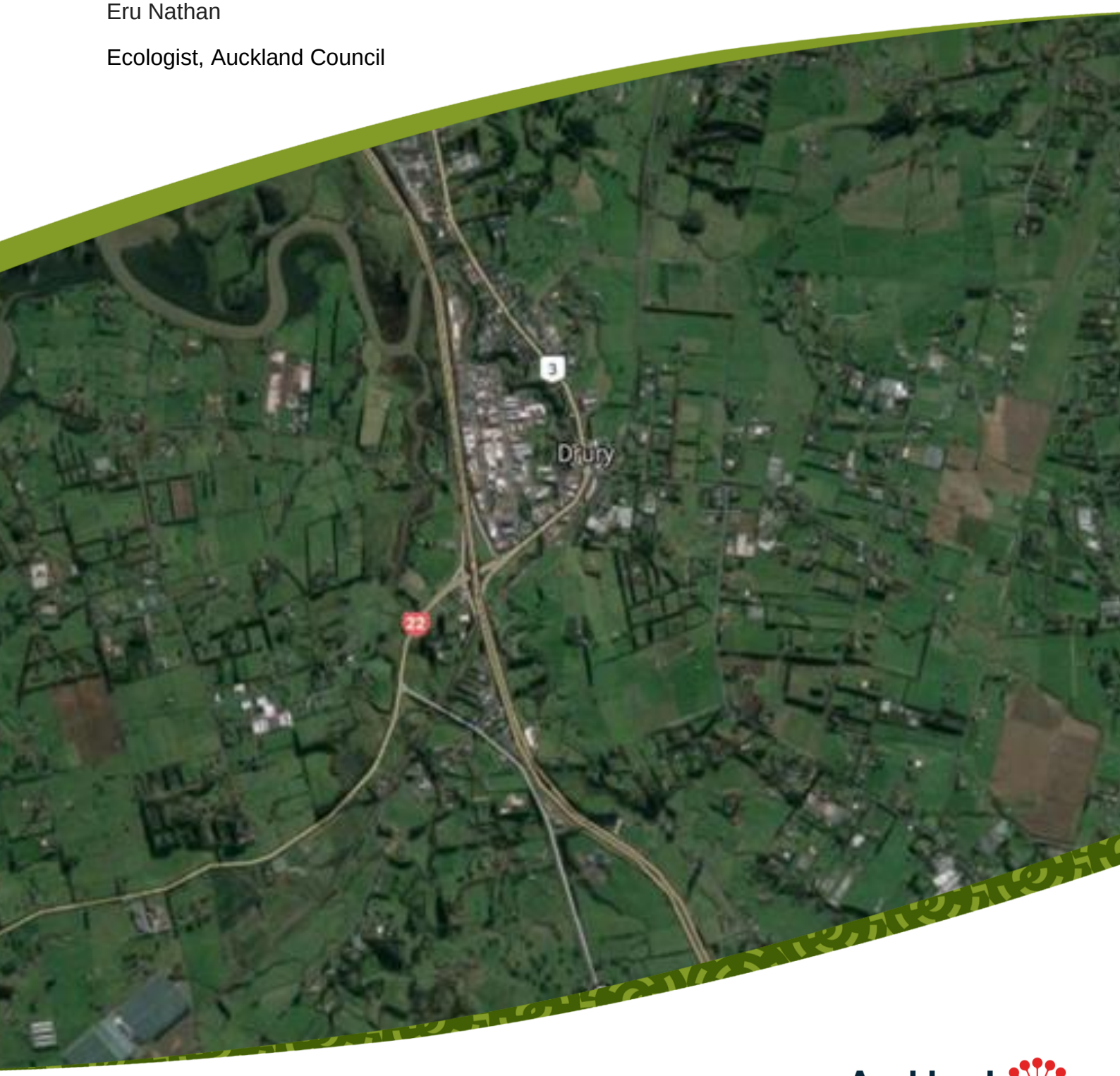
Ecology Assessment

Drury Structure Plan

30 August 2017

Eru Nathan

Ecologist, Auckland Council



Auckland Council
Te Kaunihera o Tāmaki Makaurau

Foreword

The Drury-Opaheke area has been identified by Auckland Council as suitable for future urban growth and been zoned *Future Urban* under the Auckland Unitary Plan. The Drury Structure Plan (the structure plan) will outline and guide how and where development will occur within the greenfield Drury Future Urban Zone.

Opportunities and constraints are to be identified from a number of relevant disciplines and incorporated into the structure plan, helping to inform the future pattern of land use, transport and service networks.

Structure plans are an important method for establishing the pattern of land use and the transport and services network within a defined area. They can provide a detailed examination of the opportunities and constraints relating to the land including its suitability for various activities, infrastructure provision, geotechnical issues and natural hazards.

Structure plans should identify, investigate and address the potential effects of urbanisation and development on natural and physical resources in the structure plan area and in neighbouring areas, particularly those that have been scheduled in the Unitary Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character.

Structure plans should explain how any adverse effects of land use and development are to be avoided, remedied or mitigated by proposed plan provisions. This will ensure that all the effects of development are addressed in advance of development occurring. A structure plan is an appropriate foundation for the plan change process required to rezone land.

Executive summary

The Drury-Opaheke area is a highly modified landscape, with a town centre surrounded predominantly by arable horticultural, pastoral and rural lifestyle activity. Very little native vegetation remains and freshwater habitats are degraded. There is an estuarine coastal edge in the northwest of the structure plan area and the marine environment remains in good condition.

Formulation of the structure plan provides an opportunity to maintain and improve ecological values, set objectives for ecological enhancement, guide the placement of reserves and align community recreation corridors with these.

Ecological constraints for development include:

- proximity of development in relation to watercourses
- proximity and scale of development in relation to the coastal environment
- proximity and scale of development in relation to floodplains
- avoidance of watercourse loss i.e. no permanent loss with culverting
- avoidance of vegetation loss, especially Significant Ecological Areas

Key ecological opportunities include:

- retaining and enhancing remaining native vegetation to improve wildlife habitat
- retaining and buffering natural watercourses to improve water quality and increase numbers and diversity of instream biota
- aligning reserves and recreational connections with existing natural watercourse corridors to provide user integration with nature and wider buffering for wildlife movement
- retaining natural topography to ensure watercourses can maintain natural form and function
- reintroducing riverine wetlands to natural floodplains
- restoration of modified watercourses to reinstate sinuosity and habitat heterogeneity
- revegetation of the terrestrial coastal edge to buffer the marine environment and re-establish linkage between terrestrial and marine ecosystems

Implementing these opportunities will contribute to the implementation of national and regional environmental policies and strategies (such as the National Policy Statement for Freshwater Management) and implementation of the Auckland Growing Greener principles related to urban transformation, restoring nature and healthy waterways.

In the context of the wider landscape, the Drury-Opaheke area currently represents a spatial gap in native vegetation and other areas of ecological value. This means that restoration of ecological values in the Drury-Opaheke structure plan area will help bridge this gap and is thus expected to yield ecological benefits of a larger scale and across a much larger area of the Auckland region.

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1 Scope of report

The purpose of this report is to identify and describe the ecological values present in the Drury-Opaheke Structure Plan area and provide guidance for development that ensures that these values are enhanced and protected in the long term. Both constraints and opportunities relating to the area's ecological values are identified and discussed.

Formulation of this report has drawn on relevant historical reports, Auckland Council databases, external databases, aerial imagery, and internal Auckland Council expertise.

The scope of works undertaken during this assessment includes:

- review of historical investigation reports
- review all existing Auckland Council-held ecosystem and biodiversity records
- identification of ecological constraints and opportunities across the structure plan area, including summarising ecological outcomes which could be sought via the structure plan process and subsequent plan changes
- identification of actual or potential areas of absent information
- provision of recommendations for further environmental investigations required to support future applications for resource consent for site subdivision and redevelopment works

Sustainability initiatives and other factors which can indirectly contribute to the protection or enhancement of ecological or biodiversity values are outside the scope of this report.

2 Site description

The structure plan will provide for the urbanisation of about 1907 hectares of future urban zoned land. The extent of the subject land is shown in lemon-yellow in Figure 1 below. The structure plan area is centred on the existing Drury-Opaheke town centre and its current land uses are predominantly for arable horticultural, pastoral and rural lifestyle activities. Originally, the entire structure plan area would have been vegetated with a diverse range of terrestrial and freshwater ecosystems present and diverse fauna communities

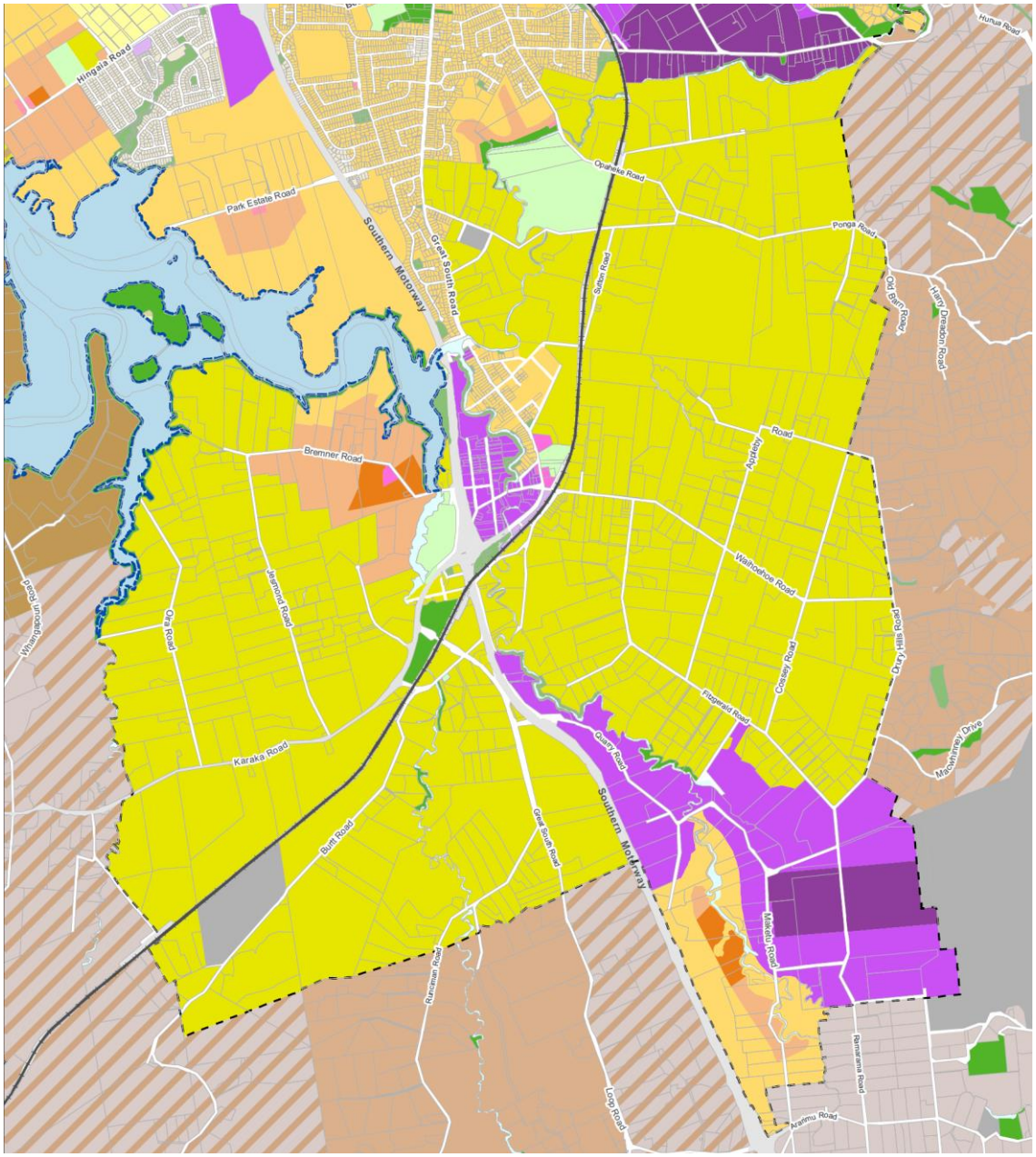

Figure 1: extent of the Drury-Opaheke Structure Plan area (in lemon-yellow)

2.2 Original vegetation cover

Originally the entire structure plan area would have been covered in native vegetation. Modelling suggests that predominantly three forest ecosystem types occurred across the Drury-Opaheke landscape (figure 2); puriri forest (WF7), kahikatea, pukatea forest (WF8) and taraire, tawa, podocarp forest (WF9). Puriri forest would have dominated most of the flattest and most fertile volcanic or alluvial soils. Kahikatea, pukatea forest would have formed corridors associated with the major streams and wettest lowland areas, especially in the wider catchments of Slippery Creek, Ngakoroa Stream and Oira Creek. Slightly more elevated or otherwise more moderately fertile areas would have featured taraire, tawa, podocarp forest. Although not highlighted in the modelling, the landward edge of the coastal area is also likely to have featured a belt of coastal pohutukawa, puriri, broadleaved forest (WF4).

The coastal marine area immediately adjacent to the structure plan area would have consisted of mangrove forest and scrub (SA1), including both mangrove dominated areas as well as areas of various salt marsh communities. As the various creeks progress inland, these saline ecosystems would have graded into various freshwater wetland ecosystems, including oioi, restiad rushland (WL10) and raupo reedland (WL19) in particular.

2.2 Original native fauna

In forested areas, birds such as kereru, tui, bellbird, yellow and red-crowned kakariki, kaka, kokako, tomtit, fantail, grey warbler, whitehead, morepork, North Island robin, shining cuckoo, North Island brown kiwi, and weka would have been present. Arboreal native reptiles such as forest, elegant and Pacific gecko and ground dwelling skinks such as copper, ornate, and striped skink would have been common. In the swampy areas, wetland birds such as banded rail, spotless crake, pukeko, pateke, and bittern would have been common, as would fern bird, Australasian harrier and kingfishers.

2.3 Original freshwater systems

Due to the gentle topography of the structure plan area, freshwater systems were characterised by low order, low energy watercourses connected to large wetland swamps and fens. These wetland areas functioned to attenuate water flows and acted as slow release storage areas preventing any downstream channel scouring, and reducing sediment load. As stated above, these wetland areas would have harboured a variety of native terrestrial flora and fauna. Instream and wetland biota would have included a high diversity of native macroinvertebrates and fish species. Fish species were likely to have included lowland galaxiid species such as banded kokopu, inanga, and giant kokopu, and also longfin eel, short fin eel, koura, Cran's bully, red fin bully, and black mudfish.

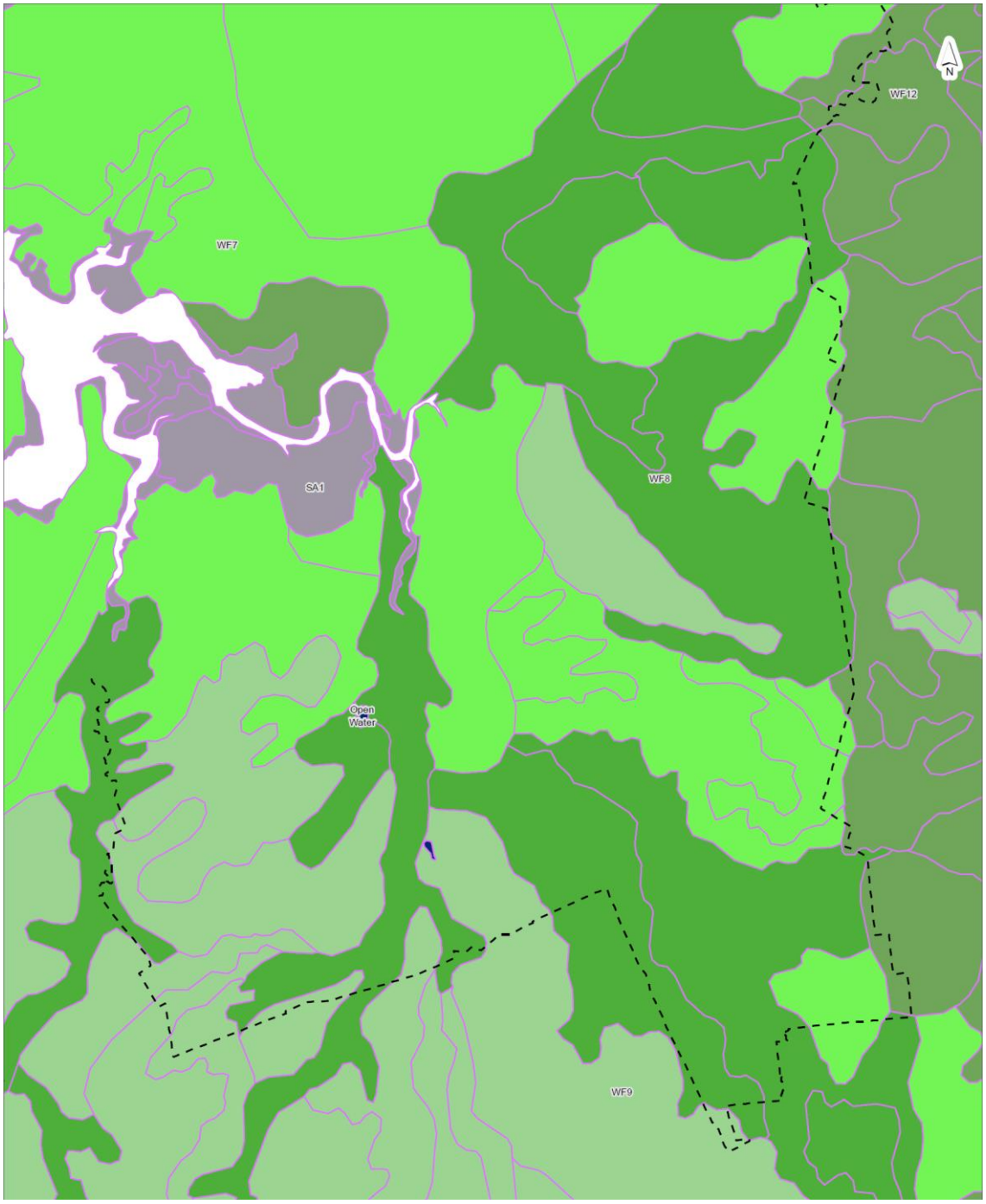

Figure 2: original vegetation cover of the Drury-Opaheke Structure Plan area

3 Current ecological values

Ecological values have been severely degraded by the removal of vegetation from the landscape. Very little remnant native vegetation still exists, consisting mostly of small and isolated areas which are unlikely to sustain themselves long-term. Originally diverse and abundant fauna communities have also been decimated by near-complete removal of their habitat. Watercourses remain, but the values of these have been degraded by the removal of vegetation cover, inputs of sediments and nutrients from surrounding land use, channel modification, and draining or infilling of wetlands/swamps. Instream and wetland fauna have severely declined in line with this modification and degradation. The coastal marine area is largely intact and in good ecological health, however, the terrestrial coastal edge has been all but cleared of native vegetation and is weedy, limiting the ecological connections between land and sea.

3.1 Terrestrial

Very little native vegetation cover remains, a reflection of the historic and current intensive agricultural, horticultural and pastoral activities undertaken on the fertile soils of the structure plan area. Removal of native vegetation from the entire area has had negative impacts on native ecosystems and functionality is all but lost. The small pockets of remaining vegetation will be providing limited refuge for native birds, invertebrates and possibly lizards and bats. However, these remaining vegetated pockets will be severely compromised in function given their isolation, limited size, vulnerability to edge effects such as wind damage and weed infestation, and likely presence of pest animals.

3.1.1 Terrestrial ecosystems

At present, the structure plan area is mainly un-vegetated (un-forested) and very few native forest ecosystem areas remain in the structure plan area. Those that are present are small in size and spatially isolated from other forest patches or larger areas of intact vegetation (figure 3). As a consequence, the ecological value and long-term viability of these areas is severely compromised for reasons such as low population sizes, low levels of reproductive and gene flow connectivity to other areas, high exposure to the damaging edge effects of high wind and light conditions and weed infestation, and the highly likely presence of pest animals.

Only two small areas of mature native forest have been identified in Auckland Council Biodiversity's ecosystem database; both are kahikatea forest (MF4), a lowland and riparian forest type occurring here in association with Slippery Creek and Symonds Stream, both within the wider Slippery Creek catchment. The only other area of terrestrial native vegetation identified in the ecosystem database is a small patch of manuka scrub (VS3) at the very northern border of the structure plan area, but this is of low ecological significance

and is likely to be fairly recently planted vegetation. The coastal edge areas and some areas of surveyed stream edge have been variously identified as exotic forest (EF), exotic scrub (ES), exotic treeland (TL), exotic grassland (EG) and native planted vegetation (PL). These areas are all low significance ecosystems and are predominantly composed of exotic species including numerous weedy species.

Additional to the sites identified in the ecosystem database, there are likely to be various other areas of remnant or otherwise significant vegetation across the structure plan area. This includes in particular various areas of vegetation within statutory conservation covenants; unfortunately these areas are not well documented or databased but there are at least a few across the structure plan area and these are presumably of some reasonable level of significance given that they have been made subject to a conservation covenant.

Also prevalent across much of the structure plan area are exotic shelterbelt plantings. Shelterbelts in this geography comprise mostly of exotic trees, including many species which are considered to be weeds. However, in the absence of significant native vegetation, they provide an important function as refuges for native fauna, while providing basic ecosystem services.

Riparian vegetation is not well documented across the structure plan area but it appears that the majority of riparian corridor is either un-vegetated or weedy, or in places vegetated with exotic bank stabilising species (many weedy themselves). Native riparian vegetation appears to exist in some places, however these areas are small in number and size, as well as isolated and disconnected across the landscape.

3.1.2 Terrestrial Significant Ecological Areas

Significant ecological areas (SEAs) have been identified as a management overlay layer in the Auckland Unitary Plan (AUP) in order to protect and enhance existing areas of high ecological value. Background, objectives and policies relating to SEAs are contained in Chapter D9 of the AUP and rules relevant to terrestrial SEAs are found in chapters E3 (lakes, rivers, streams and wetlands), E15 (vegetation management & biodiversity), E11 (land disturbance - regional) and E26 (infrastructure).

Only four terrestrial SEAs occur within the structure plan area; two remnant forest fragments and two areas of costal and riparian vegetation associated with the inner Drury-Opaheke Creek and the top of Ngakoroa Stream (figure 4).

The two remnant fragments of kahikatea forest discussed in section 3.1.1 above are identified as SEAs (SEA_T_77 and SEA_T_545). Notwithstanding that these areas are small, isolated and compromised, the presence of the kahikatea forest ecosystem type

Figure 3: current terrestrial vegetation cover of the Drury-Opaheke Structure Plan area

qualify these remnants as significant ecological areas, under both the ‘representativeness’ and ‘threat status and rarity’ SEA factors; kahikatea forest has been classified as a critically endangered ecosystem type in the Auckland region. For these reasons, these two forest fragments have also been identified as priority sites for protection and enhancement under the Auckland Council Biodiversity Focus Area ecosystem prioritisation framework.

Several small patches of coastal edge vegetation on Drury Creek just north of the Bremner Road bridge have been collectively identified as SEA_T_530. Most of these small patches are adjacent to currently urban zoned land, however two patches on the eastern edge of

Drury-Opaheke Creek occur in the existing coastal esplanade immediately adjacent to future urban zoned land at 31, 33 and 37 Bremner Road. The section of Drury-Opaheke Creek south of the Bremner Road bridge and north of SH22 has been identified as SEA_T_530b. Similar to SEA_T_530, this SEA_T_530b mostly borders or covers currently urban zoned land, however a small section at its southern end borders and partially covers future urban zoned land at 67 Mercer Street. These areas have been identified as SEA due to the presence of rare and threatened species (both flora and fauna), as well as the fact that they buffer the adjacent marine SEA (for SEA_T_530 only).

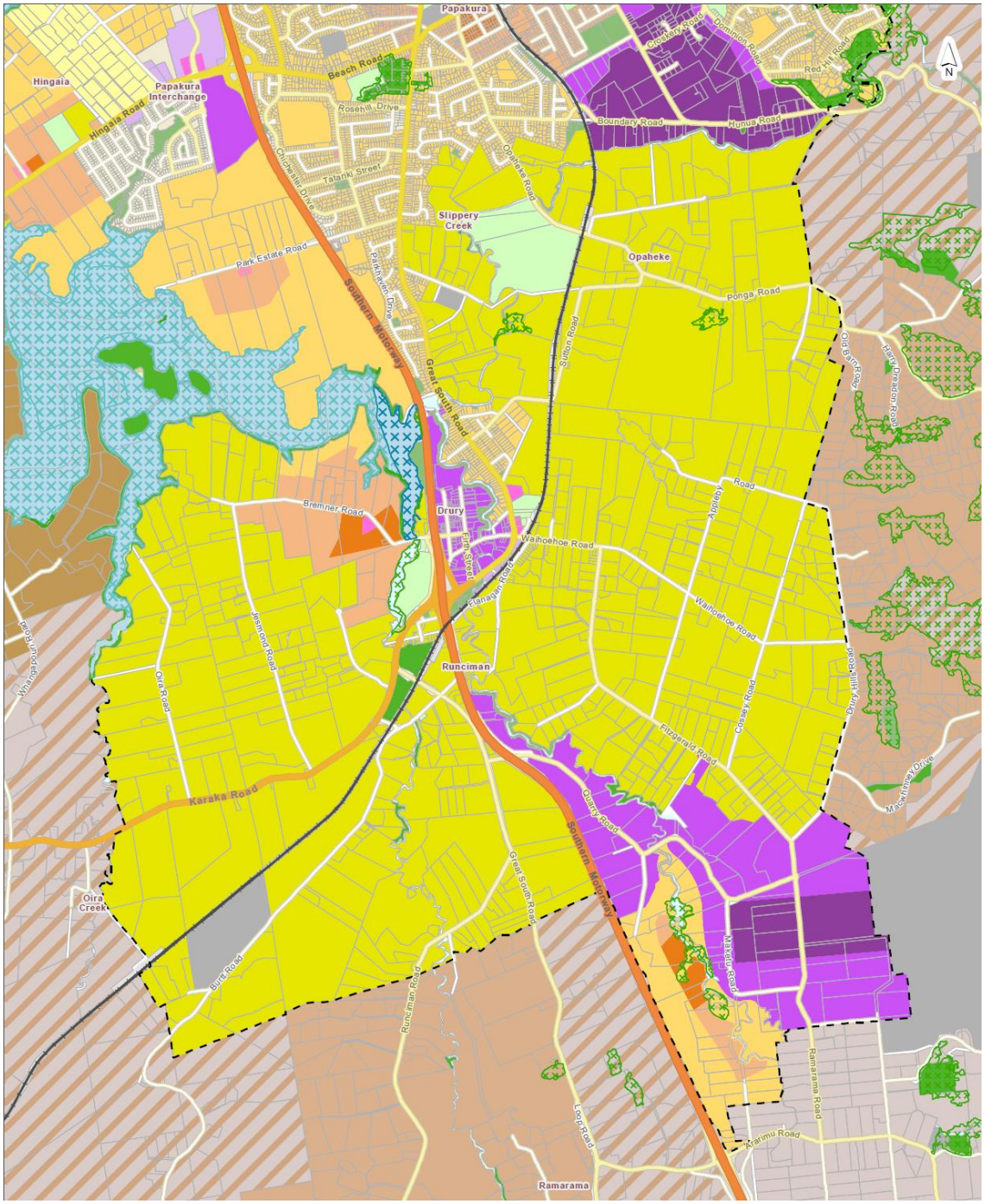

Figure 4: significant ecological areas of the Drury-Opaheke Structure Plan area (green=terrestrial, blue=marine)

3.1.3 Native flora

Although little native vegetation remains, there are records of nationally or regionally threatened plant species occurring in the structure plan area (Table 1), although all occur in relation to the two terrestrial SEAs at the northern end of Ngakoroa Stream (SEA_T_530 and SEA_T_530b). These records are summarised in table 1 below.

Table 1: threatened plant species recorded in the Drury-Opaheke Structure Plan area

Species	National threat status (2012)	Regional threat status (2005)
Native oxtongue (*Picris burbidgeae*)	Nationally endangered	Serious decline
Kaikomako (*Pennantia corymbosa*)	Not threatened	Sparse
Korokio (*Corokia cotoneaster*)	Not threatened	Sparse
Mingimingi (*Coprosma propinqua var. propinqua*)	Not threatened	Regionally vulnerable
Small-leaved kowhai (*Sophora microphylla*)	Not threatened	Sparse

3.1.4 Native birds

Similar to the native flora records above, the only records of nationally or regionally threatened bird species occurring in the structure plan area are associated with the coastal end of Ngakoroa Stream (all records from SEA_T_530b). These records are summarised in table 2 below.

Table 2: threatened bird species recorded in the Drury-Opaheke Structure Plan area

Species	National threat status (2008)	Regional threat status (2015)
Caspian tern (*Sterna caspia*)	Nationally vulnerable	Serious decline
South Island pied oystercatcher (*Haematopus finschi*)	Declining	Sparse

Given the small amount of native vegetation remaining and the highly modified nature of the structure plan area, the landscape provides little in the way of habitat or connective corridors for forest birds or many native terrestrial fauna in general. As such, numbers of common native bird species are likely to be low across the structure plan area, especially forest-dwelling species. Native birds which are common in modified rural landscapes in Auckland, and therefore likely to be common across the Drury-Opaheke structure plan area, include pukeko, Australasian harrier, silvereye, kingfisher, white-faced heron and spur-winged plover. Common native forest birds such as tui, fantail, grey warbler and possibly kereru are likely to be present in those few areas with remnant native vegetation, although the small and isolated nature of these remnant fragments means numbers are likely to be low. None of these species are classified as nationally or regionally rare or threatened.

3.1.5 Native lizards

Due to the lack of native vegetation, it is unlikely that many native tree dwelling geckos are present, and the Council holds no records of geckos in the structure plan area. Similarly, there are no records of native ground dwelling skinks. However, skinks are more adaptable in their habitat use and often inhabit rank grass and weedy areas, which are common in the structure plan area. Areas with debris are also important so that skinks can take refuge from native predators such as kingfishers and introduced predators such as rats. The most common native non-threatened skink is the copper skink and it is likely that at least this species is present in the structure plan area, albeit at low numbers. Suitable habitat for other native skinks is present within the structure plan area, mostly along margins of pasture and watercourses, however surveying for skinks (or geckos) is not considered necessary given the low likelihood of detection at low presence densities.

3.1.6 Native bats

Despite the absence of large tracts of mature bush in the structure plan area, it is possible that native long-tailed bats could be present. Bats roost in cavities in mature trees and in the absence of suitable native trees do use exotic tree species. Long-tailed bat surveys undertaken by Council at nearby Hunua foothills, Totara Park, Clevedon, Mauku, Puni and Patumahoe locations have all detected small numbers of bats, the closest to the structure plan area being only 2.5kms away. No surveys have been carried out within the structure plan area but it is highly likely that bats are present in low numbers. Bats feed on the wing for flying invertebrates and often forage near streams where invertebrate life is more abundant. Long-tailed bats are listed as a ‘nationally vulnerable’ threatened species by the Department of Conservation and so have a high ecological value.

3.2 Freshwater

Freshwater systems within the structure plan area, including both streams and wetlands, are highly modified from their original condition and freshwater ecosystem, habitat and fauna values have all been severely compromised. Stream modifications include channelization and straightening, removal of riparian vegetation, installation of structures such as culverts and dams, and pollution. These changes have resulted in low habitat diversity, low biodiversity and poor water quality. Virtually all freshwater wetlands have been drained, filled or otherwise reclaimed, largely for agricultural purposes. These modifications have resulted in a near complete loss of wetland ecosystem types from the area along with the biota dependent on them. Valuable ecosystem services provided by wetland systems have also been lost.

3.2.1 Streams

The structure plan area is divided between four large catchments, and each of these catchments is drained by a number of watercourses (figure 5). The catchments are named for their most significant watercourse; Slippery Creek, Hingaia Stream, Ngakoroa Stream and Oira Creek. The coastal outflow of all four catchments is into Drury Creek. Slippery Creek, Hingaia Stream and Ngakoroa all join Drury Creek in very close proximity to each other at the far eastern end of Drury Creek, especially Slippery Creek and Hingaia Stream, which meet at virtually the same point on the coast. Oira creek joins Drury Creek further west in a spatially distinct area of Drury Creek from the other three catchments.

In each of these catchments a number of other permanent streams exist, as well as numerous intermittent streams and many more ephemeral streams and overland flow paths. Exact stream classifications and extents are not well known in these catchments and this need to be comprehensively surveyed and mapped before the development of detailed development plans for the structure plan area.

3.2.1 Instream fauna

It is expected that only a low diversity of native freshwater fauna exists within the structure plan area. Due to the degraded nature of the watercourses, species present are likely to consist predominantly of pollution tolerant and common (non-threatened) species. However, records of fish species in the structure plan area do include two nationally or regionally threatened species (table 3). Other non-threatened fish species known from records to occur in structure plan area streams are shortfin eel, common smelt, common bully and Cran’s bully.

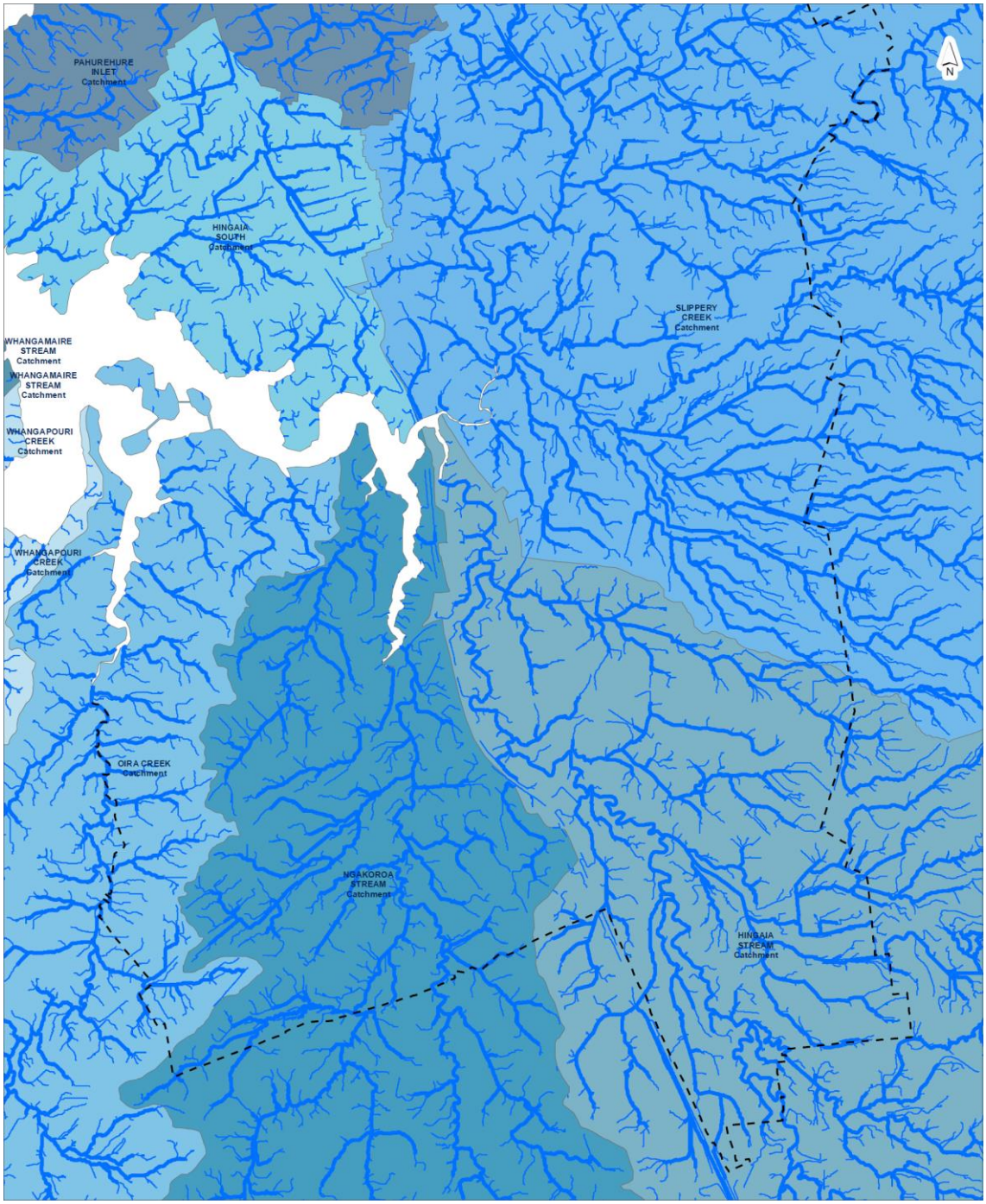

Figure 5: catchments and permanent and intermittent streams of the Drury-Opaheke Structure Plan area (stream classifications and extents approximate only)

Table 3: threatened fish species recorded in the Drury-Opaheke Structure Plan area

Species	National threat status (2013)	Regional threat status (2015)
Inanga (*Galaxia maculatus*)	Declining	Declining
Torrentfish (*Cheimarrichthys fosteri*)	Declining	Regionally vulnerable

The most damaging ‘pollutant’ to instream fauna is usually raised water temperature, which typically occurs due to either point source discharges from online shallow ponds or from increases in stream temperatures due to lack of shading. Removal of riparian vegetation not only removes shading but also the detritus input required to increase stream form heterogeneity and provide refuges for fish species and the aquatic life stages of various freshwater macroinvertebrates.

Channelisation will also have increased watercourse flow and affected depth in some areas, making the habitat unsuitable for smaller species or juveniles. In other areas watercourse flow has likely slowed and when combined with nutrient inputs from surrounding land management practices, has decreased available oxygen levels, increased undesirable aquatic weed growth and become unsuitable for a range of fish species.

The presence of pest fish such as gambusia will also be reducing native fish numbers due to predation and competition for food. Large amounts of aquatic weed species will be contributing to the degradation of fish habitat and water quality (including dissolved oxygen in particular).

Many impediments to fish passage and access to upper catchments are present throughout structure plan area watercourses, including improperly designed, placed or perched culverts and on-line dams and ponds. Impediments to fish passage can severely impact native freshwater fish populations as many native fish species are diadromous and juveniles migrate out to the open sea to grow before returning to their natal catchments for their adult life phase and for breeding. Adult inanga migrate downstream to spawn in vegetation flooded by spring high tides where stream banks are covered by tidal freshwater at the upper limit of saltwater influence. Limitations to inanga spawning in the structure plan area appear to include not only barriers to fish passage but also grazing of low-lying coastal areas and riparian margins and possible water quality issues.

3.2.2 Wetlands

It appears that virtually all original wetlands within the structure plan area have been drained or infilled for other uses. The vast floodplains across large tracts of the structure plan area, and the Slippery Creek catchment in particular, provide an indication of probable location and a sense of the possible scale of these historical wetlands (figure 6). The locations, extent and condition of remaining wetlands in the structure plan area is not well known, and this need to be comprehensively surveyed and mapped as part of the stream survey work before the development of detailed development plans for the area. Those small areas of freshwater wetland which do remain in the structure plan area are likely to be highly modified by stock access (grazing and pugging), drainage or the creation of stock ponds. Consequently, freshwater fauna and terrestrial flora and fauna associated with wetlands is also likely to be all but absent from the structure plan area.

Freshwater wetlands perform a varied and valuable set of ecosystem service functions, including flood water attenuation, sustaining and balancing base flow rates, and filtration and removal of sediment, nutrients and other pollutants reaching watercourses through overland flow. These ecosystem service values are lacking in the structure plan area.

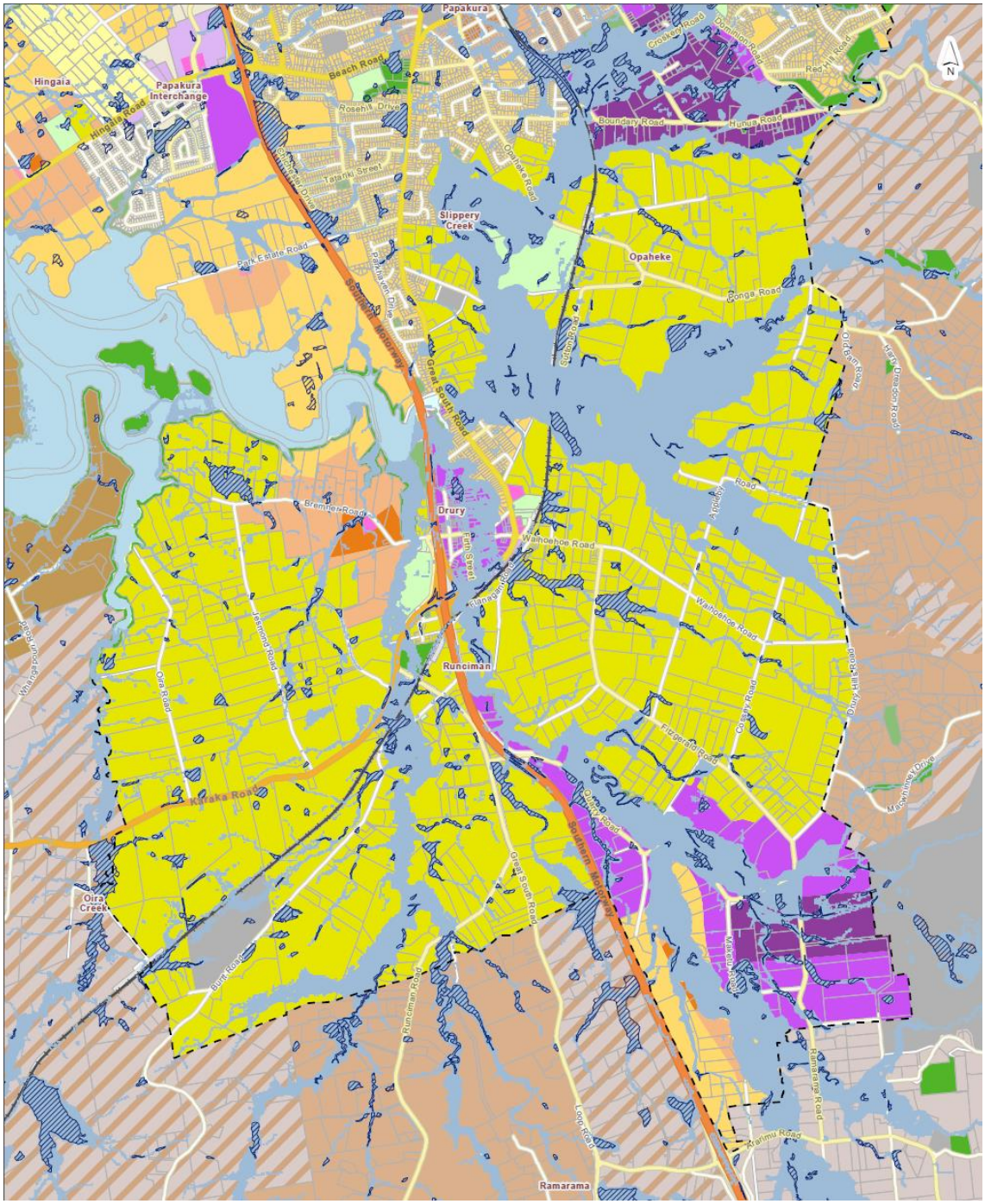

Figure 6: floodplains of the Drury-Opaheke Structure Plan area

3.3 Coastal

While virtually all native vegetation has been removed from the terrestrial coastal edge, the coastal marine area itself remains largely intact and of good ecological health. The marine areas provide high ecological value in terms of supported ecosystems, flora and fauna (including a diverse range of native birds in particular) and the provision of valuable ecosystem services. However, the lack of native vegetation on the terrestrial coastal edge provides limited buffering of the marine area and limits the ecological connectivity and function between the terrestrial and marine ecosystems.

3.3.1 Coastal Ecosystems

The two most common coastal marine vegetation types found across the Auckland region are mangrove forests and saltmarsh. Both of these ecosystem variants are found extensively within the Drury Creek marine area. In terms of marine vegetation, mangrove forest is the dominant ecosystem variant along much of the coastline, found extensively across the shallow estuarine and coastal wetland areas. Saltmarshes form on the edge of estuaries and in areas where there is little wave action, most commonly between the immediate coastal edge and the mangrove forest communities. Mangrove and saltmarsh communities function as nurseries for juvenile fish and provide important breeding and feeding areas for birds, as well as providing valuable ecosystem services. Additionally, large areas of mudflats exist on the intertidal plains beyond the extent of mangrove forest cover. These areas constitute high value feeding grounds for a number of shorebird species.

Originally, coastal forest would have existed right across the terrestrial coastal edge and transitioned to saltmarsh and mangrove forest in the marine tidal inlets of the structure plan area. However, the historic surrounding land uses have resulted in the removal of all coastal forest in the area. As described in section 3.1.1 above, the entirety of the terrestrial coastal edge now consist of various types of exotic dominated vegetation, and for the most part the immediate coastal edge banks are dominated by weedy species.

Sedimentation associated with the historic vegetation clearance and land use change is likely to have also resulted in increases to the extent of mangrove forest within the inlet at the expense of the various saltmarsh communities and previously open areas of mudflats. Notwithstanding any changes in relative cover levels, the mangrove and saltmarsh ecosystems of the Pahurehure Inlet remain largely intact and are of high value for their ecological and ecosystem services attributes.

3.3.2 Marine Significant Ecological Areas

Similar to terrestrial SEAs, marine SEAs have been identified in the AUP in order to protect and enhance existing areas of high ecological value in the marine environment. Background, objectives and policies relating to SEAs are contained in Chapter D9 of the

AUP. There are also objectives and policies in E15. Rules relevant to marine SEAs are found in chapter F (coastal). The high ecological values of the coastal marine area adjacent to the structure plan area have been recognised in the AUP and the entirety of these areas has been classified as various marine SEAs, including marine SEA subtypes M1, M2 and M2w (figure 4). The M1 subtype covers those areas considered to be both highly significant and most vulnerable to any adverse effects of inappropriate subdivision, use and development. The M2 subtype covers similarly significant areas that are considered to be more robust. The M2w subtype describes areas of M2 subtype that are further identified as significant wading bird areas.

For the marine SEAs adjacent to the structure plan area, the diversity of ecosystem types and high value as native bird habitat have been recognised as particularly significant. Almost the entirety of the Drury Creek area, including the entire length of the structure plan areas coastline has been classified as SEA-M2-29a. Schedule 4 of the AUP outlines the values of this SEA as follows:

> This area 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. Healthy and often expanding areas of mangroves grow in the shelter of the Whangamaire Stream, and Drury and Whangapouri Creeks and in the southern half of the Whangapouri Creek are notable eelgrass (Zostera) beds. 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 area, including important area for pied stilt.

A subset of the SEA-M2-29a area found north of the Drury Creek Islands has been additionally classified as SEA-M2-29w1, a classification which highlights the particularly high importance of this area as feeding and roosting habitat for a variety of wading bird species, including in particular pied stilt.

The inner Drury Creek area, immediately north of the Bremner Road bridge has been classified as SEA-M1-29b. Schedule 4 of the AUP outlines the values of this SEA as follows:

> Within the upper tidal reaches of Drury Creek there are 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 same area is a migration pathway between marine and freshwater habitats for a number of different species of native freshwater fishes.

Most of this marine SEA is adjacent to already zoned land, however a small part is adjacent to future urban zoned land at 31-37 Bremner Road, immediately north of the Bremner Road bridge. The M1 subtype covers those areas considered to be both highly significant and most vulnerable to any adverse effects of inappropriate subdivision, use and development.

3.3.3 Native birds

The marine SEAs adjacent to the structure plan area have been classified that way at least in part due to the presence of significant bird species and habitat provision for wading bird species in general. Pied stilt have been specifically highlighted in relation to SEA-M2-29a and SEA-M2-2w1. Additionally, as discussed in relation to terrestrial SEAs in 3.1.4 above, records of the nationally vulnerable Caspian tern and declining South Island pied oystercatcher occur in relation to the coastal transition area adjacent to SEA-M1-29b.

A diverse variety of other native bird species are known to occur in or occasionally make use of other areas of the inner Pahurehure Inlet, including royal spoonbill, paradise shelduck, pied shag, little pied shag, white-faced heron, pukeko, variable oystercatcher, spur-winged plover, red-billed gull, south black backed gull, white fronted tern, sacred kingfisher, banded rail, spotless crake, wrybill, bar-tailed godwit and possibly white heron. Some of these species are nationally or regionally threatened. The quality and variety of habitat types within the coastal areas immediately adjacent to the structure plan area, alongside its closely proximate location within the Pahurehure Inlet, means that most of these species are likely to be present, at least at times, despite a lack of records on Auckland Council databases.

Additionally, a diverse range of marine and terrestrial invertebrates will be supported by these saline ecosystems. It is largely these species which provide the rich food source utilised by the native birds.

3.3.4 Ecosystem services

The transition from land to sea represents a unique and sensitive environment, and provides a very important function in connecting the functionality of both biotic and abiotic natural. Coastal saline ecosystems, such as the mangrove forests and saltmarshes adjacent to the structure plan area, provide valuable ecosystem services which are often overlooked. These include buffering against coastal erosion, retention of sediment and contaminants arriving from the catchment above and carbon sequestration, all in addition to habitat and resource provision for a the wide variety of birds, fish, and marine and terrestrial invertebrates these ecosystems support.

4 Outcomes sought

An increase in the amount of area of native vegetation in the structure plan area is important as the current state is notably sparse and poorly connected, providing a major barrier at the landscape scale for flora, fauna and ecological function.

It is critical to buffer and connect existing forest fragments and also to establish additional areas to provide habitat for native species. Protection and enhancement of watercourses is needed to improve water quality, habitat, and function.

Opportunities exist to increase wetland areas and use riparian and wetland margins for green ecological, recreational and active transport corridors.

Riparian areas provide a key opportunity to increase vegetation cover, connect and buffer existing ecological areas, provide landscape level corridors for the movement of native flora and fauna, and to restore ecological connectivity and function.

The terrestrial coastal edge environment also provides an important opportunity for restoration to buffer the ecologically valuable marine areas, reconnect land and sea ecosystems, and link other ecological areas such as riparian corridors to each other across land.

All areas of open space, streams, coastal edge, forest, street trees, residential gardens, storm water devices and any other area that could potentially support plants and animals in this geography would combine and contribute to what is commonly referred to as a Green Network.

4.1 Terrestrial

As seen from figures 3 and 4, the terrestrial structure plan area is depauperate in terms of mature native vegetation and areas of significant ecological value, especially relative to the Hunua foothills area immediately to the east and the Pahurehure Inlet to the west. As such, it is critical that pressures of development are managed to maintain the values of all remaining areas of native vegetation and ecological value as an absolute baseline and also enable the enhancement and buffering of these areas as much as possible.

The current lack of native vegetation across the structure plan area means there is a lack of habitat value for most native flora and fauna. In order to increase the abundance of native birds, lizards and other fauna, increasing vegetation cover, and by association available habitat and food resources, is the key requirement.

The current lack of native vegetation also means that the structure plan area constitutes a ‘gap’ in ecological connectivity and a barrier to the movement of flora and fauna at the broader landscape scale. The creation of the structure plan and subsequent development

across the structure plan area provides an invaluable ‘one-off’ opportunity for this gap to be bridged with new areas of vegetation. This would re-establish connectivity of ecological function and the movement of flora and fauna between the Pahurehure Inlet at the western edge and the Hunua foothills at the eastern edge of the structure plan area. Across the wider landscape of the Auckland region this would also provide the missing link in coast-to-coast ecological connectivity via the Hunua Ranges and adjacent coastal areas further to the east.

The most significant opportunity to achieve all of these outcomes is the restoration and planting of riparian corridors. Riparian margins constitute an existing (albeit severely degraded) corridor across the landscape and thus can act as spines around which to focus revegetation activity. Existing mechanisms mean that riparian corridors are able to be readily utilised as a basis for revegetation and restoration; the fact that esplanade reserves will be required as vestments to Council provides an excellent starting point for these purposes. However, to maximise increases in both vegetation cover and landscape level ecological connectivity requirements for planting and restoration of riparian corridors should extend beyond where esplanade reserves are required and across all privately held areas as well. Most of the major streams within the structure plan area run in a roughly west-east direction from the Hunua foothills across to the Pahurehure Inlet. As such, riparian margins provide an ideal opportunity to reconnect these areas either side of the structure plan area; an opportunity which can only be properly realised by including provisions for the restoration of these corridors on private as well as public land.

Another key opportunity is promoting the use of road corridors and urban gardens for the planting of additional native vegetation. This would provide further habitat value and green connectivity across the intervening urban matrix which sits between the key corridors of connectivity constituted by the restored riparian areas.

A summary of desired outcomes and possible mechanisms to achieve these outcomes includes:

- retention of all remnant native forest patches, whether identified as an SEA or not
- enhancement of remnant forest patches through buffer planting, creation of green corridors to restore connectivity and pest plant and animal control
- planting of watercourse margins to create a natural green corridor and allow for colonisation and/or movement of flora and fauna across the landscape. Vegetated watercourse margins will also function to filter runoff from surrounding land
    - retaining and encouraging native bird species is very important for continued ecological function and to enable pollination and seed dispersal in existing and future native ecosystems. New vegetated areas will provide suitable habitat for a range of bird species
    - new native vegetation areas should be protected in perpetuity either through covenants or vestment with Council
- all new native plantings should be aligned with the original vegetation types of the relevant locations as these are most suited for local conditions such as soil type and hydrology. All native plants should be eco-sourced from Manukau Ecological District

- retention or creation of areas of rank grass or low growing native vegetation to provide habitat for native skinks, perhaps in alignment with areas to be vested or acquired as open space, e.g. riparian corridors and the coastal edge
- mature tree species should be retained regardless of whether native or exotic to provide bat roosting habitat
- encourage street trees, public amenity plantings and private garden plantings to be made up of a diverse range of native species

4.2 Freshwater

Freshwater systems within the structure plan area have been heavily modified and degraded as a result of the surrounding land use. It is critical that no further loss of streams or wetlands occurs in the structure plan area, and that the pressures of development do not result in further degradation of these freshwater systems. Furthermore, the opportunity provided by the creation of the structure plan and subsequent development across the structure plan area should be utilised to enable the restoration of freshwater ecosystems and habitat, thus increasing both biodiversity values and valuable ecosystem service values.

The revegetation of stream riparian corridors outlined above will not only increase terrestrial ecosystem values but also freshwater ecosystem values. Riparian vegetation acts to filter and reduce the input of sediment, nutrients and contaminants such as heavy metals. It also shades the stream and thereby reduces water temperatures – raised water temperature is perhaps the most significant limiting factor for many native fish and other in-stream fauna. Riparian vegetation also contributes detritus input into the stream, which increases food availability and habitat heterogeneity for in-stream fauna.

Other specific opportunities to increase in-stream values include the removal of structures which act as barriers to fish passage such as inappropriate culverts and online dams and ponds. As well as blocking fish passage, online dams and ponds also contribute to raising water temperatures and the associated negative effects on in-stream fauna.

As important as the removal of existing in-stream structures is the prevention of adding new ones. With the large amount of construction and road building expected to occur across the structure plan area it is important that considerations are made to limit the effects of these activities on in-stream values. In particular, adding further structural barriers to streams should be avoided. This includes minimising the number of new stream crossings, and where new stream crossings are necessary ensuring they appropriately allow fish passage, as well as ensuring they are as perpendicular as possible to the direction of the stream to minimise their impact.

Where possible, restoring more natural sinuosity to previously straightened or channelized streams will also slow stream flow rates, decrease stream depths, and contribute to habitat heterogeneity for in-stream fauna, especially smaller species or juveniles

disproportionately affected by high depths and flow rates. However, these factors may conflict with utilisation of streams for stormwater management purposes.

Modified watercourses, especially in urbanised locations with large impervious surface areas, can suffered from lack of ground water recharge. Maintaining continuity of flow throughout the year is vital to watercourse health and function and the smaller low order streams of the Auckland region rely on groundwater recharge to achieve this. Retaining natural landform and avoiding development within the floodplain in the future will protect remaining watercourses and groundwater levels.

Virtually all natural wetlands in the structure plan area are likely to have been removed. As such, the high value of these areas for both biodiversity and ecosystem service provision is missing from the area. Where possible, re-establishment of wetland ecosystems should be undertaken. The most suitable locations for wetland re-establishment and restoration to occur are the extensive floodplain areas of the structure plan area where large wetlands would historically have occurred and present topography and hydrology lend themselves to restoration of this ecosystem type. Contours in these areas appear to be relatively unmodified so repatriation is likely possible. Importantly, wetland re-establishment and restoration can be aligned with floodplain locations required to be kept free from development for stormwater management purposes to also achieve ecological outcomes in these areas.

Protection and retention of natural flood plains outside of the 1% annual exceedance probability (AEP) of flooding will also contribute to maintaining and improving watercourse form and function, and prevent scouring or erosion of downstream channels. Protection of floodplains is also likely to have cost benefits for adjacent infrastructure. Note that while ensuring development occurs outside the 1% AEP is likely to protect infrastructure in general, this does not allow for natural watercourse and floodplain function and encroachment on floodplains is likely to result in further watercourse degradation.

A summary of desired outcomes and possible mechanisms to achieve these outcomes includes:

- avoid any loss of wetted habitat, enhance and increase wetted habitat as a primary principle
- retain all orders of watercourses i.e. including tributaries whether permanent or intermittent. Protect overland flow paths so that intermittent watercourses remain
- retain natural topography to promote ground water recharge and natural watercourse form
- introduce and integrate wetland and riverine elements into developments and use these spaces as opportunities for providing green corridors and recreational walkways and linkages
- require planting of riparian margins to a minimum width of 10m on both sides of watercourses and wetlands
    - Any recreational or transport areas associated with riparian corridors should occur outside the 10m planted area

    - Removal of exotic riparian species, and replace with native species; noteworthy exotic trees could be retained in incorporated
- keep development footprints outside of the natural flood plain to avoid effects on hydrology
- remove online ponds when subdivision provides opportunity
- seek repatriation of wetlands and modified watercourse channels to their natural state during development
- protect fish spawning areas from modification, provide for suitable enhancement plantings and implement long term pest animal control
- remove barriers to fish passage and ensure infrastructure design allows for long term fish passage, including bridging in preference to culverts wherever feasible
- ensure any watercourses that form part of the structure plan area boundary are protected as per recommendations above
- any works in watercourses to adhere to hygiene protocols to avoid spreading aquatic weed species
- map and delineate watercourses prior to developing any scheme plans or yield calculations to identify constraints and achieve maximum watercourse protection
- restoration of lost wetland areas will increase ecosystem diversity
- stormwater outflows from roads are likely to be contributing to pollutant load so opportunities to improve these during any transport corridor improvements should be taken. New roading infrastructure should be designed to avoid these inputs as much as possible
- encourage roads and/or active transport routes bordering on stream esplanade areas and other planted riparian areas to effectively widen these corridors and provide connection to the public realm
- stream and wetland crossings seek to avoid freshwater habitat loss, whilst ensuring that crossings are, as far as practicably possible, perpendicular to the stream and/or wetland where required

4.3 Coastal

The biodiversity and ecosystem values of the marine SEAs and general coastal marine area adjacent to the structure plan area remain high. It is important that any adverse impacts of development and land use change on these values are considered and avoided or minimised as appropriate, including through avoiding the use of hard surfaces or engineered solutions to stabilise banks or prevent coastal erosion, maximising development setback from the coastal edge as much as possible, and zoning of land in close proximity to the sensitive coastal edge at lower densities.

All existing saline vegetation communities, including mangroves, should be retained in the marine coastal environment for their biodiversity and ecosystem values. Mangroves in particular also help to protect coastal edges and banks from erosion; an important consideration in defending the coastal esplanade and as a consideration against future sea-level rise.

Any large trees that occur in close proximity to the coastal edge should be retained, particularly native but also exotic. These large trees are likely to provide roosting (and potentially nesting) habitat for some bird coastal bird species such as shags and herons. Over the long-term any undesirable exotic trees retained could be progressively removed as native replacements mature.

Restoration and revegetation of the coastal esplanade should be prioritised to further protect these areas from erosion, as well as buffering the marine SEAs and providing ecological linkage between sea and land ecosystems. Furthermore a revegetated coastal esplanade would provide ecological linkage of restored/revegetated stream corridors with each other along the terrestrial coast as well via as the coastal marine area, which will be of major benefit especially for terrestrial obligate flora and fauna species.

A summary of desired outcomes and possible mechanisms to achieve these outcomes includes:

- avoid intentional modification and incidental adverse effects of development on the sensitive marine environment
- retain all existing vegetation in the marine environment, including mangroves
- promote terrestrial coastal margin plantings as a buffer to sensitive coastal habitats, including within existing the esplanade reserve, future coastal open space areas and areas of private ownership
- retain existing large trees on the terrestrial coastal edge, including both native and exotic species
- removal of weedy and other exotic plant species from the terrestrial coastal edge, where necessary including progressive replacement as native replacement plantings mature to avoid causing bank instability and erosion
- location of some future open space at the coastal edge in addition to the esplanade reserve. Grassy open areas in addition to coastal vegetation will provide habitat for native fauna including native skinks and roosting areas for coastal native birds feeding in the marine area
- generally facilitate public access to the coast, while discouraging access to highly sensitive coastal sites of ecological significance to be protected
- predator control to reduce impacts on roosting birds and potential nesting habitat, in conjunction with monitoring of coastal avifauna populations
- avoid the construction of hard structures in the marine environment or coastal edge, instead relying on increased coastal setbacks and vegetative protection against erosion
- encourage roads and/or active transport routes bordering on the coastal esplanade to effectively widen the setback and provide connection to the public realm

5 Relevant policy documents

This section contains excerpts from relevant policy documents at both an Auckland and national level which support the need to achieve the ecological outcomes described in this document. This provides existing mandates that Auckland Council is responsible for delivering and which can be enabled via the structure planning process. Where bold text occurs this has been added for the purposes of this document to emphasise particularly important points or concepts.

The Auckland Unitary Plan became operative (in part) in November 2016 and details new land use policy, rules and zoning for Auckland, along with overlays which identify important natural and historic values and characteristics which must be taken into account when making decisions about land use. Included in the Unitary Plan are provisions to protect and enhance ecological values across the Auckland region. In addition to the Unitary Plan, Auckland Council has other ecological obligations and commitments it is responsible for delivering on, including those found in policy and strategy documents at both the Auckland and national level. These other obligations and commitments can also be incorporated into and enabled via the structure planning process.

5.1 Auckland Council policy documents

5.1.1 Auckland Plan

C1 Auckland's Strategic Framework

A green Auckland

63_ **Our waterways and coastlines are clean and full of life**. Our air is healthy and we have sustainable rates of water consumption, greenhouse gas emissions, and waste production. Many Aucklanders prefer to use public transport, and our energy supply is resilient and sustainably sourced. **Biodiversity is abundant on private land, in our network of parks, and in protected areas of native bush and wetlands**. We have developed new industries in leading-edge, green technology.

…

C3 Transformational shifts to achieve the vision

2. Strongly commit to environmental action and green growth

71_ Our stunning natural environment and our ability to access it relatively easily, is one of the reasons Auckland ranks so highly on international quality of life surveys. But the health of that environment, and its **biodiversity, is deteriorating**. Air pollution, soil degradation, the **poor state of many of our waterways, and declining fish stocks** are some of the

pressing environmental problems we face. **A fundamentally different approach to the way Auckland will grow and develop is required**. **We will protect and restore our environment, and respect its values**. This Plan sets an aspirational target to make a 40% reduction in greenhouse gas emissions (relative to 1990 levels) by 2040. Joining the global shift towards green growth is essential to achieving our environmental and economic goals.

…

Strategic Direction 7 – Acknowledge that nature and people are inseparable

Targets:

Ensure **no loss in the area of significant landscape, natural character and natural features**

Reduce the overall yield of suspended sediment to priority marine receiving environments from 2012 levels by 15% by 2040

Ensure no regional extinctions of indigenous species and a reduction in the number of 'threatened' or 'at risk' species from 2010 levels by 50% by 2040

Environmental Principles:

Auckland's environment must be healthy and resilient in order to support life and lifestyles. To ensure this we must recognise that:

1. The environment supports us - **the natural resources provided by our environment have limits, and must be protected and restored** to ensure our future wellbeing.

2. We need to consider environmental values in all that we do – the interaction between the environment and people is understood and considered in our everyday behaviour and choices.

3. Everything is connected – human activities affect the air, sea, land and freshwater systems. Understanding the connections between environments in the way we manage them is critical.

4. Biodiversity is everywhere – **our flora and fauna, and their habitats, occur on both public and private spaces, and in urban, rural, freshwater and coastal areas**. To maintain biodiversity values we must all work together.

5. Natural hazards can affect our well-being – we need to ensure that Auckland and its people are resilient to the effects of natural hazards.

6. We are environmental stewards – future generations will depend on how well we manage the natural environment.

…

Directive 7.1 – **Acknowledge and account for ecosystem services** when making decisions for Auckland

…

Directive 7.2 – Recognise and promote:

- **the contribution of natural heritage to urban character, quality, amenity and sense of place**
- natural heritage as part of sustainable rural land management
- **opportunities for conservation of natural heritage on public open space and private land.**

439_ **Protecting Auckland's irreplaceable natural areas against poorly located or designed development is essential** to maintaining and improving the quality of the environment. In particular, development should be carefully managed or avoided in significant landscapes as shown in Map 7.3 and **significant ecological areas** as shown in Map 7.4. As Auckland continues to develop, our challenge is to do so in sympathy with the scale and character of existing landscapes. We must manage the increased pressure on ecosystem services to ensure our natural heritage is protected for future generations.

…

Directive 7.3 – Identify significant landscapes, landscape character, natural character and natural features, and appropriately manage these to **protect and enhance** their biophysical and sensory qualities, and associated values.

…

Directive 7.4 – Identify places of high natural heritage value, and where appropriate, **protect, manage and expand public open space areas** so they can be enjoyed by everyone.

442_ Maintaining biodiversity means continuing to **control pest plants, fish and animals**; **managing development on both public and private land**; and **ensuring that this development is located away from ecological areas of high value**.

…

Directive 7.5 – **Protect ecological areas, ecosystems and areas of significant indigenous biodiversity from inappropriate use and development**, and **ensure ecosystems and indigenous biodiversity on public and private land are protected and restored**.

…

Directive 7.10 – **Manage land to support the values of waterbodies** by protecting them where they are high and **reviving them where they are degraded**.

…

Directive 7.12 – **Protect coastal areas**, particularly those with high values – including special natural character, significant marine habitats and recreational importance – from the impacts of use and development, **and enhance degraded areas**.

…

Directive 7.14 – **Take account of environmental constraints** as identified on Map 7.6 and Figure 7.1 **when considering the location and nature of any future development.**

…

Directive 7.15 – **Avoid placing communities and critical infrastructure and lifeline utilities in locations at risk from natural hazards**, unless the risks are manageable and acceptable.

5.1.2 Local Board Plans

Franklin Local Board Plan (2014-2017)

Outcome: Cherished natural environment

Franklin's **forests, open countryside and waterways are healthy**, and local parks are cared for and well used for a variety of leisure activities.

…

As Franklin grows, we will need more outdoor space for everyone to enjoy. In developing a Greenways Plan, we will identify how **local parks, forests, rivers, waterfronts and streams can be linked by walking and cycling tracks** and, in some places, bridleways.

…

To retain our natural environment we need to **ensure animal and plant pests are controlled**. To provide leadership and a good example to private landowners, we will work towards **eliminating pests from council-owned land, including road berms and areas of native bush.**

…

We heard that you want our **waterways, coastlines and harbours to be clean and full of life**, to support the Auckland Plan outcome of a green Auckland. However, **the poor state of many of our waterways and the declining fish numbers are two of the problems we face**. Mangrove growth and non-cultivated oyster beds also continue to be a problem along our coastlines and harbours.

Papakura Local Board Plan (2014-2017)

Outcome: Treasured for its environment and heritage

We value and protect the land of our ancestors and the shores of Pāhurehure. We love our well designed streets and buildings.

…

The Auckland Plan and the Unitary Plan propose lots of population and housing growth that will change the face of Papakura. This **growth must be done in an environmentally sensitive way**, so we do not damage more of our heritage. In recent times, as the population has grown, with new housing and industry, people have lost touch with the land and the **water has become polluted by wastewater and stormwater discharges, both directly into the harbour and into local rivers that run into the harbour**.

…

We will also champion green drainage systems such as **new wetlands**, which provide a **more natural way of dealing with stormwater**. We will continue our work to improve access to beaches and to the foreshore.

5.1.3 Indigenous Biodiversity Strategy (2012)

The State of the Auckland Region report (2010) describes the **increasing pressures that a growing population continues to place on the biodiversity of our natural environment** including new and existing biosecurity risks, the unsustainable use of natural resources, habitat fragmentation, the increasing demand for infrastructure and climate change. In order to effectively argue the threat that these pressures pose on our own survival we need to know what level of indigenous biodiversity we think is enough to meet our statutory obligations and to provide the ecosystem services that will sustain Auckland's inhabitants. The objectives in this document provide this bottom line. **This is what we have decided is essential to achieve in order to fulfil our responsibilities related to indigenous biodiversity**.

…

Biodiversity is everywhere and the Council needs to consider the impact of all its activities and decision making everywhere. This document applies to indigenous biodiversity on both **public and private land, including people's backyards in urban areas, parks and schools, farms, industrial sites, and roadsides**. It includes **aquatic and terrestrial biodiversity from forests, scrubland, streams, wetlands, estuaries to coastal, intertidal, island and marine biodiversity**.

…

We value and want to see:

Healthy and diverse ecosystems of plants and animals

- Auckland's ecosystems are functioning and healthy
- Priority ecosystems and species managed effectively
- Threatened species flourishing in natural habitats
- **Significant sites of indigenous biodiversity protected**
- **Nature connected across Auckland in linkages and sequences**

…

Ecosystem services provided by indigenous biodiversity

- **Ecosystem service values are recognised and incorporated in plans and decision making**
- Policies in our plans that recognise the **resilience that biodiversity provides to ecosystem services and functions** by protecting what we currently have and enabling the uptake of opportunities to better manage and **enhance** our environments
- Biodiversity maintained or **enhanced** to ensure that future environmental changes will not reduce ecosystem services or functions

…

Integrated management producing biodiversity gains

- **Linkages and interactions between biodiversity across terrestrial, freshwater and marine ecosystems are recognised and provided for in planning documents and internal and external programmes**

…

Objective 8: Improve implementation of council statutory responsibilities to support our biodiversity mandate

This means:

- The nature of provisions in council statutory documents, e.g.: the unitary plan, reserve management plan, and the **degree to which these provisions are implemented in line with the strategy**.
- The processing of resource consents and the degree to which they implement this strategy.
- Ensure that consent conditions requiring remediation, mitigation and offsetting actions contribute to achieving the objectives of the Strategy.
- No net loss of ecosystems functions and processes resulting from consented activities

…

Principles

- Manage the region as a **network** of protected habitats (including aquatic, terrestrial and marine) which are **buffered**, and **linked** to other habitats. Ideally these habitats sit in a **matrix of land uses and actions which support the ecological function** of these habitats.

5.1.4 Auckland Growing Greener (2016)

Growing greener means:

- making it possible to live in compact, walkable communities
- changing how we move around, with more public and active transport options
- sustainable use of resources – energy, water and materials

- treating waste as a resource
- **restoring and enhancing natural ecosystems to ensure their resilience and productivity**
- **using natural assets and green infrastructure to manage stormwater and flood risks**
- finding and investing in green business opportunities, including eco-tourism and cultural tourism, green technology, food and beverage production.

…

Greenways could enhance biodiversity by acting as wildlife corridors or restoring ecological functions.

…

Natural habitats in urban areas act as stepping stones and corridors where indigenous species can rest, feed, roost and move across the landscape. They can also provide homes for rare and threatened species that prefer different types of habitat, such as the ornate skink found in Newmarket Park.

…

City parks and open spaces, neighbourhood commons, gardens and streets provide opportunities to bring biodiversity into the city, offering many benefits.

…

Priority initiatives include:

- Tūpuna Maunga o Tāmaki Makaurau Authority's biosecurity project for Auckland's volcanic cones
- ecological connections programme (e.g. North-West Wildlink) linking biodiversity sites across the region
- **supporting bigger and smaller-scale wetland restoration**
- supporting community gardens (e.g. Kai Auckland Initiative) and pā harakeke (flax gardens)
- promotion of sustainable garden practices at Auckland Botanic Gardens
- **continued incorporation of biodiversity outcomes in urban design and transport infrastructure**
- undertaking or promoting community planting
- delivering Education for Sustainability programmes
- providing regional and local board grants to support environmental initiatives
- supporting and encouraging best practice management of biodiversity by private landowners and community groups
- supporting citizen science initiatives where the public collect information on their local environment for use in decision-making.

…

Priority initiatives are to:

- **promote the use of water sensitive design in all developments**
- **improve water quality by reducing stormwater contaminants at source** and local board driven industry pollution prevention programmes
- implement, with community partners, the West Coast Lagoons Action Plan to address the multiple sources of pollutants entering the lagoons from surrounding land
- roll out improved stormwater catchpit maintenance practices which is likely to achieve 75 per cent more sediment being removed
- build the Central Interceptor tunnel between Western Springs and Māngere Wastewater Treatment Plant to reduce wastewater overflows into the Waitematā Harbour and allow for growth
- deliver a water quality monitoring, education and action programme for community groups, individuals, businesses and schools
- support community-based catchment initiatives such as Project Twin Streams, Te Auaunga Awa, and the Whau and Weiti restoration projects
- implement the Auckland Regional Water Demand Management Plan.

…

WSD [water sensitive design] principles include using **green infrastructure** like swales and rain gardens, and **integrating landscape and land use when designing water management**.

…

Walking the talk – ensuring we are thinking and acting green in all we do

Given our scale, we have the opportunity and responsibility to lead the way for Auckland, using environmentally responsible practices. Walking the talk means embedding sustainability goals into internal business practices.

…

Embracing innovation – looking for new ways to grow greener, and new methods to fund improvements

Current approaches will not lead to the environmental outcomes required to create the world's most liveable city. The council will actively pursue innovative ways to **shift the focus from treating symptoms of environmental decline to making changes that directly influence the causes**.

A wider and more open exploration of root causes will encourage innovative ways of planning, design and delivery solutions to tackle the challenges. Willingness to consider new approaches is also an important part of stimulating the production and uptake of sustainable goods and services.

…

Delivering environmental, social and cultural benefits through built infrastructure and development projects

The council is committed to generating multiple outcomes by investing in infrastructure. Integrated asset planning, design and delivery requires **embedding environmental values and benefits into planning and decision-making for all forms of infrastructure**.

This applies where the council or a CCO has direct influence on infrastructure as a purchaser, owner, operator, educator or regulator.

5.1.5 Low Carbon Auckland (2014)

Our **built environment is intermingled with green and open spaces** which are traditionally valued for **conservation** and as places for people to relax, play and interact. These areas also help to improve community resilience to the effects of climate change and resource scarcity − for instance, local food production. They reduce the negative environmental effects of our built environment.

…

In becoming the world's most liveable city, Auckland is a globally competitive, quality, compact city accommodating high population and economic growth while living within nature's limits and embracing sustainability in its neighbourhoods, buildings, green infrastructure and open spaces.

…

As a **city within a forest**, urban Auckland is interwoven within a **network of green and open spaces, urban garden allotments, waterways and coastal areas**. Green infrastructure provides a wide range of benefits including **enhanced biodiversity** and air quality, community and infrastructure services (for instance, improved **stormwater management**), **connectivity** (for example, walking and cycling), moderation of temperature, carbon sequestration (carbon 'sinks' that remove greenhouse gas from the atmosphere), urban food production and overall improved liveability.

…

Aucklanders are proud of their reputation as a city within a forest. The city's lush tree canopy cleans our air and actively sequesters carbon dioxide. **Diverse native vegetation supports healthy biodiversity** with recreation, economic and cultural co-benefits. The trees that make up our urban green spaces and rural forests contribute significantly to the general health and well-being of Aucklanders by providing a respite for people from the 'hard edges' of the city and **habitat for plants and animals**.

…

By 2020

- Significant ecological areas are identified and protected.
- Areas covered by the Ecological Corridors Plan achieve a 50 per cent increase in carbon sequestration (based on 2014 levels).

- **Ecological 'corridors' are integrated into planning.**
- **Ecosystem services are valued.**

…

What we need to do in the next 10 years

Element 1: Growing the extent of urban and regional forests

This involves creating a city within a forest by **protecting existing forests** and **planting trees** throughout Auckland, **primarily natives**, including on **riparian/marginal land**. It also involves **protecting and expanding, where appropriate, saline ecosystems and coastal corridors**.

This commitment includes our regional parks network (for instance, the Waitakere and Hunua Ranges), **private land (including riparian planting, coastal zone), urban planting** and rural forests, whether commercial or non-commercial, native or exotic. Such programmes will contribute to a range of environmental outcomes including:

- carbon sequestration
- building community resilience to the effects of climate change, for example, **riparian vegetation that reduces the effects of flooding and coastal ecosystems that can help protect against sea level rise and storm surges**
- resource scarcity
- **biodiversity protection and improved health of streams**
- **linking up existing remnants of vegetation to create green corridors for native animal life**
- resources that tangata whenua currently struggle to find for cultural practices including arts, healing and food.

Action 1:

Integrate and consider native forestry planning when undertaking **local area plans and structure planning to expand Auckland's ecological corridors**. For example:

- Engage recreation groups to enable integrated design of forest resources and recreational opportunities.
- **Establish tree-based ecological corridors and plans based on existing available land, e.g. transport routes, forest remnants, streamways, coastal zones and land acquisitions.**
- Initiate public engagement programmes to promote and develop understanding of the 'corridors' concept and the benefits derived from Auckland's natural assets.
- **Apply low-impact design to establish ecological corridors through urban and newly developed areas**.
- Develop a planting programme that implements the biodiversity strategy and delivers healthy green corridors.

5.2 National policy documents

5.2.1 National Policy Statement for Freshwater Management (2014)

Objective A1

To safeguard:

a) the life-supporting capacity, **ecosystem processes** and **indigenous species including their associated ecosystems**, of fresh water; and

b) the health of people and communities, at least as affected by secondary contact with fresh water;

in sustainably managing the **use and development of land**, and of discharges of contaminants.

…

Objective A2

The overall quality of fresh water within a region is maintained or **improved** while:

a) protecting the significant values of outstanding freshwater bodies;

b) protecting the significant values of **wetlands**; and

c) **improving the quality of fresh water in water bodies that have been degraded by human activities** to the point of being over-allocated.

…

Objective B4

To protect significant values of **wetlands** and of outstanding freshwater bodies.

…

Objective C1

To improve integrated management of fresh water and the use and development of land in whole catchments, including the **interactions between fresh water, land, associated ecosystems and the coastal environment**.

5.2.2 New Zealand Coastal Policy Statement (2010)

Objective 1

To safeguard the integrity, form, functioning and resilience of the coastal environment and sustain its **ecosystems**, including marine and intertidal areas, estuaries, dunes and land, by:

- maintaining or enhancing natural biological and physical processes in the coastal environment and recognising their dynamic, complex and interdependent nature;
- **protecting representative or significant natural ecosystems and sites of biological importance and maintaining the diversity of New Zealand's indigenous coastal flora and fauna**; and
- maintaining coastal water quality, and **enhancing it where it has deteriorated** from what would otherwise be its natural condition, with significant adverse effects on ecology and habitat, because of discharges associated with human activity.

…

Policy 1 Extent and characteristics of the coastal environment

(1) Recognise that the extent and characteristics of the coastal environment vary from region to region and locality to locality; and the issues that arise may have different effects in different localities.

(2) Recognise that the coastal environment includes:

(a) the coastal marine area;

(b) islands within the coastal marine area;

(c) areas where coastal processes, influences or qualities are significant, including coastal lakes, lagoons, **tidal estuaries, saltmarshes, coastal wetlands, and the margins of these;**

(d) areas at risk from coastal hazards;

(e) **coastal vegetation** and the **habitat of indigenous coastal species including migratory birds**;

(f) elements and features that contribute to the natural character, landscape, visual qualities or amenity values;

(g) items of cultural and historic heritage in the coastal marine area or on the coast;

(h) **inter-related coastal marine and terrestrial systems**, including the intertidal zone; and

(i) physical resources and built facilities, including infrastructure, that have modified the coastal environment.

…

Policy 6 Activities in the coastal environment

(1) In relation to the coastal environment:

(i) **set back development from the coastal marine area and other water bodies**, where practicable and reasonable, to protect the natural character, open space, public access and amenity values of the coastal environment; and

(j) where appropriate, **buffer areas and sites of significant indigenous biological diversity**, or historic heritage value.

…

Policy 14 Restoration of natural character

Promote restoration or rehabilitation of the natural character of the coastal environment, including by:

(a) identifying areas and opportunities for **restoration or rehabilitation**;

(b) **providing policies, rules and other methods directed at restoration or rehabilitation in regional policy statements, and plans**;

(c) where practicable, imposing or reviewing **restoration or rehabilitation conditions on resource consents and designations**, including for the continuation of activities; and recognising that where degraded areas of the coastal environment require restoration or rehabilitation, possible approaches include:

(i) **restoring indigenous habitats and ecosystems, using local genetic stock where practicable**; or

(ii) encouraging natural regeneration of indigenous species, recognising the need for effective weed and animal pest management; or

(iii) creating or enhancing habitat for indigenous species; or

(iv) rehabilitating dunes and other natural coastal features or processes, including saline wetlands and intertidal saltmarsh; or

(v) **restoring and protecting riparian and intertidal margins**; or

(vi) **reducing or eliminating discharges of contaminants**; or

…

Policy 22 Sedimentation

(2) Require that **subdivision, use, or development will not result in a significant increase in sedimentation** in the coastal marine area, or other coastal water.

(4) **Reduce sediment loadings in runoff and in stormwater systems through controls on land use activities.**

…

Policy 23 Discharge of contaminants

(1) In managing discharges to water in the coastal environment, have particular regard to:

(d) **avoid significant adverse effects on ecosystems and habitats** after reasonable mixing;

(4) In managing discharges of stormwater take steps to avoid adverse effects of stormwater discharge to water in the coastal environment, on a catchment by catchment basis, by:

(a) avoiding where practicable and otherwise remedying cross contamination of sewage and stormwater systems;

(b) **reducing contaminant and sediment loadings in stormwater at source, through contaminant treatment and by controls on land use activities**;

(c) promoting **integrated management of catchments and stormwater networks**; and

(d) promoting **design options that reduce flows to stormwater reticulation systems at source**.

…

Policy 25 Subdivision, use, and development in areas of coastal hazard risk

In areas potentially affected by coastal hazards over at least the next 100 years:

(a) avoid increasing the risk of social, environmental and economic harm from coastal hazards;

(b) **avoid redevelopment, or change in land use, that would increase the risk of adverse effects from coastal hazards**;

(c) encourage redevelopment, or change in land use, where that would reduce the risk of adverse effects from coastal hazards, including managed retreat by relocation or removal of existing structures or their abandonment in extreme circumstances, and designing for relocatability or recoverability from hazard events;

(d) **encourage the location of infrastructure away from areas of hazard risk where practicable**;

(e) **discourage hard protection structures and promote the use of alternatives to them, including natural defences**; and

(f) consider the potential effects of tsunami and how to avoid or mitigate them.

…

Policy 26 Natural defences against coastal hazards

(1) Provide where appropriate for the **protection, restoration or enhancement of natural defences** that protect coastal land uses, or sites of significant biodiversity, cultural or historic heritage or geological value, from coastal hazards.

(2) Recognise that such natural defences include beaches, estuaries, **wetlands**, intertidal areas, **coastal vegetation**, dunes and barrier islands.

5.2.3 New Zealand Biodiversity Strategy (2000)

THEME 1: Biodiversity on Land

Scope

New Zealand's terrestrial ecosystems (**including natural and modified habitats** within and outside of protected areas, rural production landscapes and **urban environments**) and the indigenous species inhabiting these areas.

Desired outcome for 2020

A net gain has been made in the **extent and condition** of natural habitats and ecosystems important for indigenous biodiversity. Scarce and fragmented habitats (such as **lowland forests and grasslands, wetlands** and dunelands) have **increased in area and are in better ecological health** due **to improved connections** and the sustainable management of surrounding areas. Some **modified habitats are restored**.

A more representative range of natural habitats and ecosystems is secure in public ownership, complemented by an increase in privately owned and managed protected natural areas. Increased and more effective pest management, coupled with species recovery, has restored ecological processes in these areas. No new pest species have become established.

No further human-induced extinctions have occurred. Populations of all indigenous species and subspecies are sustained in natural or semi-natural habitats, and their genetic diversity is maintained. Fewer threatened species require active recovery programmes and ex situ management.

Threats to indigenous biodiversity from the activities of people are avoided or mitigated through sustainable use regimes and the sustainable management of production landscapes and **urban areas**.

…

THEME 2: Freshwater Biodiversity

Scope

All freshwater ecosystems (such as **streams**, lakes, **wetlands**, geothermal systems and underground aquifers) and the freshwater species within them. These waterbodies and ecosystems are **interconnected with both land and estuarine and coastal ecosystems**.

Desired outcome for 2020

The extent and condition of remaining natural freshwater ecosystems and habitats are maintained. Some **degraded or scarce habitats, such as lowland river systems, important wetlands and riparian areas, are restored or increased in area**. Intact natural freshwater areas are protected and their natural character is maintained.

Human activities in catchments are managed in an integrated way, avoiding, remedying or mitigating the adverse effects of land and water use (including pollution and sedimentation) on freshwater ecosystems. **All freshwater ecosystems support biological communities largely comprising indigenous species**. **Plant and animal pests are managed** to prevent further spread, and eradicated where necessary, to protect threatened indigenous ecosystems and species. Introduced fish (including sports fish such as trout and bio-control species such as grass carp) and introduced game (such as ducks) are managed so that they do not pose threats to indigenous species of plants or animals.

There have been no further human-induced extinctions of indigenous freshwater species. Threatened species are on their way to recovery within their natural habitat, or in temporary ex situ facilities where necessary. The harvest of indigenous and introduced freshwater species is sustainable and does not pose a threat to freshwater biodiversity.

Land managers and communities continue to be actively involved in protecting and restoring freshwater bodies and habitats of special value to them.

…

THEME 3: Coastal and Marine Biodiversity

Scope

Coastal and marine environments including **estuaries,** inshore coastal and offshore areas within New Zealand's territory and other jurisdiction (including the Exclusive Economic Zone) and the resident and migratory marine species (plants, benthic organisms, fish, marine mammals, birds and other organisms) inhabiting these areas.

Desired outcome for 2020

New Zealand's natural marine habitats and ecosystems are **maintained in a healthy functioning state**. Degraded marine habitats are recovering. A full range of marine habitats and ecosystems representative of New Zealand's indigenous marine biodiversity is protected.

No human-induced extinctions of marine species within New Zealand's marine environment have occurred. Rare or threatened marine species are adequately protected from harvesting and other human threats, enabling them to recover.

Marine biodiversity is appreciated, and any harvesting or marine development is done in an informed, controlled and ecologically sustainable manner26.

No new undesirable introduced species are established, and threats to indigenous biodiversity from established exotic organisms are being reduced and controlled.

5.2.4 National Policy Statement for Indigenous Biodiversity (proposed)

POLICY 6

To promote the maintenance of biodiversity **outside** of identified areas of significant indigenous vegetation and significant habitats of indigenous fauna, and to support the **resilience and viability of populations and species assemblages** within identified areas and habitats, decision-makers should:

a. recognise the contribution that **all remaining areas** of indigenous vegetation make to the maintenance of indigenous biodiversity and encourage the retention of as many elements as possible
b. recognise the full range of potential adverse effects on indigenous biodiversity including, but not limited to, **population fragmentation, degradation of non-living**

components (eg, water and soil), interruption to breeding cycles and migratory pathways, and increased exposure to invasive introduced plant and animal species that pose a threat to indigenous biodiversity.

c. encourage the **retention of existing vegetation**, whether indigenous or not (but not including recognised pest plants), that provides:
    i. habitat for indigenous species
    ii. seasonal food sources for indigenous species
    iii. **ecological linkage between areas and habitats** identified in accordance with Policy 4
    iv. **a buffer to indigenous vegetation for areas and habitats** identified in accordance with Policy 4 *[these areas effectively equate to SEAs in the context of the Auckland Unitary Plan]*
d. when the retention of existing vegetation and habitat will not achieve sustainable management, encourage measures that mitigate and offset adverse effects on indigenous species during, and subsequent to, removal or modification of that vegetation or habitat through harvest or clearance or other activity that may threaten the survival of affected species populations
e. **encourage the planting of naturally occurring, locally sourced indigenous species and the creation of habitats for indigenous species as well as plant and animal pest control**
f. **encourage the establishment of additional indigenous riparian vegetation as a means of increasing connectivity and enhancing freshwater habitat for indigenous species**
g. **ensure human-made structures do not adversely impact on indigenous species by interfering with their natural migratory movements**
h. consider both **regulatory incentives (such as bonus development rights in exchange for protection and enhancement of vegetation and habitats)** and non regulatory incentives, (such as technical advice and practical help) to **support and encourage landowners to make appropriate land management decisions.**

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