delineation Results

# ANNEXURE D: BCM