



Drury Metropolitan Centre

Assessment of Ecological Effects

Prepared for

Kiwi Property Group Limited

Prepared by

Tonkin & Taylor Ltd

Date

September 2019

Job Number

1003297.1000.v1



Exceptional thinking together

www.tonkintaylor.co.nz

Document Control

Title: Drury Metropolitan Centre					
Date	Version	Description	Prepared by:	Reviewed by:	Authorised by:
17/09/2019	1.2	Final Assessment of Ecological Effects	J. Quinn	J. Markham	T. Fisher

Distribution:

Kiwi Property Group Limited

1 PDF copy

Tonkin & Taylor Ltd (FILE)

1 PDF copy

Table of contents

1	Introduction	1
1.1	Purpose and scope	1
2	Methods	3
2.1	Desktop assessment	3
2.2	Site walkover	3
2.2.1	Stream classification	3
2.2.2	Stream ecological valuation assessment	4
2.3	Assessment of effects	4
3	Ecological values	4
3.1	Catchment description	4
3.2	Freshwater ecological values	5
3.2.1	Hingaia stream	5
3.2.2	Stream A	5
3.2.3	Streams B, C and D	6
3.2.4	Streams E, F, G	6
3.2.5	Wetlands	7
3.2.6	Native fish	7
3.3	Terrestrial ecology values	8
3.3.1	Vegetation	8
3.3.2	Terrestrial fauna	9
3.4	Marine ecology values	9
3.5	Summary of ecological values	10
4	Assessment of ecological effects	10
4.1	Earthworks and sediment discharges	10
4.2	Water quality and quantity	11
4.3	Stream and wetland habitat loss	11
4.4	Impacts on terrestrial flora and fauna	13
4.5	Summary of effects	13
5	AUP: OP objectives and policies	14
6	Conclusion	15
7	Applicability	16
Appendix A :		Site Map
Appendix B :		Ecological Impact Assessment Guidelines
Appendix C :		Site photographs

1 Introduction

This report has been prepared to inform the Drury Metropolitan Centre Plan Change on behalf of Kiwi Property Group Limited (Kiwi). Kiwi has engaged Tonkin + Taylor Limited (T+T) to prepare an assessment of ecological effects associated with the Plan Change.

The proposed Plan Change Area (pPCA) is approximately 95 ha and is located to the south of the existing Drury Local Centre and Light Industrial area on Great South Road (Figure 1.1).

The pPCA has frontage to Fitzgerald Road to the east, Brookfield Road to the south, Flanagan Road to west, and Waihoehoe Road to the north. The subject sites are primarily used for farming, with some residential activity. Kiwi currently own 52 ha of land within the pPCA as shown in blue outlined in Figure 1.1. All other properties within the wider pPCA are owned by various parties.

The overall topography of the area is undulating, with several elevated ridgelines. The western extent of the pPCA is traversed by the Hingaia Stream, which forms part of an inter-connected catchment which eventually drains into Drury Creek, an estuary of the Pahurehure Inlet and Manukau Harbour.

The pPCA is currently zoned Future Urban under the Auckland Unitary Plan (Operative in Part) (AUP). Kiwi are seeking to rezone the land to a mix of Metropolitan Centre, Mixed Use, and Open Space – Informal Recreation.

The conceptual layout of the pPCA is shown on Figure 1.1 and Figure 1.2 and includes:

- A rail/bus public transport hub adjacent to Flanagan Road and the main truck railway line at the north end of the Plan Change Area;
- A Metropolitan Centre will extend south from the transit hub. The Metropolitan Centre is likely to feature multi-storey development and a range of retail and commercial activities. Residential development is proposed above ground level in the Metropolitan Centre area;
- An open space reserve is proposed along the western boundary of the pPCA, encompassing the Hingaia Stream;
- A Hilltop Park and Valley Park are proposed to be located in areas of existing vegetation and natural features; and
- The Mixed Use Zone is proposed to occupy the bulk of the remainder of the pPCA to the east, south and northeast of the Metropolitan Centre. A range of commercial and residential activities will occupy this area.

1.1 Purpose and scope

The purpose of this report is to provide an assessment of ecological effects to accompany a private plan change application for the Drury Metropolitan Centre. The assessment includes the following:

- Characterisation of the ecological values within the pPCA;
- An assessment of ecological effects of the proposed plan change on ecological values; and
- Any recommendations to avoid, remedy or mitigate potential adverse effects.

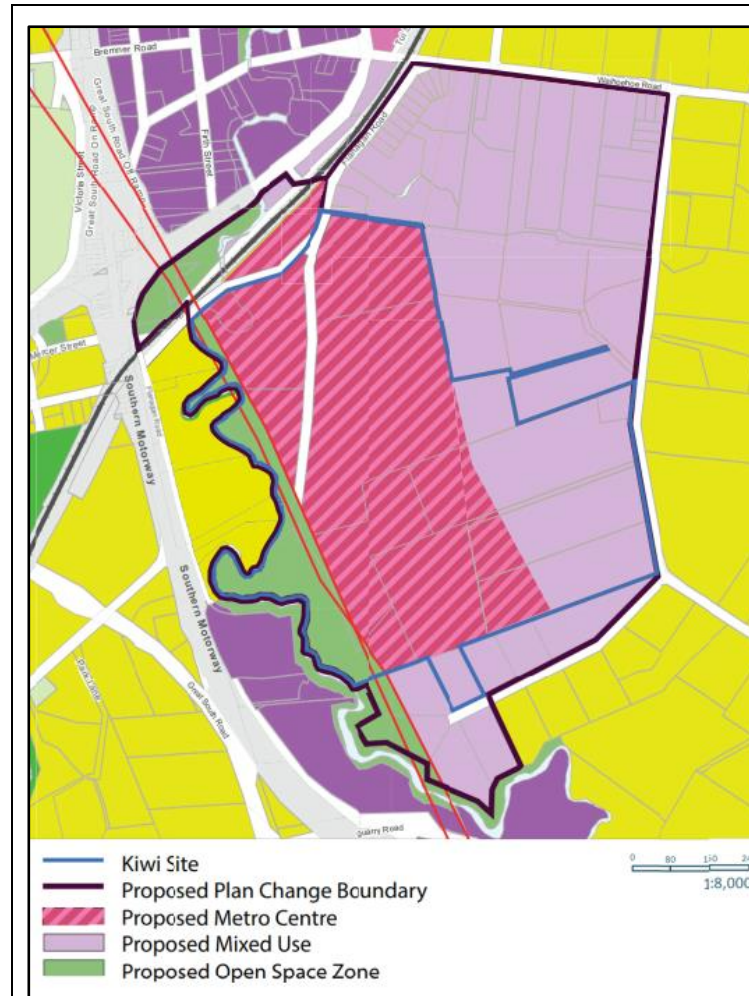


Figure 1.1: Drury Metropolitan Centre – Zoning Plan August 2019.



Figure 1.2: Indicative master plan for Drury Metropolitan Centre, showing areas of 'public realm'. Source: Drury Metropolitan Centre Master Plan Report 19 July 2019, prepared by CIVITAS.

2 Methods

A combination of desktop assessments and site visits were used to determine the ecological values of freshwater and terrestrial ecosystems within the pPCA and its surrounding environs, and the significance of those values. The following sections briefly describe the methodology for assessing the ecological values of the pPCA.

2.1 Desktop assessment

A desktop assessment was undertaken to review available information and data relating to the ecological values of the pPCA. This included the following documents and databases.

- The Ecology Assessment Drury Structure Plan¹ (EADSP);
- Auckland Unitary Plan Operative in Part (AUP);
- NIWA New Zealand Freshwater Fish Database (NZFFD);
- Auckland Council Herpetofauna Database; and
- Auckland Council GeoMaps database.

2.2 Site walkover

T+T ecologists visited the site on several occasions in 2018 and early 2019. During these visits, key terrestrial and aquatic habitat features were identified across the site.

The homestead at 120 Flanagan Road was identified as a key area of native vegetation and a species list was composed for this site. Wetlands and streams were classified and their ecological value assessed.

2.2.1 Stream classification

Streams in the Auckland Region are classified as either permanent, intermittent, ephemeral, or artificial in accordance with the criteria outlined in the AUP².

Streams within the Kiwi landholdings were identified, mapped and classified according to these criteria in November 2018. Stream extent within the wider extent of the pPCA was estimated based on aerial photography and road side observations.

The weather during the November 2018 site visit was changeable and consisted of intermittent rain showers with overcast and sunny periods. In the 48 hours prior to the November site visit, 70 mm of rainfall was recorded at the Auckland Council Turner Road rain gauge³.

¹ Auckland Council, 2017. Ecology Assessment Drury Structure Plan. Prepared by Eru Nathan, Auckland Council, dated 30 August 2017.

² Permanent river or stream is defined as “The continually flowing reaches of any river or stream”.

Intermittent stream is defined as “Stream reaches that cease to flow for periods of the year because the bed is periodically above the water table. This category is defined by those stream reaches that do not meet the definition of permanent river or stream and meet at least three of the following criteria: a) it has natural pools; b) it has a well-defined channel, such that the bed and banks can be distinguished; c) it contains surface water more than 48 hours after a rain event which results in stream flow; d) rooted terrestrial vegetation is not established across the entire cross-sectional width of the channel; e) organic debris resulting from flood can be seen on the floodplain; or f) there is evidence of substrate sorting process, including scour and deposition.

Ephemeral stream is defined as “Stream reaches with a bed above the water table at all times, with water only flowing during and shortly after rain events. This category is defined as those stream reaches that do not meet the definition of permanent river or stream or intermittent stream”

³ Auckland Council GeoMaps, 2018. Rainfall data from Drury Rain @ Turner Road (N: 1786464; E: 5886543).

2.2.2 Stream ecological valuation assessment

A Stream Ecological Valuation (SEV) was carried out on a 100 m reach of 'Stream A' following the methodologies outlined in TR2011/009⁴ for permanent reaches. The location of Stream A is shown in Appendix A. The Masterplan seeks to retain streams across the site, however, an SEV calculation was undertaken to understand the effects if modifications to Stream A were to occur at some point in the future.

Field data was entered into the Permanent Stream SEV calculator to derive SEV scores for the sampled reach. A macroinvertebrate sample was collected however has not been included within the SEV scores as it isn't required for modelling purposes. Fishing was not undertaken within the SEV reach.

2.3 Assessment of effects

The method applied to this assessment of ecological effects broadly follows the Ecological Impact Assessment Guidelines (EclAG) (EIANZ, 2018). Using a standard framework and matrix approach such as this provides a consistent and transparent assessment of effects.

The framework for assessment provides structure to quantify the level of ecological effects 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.

Outlined in the following sections, the guidelines have been used to ascertain the following:

- The level of ecological value of the environment;
- The magnitude of ecological effect from the proposed activity on the environment; and
- The overall level of effect to determine if mitigation is required.

Further detail regarding these guidelines and the scale used is included in Appendix B.

3 Ecological values

3.1 Catchment description

The Hingaia Stream catchment is approximately 5490 km² with its headwater tributaries located within the Hunua Ranges. The main stem of the Hingaia Stream meanders from south to the north, through undulating agricultural and horticultural land before discharging to Drury Creek and the upper Pahurehure Inlet in the Manukau Harbour. The pPCA that this assessment of effects relates to is the lower Hingaia Stream catchment, to the south of Drury (Appendix A).

Historical and current agricultural and horticultural landuse practices have resulted in a range of impacts within the wider catchment. These impacts include stream channel straightening, native vegetation removal, habitat fragmentation and installation of in stream structures (e.g. culverts). Although the Hingaia Stream catchment is heavily modified the upper reaches of the main tributaries maintain some natural habitats, particularly where remnant native vegetation and forest fragments are present at the edge of the Hunua ranges.

The Hingaia Stream remains an important link between the marine environment and an array of freshwater ecosystems located within the upper catchment. These links provide important migration

⁴ Storey, R. G., Neale, M. W., Rowe, D. K., Collier, K. J., Hatton, C., Joy, M. K., Maxted, J. R., Moore, S., Parkyn, S. M., Phillips, N. and Quinn, J.M. 2011: Stream Ecological Valuation (SEV): a method for assessing the ecological function of Auckland streams. Auckland Council Technical Report 2011/009.

pathways for diadromous native fish species and provides for the movement of water, sediment and organics downstream to the marine environment.

3.2 Freshwater ecological values

Across the pPCA, permanent and intermittent stream tributaries of the Hingaia Stream were identified as well as two seepage wetlands (Appendix A). Intermittent and permanent watercourses (including wetlands) are subject to the provisions of Chapter 3 of the AUP.

Historical agricultural and horticultural land use has resulted in the modification and degradation of many of the tributaries of Hingaia Stream. All watercourses within the pPCA showed habitat modifications that are typical of a rural environment.

A description and evaluation of ecological value for each watercourse is provided below and a series of photographs is available in Appendix C.

3.2.1 Hingaia stream

The Hingaia Stream meanders along the entirety of the western boundary of the pPCA (Appendix B: Figure 2), before flowing for approximately 1 km to its confluence with Drury Creek.

Large run and pools sections were dominant along the Hingaia Stream. At the downstream end where the road and rail intersect the stream, a run-riffle sequence was present. Cascade sequences become apparent along the length of the stream when flows are low.

The meandering nature of the stream has resulted in a substrate primarily made up of soft silts, with areas of bedrock forming cascades and providing some instream heterogeneity. Areas of macrophyte growth including oxygen weed (*Lagarosiphon* sp.) and willow weed (*Persicaria* sp.) were observed.

Riparian vegetation on the true left bank comprised primarily exotic weed tree species. The true right bank (within Kiwi landholdings) was fenced along its length and vegetation comprised rank pasture grasses and occasional exotic trees. Outside of the fenced areas, the riparian vegetation was limited to grazed pasture.

The stream banks were typically incised and bank erosion was present throughout the reach. Erosion has likely been exacerbated due to the loss of mature riparian vegetation that would help with binding soils along the margins.

The lower Hingaia Stream (in the vicinity of the pPCA) is typical of soft-bottom lowland river systems that have undergone periods of extensive historic habitat modification. Due to its close proximity to the marine environment, the Hingaia Stream remains an important waterway that contributes to biological processes within the downstream marine environments.

3.2.2 Stream A

Stream A comprises intermittent and permanent stream reaches of approximately 400 m length. It emerges in a paddock, via a series of small intermittent tributaries, before becoming a permanent channel which flows south to north to the Fitzgerald Stream (river 438401⁵) before discharging under Flanagan Road to the Hingaia Stream (Appendix A).

An SEV assessment was undertaken on the middle reaches of Stream A to assist in determining its ecological value. The assessed reach comprised a defined permanently flowing channel with an average width of 1.2 m. The stream reach had unrestricted stock access that has resulted in poor bank stability, slumping, pugging and channel degradation. Riparian vegetation was absent, with

⁵ River number derived from Auckland Council GeoMaps (19/02/2019).

grazed grass to the stream edge and only limited shading of the stream channel by a shelterbelt of large non-native trees.

The instream habitat was characterised by a lack of pools and a relatively deep/straight channel with a silt and sand dominated substrate. Patches of leaf litter, woody debris, emergent macrophytes and riparian roots were common. In the lower reaches, emergent macrophytes smothered the channel, likely due to a complete lack of shade and ongoing nutrient inputs from agricultural landuse.

An SEV value of 0.55⁶ was recorded at this site, indicating a moderate current ecological function and typical of rural streams⁴.

The agricultural land use (both historic and current) has resulted in the modification and degradation of Stream A. The stream was characterised by unrestricted stock access, limited shading and low instream habitat diversity, which is typical of many small tributaries within the wider Hingaia Stream catchment. The SEV value obtained at this site is considered to be representative of other shorter tributaries across the pPCA, such as Stream B and C.

3.2.3 Streams B, C and D

Stream B is approximately 120 m in length and comprises intermittent and permanent stream reaches. Encroachment of weeds into the channel has resulted in a wetland typology in the upper reaches, which is likely exacerbated by the absence of a riparian margin. The entire area is fenced and there is no stock access to stream channel. A culvert is present in the lower 20 m of the reach.

Stream C is an intermittent stream approximately 40 m long, which has been straightened along a fence line. The stream appears to be spring fed. While the stream lacks a riparian margin, it is fenced and some shading is provided in the upper reach.

Stream D is a remnant channel of the Hingaia Stream that is no longer connected to the main channel. As identified within the Heritage Report⁷, the course of the Hingaia Stream was modified in approximately 1969. At this time, the meander (that is currently identified as 'Stream C') was cut off and the Hingaia Stream was straightened. Boffa Miskell⁸ determined that this watercourse was an isolated depression that was separate from the main Hingaia Stream.

At the time of T+Ts assessment, some water was present within the depression however there was no clear source or outlet for the water. Due to its historic modification and lack of connection to the Hingaia Stream, Stream C is considered to be a remnant channel, and not a 'river or stream' under the definitions of the AUP.

3.2.4 Streams E, F, G

Streams E, F and G are on the Fitzgerald Stream outside of Kiwi landholdings but within the pPCA. These streams were not walked, however they were observed from a distance and their presence assessed from aerial imagery. Photographs of these streams are included in Appendix C.

Stream E (hereafter Fitzgerald Stream) has a substantial catchment to the east, with areas of significant ecological value in the headwaters (as determined by the AUP). The catchment is typical of those in the area, having been subject to modification resulting from agricultural and horticultural landuse. Within the pPCA Fitzgerald Stream has been modified, with evidence of straightening and unnatural meanders. Riparian vegetation is predominantly grass, with isolated pockets of woody

⁶ Invertebrate and fish fauna are functions of the SEV method which are excluded from the overall SEV score.

⁷ Clough & Associates Ltd (2019), Drury Town Centre: Plan Change for Drury Future Urban Zoned Land (Centre and Surrounds) Heritage Assessment.

⁸ Boffa Miskell Limited 2017. Kiwi Drury - Ecology: Master Plan Ecology Values, Constraints & Opportunities. Report prepared by Boffa Miskell Limited for Kiwi Property Trust Limited.

vegetation along the immediate stream edge. A perched culvert at Fitzgerald Road forms a barrier to fish passage.

Streams F and G are tributaries of Fitzgerald Stream and are likely to be intermittent. Both are unfenced and unshaded streams, with excessive macrophyte growth. Unrestricted stock access is likely to have caused damage to the stream banks and exacerbated nutrients entering the stream. Both Stream F and G are expected to have similar ecological values as Stream A.

3.2.5 Wetlands

Two seepage wetlands were identified in depressions on the true right margin of the Hingaia Stream (Appendix A). Wetland 1 encompasses an area of approximately 150 m² and is currently unfenced allowing unrestricted stock access to the entire wetland area. Wetland 2 is approximately 1,000 m². The upper section is unfenced with riparian vegetation consisting of grazed pasture grasses and sporadic gorse. The lower section of Wetland 2 is located alongside the Hingaia Stream edge and is fenced with Willow sp (*Salix spp.*) present.

Both wetlands are degraded with stock only excluded from a portion of Wetland 2. Weed species such as willow trees (*Salix sp.*) and gorse (*Ulex europaeus*) have colonised the wetland area and stock trampling and pugging has reduced the colonisation of native wetland plants.

As stated within the EADSP, virtually all original wetlands within the wider area have been drained or infilled for other uses. Although the wetland habitats within Kiwi landholdings are degraded, as these are underrepresented in the wider catchment it is considered they are providing some ecological value, albeit at a currently low level. Refer to Appendix C for photographs.

3.2.6 Native fish

A desktop review of the Hingaia Stream catchment was carried out using the NZFFD. There are no NZFFD records within the pPCA, however the records show that a range of native fish are present within the wider Hingaia Stream catchment. In total eight native species have been identified of which one is classified as 'Threatened – Nationally Vulnerable' and three are classified as 'At risk – Declining' by Dunn *et al* (2017)⁹ (Table 3.1).

It is likely the species identified in the wider Hingaia Stream catchment will inhabit the lower Hingaia Stream itself and those species tolerant of habitats influenced by agricultural degradation may be present in the tributaries located on the Kiwi landholdings (e.g. Stream A).

Diadromous migration is an important life history trait of many of the species that were identified within the Hingaia Stream catchment. Fish species that undertake diadromous migration must undertake a period of time at sea to complete their life cycle. The occurrence of diadromy within the Hingaia Stream catchment shows that the connection between marine habitats and upstream freshwater habitats is vital for these species. Likewise, it is important to highlight that as fish are highly mobile, migration between freshwater habitats will occur during most of the year and not just at key migration times. The presence of the aforementioned threatened and at-risk species within the Hingaia Stream catchment identifies that maintaining and/ or improving instream habitat health and connectivity to higher quality upstream habitats is an important priority.

A range of farm crossings and structures (e.g. culverts) were identified within the pPCA, including several within Stream A and at Fitzgerald Road. These structures have been designed with the focus primarily on hydraulic conveyance rather than habitat connectivity. Further fish passage issues are likely to have been exacerbated by their lack of maintenance. As such it is likely that these structures

⁹ Dunn, N.R., Allibone, R.M., Closs, G.P., Crow, S.K., David, B.O., Goodman, J.M., Griffiths, M., Jack, D.C., Ling, N., Waters, J.M., and Rolfe, J.R. 2017. Conservation status of New Zealand freshwater fishes New Zealand Threat Classification Series 24. Department of Conservation, Wellington. 11 p

present a partial or complete barrier to fish passage. Existing barriers to fish passage can be removed or remediated to improve passage to stream areas proposed to be enhanced.

Table 3.1: Fish species present within the Hingaia Stream Catchment (source: NZFFD).

Species	Common Name	Threat Status	Diadromous
<i>Anguilla australis</i>	Shortfin eel	Not threatened	Y
<i>Anguilla dieffenbachii</i>	Longfin eel	At risk – Declining	Y
<i>Anguilla spp.</i>	Unidentified eel		Y
<i>Cheimarrichthys fosteri</i>	Torrentfish	At risk – Declining	Y
<i>Galaxias fasciatus</i>	Banded kokopu	Not threatened	Y
<i>Galaxias maculatus</i>	Inanga	At risk – Declining	Y
<i>Geotria australis</i>	Lamprey	Threatened - Nationally vulnerable	Y
<i>Gobiomorphus cotidianus</i>	Common bully	Not threatened	N*
<i>Gobiomorphus huttoni</i>	Redfin bully	Not threatened	Y
<i>Gobiomorphus spp.</i>	Unidentified bully		
<i>Retropinna retropinna</i>	Common smelt	Not threatened	Y
<i>Gambusia affinis</i>	Gambusia	Non-native	N
<i>Ctenopharyngodon idella</i>	Grass carp	Non-native	N
<i>Cyprinus carpio</i>	Koi carp	Non-native	N
<i>Hypophthalmichthys molitrix</i>	Silver carp	Non-native	N
<i>Scardinius erythrophthalmus</i>	Rudd	Non-native	N
Invertebrates present within the Hingaia Stream catchment			
<i>Hyridella menziesi</i>	Freshwater mussel	Declining	
<i>Paranephrops spp.</i>	Koura	Not threatened	
<i>Paratya curvirostris</i>	Freshwater shrimp	Not threatened	

Note: Sea-going populations occur in river and streams near to the coast.

3.3 Terrestrial ecology values

3.3.1 Vegetation

Vegetation within the pPCA is predominantly grazed pasture grasses. Exotic trees have been planted to create shelter belts or to form ornamental and amenity gardens. A non-exhaustive list of species observed is included in Table 3.2 and areas of predominantly native vegetation are shown in Appendix A.

A cluster of mature native and exotic canopy trees with a well-developed understory has been identified within 120 Flanagan Road, Drury ('Homestead Park') (Figure 1.2). Some native trees are also present adjacent to the remnant channel referred to as Stream D.

Historical landuse changes from forest cover to intensive agriculture have severely degraded the landscape. The pPCA is still actively farmed and few remnant native plants are present. Riparian cover along the Hingaia Stream is discontinuous and comprises predominantly weed species.

The site itself is not listed as a Significant Ecological Area (SEA) under the AUP however it is situated between mosaics of SEAs; namely a large marine SEA to the west and a terrestrial SEA to the east.

Table 3.2: Plant species observed within the pPCA (not exhaustive).

Exotic		Native	
Common name	Scientific name	Common name	Scientific name
		Titoki	<i>Alectryon excelsus</i>
Yucca	<i>Yucca</i> sp.	nīkau	<i>Rhopalostylis sapida</i>
Bromeliads		Puka	<i>Meryta sinclairii</i>
Elms	<i>Ulmus</i> sp.	Pōhutukawa	<i>Metrosideros excelsa</i>
Fan palm		Karaka	<i>Corynocarpus laevigatus</i>
Gingko		Puriri	<i>Vitex lucens</i>
Cypress	<i>Cupressus</i> sp.	Muehlenbeckia	<i>Muehlenbeckia</i> sp.
Camelia		Kowhai	<i>Sophora</i> sp.
Phoenix palm	<i>Phoenix canariensis</i>	Karo	<i>Pittosporum crassifolium</i>
Bottle brush tree	<i>Callistemon</i> sp.	Red mapou	<i>Myrsine australis</i>
African love grass	<i>Eragrostis curvula</i>		
Grapefruit tree			
Woolly nightshade	<i>Solanum mauritianum</i>		
Willow	<i>Salix</i> sp.		
Norfolk pine	<i>Araucaria heterophylla</i>		

3.3.2 Terrestrial fauna

At a local and/or landscape-level shelter belts and remnant trees present across the site have the potential to provide habitat, refugia, food source, flight path connectivity for native avifauna, bat, and lizard populations. The pPCA also supports a large array of common non-native bird species.

A known population of threatened long-tailed bats (*Chalinolobus tuberculatus*) is located in the Hunua Ranges. Shelter belts are likely to support bat foraging and movement pathways across site. Mature specimen trees (exotic and native) observed within Homestead Park and distributed throughout the site can also act as roost trees (i.e. mature puriri trees with abundant crevices).

Lizard habitat is likely to be restricted to areas outside of heavily grazed pastures and any low lying areas that are regularly inundated by during rain events. Lizard habitat is expected to include rank pasture grasses and any refuge habitat that may exist in tree fell areas and farming debris.

3.4 Marine ecology values

The streams within the site discharge to the Pahurehure Inlet of the Drury Creek approximately 1 km downstream. The intertidal marine areas of the Drury Creek are recognised as significant ecological areas.

The upper tidal reaches of Drury Creek are identified as an SEA (M1-29b) due to the value of the habitat present, comprising a variety of marshes, grading from mangroves through to extensive areas of jointed rush-dominated saltmarsh, to freshwater vegetation in response to salinity changes. This area is identified as a valuable migration pathway for a number of different species of native freshwater fish.

The more intertidal and estuarine reaches (M2-29a) are comprised of a variety of intertidal habitats ranging from sandy mud intertidal flats, to tidally-exposed rocky reefs and a variety of saline

vegetation. Areas of mangroves grow in the Whangamaire Stream, and Drury and Whangapouri Creeks. Notable eel grass (*Zostera*) beds are present in the southern half of the Whangapouri Creek.

Drury Creek is comprised of a variety of intertidal habitats ranging from sandy mud intertidal flats to current-exposed rocky reefs and a variety of saline vegetation. Wading bird roosting habitats are present, including an important area for pied stilt.

Due to the depositional nature of this area, it is sensitive to sedimentation and contaminants transported from the wider catchment.

3.5 Summary of ecological values

In summary, the ecological values of the pPCA are of low to moderate overall value, consistent with typical agricultural landuse.

The intermittent and permanent watercourses and wetlands present have moderate to low current ecological value, but have the potential to be enhanced, particularly the small tributaries. The Hingaia Stream adjacent to the site provides connectivity to the wider catchment and is an important migratory pathway for native fish, including threatened and at risk species.

Terrestrial vegetation of low to moderate value is located within isolated pockets across the site, with the area of highest value located in the future Homestead Park. The marine environment downstream of the pPCA is an SEA and sensitive to changes in upstream landuse.

4 Assessment of ecological effects

A change from rural to urban land use poses a range of potential effects to the ecological values that have been identified within the pPCA. This section provides an assessment of the ecological effects of the proposed plan change and future development of the site. The assessment is based on the indicative master plan shown in Figure 1.2 which will be further refined. A summary of the activities and the relative affects according to the EclAG is provided in Section 4.5.

4.1 Earthworks and sediment discharges

Earthworks activities associated with the land use change, including any works in watercourses, have the potential to result in an uncontrolled discharge of sediment laden water. Increased sediment in the receiving environment can impact water quality within the freshwater and marine environment and result in sediment deposition, changing habitat features. Further, modifications to landforms through earthworks can result in changes to contributing catchments.

A cut to fill balance is proposed to be achieved on site and will be managed through minimal modification to the natural topography. It is the intention that the landforms remain much the same, with no changes to contributing catchments proposed.

The Hingaia Stream and the Drury Creek are both sensitive to sediment deposition, particularly the marine environment which is an SEA. Implementation of an erosion and sediment control plan that is designed and maintained in accordance with Auckland Council GD05 - Guidance for Erosion and Sediment Control¹⁰ will reduce the potential for an uncontrolled discharge of sediment laden water to the environment and this can be addressed as part of a future resource consent process in accordance with the Unitary Plan earthworks provisions.

¹⁰ Leersnyder, H., Bunting, K., Parsonson, M., and Stewart, C. (2016). Erosion and sediment control guide for land disturbing activities in the Auckland region. Auckland Council Guideline Document GD2016/005. Incorporating amendment 1. Prepared by Beca Ltd and SouthernSkies Environmental for Auckland Council.

4.2 Water quality and quantity

Under the current landuse, the hydrological cycle occurs in a relatively unmodified state and water is filtered through the soil or grassed paddocks prior to entering streams. The proposed change to urban landuse will result in an increase in impervious surfaces across the site and will change the quality and quantity of water entering the receiving environment.

The streams within the pPCA including the Hingaia Stream are subject to degraded water quality resulting from agricultural landuse and a lack of riparian buffers and unrestricted stock access. The streams exhibit abundant macrophyte growth which is an indicator of nutrient enrichment.

The proposed urban landuse will change the type of contaminants entering the stream environment, with an expected reduction in nutrients and increase in heavy metals and hydrocarbons associated with impervious surfaces. These contaminants can impact aquatic flora and fauna and the way that streams function as a whole.

Auckland Council GD01 provides guidance on applying a water sensitive urban design (WSUD) approach to treating urban stormwater runoff¹¹. This includes using devices such as swales, rain garden, tree pits and permeable paving to treat stormwater prior to it entering the receiving environment¹². This approach is proposed to be applied across the pPCA to minimise the potential for contaminants to enter the environment. Contaminant specific treatment is proposed for high contaminant generating areas such as roads and car parking.

An additional potential impact from the proposed landuse change, specifically increased impervious surfaces, is increased temperatures¹³. Elevated temperatures within the receiving environment can have acute effects on fauna. Streams across the site are currently subject to elevated temperatures due to lack of shading. The proposed riparian planting adjacent to streams across the site will work to reduce potential temperature increases in stream. Stormwater treatment in ponds can further increase water temperature, so WSUD approaches are proposed to minimise this potential effect.

Increased impervious surfaces also have the potential to change the volume of and rate at which stormwater enters the receiving environment. High velocity flows can cause stream erosion and scour, which contributes to bank instability and sediment deposition. Use of detention and retention of stormwater across the site is the best practice approach to stormwater management and reduces the potential for these effects to occur.

4.3 Stream and wetland habitat loss

Auckland Council has identified that intermittent and permanent streams and wetlands are important and subsequently they are protected under the AUP (Chapter E3). Changes in landuse often results in the loss of streams to enable efficient use of land and maximum yield.

There are several streams and wetlands across the pPCA including some within the centre of the site. Kiwi recognises the importance of these ecosystems within the pPCA and as such, impacts to stream and wetland ecosystems will be avoided and minimised wherever possible.

Hingaia Stream and the stream tributaries along the true right bank will be retained and enhanced. Retained streams and wetlands across the site will be planted to have riparian margins of no less

¹¹ Cunningham, A., Colibaba, A., Hellberg, B., Silyn Roberts, G., Simcock, R., S. Speed, Vigar, N and Woortman, W (2017) Stormwater management devices in the Auckland region. Auckland Council guideline document, GD2017/001.

¹² Tonkin & Taylor Ltd (2019). Drury Metropolitan Centre Stormwater Management Plan. Prepared for Kiwi Property Trust Ltd.

¹³ Young D, Afoa E, Meijer K, Wagenhoff A, Utech C (2013). Temperature as a contaminant in streams in the Auckland region, stormwater issues and management options. Prepared by Morphem Environmental Ltd for Auckland Council. Auckland Council technical report, TR2013/044.

than 10 m on smaller streams and 20 m on the main channels of the Hingaia Stream and Fitzgerald Stream.

An Enhancement Plan will be developed prior to landuse consents being sought which incorporates ecological enhancement with amenity and recreational use. This approach will see the landuse change associated with the pPCA is aligned with policies of the AUP and EADSP.

The historically diverted section of the lower Hingaia Stream (i.e. Stream D) is expected to be reclaimed. The remnant channel does not appear to have connectivity to the Hingaia Stream and the effects of its isolation from the main channel will have been addressed in the 1960's when the diversion occurred. The channel is not a 'river or stream' as defined under the AUP and as such, the provisions of E3 do not apply and any further assessment of effects is not considered to be necessary.

While the intention is to retain and enhance aquatic habitats within the pPCA, it may be necessary to modify some stream or wetland to enable land development. Impacts to stream or wetland habitat may require resource consents and further consideration of effects at the time of consenting. The following provides some guidance as to the potential options to address effects.

Where practicable, bridges will be constructed for stream crossings. Culverts of less than 30 m in length and that meet other criteria are a permitted activity in the AUP. In the event that the permitted activity criteria cannot be met and to address potential future stream loss requirements, an assessment of the potential effects of stream loss, which would be subject to resource consent has been provided. An assessment of stream culverting and stream reclamation has been undertaken.

Any culverts required will be designed and constructed in accordance with best practice guidelines, for instance, the New Zealand Fish Passage Guidelines¹⁴. Existing culverts which are barriers to passage will be removed or remediated.

It is not possible to remediate or mitigate stream reclamation at the point of impact. To 'mitigate' means to alleviate, or moderate the severity of something¹⁵ which is not possible in relation to stream reclamation as there is a complete and permanent loss of habitat.

While stream and wetland reclamation cannot be mitigated, it can be offset. Offsetting is 'a measurable conservation outcome resulting from actions designed to compensate for residual adverse biodiversity effects arising from activities after appropriate avoidance, remediation, and mitigation measures have been applied'¹⁵. To be considered an offset, the conservation outcomes resulting should be consistent with a set of offsetting principles, including the goal of 'no net loss'.

At this stage, the final extent of stream or wetland impact is unknown and will not be known until the master plan design is finalised.

Wetland offset, if required, should be determined based on enhancement measures proposed and will be based around infill and riparian margin planting on site.

In terms of any stream offset required, riparian planting or creation of new stream habitat, through diversion for example, could also contribute to an offset package.

While the potential effects and offset requirements have not been quantified in this assessment, we consider that the identified activities should be considered at the time of consenting as part of an offset package and not part of the plan change requirements. That is, the enhancement should be

¹⁴ Franklin, P, Gee, E, Baker, C, and Bowie S. (2018). New Zealand Fish Passage Guidelines for structures up to 4 metres. Prepared by NIWA. Client Report 2018019HN.

¹⁵ Maseyk, F, Ussher, G, Kessels, G, Christensen, M, and Brown, M (2018). Biodiversity offsetting under the Resource Management Act – A guidance document September 2018.

considered to benefit the stream and wetland habitat to address those potential effects, and not to address effects of the plan change itself.

In respect of the wider principles of offsetting (outlined in AUP Policy E3.3(4)), the offset works within the site would be on aquatic habitats streams that are like for like and proximate to the impact.

A resource consent for streamworks would be required to be sought, however the effects of the potential habitat loss could be addressed by the enhancement activities outlined within this proposal. Any impacts beyond those anticipated by this assessment would need to be considered separately and may require additional offset works to be undertaken outside of the pPCA.

4.4 Impacts on terrestrial flora and fauna

Current landuse across the pPCA has resulted in an almost complete removal of native vegetation and there are no areas of ecological significance. Current vegetation consists of grazed and rank pasture grasses and exotic trees which form shelter belts or planted ornamental/amenity gardens.

The proposed plan change and site works will result in some additional loss of vegetation particularly through the removal of shelter belt vegetation (predominantly mature exotics) to facilitate land development. Vegetation loss will be kept to a minimum and will be avoided where possible. Of note, planted native vegetation adjacent to the homestead is intended to be retained where practicable.

Removal of vegetation has the potential to adversely affect terrestrial fauna. Potential direct effects to both avifauna and herpetofauna have been identified as damage to nests, associated eggs, fledglings, and loss of individuals killed during vegetation removal, construction, and earthworks.

The implementation of a Fauna Management Plan is recommended at the time of resource consenting for future works to manage potential impacts on terrestrial fauna. Where practicable remnant native vegetation or large exotic trees within the pPCA will be retained, to minimise effects on terrestrial fauna.

Potential indirect effects of vegetation removal include loss of habitat and food resources (particularly from mature trees), and general disturbance during construction and development. It is considered the effects will be mitigated through enhancement planting across the pPCA particularly along the Hingaia Stream which will create high quality habitat, migratory corridors and see an overall increase in native food resources for terrestrial fauna. An Enhancement Plan will be developed prior to landuse consents being sought which incorporates ecological enhancement with amenity and recreational use.

Overall it is considered that the effects of the landuse change on terrestrial flora and fauna is low.

4.5 Summary of effects

Table 4.1 provides a summary of each of the above activities in general accordance with the EcIA guidelines, drawing on the information presented in the above sections. For each activity, the relevant ecological values, magnitude of effect after mitigation and the overall level of effect are provided. Refer to Appendix B for interpretation of this assessment.

The overall level of effect has not been translated into statutory language (i.e. more than or less than minor), however the guidance in Appendix B can assist with this interpretation.

Table 4.1: Overall level of ecological effect after mitigation measures are implemented.

Activity	Ecological value of affected environment	Magnitude of effect – with mitigation measures	Overall level of effect
Earthworks and sediment	Freshwater environment – moderate in tributaries, high in Hingaia due to presence of threatened fish, its value for migration, sensitivity of banded kokopu to sediment and SEV values within tributary streams. Marine environment – high , due to status as SEA and depositional nature of catchment	Low If erosion and sediment control measures are implemented in accordance with GD05.	Low
Water quality and quantity	Freshwater environment – moderate in tributaries, high in Hingaia (as above). Marine environment – high , (as above)	Low If water sensitive urban design approach applied across site in keeping with recommendations of the Stormwater Management Plan and GD01.	Low
Stream habitat loss	Freshwater environment – moderate in tributaries.	Low if bridges or culverts consistent with permitted activity standards and fish passage guidance implemented. Very High if reclamation, but expect effects can be offset onsite (positive effect).	Low to High Offset contributes a positive effect, but does not reduce the overall effect if the activity is reclamation.
Terrestrial vegetation and fauna	Low to moderate	Low Enhancement of wider site with vegetation and habitat corridors along Hingaia Stream and Fitzgerald Stream.	Low

5 AUP: OP objectives and policies

This section summarises the key chapters of the AUP which provide direction for stormwater management, streams and wetlands and vegetation. Chapter B also provides higher level regional policy level direction.

Chapters E1, E8 and E9 of the AUP outline the policies and objectives in respect to the management of stormwater, including specific provisions regarding high contaminant generating areas and macroinvertebrate indices.

Chapter E3 of the AUP outlines the policies and objectives in regards to lakes, rivers, streams and wetlands. The AUP directs that permanent loss of rivers or streams is minimised and that significant modification or diversion of streams and rivers is avoided. The AUP also recognises that a balance must be struck between the need to provide for infrastructure and the protection of rivers and streams.

Chapter E15 provides direction to the objectives and policies regarding vegetation management in the Auckland region. The AUP identifies that vegetation contributes to a range of ecosystem services such as erosion and sediment control, reducing stormwater flows, protecting or enhancing water quality, amenity and natural character values, and mitigating natural hazards. In areas such as this, where ecological values are degraded, indigenous biodiversity should be restored and enhanced, while also providing for appropriate development.

6 Conclusion

The Drury Metropolitan Centre pPCA will result in rural land being rezoned to enable the development of a town centre and associated residential properties.

The ecological values of the site are consistent with those anticipated within rural landuse. Vegetation across the area is limited to exotic shelterbelts or planted ornamental gardens, where some native trees are present. Streams within the pPCA area are degraded resulting from unrestricted stock access, lack of riparian margins and degraded water quality associated with agricultural landuse. The Hingaia Stream is located on the western boundary of the pPCA and lacks riparian margins of any significance, however, it is an important watercourse with connectivity to significant ecological areas in its headwaters. The ultimate receiving environment is the Drury Creek which is a marine SEA, important for its intertidal bird habitat.

The proposed landuse change has the potential to impact the remaining ecological values of the site through sedimentation, increased impervious surface resulting in changes to water quality and quantity, stream habitat loss and vegetation removal.

Through the implementation of appropriate sediment and erosion controls across the site, the potential for sedimentation effects is reduced and measures will be in accordance with best practice methods.

Water sensitive urban design principles will be applied for all stormwater management which will result in potential effects of stormwater on the receiving being minimised. A level of water quality treatment will be applied which will result in a reduction in nutrients under the current scenario and a change to high level treatment of urban contaminants.

Stream and wetland habitat loss will be minimised across the site. A remnant channel (Stream D) of currently low ecological value will be reclaimed. It is considered that Stream D is not a 'river or stream' and is therefore not subject to the provisions of the AUP. Where stream modification may be required in the future for road crossings or to enable development, enhancement of aquatic habitat within the site could contribute to an offset package to achieve no net loss of ecological function onsite.

Vegetation removal will be limited to shelterbelts, small areas of native vegetation and some planted trees within the homestead. These areas of vegetation may provide limited habitat value to fauna and a fauna management plan should be prepared at time of consenting to address potential effects.

An Enhancement Plan will be developed prior to landuse consents being sought which incorporates ecological enhancement with amenity and recreational use. Fauna Management Plans will also be prepared prior to works commencing to address potential effects on fauna.

The AUP includes a comprehensive set of rules relating to identified features (for example E1 for stormwater, E3 for streams and E15 for vegetation). These are considered to be appropriate to address the potential for adverse effects in the same way they already apply to the area's Future Urban Zone. From an ecological perspective, these rules are appropriate to address relevant effects that may be generated at the time of resource consent.

Overall, it is considered that the potential effects of the change in landuse and the development of the Drury Metropolitan Centre can be avoided, minimised, mitigated or offset and as such, the overall level of effects is low.

7 Applicability

This report has been prepared for the exclusive use of our client Kiwi Property Group Limited, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Report prepared by:



.....
Justine Quinn

Senior Freshwater Scientist

Authorised for Tonkin & Taylor Ltd by:



.....
Tim Fisher

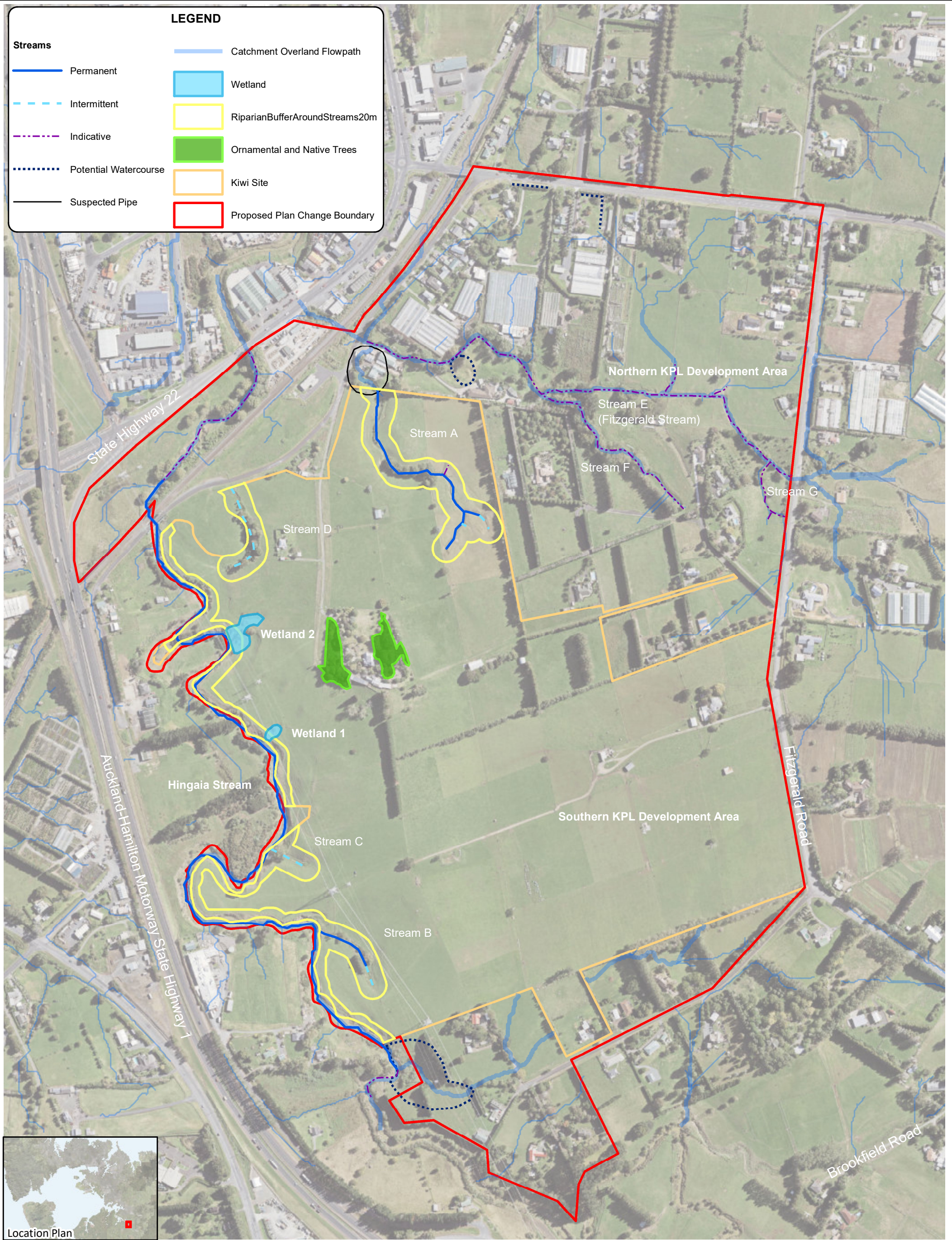
Project Director

Technical review: Josh Markham, Senior Ecologist.

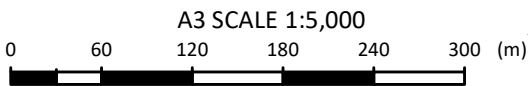
JQU

t:\tauranga\projects\1003297\1003297.1000\5 ecology stage 3\issueddocuments\1003297.1000_ecology aece report_final_september 2019.docx

Appendix A: Site Map



Notes: Aerial photograph sourced from Auckland Council and licensed for re-use under the Creative Commons Attribution 3.0 New Zealand licence.



Tonkin+Taylor
105 Carlton Gore Rd, Newmarket, Auckland
www.tonkintaylor.co.nz

DRAWN	DXLR	Mar.19
CHECKED		
APPROVED		
ARCFIELD 1003297.1000_FIG001.mxd		
SCALE (AT A3 SIZE) 1:5,000		
PROJECT No. 1003297.1000		

KIWI PROPERTY LIMITED
DRURY METROPOLITAN CENTRE
Ecological Considerations
Stream extent and ecological features

Appendix B: Ecological Impact Assessment Guidelines

Appendix B Table 1: Factors to consider in scoring sites values in relation to species representativeness, rarity, diversity and pattern, and ecological context (adapted from EIANZ, 2018).

Value	Species Values	Vegetation/Habitat Values
Very High	Nationally Threatened - Endangered, Critical or Vulnerable.	Supporting more than one national priority type. Nationally Threatened species found or likely to occur there, either permanently or occasionally.
High	Nationally At Risk - Declining,	Supporting one national priority type or naturally uncommon ecosystem and/or a designated significant ecological area in a regional or district Plan. At Risk - Declining species found or likely to occur there, either permanently or occasionally.
Moderate-high	Nationally At Risk - Recovering, Relict or Naturally Uncommon.	A site that meets ecological significance criteria as set out the relevant regional or district policies and plans.
Moderate	Not Nationally Threatened or At Risk, but locally uncommon or rare	A site that does not meet ecological significance criteria but that contributes to local ecosystem services (e.g. water quality or erosion control).
Low	Not Threatened Nationally, common locally	Nationally or locally common with a low or negligible contribution to local ecosystem services.

Appendix B Table 2: Summary of the criteria for describing the magnitude of effect (adapted from EIANZ, 2018).

Magnitude	Description
Very High	Total loss or very major alteration to key elements or features of the existing baseline conditions; Loss of high proportion of the known population or range of the element/feature.
High	Major loss or alteration to one or more key elements of existing baseline conditions; Loss of high proportion of the known population or range of the element/feature.
Moderate	Loss or alteration to one or more key elements of existing baseline conditions; 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; Having a minor effect on the known population or range of the element/feature.
Negligible	Very slight change from the existing baseline physical or chemical conditions; change barely distinguishable from the 'no change' scenario; Having negligible effect on the known population or range of the element/feature.

Appendix B Table 3: Criteria for describing overall levels of ecological effects (adapted from EIANZ, 2018).

Level of effect	Ecological Value				
	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

Appendix B Table 4: Interpretation of assessed ecological effects against standard RMA terms.

Level of Ecological Effect (refer Table E3)	RMA Interpretation	Description
Very high	Unacceptable adverse effects	Extensive adverse effects that cannot be avoided, remedied or mitigated.
High	Significant adverse effects that could be remedied or mitigated	Adverse effects that are noticeable and will have a serious adverse impact on the environment but could potentially be mitigated or remedied.
Moderate	More than minor adverse effects	Adverse effects that are noticeable and may cause an adverse impact on the environment, but could be potentially mitigated or remedied.
Low	Minor adverse effects	Adverse effects that are noticeable but that will not cause any significant adverse impacts.
Very low	Less than minor adverse effects	Adverse effects that are discernible day to day effects but which are too small to adversely affect the environment.
Nil	Nil effects	No effects at all.

Appendix C: Site photographs



Photograph Appendix C.1: Stream B, with some wetland characteristics



Photograph Appendix C.2: Stream C.



Photograph Appendix C.3: River 438401 immediately upstream of Flanagan Road, downstream of confluence with Stream A.



Photograph Appendix C.4: Wetland seep 1



Photograph Appendix C.5: Wetland seep 2



Photograph Appendix C.6: Hingaia Stream



Photograph Appendix C.7: Stream A, western headwater tributary, view upstream, perched culvert in background.



Photograph Appendix C.8: Stream A, central headwater tributary (looking downstream)



Photograph Appendix C.9: Stream A, eastern headwater tributary (looking downstream).



Photograph Appendix C.10: Stream A main channel (looking downstream)



Photograph Appendix C.11: Stream A, main channel under deciduous shelter belt (looking downstream).



Photograph Appendix C.12: Remnant stream channel (Stream E).



Photograph Appendix C.13: Remnant stream channel (Stream E).



Photograph Appendix C.14: Stream F overgrown with macrophyte growth at 113 Fitzgerald Road.



Photograph Appendix C.15: Stream G within 111 Fitzgerald Road.

