Te Kaunihera o Te Tairāwhiti
GISBORNE
DISTRICT COUNCIL

# STATE OF OUR ENVIRONMENT 2020

## TE ĀHUATANGA O TE TAIAO

Te Kaunihera o Te Tairāwhiti
GISBORNE
DISTRICT COUNCIL

# Council's responsibilities

Gisborne District Council has a responsibility for ensuring economic prosperity throughout Tairāwhiti while providing a healthy environment for current and future generations.

There are environmental legislative requirements that Council must adhere to, primarily the Resource Management Act 1991 (RMA) and the RMA's national policy statements. The RMA requires Council to monitor and report on Tairāwhiti's environmental conditions. For up-to-date monitoring results, please visit **www.lawa.org.nz**.

The information contained within this report will help Council identify areas that need further investigation or action to meet environmental requirements. Scientific investigations and proposed actions will be detailed in Council's Long Term Plan. For more information on the Long Term Plan, please visit **www.gdc.govt.nz.**

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*Cover: Mel Ma'afu*

# State of our environment report

The five sections of this report will take you on a journey through Tairāwhiti's environment. Loosely following the principle of "maunga ki te moana" or mountains to the sea, each section includes environmental data, scientific analysis and case studies of community initiatives.

***Our land and soil*** shows the varied land types and uses in our region. Included in this section are the results of an annual summer crop survey which highlights the variety of crops grown in Tairāwhiti.

***Our biodiversity and biosecurity*** discusses the challenge of protecting and enhancing our natural environment. The section includes several case studies which show the great efforts made to improve our native flora and fauna.

A good supply of clean water is vital for many industries to function and wildlife to survive. ***Our freshwater*** provides a series of graphs showing the health of our rivers and streams.

***Our coast and estuaries*** takes you through our diverse coastline and in this section you can find out whether the water quality at your local beaches is clean enough for swimming.

Finally, ***Our air, climate and waste*** includes the region's carbon emissions and how much waste is recycled in Tairāwhiti.

We hope you enjoy reading the report and find it useful. We want to ensure this report is helpful to our region's residents and businesses and welcome any feedback. Please email **service@gdc.govt.nz**.

# Our region

## Did you know....

- Tairāwhiti covers a total land area of 8,386km$^2$
- The highest point in the region is the 1,752m maunga Hikurangi
- Gisborne has New Zealand's shortest river, the 1,200m Turanganui River
- Gisborne is the first city in the world to see the sun
- The largest pohutukawa tree in the world is in our region at Te Araroa.

# Our environment

Our environment provides income to our region, a place for our community to carry out recreation and somewhere for our people and wildlife to live and thrive. A healthy environment is vital for our native plants, birds and animals to flourish.

Tairāwhiti's environment is important culturally. Our people have a spiritual connection to the environment particularly through our kaitiakitanga (guardianship and protection) of our environment.

We have a mixture of land types and uses, from hilly land to native bush, forests to fertile pasture (such as the Poverty Bay Flats) and over 700km of coastline.

Some of the key industries for our region include horticulture, agriculture, fishing and forestry. The different land uses puts pressure on our environment, for example through the extraction of water from our aquifers or the loss of biodiversity through the clearance of native bush.

Tourism provides valuable income and an opportunity to showcase our beautiful region. Destinations such as Rere Falls, our region's vineyards, Tolaga Bay Wharf and beaches all depend on our environment.

# Our people

Tairāwhiti has a population of around 48,000 with the majority living in the city of Gisborne (around 37,000). Other larger settlements include Ruatōria (860), Tolaga Bay (860), Te Karaka (550) and Tokomaru Bay (420).

Our region contains a range of ethnicities with 58% of the population identifying as New Zealand European and 53% of the population identifying as Māori.

From the southern boundary of our region, the iwi of Tairāwhiti are:

- Ngāti Porou
- Ngāi Tāmanuhiri
- Rongowhakaata
- Te Aitanga-a-Māhaki

# OUR LAND & SOIL

## TŌ TĀTAU WHENUA, ONE HOKI

## HIGHLIGHTS

Tairāwhiti has varied land types with 71% of the region classified as steep hill country. Our gentle rolling land is very fertile - the Poverty Bay Flats is the single largest area of high-quality fertile soils in New Zealand.

Maize and sweetcorn are the most abundant crop types, making up 42% of crops recorded in the region.

On the Poverty Bay Flats there has been a 110% increase in irrigated high-value crops such as apples, kiwifruit and persimmons over the last ten years.

There has been an increase in commercial vegetables grown in winter. In 2019, there were 320ha of these vegetables (mainly lettuce, cabbage, cauliflower and broccoli).

Our region is susceptible to erosion due to our geology, heavy rainfall and previous removal of forest cover. Council is working with landowners to protect our most vulnerable land. 42,946ha (86%) of our land requiring treatment for erosion (Land Overlay 3A) now has effective tree cover, with a further 7,223ha (14%) still requiring action – 3,207ha of this is in the Waiapu catchment.

Forestry is important economically to Tairāwhiti. In 2018 the total harvest was 10,707ha. This included 9,451ha consented for harvest and 1,177ha as a permitted activity. 2018 was the first year that harvest was allocated as a permitted activity under the National Environmental Standard for Forestry.

A huge landslide in February 2018 formed a new lake – the largest in our district – on the Mangapoike River.

A new mud volcano erupted in the Waimata Valley in December 2018 covering an area of 2.1ha.

# OUR LAND

Gisborne is a region with a young geology, located on an actively rising fold of the earth's crust, the crest of which is the bush-covered Raukumara Range. The high rate of uplift (4mm a year), tectonic crushing, soft rocks, frequency of heavy rainfall and removal of much of the original forest cover means Gisborne has significant erosion problems. Twenty-five per cent of the North Island's most severely eroding land is found in Gisborne. This presents a big challenge for sustainable land use.

A positive result of the erosion is that our flat and gently rolling land – 71,000ha – is incredibly fertile. In fact, the Poverty Bay Flats are the single largest area of high-quality fertile soils in New Zealand. Other fertile flats can be found at Tolaga Bay, Takamore and Tikitiki. The combination of fertile soil and climate means horticulture and cropping are more economically attractive land uses than dairy farming.

Steep hill country makes up 596,000ha (71%) of the district, the heartland of mixed sheep and beef farming and 20% of the district's forestry.

### Two sides of erosion

25% of the North Island's most severely eroding land is found here, yet the Poverty Bay Flats is the single largest area of high-quality fertile soils in New Zealand.

# CROPPING

## Horticulture trends on the Poverty Bay Flats

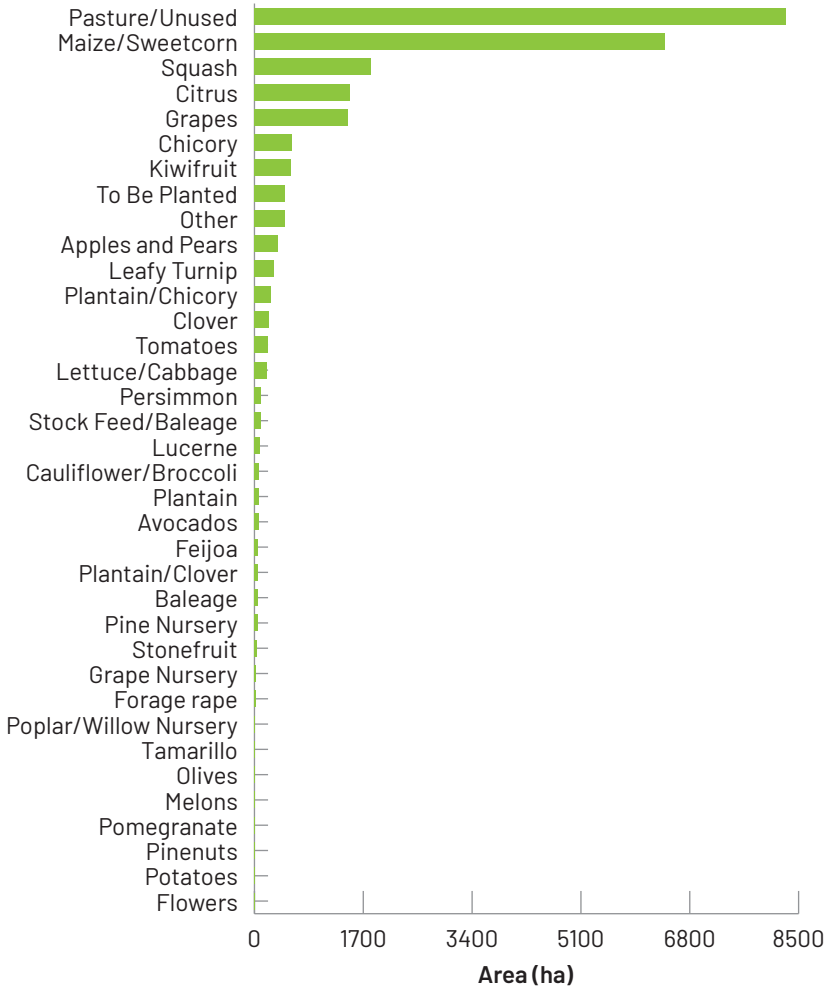
As the single largest area of horticultural land in our region, with approximately 10,200ha out of a possible 18,000ha cropped, Council has been monitoring the highly diverse crop trends on the Poverty Bay Flats since summer 2007-08. Over this period there have been significant changes to crop types. There has been a steady increase in the number of crops requiring irrigation such as modern apples, kiwifruit and persimmons. These "high-value" crops are displacing lower value crops which do not require irrigation, such as grapes and older apple varieties. Overall there has been a 110% increase in high-value permanent crops over the last ten years.

### Maize and sweetcorn

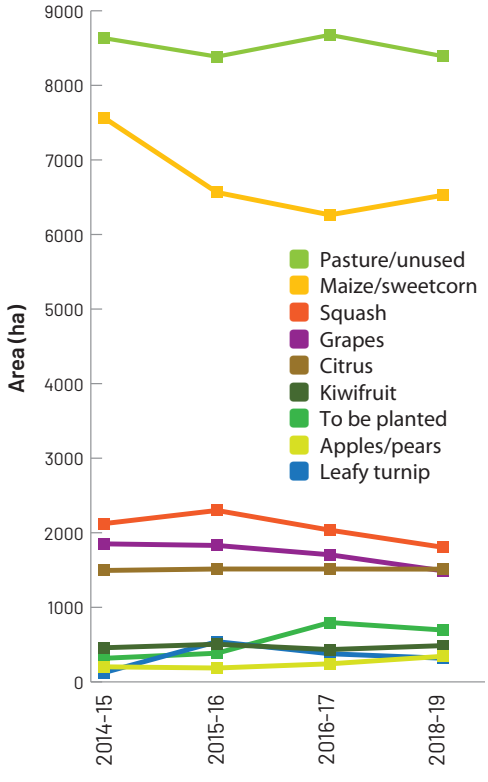
Maize and sweetcorn were the most abundant crop types in the Gisborne region. Maize and sweetcorn account for 42% of all crops recorded in the Gisborne region (excluding pasture and tilled land), covering 6,408ha. Maize and sweetcorn were grouped together for analysis as they were difficult to identify separately in some instances and have similar impacts on the environment and water use.

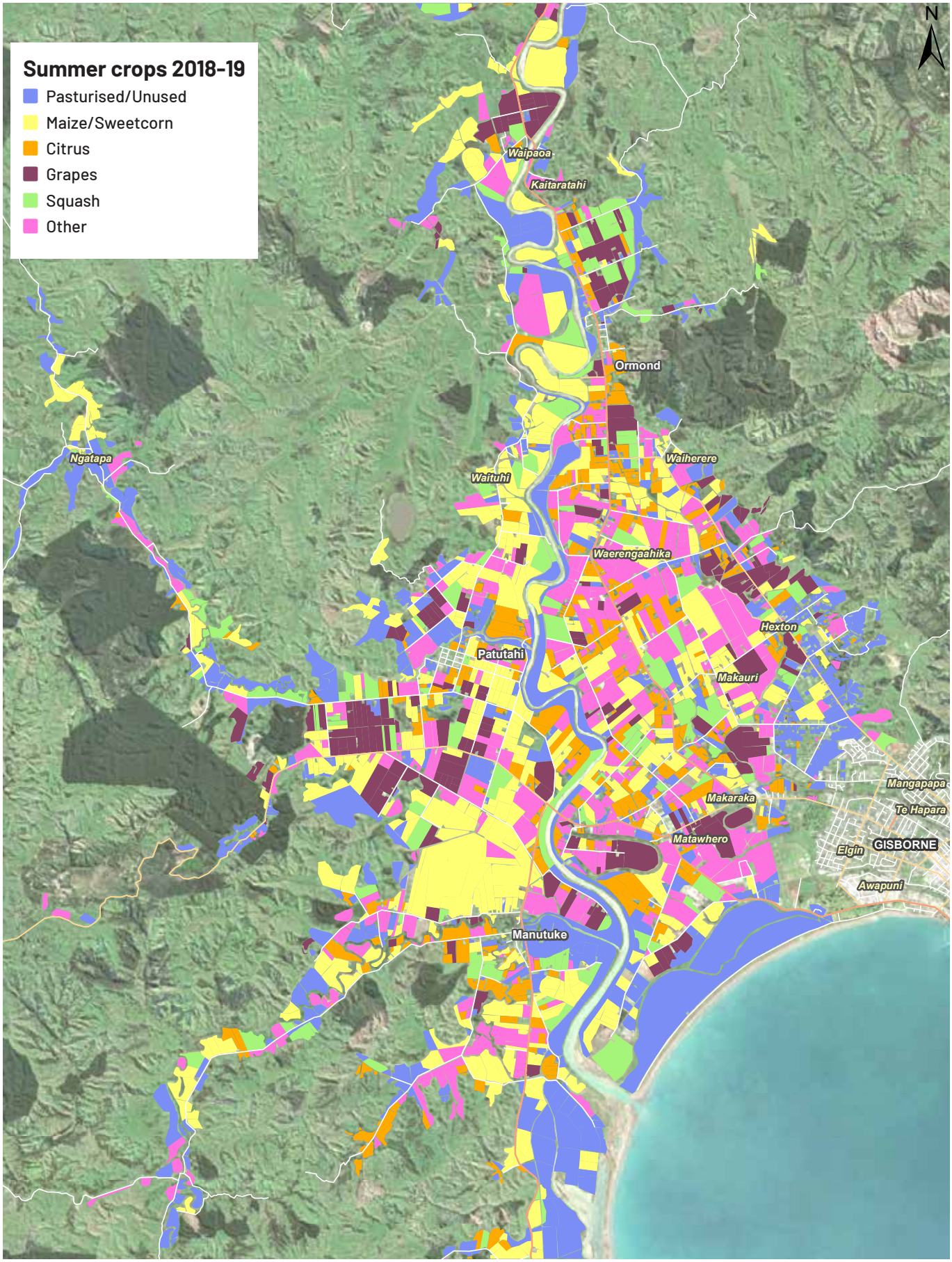
Overall, maize and sweetcorn is decreasing, with a major drop from 2015 to 2016. The trend appears to be plateauing at around approximately 6,400ha. This could be attributed to a large proportion of crop land transitioning to citrus and kiwifruit orchards and also leafy greens such as lettuce, cabbage, cauliflower and broccoli, particularly around the Poverty Bay Flats.

**Total area (ha) of crop types identified in the 2018/19 Summer Crop Survey**




**Five year trend of the major crops in the Gisborne region (2014/15 – 2018/19)**




Summer crops 2018-19
Pasturised/Unused
Maize/Sweetcorn
Citrus
Grapes
Squash
Other
N
Waipaoa
Kaitaratahi
Ormond
Ngatapa
Waituhi
Waiherere
Waerengaahika
Hexton
Patutahi
Makauri
Mangapapa
Makaraka
Te Hapara
Matawhero
Elgin
GISBORNE
Awapuni
Manutuke

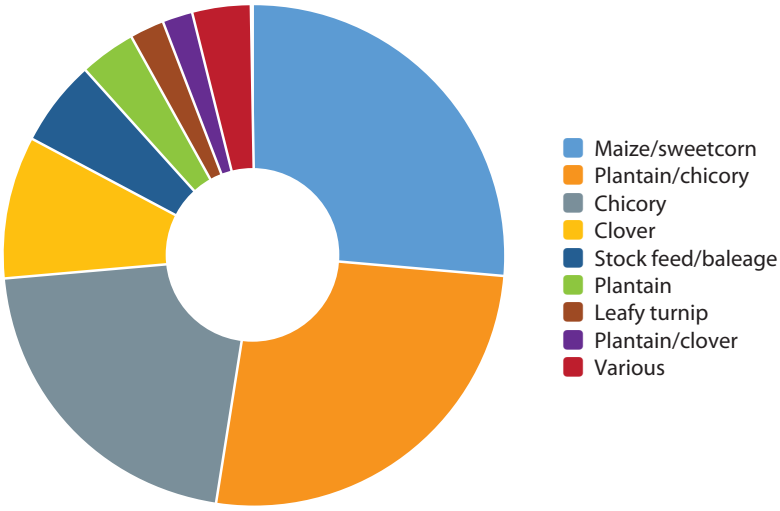
# Summer crops

Over the last four years there has been a decline in the area planted – with crops in Tolaga Bay, Tokomaru Bay, Ruatoria and East Cape. Generally there has been an increase in crops for animal feed, partly offsetting a decrease in maize plantings which may have been trucked out of the district.

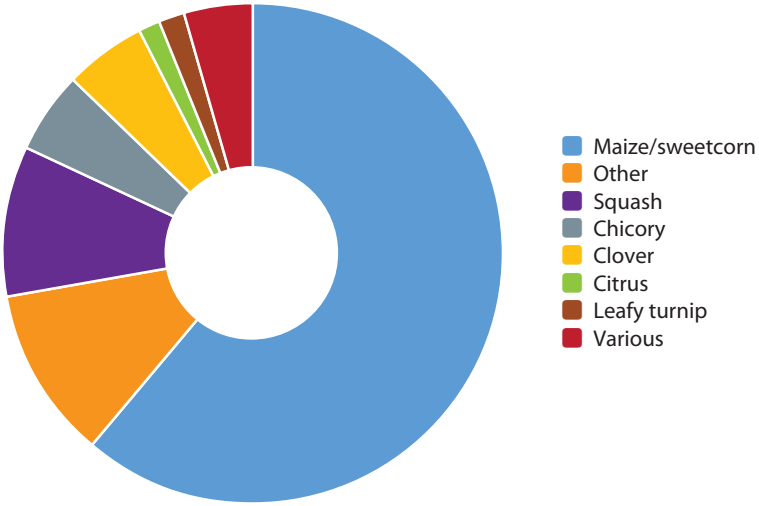
The most abundant crop in the East Cape and Ruatoria areas is maize and sweetcorn with 228ha, closely followed by plaintain/ chicory mix with 222ha. Chicory is the third most abundant crop with 182ha. The remaining crops — including baleage, citrus, clover, fodder beet, leafy turnip, lucerne, olives, plantain, plantain/cover, poplar/willow nurseries, other, and stock feed/baleage — were found in much lower quantities.

The major crop type found in the Tolaga and Tokomaru areas was maize and sweetcorn with a total area of 1,224ha.

**Crop types in the East Cape/ Ruatoria area (ha)**




**Crop types recorded in the East/Tolaga/Tokomaru area (ha)**




# Winter crops

The 2019 Winter Crop Survey is the fifth consecutive survey to be conducted in the Gisborne region. The crop survey identifies the type, location and total area of different winter crops. In previous years the survey was conducted over the Gisborne region, and in 2019 there was a specific focus on the Taruheru catchment in response to the growing land use intensification in this area.

The 2019 Winter Crop Survey outlines how the land use trends within the Poverty Bay Flats may influence water quality in the Taruheru River. A total of 1,202ha within the Taruheru catchment was surveyed, with the total winter crops recorded covering 447ha (excluding maize stubble, tilled land and pasture). The main crop types included lettuce/cabbage, cauliflower/broccoli, unidentified, clover, kale and other.

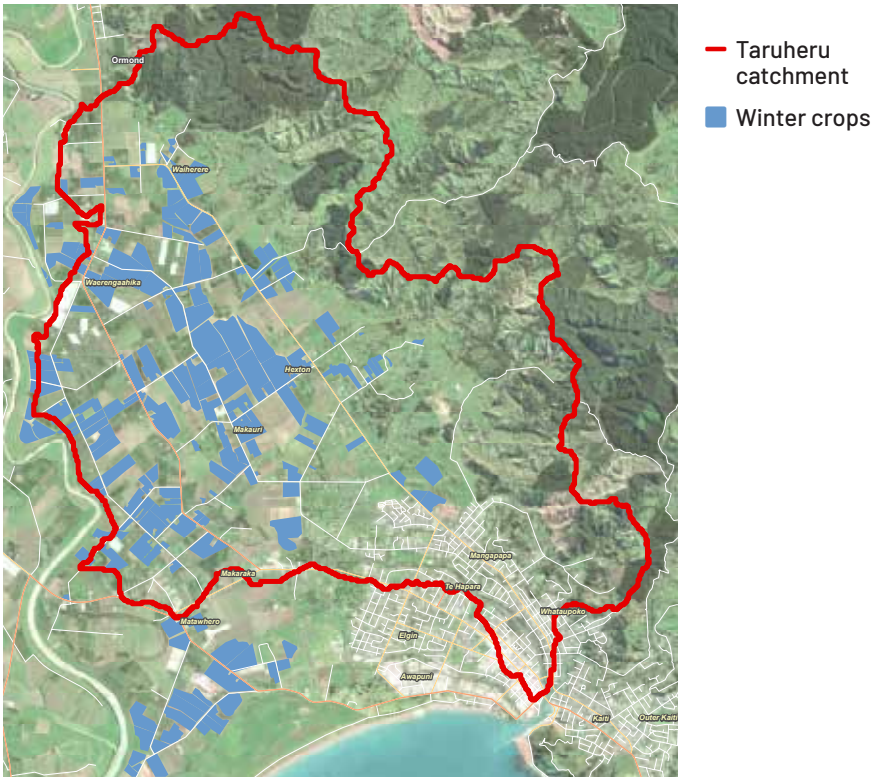
The Taruheru catchment area surveyed in 2019 (1,201.9ha) was smaller than 2018 (1,286.5ha) but more than 2017 (751.2ha) and 2016 (733.8ha). The decrease from 2018 is due to more areas being converted to high-value permanent horticulture, for example kiwifruit, which are excluded from the Winter Crop Survey. The increase from 2017 reflects the horticultural intensification of the wider Poverty Bay Flats area.

The area of winter crops excluding pasture, tilled land and maize stalk was 304ha. The total area surveyed and recorded was 1,201ha. The areas of pasture (328ha), tilled land (469ha) and maize stalk (99ha) were excluded to calculate the total area of winter crops. Pasture is not cropped for winter fodder and was therefore excluded from the total number of winter crops surveyed.

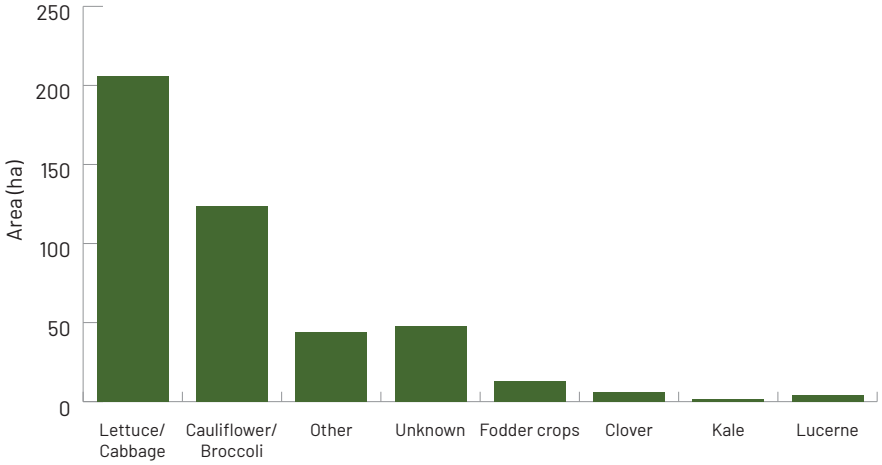
On the Poverty Bay Flats there is an increasing trend in the production of commercial winter vegetables with 311.9ha planted in winter 2018. The winter vegetables are lettuce, cabbage, cauliflower and broccoli.

Winter cropping is also undertaken as feed to support sheep and beef farms. Because of the amount of land disturbance and potential impacts on the environment, there are rules in our Tairāwhiti Resource Management Plan

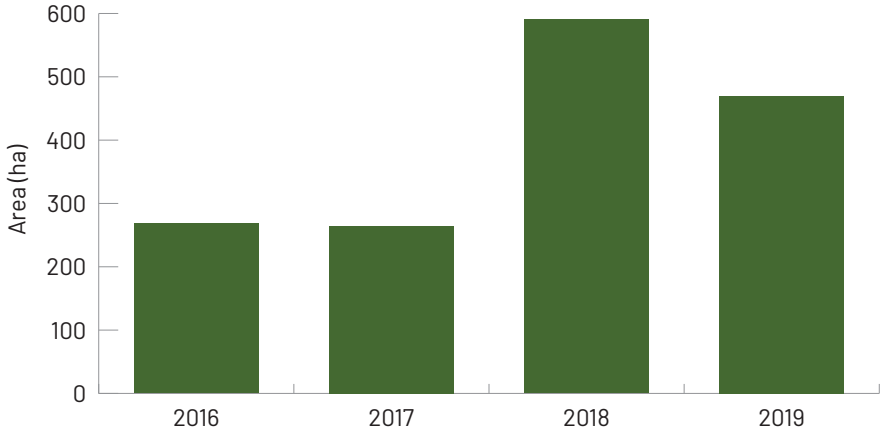
**Winter crops within the Poverty Bay Flats (Taruheru catchment)**




**2019 winter crops (excluding pasture, tilled and maize stubble)**



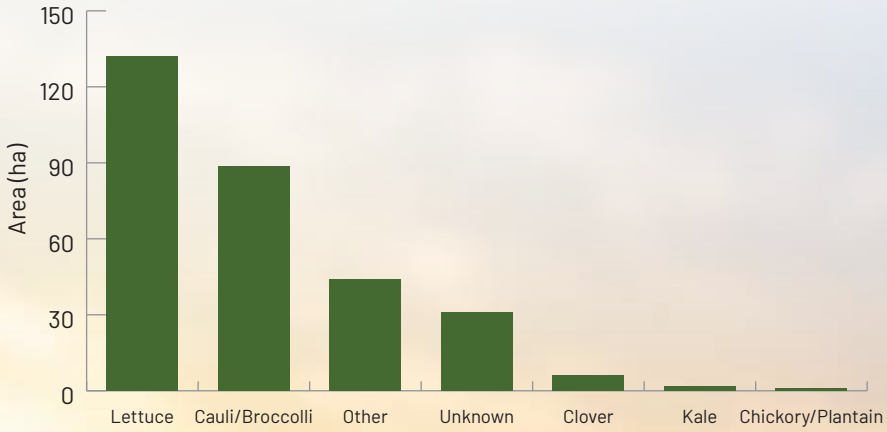

**Winter tilled land trends in the Taruheru catchment (2016-19)**



about how close to streams cropping can be undertaken.

Trends in winter cropping for fodder crops show, after a peak of 2,120ha in winter 2015, there has been a reducing area of winter crops to 1,678ha in winter 2018. However, this reflects only part of the story as hill country areas have not been included in past surveys and fodder crops are known to be increasing in the hill country.

**Winter crops within the Taruheru catchment (excluding pasture, tilled and maize stubble)**




*"Other" covers a wide range of different crops including spinach, beetroot, pumpkin/squash and also market gardens*

# LIVESTOCK

Livestock trends show that stock numbers have fluctuated over the last five years. These trends generally reflect the quality of growing season and market conditions. However, there is a longer term trend of reduction in sheep numbers due to retirement of land from pastoral farming. The number of dairy cattle has decreased since 2012. A percentage of Gisborne's dairy cattle are being grazed not milked, as cattle from the Bay of Plenty and Hawke's Bay are wintered in Gisborne.

| Livestock numbers at June each year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| Total sheep | 1,602,000 | 1,472,000 | 1,515,000 | 1,412,000 | 1,457,000 |
| Total beef | 277,000 | 245,000 | 247,000 | 261,000 | 277,000 |
| Total deer | 18,000 | 13,000 | 8,000 | 12,000 | - |
| Total dairy cows | 15,000 | 10,000 | 12,000 | 9,000 | - |

*New Zealand Agricultural Production Statistics*

*Sheep muster east of Matawai*

# EROSION

The Gisborne district is well known for its soft rock soil erosion – on a scale and severity greater than any other part of New Zealand. Our natural erosion susceptibility has been aggravated by deforestation as native forests were cleared for pastoral farming over the 19th and early 20th centuries.

Efforts to re-establish vulnerable hill country areas in trees began in the 1950s and came together as the East Coast Project in 1970. That project set about planting exotic forests in the back country, small woodlots and strategically placed trees in the pastoral forelands. Later this was changed to better match land use to land use capability.

These schemes have seen erosion protection plantings such as poplars and willows, the planting of forestry, native reversion and most recently manuka plantations for honey production.

Cyclone Bola in 1988 was a key event and a "step change" in the erosion problems in our district. The worst eroding or erosion-prone land (Land Overlay 3A) must be treated with effective tree cover or fenced for reversion by 2021, according to the Gisborne District Council Tairāwhiti Resource Management Plan. Funding from the Ministry for Primary Industries through the Erosion Control Funding Project (ECFP Land Treatments) has been available to assist landowners in the implementation of works plans which detail planting and are prepared in conjunction with Council.

*Severe erosion at Waerenga-o-Kuri reserve*

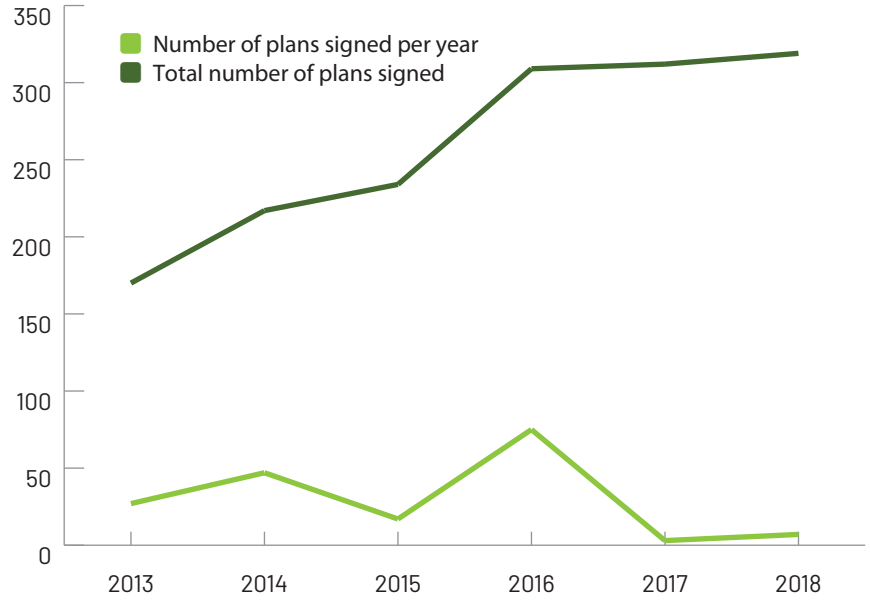
# The Sustainable Hill Country Project

Works plans were required to have been submitted by 2011 and treatment works are to be completed by 2021. While the deadline for completion of works plans has now passed, with a number of properties still yet to complete their plans, substantial progress has been made particularly in securing funds while they were available and progressing planting and reversion works.

**Progress of Overlay 3A works plans development 2013-18**

| Year ending 31 Dec | No. plans signed/year | 03A area (ha) signed off/year | Total no. of plans signed | Total 03A area (ha) covered by plans |
|---|---|---|---|---|
| 2013 | 27 | 1,214 | 170 | 17,339 |
| 2014 | 47 | 6,388 | 217 | 23,727 |
| 2015 | 17 | 4,161 | 234 | 27,888 |
| 2016 | 75 | 6,548 | 309 | 34,436 |
| 2017 | 3 | 581 | 312 | 35,017 |
| 2018 | 7 | 761 | 319 | 35,778 |

**Progress in Overlay 3A works plans**




**Area (ha) with Overlay 3A works plans**


## What exactly is Land Overlay 3A?

Land Overlay 3A is a subset of Land Overlay 3 and is the worst eroding land in our district. It consists of land identified on the Tairāwhiti Plan Maps as "LO3A" and was mapped at a farm scale (1:10,000 and 1:15,840). Land Overlay 3A includes Land Use Capability units which feature severe to extreme soil erosion.

# Establishing effective tree cover

Establishing effective tree cover on Land Overlay 3A is the key measure of success in reducing erosion throughout our region. In April 2019 it was estimated there was 7,223ha (14.4%) of untreated Overlay 3A remaining. This does not include land that holds an Erosion Control Funding Programme (ECFP) grant where treatments have yet to be implemented.

Within the Waiapu catchment there is 22,995ha (45.8%) of Overlay 3A, of this 19,788ha (86%) has effective tree cover or holds an ECFP grant to apply treatments, and 3,207ha (14%) remains to be treated.

**Total area of Overlay 3A in Gisborne region: 50,169ha**

| Year | Area of Overlay 3A with effective tree cover | Area of Overlay 3A remaining to be treated |
|---|---|---|
| 2016 | 41,466ha | 8,703ha |
| 2019 | 42,946ha | 7,223ha |

**Waiapu catchment – Overlay 3A land treated**

| Overlay 3A in the Waiapu catchment | Area of Overlay 3A with effective tree cover | Area of Overlay 3A remaining to be treated |
|---|---|---|
| 22,995ha | 19,788ha | 3,207ha |

# Funding for erosion control

The Erosion Control Funding Programme (ECFP) has been running for a number of years and has contributed significantly to the establishment of effective tree cover on both Overlay 3A and other eroding land within the Gisborne district.

As of 2019, the landowner grant component of the ECFP Land Treatments is fully allocated. Funding can now be obtained through the ECFP community grants and the One Billion Trees Programme to allow landowners with eroding land to achieve effective tree cover. The One Billion Trees Programme includes land treatment options of mixed native planting, manuka/kanuka, native regeneration and exotic forestry.

Forestry was once the major component of ECFP grant approvals. However, in recent years there has been a trend towards increased use of indigenous reversion and manuka plantings. This has been particularly notable in areas more remote from Gisborne Port, and on land less suited to plantation forestry, and follows changes to the funding scheme to better reflect iwi and community aspirations for long-term land uses.

ECFP grants approval data shows a very successful picture of engagement from 2016-18, with a further 11,105ha now being included in the ECFP scheme. Of this, 5,544ha is apportioned to forestry, 507ha to manuka, 3,952ha to reversion and 1,102ha to pole planting - in the previous three years there was only 1,625ha committed to the scheme.

The increase in ECFP engagement can be attributed to a better understanding of landowner needs to treat erosion, and adjustments made to treatment options. Implementation of ECFP grant agreements will be an important focus for Council to ensure the funding results in effective tree cover.

## ECFP — established tree cover

| Year | Treatment | Total area (ha) | O3A area (ha) | Regional target land (ha) |
|---|---|---|---|---|
| 2013 | Forestry | 671 | 77 | 419 |
| | Native reversion | 186 | 23 | 86 |
| | Conservation pole planting | 32 | 8 | 8 |
| 2014 | Forestry | 347 | 93 | 158 |
| | Native reversion | 10 | 3 | 5 |
| | Conservation pole planting | 29 | 15 | 6 |
| 2015 | Forestry | 77 | 14 | 21 |
| | Native reversion | 43 | 18 | 25 |
| 2016 | Forestry | 6 | 0.02 | 5 |
| | Native reversion | 47 | 21 | 32 |
| | Conservation pole planting | 110 | 70 | 49 |
| 2017 | Forestry | 16 | 3 | 0 |
| | Native reversion | 207 | 155 | 179 |
| | Conservation pole planting | 29 | 19 | 19 |
| 2018 | Forestry | 385 | 0.45 | 7 |
| | Native reversion | 16 | 13 | 15 |
| | Conservation pole planting | No data | No data | No data |

**Successfully established and paid out (ECFP GIS Geodatabase)*

## Land treatment area granted

| Year | Treatment | Total area (ha) |
|---|---|---|
| 2013 | Forestry (all exotic incl P.radiata) | 107 |
| | Manuka | 40 |
| | Indigenous reversion | 24 |
| | Pole planting | 340 |
| | **TOTAL** | **511** |
| 2014 | Forestry (all exotic incl P.radiata) | 78 |
| | Manuka | 186 |
| | Indigenous reversion | 22 |
| | Pole planting | 92 |
| | **TOTAL** | **378** |
| 2015 | Forestry (all exotic incl P.radiata) | 6 |
| | Manuka | 0 |
| | Indigenous reversion | 475 |
| | Pole planting | 255 |
| | **TOTAL** | **736** |
| 2016 | Forestry (all exotic incl P.radiata) | 16 |
| | Manuka | 102 |
| | Indigenous reversion | 1,053 |
| | Pole planting | 267 |
| | **TOTAL** | **1,438** |
| 2017 | Forestry (all exotic incl P.radiata) | 3,808 |
| | Manuka | 0 |
| | Indigenous reversion | 807 |
| | Pole planting | 283 |
| | **TOTAL** | **4,898** |
| 2018 | Forestry (all exotic incl P.radiata) | 1,720 |
| | Manuka | 405 |
| | Indigenous reversion | 2,092 |
| | Pole planting | 552 |
| | **TOTAL** | **4,769** |

** Indicates year of grant approval, not year of establishment*

**Forestry was once the major component of ECFP grant approvals. In recent years there has been an increase in use of indigenous reversion and manuka plantings following changes to the scheme to better reflect iwi and community aspirations for long-term land uses**

# #01 CASE STUDY | HE TAUIRA

## MANAGING EROSION AT TAUWHAREPARAE

*In 1945 the land had been completely cleared and the erosion was severe*

*In 1988 , soon after Cyclone Bola there was a significant increase in the extent and severity of the erosion*

*By 1998, the lower half of the paddock had been established in pine. This was an important first step towards long-term erosion control*

*In the 2012 photo there is a further reduction in bare ground. While the erosion is still severe in the main gully, it is not increasing*

*The 2018 photo shows part of the pine forest has been harvested*

Aerial photos taken in 1945, 1988, 1998, 2012 and 2018 provide a visual timeline of the progress in addressing severe gully and slope erosion in the Lakes paddock at Tauwhareparae farm.

In 1945 the land had been completely cleared and the erosion was severe.

In 1988 – soon after Cyclone Bola – there was a significant increase in the extent and severity of the erosion.

By 1998, the lower half of the paddock had been established in pine. This was an important first step towards long-term erosion control.

In the 2012 photo there is a further reduction in bare ground. While the erosion is still severe in the main gully, it is not increasing.

The 2018 photo shows part of the pine forest has been harvested. Replanting is a critical requirement for the block. Consent conditions require willows and coppicing species to be planted in the gully, and on bare land where pines have not succeeded.

**The aerial images of Tauwhareparae farm show how planting has been used to address erosion over more than 70 years.**

# FORESTRY

Much of the forestry was planted as a result of erosion protection schemes, with the rate and amount of plantings accelerating after Cyclone Bola. Many of these forests are now being harvested. Until 2018, all forestry in Gisborne required a resource consent. However, from May 2018 only forestry on the most severely eroding land (Erosion Susceptibility Classification Very High/ Red) requires consent for harvest. All forestry harvest does, however, require lodging of Permitted Activity notices with Council. These notices must be lodged within 20 and 60 working days of harvest commencing.

Forestry harvest planning tends to be on a two-year cycle which is then reflected in consenting activity – with a busy year followed by a less busy year. This trend can be generally observed since 2003, with a step change increase in harvest areas from 2009. However, the strongest trend is the large increase in area of harvest, with a peak of 9,541ha in 2018. When permitted forestry harvest under the National Environmental Standards for plantation forestry is also considered, 2018 saw 10,707ha of forestry harvest commencing under these rules, more than three times the amount of harvest underway in the previous year.

| Year | Area of consented forestry harvest (ha) | Area of permitted forestry harvest (ha) | Total harvest area approved (ha) |
|---|---|---|---|
| 2003 | 1,376 | N/A<br>All harvest required resource consent | 1,376 |
| 2004 | 3,379 | | 3,379 |
| 2005 | 398 | | 398 |
| 2006 | 3,236 | | 3,236 |
| 2007 | 957 | | 957 |
| 2008 | 3,647 | | 3,647 |
| 2009 | 5,002 | | 5,002 |
| 2010 | 2,528 | | 2,528 |
| 2011 | 5,462 | | 5,462 |
| 2012 | 3,091 | | 3,091 |
| 2013 | 7,279 | | 7,279 |
| 2014 | 5,747 | | 5,747 |
| 2015 | 5,952 | | 5,952 |
| 2016 | 7,718 | | 7,718 |
| 2017 | 3,538 | | 3,538 |
| 2018 | 9,541 | 1,177 | 10,718 |

**Area of consented forestry harvest (ha)**

# Forestry & erosion risk

The first major forestry plantings in the Gisborne district were undertaken in the Mangatu forest in the 1960s. Since then, there has been significant forestry planting in a range of areas across the district. By 2016 the total area in exotic forestry comprised 141,581ha, down from a peak of 156,400ha in 2011. It is estimated that around 24,000ha of mature exotic forest was available for harvest in 2016 with a further 10,000ha available for harvest by 2021.

Initial harvesting was on highly erosion prone, but generally less steep, areas. As the first rotation harvests on steep lands with thin soils have proceeded, the issue of sediment and woody debris deposition into waterways, onto floodplains, beaches and ultimately the coastal environment have become an increasing concern.

Harvesting of steep land followed by heavy rainfall events during the length of the risk period (five to seven years post-replant) can result in landslips and mobilisation of soil and sediment, which is then deposited in waterways. With the relatively high level of harvest residues occurring in Tairāwhiti relative to other regions, this results in forestry harvest residues – including logs, slash and other woody debris – migrating to the waterways. In some instances, the weight of material is so significant it will crash through remaining pine or native riparian areas or buffers, which get incorporated into the mobilised woody residues. The key risk periods are harvesting to canopy closure (around a seven-year period, which is approximately 25% of the year rotation cycle).

Since 2010, this situation has become increasingly prevalent as steeper land such as the Wharerata Ranges, upper Waimata and inland Tolaga Bay have been harvested (table below). As other very steep lands are harvested, these concerns are expected to continue.

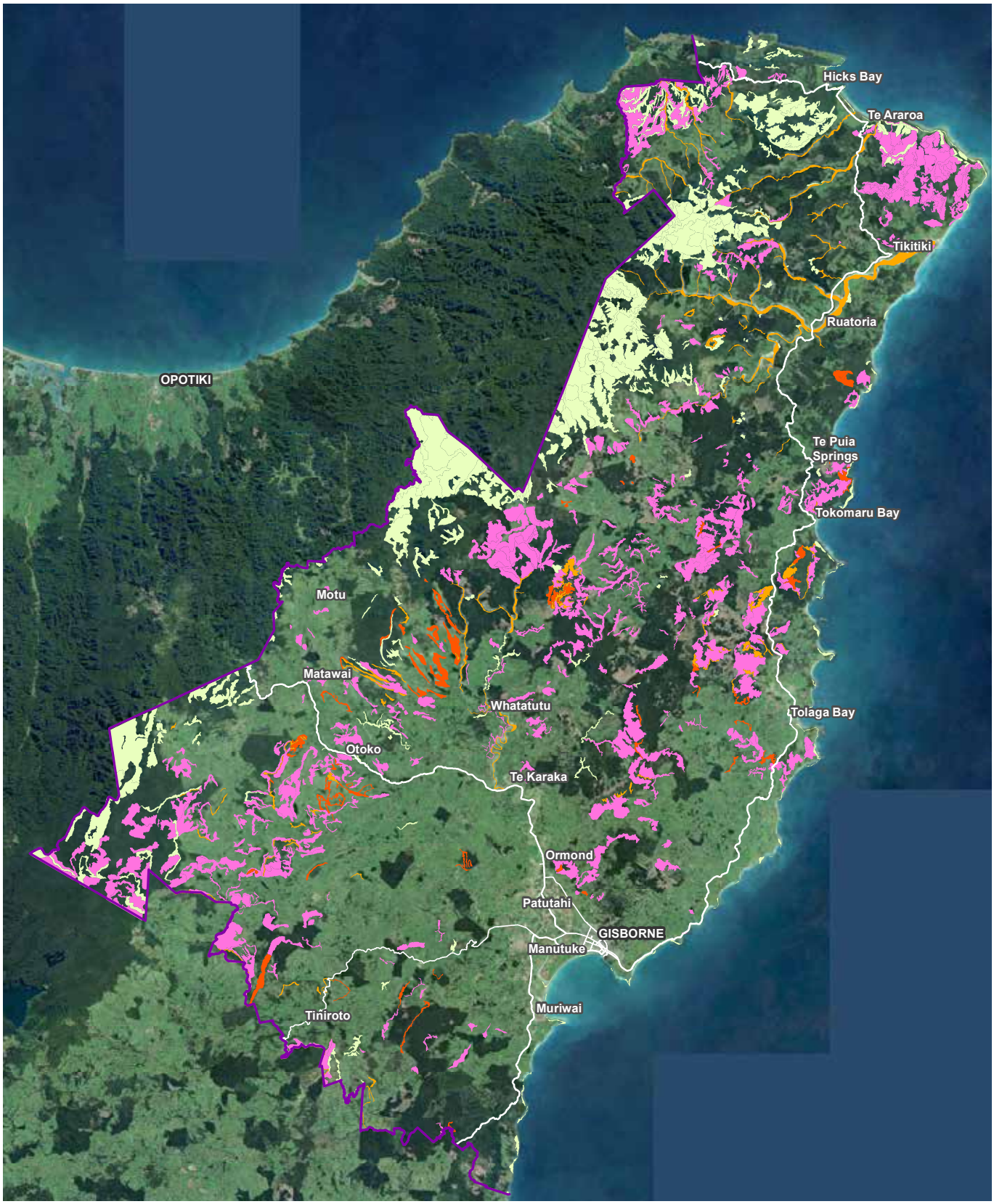
Council commissioned The School of Forestry at the University of Canterbury to undertake a study on the forest management production cycle. The findings show that pine plantations are typically harvested at between 25-30 years. The national average volume for a pine stand at harvest is estimated to be 500m$^3$/ha but are typically 650m$^3$/ha or higher on professionally managed stands with good soils. The merchantable volume (volume converted to logs for sale) depends on the quality and characteristics of the trees in a stand, but also on the desired product mix. Based on estimates from the Ministry for Primary Industry, an average of 85% of the total standing volume will be merchantable. This ranges from 90% for well-tended stands in good condition, down to 80% for untended stands on moderately steep terrain.

Conversely, this means between 10 and 20% of the total standing volume is left on site post-harvest. As a national average, this would be approximately 75m$^3$/ha. For the Gisborne region, however, on most stands there is a higher volume left on site at harvest (estimated to be 650m$^3$/ha), and given the difficulty of the terrain and poorer markets, it would be reasonable to estimate 100-125m$^3$/ha of residue left at harvest. As a result, the volumes of material available to be mobilised during storms may be greater than in other regions.

**Weather events recorded as causing harvest residue mobilisation in Tairāwhiti**

| Year | Location | Key impacts |
|---|---|---|
| 2018 | Mangapoike, Waimata, Tolaga, Waiau, Waiapu | Extensive landslides and slips with significant mobilisation of forest harvest residues, particularly in the inland Tolaga Bay (Uawa) area, Waiapu, Waimata, Kanakanaia, and Mangapoike |
| 2017 | Waimata, Tolaga, Mata | Extensive landslides and slips with significant mobilisation of forest harvest residues, particularly in the inland Tolaga Bay (Uawa) area |
| 2015 | Wharerata Forest | Major slash mobilisation, debris on beaches, sedimentation of waterways and coastal environment, destruction of farm infrastructure |
| 2014 | Inland Tologa, Wharerata Ranges | Slash mobilisation, debris on beaches |
| 2013 | Tokomaru Bay | Slash mobilisation, debris on beaches |
| 2012 | Wharerata Forest | Major slash mobilisation, debris on beaches, sedimentation, loss of railway line, loss of culvert on SH2 (closing the road) |
| 2002 | Muriwai-Manutuke | Widespread flooding caused by forestry slash blocking culverts on public and private land |
| 1994 | Wharerata Forest | First major post-forestry harvest event – substantial erosion and landsliding, sedimentation and slash mobilisation |
| Annual | Region-wide | Localised storms causing sedimentation of downstream waterways, blocking of private & public road culverts, forestry debris on local beaches |

## Land vulnerable to land sliding




- District – 839,197ha
- 7e – vulnerable classes 78,922ha (9.4%)
- 7s – 6,866ha (0.8%)
- 8e – 60,331ha (7.2%)
- 8s – 11,549ha (1.4%)

# #02 CASE STUDY | HE TAUIRA

## A new lake forms at Mangapoike

Landslide dams can be very dangerous, with inundation occurring via rising waters upstream, and flooding downstream via dam breaching. On 25 February 2018, local landowners heard a noise and saw a dust cloud downstream from the Mangapoike and Paparatu Stations and on 26 February, a topdressing pilot reported to the landowner the presence of a large rockslide that had dammed the Mangapoike River. They in turn contacted both Gisborne District Council and Hawke's Bay Regional Council. An initial inspection was undertaken followed by a more detailed investigation in early March. While it was envisaged that the lake forming behind the landslide would take several months to fill, over 140mm of heavy rain fell over the 9-10 March resulting in the lake filling faster than anticipated.

While Mangapoike Lake occupied an area of around 9ha on 8 March, by 15 March it had grown to around 30ha and was beginning to threaten access to Mangapoike Station by 20 March. As a result, Council along with Hawke's Bay Regional Council engaged specialist engineering consultants along with scientists from Auckland University to assess the risk of possible landslide dam collapse as well as the impact on Mangapoike Station several kilometres upstream.

By this stage the lake had grown to 33ha and the bridge to Mangapoike Station and two dwellings were close to being inundated. With Easter approaching and more bad weather expected, the decision was made to blast a channel to direct water to a depression that had formed between the headscarp and the main dam. This channel was blasted on 28 March and by 3 April water broke through and began filling the depression forming an additional smaller lake (Tukemokihi Lake). A second larger set of blasting was then undertaken on 9 April to allow water to flow from the Tukemokihi Lake back into the Mangapoike River. This resulted in the new Mangapoike Lake stabilising at a size of around 30ha, which makes it the largest lake in Tairāwhiti.

*View of the Mangapoike Lake on 15 March after heavy rain caused it to rapidly increase in size, fully drowning the trees previously occupying the valley floor. By this time the lake was around 50m deep at its deepest point and extended upstream more than 2km*

The lakes have since been actively monitored by Council as well as being the subject of detailed study by both Council and Auckland University so that a better understanding of what caused such a massive landslide and the long-term risks of further such landslides occurring in the region.

The rockslide formed along an escarpment in northwest-dipping sandstones, and is characterised by a linear lateral scarp, a headscarp, and a bedding-plane rupture surface. It is the intersection of these features that controlled the rockslide block geometry. The slide surface is a smooth, northwest-dipping bedding plane that intersects with vertical fractures in the lateral scarp, forming a wedge. But this escarpment is only one of several in the area and so a detailed assessment of the other escarpments will be undertaken to assess the long-term risk of further rockslides in the landscape.

It is known that the principal failure mechanism was sliding involving a single large wedge-shaped block and that this rapid movement led to the partial disintegration of most of the block. Part of the detached slide block remained intact and has a mass of around 8.5m tonnes. The rest of the displaced mass forming the rockslide dam comprises disaggregated blocks in a sandy-silty matrix and the total mass of the rockslide dam. Luckily this disaggregated material helped form an excellent seal, stopping the leakage of water through the dam and reducing the risk of the dam being undermined.

With the lake now looking like it will be a permanent feature of the landscape, Council and the owners of Mangapoke and Paparatu Stations are looking to the lake's future. The new lake will provide a habitat for rare and endangered wildlife, and species such as dabchicks have already made their home there. The stakeholders plan to embark on indigenous planting programme to protect the rockslide dam from erosion and work to armour the outfall against scour from flood events. The lake is not accessible to the public and it is not available to boating since access is across private land with landowner permission required.

# #03 CASE STUDY | HE TAUIRA

## The mud volcanoes of Tairāwhiti

*The new mud volcano in January 2019*

*The uplift and rupture of the land as the mud volcano was forming in 2016 after the Te Araroa earthquake – the uplift was a height of at least 1m*

Our region is home to a significant number of mud volcanoes and their associated diapiric or dome-like structures. Others occur on the East Coast margin between Mahia and southern Hawke's Bay and there is also one in Northland. There has been very little detailed mapping and analysis of the features or understanding of relationship of the mud volcanoes' geological processes. It is known, however, that they form when pressures in the crust force mud and rocks to the surface along fault zones and that they typically include bentonitic muds, cold hyper-saline water and hydrocarbon gases.

More recently, Council has initiated a project to better understand the natural hazard implications, and the relationship between recent spectacular mud volcano activity that occurred in the Waimata Valley in December 2018 and earthquake shaking. Complementary geophysical projects by Council together with GNS Science have focused efforts on providing a rich source of new information on the mud volcanoes and the role they play in the plumbing of the margin.

While these mud volcanoes have been known for many years, it is very rare to see a new one form but that is what happened between November 2016 and December 2018. On 1 September 2016, a 7.1 magnitude earthquake occurred off East Cape north of Te Araroa, but caused little real damage . However, 175km away in the upper Waimata Valley the shaking caused one large well-known mud volcanic dome to push up which resulted in the ground on one side to be pushed sideways by 11.5m overnight. Close by, an area not known to have a mud volcano ruptured with many cracks forming and the area uplifting by at least a metre or more.

The area has been monitored regularly and on 15 December 2018 a new mud volcano erupted over a period of around five hours at the uplifted site. The eruption was not observed as the closest landowners were not home at the time but arrived to find the new mud volcano fully formed and occupying an area of 2.1ha (figure 3). Analysis of the rocks ejected from the mud volcano shows that they are dominated by sheared altered sandstone basement rocks but with six different types of younger rocks including highly gassy sandstones and siltstones.

# #04 CASE STUDY | HE TAUIRA

## Cyclone Cook Easter 2017

Ex-tropical Cyclone Cook struck Tairāwhiti late on 12 April 2017. The duration of peak rainfall intensities was a key driver during the event with rainfall of 80mm+ over a three-hour period causing woody debris within recently harvested forests to mobilise. The area of maximum rainfall was in the headwaters of the Uawa and Waiapu catchments. The impacts of the storm were exacerbated by the antecedent rainfall conditions with Cyclone Debbie occurring just over a week earlier.

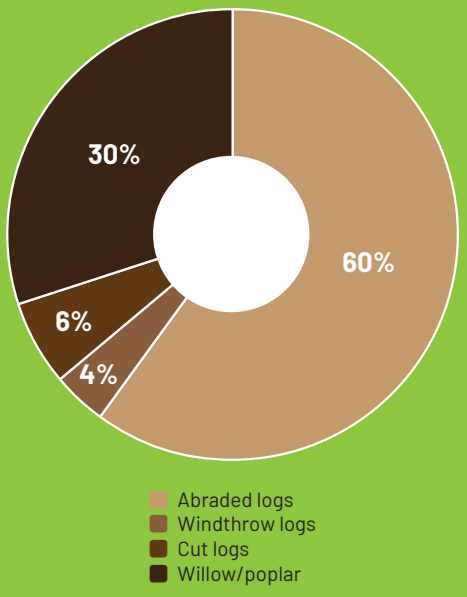
Only two major debris flows occurred, but smaller debris flows and landslides occurred in a number of locations across the Uawa catchment in particular. It was found that while not regionally extensive, those relatively small landslides that did occur were frequently associated with forestry areas that had been harvested in the previous five years.

The woody debris from the forests migrated down the Uawa catchment via the Mangaheia and Mangatokerau Rivers, eventually reaching the sea at Tolaga Bay. A considerable amount of debris was caught up against Wigan Bridge in the Mangaheia. The piles of woody debris at Wigan, along with log counts upstream of Wigan Bridge, and on Tolaga Bay Beach where students from Tolaga Bay Area School analysed the woody material established the dominant role of pine in the woody debris mobilised by the storm. This is not to say that willow did not contribute, since 30% of the debris was willow or poplar at Wigan and 32% on Tolaga Bay Beach.

Of the nearly two-thirds of material that was pine, it was found that the largest proportion of all pine were weathered or abraded logs (67% of all pine). Assessment of this suite of logs indicates that these weathered logs were originally cut logs and a number were observed with waratah marks. Equally significant was the finding that a small but notable proportion of the pine logs observed at Wigan Bridge were freshly cut logs. These comprised 8% of all pine. Windthrow pine was less abundant at 6% of all pine.

*Log jam of pines in the Mangaheia River after Cyclone Cook*

**Percentage of woody material caught up against Wigan Bridge**



# LiDAR mapping

LiDAR (Light Detection and Ranging), is a remote sensing tool that has many applications in environmental and land management and is used extensively in industries such as forestry. It works by generating light pulses that can hit the earth's surface many times per square metre and accurately measure the position and elevation of those points over very large areas with vertical accuracies of 0.15m or more. This allows for maps and computer models to be generated that give a far more accurate definition of the earth's surface than other methods.

In 2017 Council obtained funding from the Ministry of Primary Industries and Land Information New Zealand (LINZ) to acquire high-resolution LiDAR covering the entire 8,355km$^2$ of our region. NZ Aerial Surveys commenced mapping in 2019. Mapping was 85% completed by early 2020 and is scheduled to be completed by mid 2020.

The LiDAR survey generates a huge amount of data and when the project is completed around 6-10 terabytes of computer storage will be required to hold the data. The LiDAR information is being made freely available to anyone by Council directly or via LINZ and is already being used by a number of parties:

- forestry industry for environmental planning
- Auckland University for a landslide risk assessment for Gisborne city, and erosion issues in the Waiapu catchment
- GNS for active fault mapping in the area south of Tolaga Bay, and a project to assess sedimentation patterns in the Waipaoa River is planned
- Canterbury University study into the processes at the Mangapoike landslide dam
- Council for a new Wainui Beach erosion management strategy, mud volcano mapping, landslide mapping and Gisborne city/Poverty Bay/Tūranganui-a-Kiwa flood hazard mapping
- other uses include enhanced mapping of potential pa and urupa, land use planning, landslide mapping, road design among many other uses.

*Use of LiDAR to better define the Wheatstone Road mud volcano. The Wheatstone Road mud volcano is a well known feature on the outskirts of Gisborne city. The eruptive features are close to houses and are clearly visible on the 2018 aerial imagery. But the full size of the mud volcano is not apparent in the conventional aerial imagery and its not until the area is analysed using LiDAR that the full scale of the mud volcano can be appreciated. This shows that the area occupied by the mud volcano is far larger than previously known extending down Wheatstone Road for some distance and including the footprint of several houses.*

# URBAN LAND USE

## Population growth and development

Most of our region's 47,900 people live in the Gisborne urban area – an increase of 900 from 47,000 in 2013. By 2048, 5,140 more people will be living in our region, in 2,565 additional households (McIlrath, Erasmus, and Fairgray, 2019)*.

Despite this modest growth, Gisborne remains among the country's slower growing regions at 1.7% a year compared to a national increase of 2.1%.

Over the next 20+ years, we expect to see the number of people living in the urban areas around Gisborne city to increase, while small settlements like Ruatoria, Tolaga Bay and Te Karaka will see a decline in the number of residents, consistent with overall historic patterns of population decline, as well as the broader trend towards increasing urbanisation (Hurst, 2020)*.

Urban growth will invariably put pressure on existing Council services and infrastructure within Gisborne. Conversely, rural population decline may affect the viability of Council services in our townships.

## Housing supply and affordability

We are currently observing a rental market shortage in the Gisborne district — a shortage of homes on the market to buy, and an increasing demand for public housing. House prices have steadily increased over the last five years. In February 2020, the median house price was $450,000, a 15.4% increase on February 2019. Around two-thirds of the demand is for housing at $440,000 and below, suggesting that affordability will be an issue for many prospective home owners.

While there is currently a shortage of properties available to rent and buy, there is sufficient commercially feasible residential development capacity available to meet the level of projected demand over the short and medium terms.

## Land capacity for business development

There is a reasonable mix of opportunities for business development across Gisborne. In the urban area, most of the capacity (61%) is associated with redeveloping sites to a higher density. Most of the other urban zones reveal a similar pattern, ranging between 58% and 67%. In the suburban commercial zones, the situation is reversed with 72% of capacity associated with vacant sites (McIlrath, Erasmus, and Fairgray, 2019)*.

| | Mix of capacity | |
|---|---|---|
| **Planning Zone** | **Vacant** | **Redevelopment** |
| Amenity commercial | 0% | 100% |
| Fringe commercial | 40% | 60% |
| Industrial | 42% | 58% |
| Inner commercial | 38% | 62% |
| Outer commercial | 33% | 67% |
| Suburban commercial | 72% | 28% |
| **TOTAL** | **39%** | **61%** |
| Rural industrial | 83% | 17% |
| Rural commercial | 60% | 40% |
| **TOTAL** | **80%** | **20%** |

* Population projections and capacity for business development taken from consultant reports prepared for Council.

# Urban development trends

Gisborne city has continued to show an increasing intensification of housing. The area around the Taruheru Block has continued to see residential development in line with that signalled by the Tairāwhiti Resource Management Plan. Many of the residential lifestyle developments in the Taruheru Block are outside the reticulated boundary for sewerage. The impact of on-site wastewater in this area is an emerging issue for investigation particularly in light of the degrading water quality in the Taruheru River catchment as the land is poorly drained.

Other residential subdivisions include the Sponge Bay subdivision, Scarly's Way subdivision and Gaddums Hill Heights subdivision. There have been a number of new subdivisions approved which have created residential sections of varying sizes from 400m$^2$ urban plots to lifestyle options of around one hectare. Re-zoning changes in 2013 (Private Plan change 7) have seen the development of the Aerodrome Road Industrial Park commencing, and the relocation of several industrial business to the Dunstan Road area. Over the next three years, it is expected that the aspect of these areas will change from a predominantly rural outlook to that of an industrial land use.

## Noise

Land use changes are impacting on background noise. Council undertakes a background noise survey every five years with the most recent survey undertaken in 2016. The present level of background noise was generally similar to the background noise level in 2004 although there are noticeable increases at several sites located near or adjacent to state highways, arterial and primary collector roads.

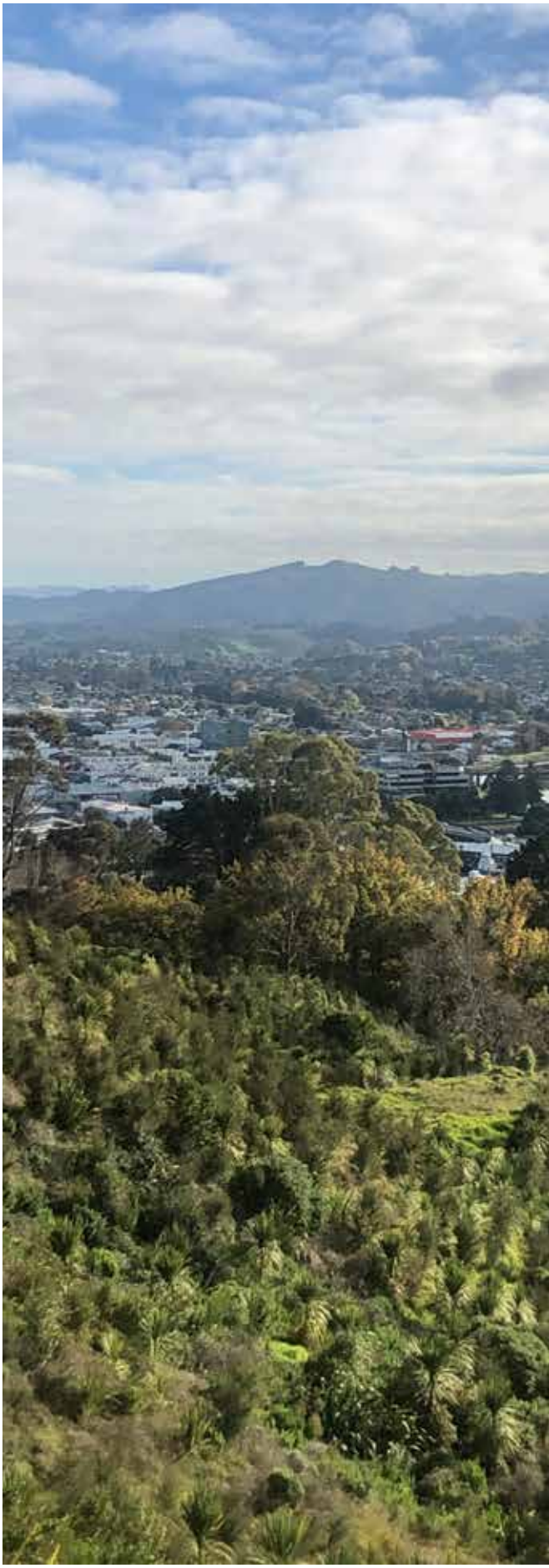
From the time of the first survey in 1993 to to the most recent one in 2016, there has been a noticeable increase in vehicle movements. Data provided for Tairāwhiti Roads indicates that there are around 3,500 more vehicles on our roads since 1999. The volume of heavy vehicles, particularly logging trucks, is likely to be responsible for an increase on the arterial roads.

Our region's log harvest has grown substantially to 1.6 million tonnes a year in 2014. This is forecast to have increased to 3.5 million tonnes during 2020 (NZTE Regional Investment Profile). This will increase the number of logging trucks on the roads. Monitoring sites on Moana, Ormond, Lytton and Awapuni Roads are recording an average of 8,000 -12,000 vehicles a day.

## Urban revitalisation

Over the past five years, Gisborne has made significant steps forward with the regeneration of the city centre and surrounding urban area through successful interventions such as the Urban Cycleways Programme, Tairāwhiti Navigations, Inner Harbour redevelopment and redevelopment of vital community infrastructure such as the HB Williams Memorial Library and War Memorial Theatre. Through its Spatial Plan – Tairāwhiti 2050 – Council will begin to explore ways to revitalise the CBD through a number of key moves. These include:

- investigating the potential for a more compact city centre
- incentivising infill residential development
- construction of a linear park along Grey Street
- investigating the development of 'town squares'
- continuation of cross-town cycle links, and
- place activation through art displays, temporary events and low-cost installations.



# OUR BIODIVERSITY & BIOSECURITY

## TŌ TĀTAU RERENGA RAUROPI, RAUHĪ HOKI

Malcolm Rutherford

*Malcolm Rutherford*

## HIGHLIGHTS

Council is returning a significant portion of its largest forestry asset – Pamoa Forest – to native bush to enhance our region's biodiversity and protect the Waingake drinking water pipeline. In addition to planting natives, the project involves extensive pest control and eradication measures. Council is working to secure funding through the One Billion Trees programme.

Since 2016, 18 projects have been funded by Council's Natural Heritage Fund.

Mediterranean fanworm was detected in our region in 2015 and 2019, a major threat to marine biodiversity.

Important areas of native bush are designated "Protection Management Areas" (PMAs). Most of these areas are on private land so landowner action is key to protecting them from threats like weeds, livestock, wild deer and goats. Landowners are encouraged to apply to Council's Natural Heritage Fund. Read how the Williams are working to improve their waterways at Turihaua on **page 38**.

Together Council, DOC and our community identified long-tailed bats, a nationally-critical species, living around the Wharekopae River – an exciting find as part of the Wharekopae River Restoration Project. Read more about this on **page 40**.

# BIODIVERSITY

Only 23% of original native vegetation remains in the Gisborne district. Outside of the Raukumara Range, remnants tend to consist largely of secondary regrowth forest dominated by kanuka. Around 7% (58,000ha) of our region is classified as Protection Management Areas (PMAs) – our highest value native vegetation.

There are 914 native plants found in our region with diverse landscapes including lowland flats, coast, dunes, hill country and the Raukumara Range providing a range of habitats. Fourteen per cent of our native plants are nationally threatened.

Wetlands are our most threatened ecosystem with only 1.75% (1,487ha) of their original area remaining. Wetland restoration is a high priority for our region.

# CLEARANCE OF NATIVE SCRUB

The change to the area of native scrub (largely manuka and/or kanuka) in our region can be assessed two ways. As the clearance of native scrub requires a consent, the area consented can be assessed with the area consented from 2016 to 2018 shown in the table. Long-term trends in the area covered in native scrub can be assessed using the Land Cover Database (LCDB) maintained by Manaaki Whenua/Landcare Research.

The LCDB is now at version 5 and covers the period 1996-2018. The LCDB defines two types of native scrub: manuka and/or kanuka and matagouri and/or grey scrub.

In 1996 72,866ha of our district was covered by manuka/kanuka and 441.56ha was covered with matagouri/grey scrub. By 2018, 6,457.45ha of the area that had been in manuka/kanuka in 1996 had been converted to other uses. Of this, 2,133ha had been converted to either low-producing or high-producing grassland/pasture and 1,887ha to exotic forestry. Notably, 2,419.7ha of manuka/kanuka had grown into broadleaf or deciduous indigenous hardwoods. This suggests that when left undisturbed land covered by manuka/kanuka acts as a successful nursery crop for indigenous canopy species. Small areas had been lost to landslides or areas of gravel (where rivers had changed courses). For areas that had been matagouri/grey scrub in 1996 (441.6ha), 395.4ha remained in 2018 with the remainder converted to exotic forestry (19.35ha), or low-producing grassland pasture (24.7ha). A further 1ha had converted to manuka/kanuka and 1ha was affected by a landslide.

The LCDB also shows that 9,815.35ha of land cover other than manuka/kanuka in 1996 had been converted to manuka/kanuka by 2018, thus the net change on manuka/kanuka between 1996 and 2018 was an increase of 3,348ha to 76,214ha from 72,866ha in 1996.

**Area changed to manuka and/or kanuka from other land uses between 1996 and 2018 (ha)**

| | |
|---|---|
| Broadleaved indigenous hardwoods | 2,419.71 |
| Exotic forest | 1,887 |
| Low-producing grassland | 1,433.61 |
| Gravel or rock | 12.96 |
| High-producing grassland | 699.47 |
| Lake or pond | 5.83 |
| Landslide | 8.87 |
| Total area lost to other land uses (ha) | 6,467.45 |

**Change in area of manuka and/or kanuka to other land uses between 1996 and 2018 (ha)**

| | |
|---|---|
| Sand/gravel | 16.19 |
| Broadleaved indigenous hardwoods | 71.45 |
| Exotic forest | 8.91 |
| Fernland | 89.9 |
| Gorse/broom | 7.24 |
| Gravel or rock | 9.56 |
| High-producing grassland | 6,004.7 |
| Low-producing grassland | 3,607.4 |
| Total hectares | 9,815.35 |

# Kanuka vs manuka

In the Gisborne district, most vegetation clearance involves kanuka or manuka dominated forest. Both species provide a range of benefits including slope stability, rainfall interception, habitat for native insects, plants and animals as well as flowers for the honey industry. Kanuka and manuka are primary succession plants, which means they are the starting point in the process of native forest regeneration.

Manuka and kanuka tend to look very similar at first glance. However, there are tangible differences (see the table on **page 33**). Careful inspections of several features will help determine whether it is kanuka or manuka.

Manuka and kanuka grow on a variety of sites throughout our district. Manuka tends to be more dominant in areas with higher rainfall such as the Wharerata Range, towards East Cape and inland to the Raukumara Ranges. Kanuka is more dominant in drier parts of our district and survives – even regenerates – in the presence of farm stock.

The process of change within kanuka and manuka forest tends to occur over different time frames. Within a relatively short time frame other native tree species tend to grow through manuka forest which can result in a mixed forest within around a decade. In contrast, kanuka forest will often exist as a solid canopy for several decades before larger native trees such as rewarewa emerge.

Despite the solid canopy, kanuka forest provides a nurse crop for native shrubs and fern species to establish underneath. The solid canopy also provides an important buffer for primary (original) forest patches. In kanuka or manuka patches, often the greatest diversity of other native plants occurs on south-facing slopes and adjacent to waterways. Increased rates of native forest regeneration occur in these microsites due to cooler summer temperatures and higher moisture levels.

*Kanuka forest with an understorey (seedling and shrub layer) dominated by tree ferns*

| | Manuka | Kanuka |
|---|---|---|
| **Leaves** | Prickly to the touch | Soft to the touch |
| **Bark** | Thin, flaky with pinkish wood underneath | Long, light brown strips |
| **Capsules** | Capsules are usually present on most plants and are easy to find | Tiny capsules are only seen in late summer and autumn |
| **Mature tree sizes** | Small and difficult to hug | Large, tall and easy to hug |
| **Smell of crushed leaves** | Smell is not distinctive | Smells like eucalyptus oil |

*Manuka: large, long-lived capsules*

*Kanuka: small, short-lived capsules*

*Manuka forest with mixed species emerging through the canopy*

*Kanuka forest buffering a tawa forest remnant*

## RESURVEY OF OUR SIGNIFICANT BUSH

# WHAT WE FOUND

Protection Management Areas (PMAs) is a term used to define important areas of native bush throughout New Zealand. PMAs cover 7% (58,000ha) of the total land area in our region. There are 315 individual PMAs, most of which are located on private land. The types of vegetation range from coastal dune land to high elevation beech forest.

In summer 2017, 15% of our PMAs were resurveyed, 48 of the 315 areas. The PMAs visited provided a good representation of types, including a range of land uses (peri-urban, farming and forestry), legally protected and unprotected, fenced / unfenced, a variety of sizes, primary and secondary forest and different bioclimatic zones (coastal, semi-coastal, lowland and montane).

*Pouawa River mouth*

*PMA in forestry landscape*

Where PMAs were located on farmland and not fenced, stock (cattle) was the greatest threat, in many cases preventing any regeneration of shrubs and seedlings.

Where PMAs were located in forestry (pre-harvest), the main threat was deer – however, the threat was significantly lower than in the Raukumara Ranges. In the forestry landscape, deer have a variety of food sources and are likely to have a greater preference for pasture than native species when pasture is available.

Overall, PMAs in unharvested forestry were in better condition largely due to the absence of farm stock.

Where PMAs were located in forestry (post-harvest), the main threats related to recovery from direct damage to the trees and invasion of key weeds (pampas and wilding pines). The post-harvest landscape creates disturbance which favours the establishment of pioneer weed species.

Goat control as part of forestry management has had a positive effect on PMAs, supporting regeneration of natives in damaged areas.

PMAs close to the Gisborne urban area were most impacted by weeds, with aggressive weeds such as Japanese honeysuckle invading.

Landowners are encouraged to apply for funding for weed and pest control and fencing through Council's Natural Heritage Fund.

The health of our PMAs (important areas of native bush) is compromised by grazing animals (stock and roaming deer and goats) and weeds. With just 7% of our district classified as native bush, most of which is on private land, landowners are key to ensuring the health and longevity of these important areas.

# #01 CASE STUDY | HE TAUIRA

## Restoring and regenerating Pamoa

*Initial reversion (including weeds) in post-harvest areas, Te Arai catchment*

*Exotic forestry in Pamoa is cleared to make way for native plantings*

Pamoa forest is a 1,613ha area purchased by Council to protect Gisborne's main water pipeline from the Mangapoike reservoirs and the Te Arai River. The pastoral farming land and scrub was planted in pine forest to prevent erosion and for potential future income.

With the harvesting of pine trees underway, Council has decided to return a large section of pipeline into native forest. This will create a biodiversity corridor linking Pamoa forest with Waingake bush, as well as providing long-term protection for the reservoirs and the pipeline. It will also protect the Waingake Stream as well as the headwaters of the Te Arai, Nuhaka and Mangapoike Rivers, all of which are ecologically valuable. Pest and weed management will be key to successfully establishing native trees in the harvested areas, as well as enabling native wildlife to rebound.

Waingake bush is the largest remnant of coastal lowland bush in our region so the Pamoa restoration is a fantastic opportunity to increase both the area of native forest and the pest-control buffer.

*Pre harvest area, headwaters of Mangapoike River*

# #02 CASE STUDY | HE TAUIRA

## A LIVING LIBRARY

## 1769 Garden at Waikereru Ecosanctuary

In 1769 Endeavour botanists Joseph Banks and Daniel Solander set about collecting and classifying specimens at Gisborne Tairāwhiti. This took place amidst the chaos of first encounters, and the deaths of a number of tangata whenua. In the small window before the Endeavour departed, 40 plants were gathered.

A garden is being developed at Waikereru Ecosanctuary to reflect the flora and fauna in Tairāwhiti in 1769, and to celebrate ancestral relationships with these plants and animals. The garden is a design collaboration between Philip Smith (02 Landscapes), Graeme Atkins (Department of Conservation, Ngati Porou) and Malcolm Rutherford (QEII National Trust, curator). The garden is intended as a future refuge for endangered plants like the critically endangered kaka beak.

For more information, please visit **www.waikereru.org**.

*The 1769 Garden: plants are grown within stone walls and mounds laid out in a quincunx grid, techniques traditionally used by Māori*

*Malcolm Rutherford*

# Funding for landowners to protect and enhance our biodiversity

Council's Natural Heritage Fund helps private landowners protect or enhance indigenous biodiversity. It's a small fund that is made available instead of rates remissions on a limited number of properties.

Any privately owned land within our district is eligible for funding. Since its inception in 2013, the fund has helped finance 31 projects and provided more than $200,000 for native planting, pest and weed control and stock exclusion fencing to protect and restore indigenous vegetation, wetlands and waterways. So far, there have been seven rounds of grants.

For more information or to apply, please visit **www.gdc.govt.nz**.

**Natural Heritage Fund June 2016-May 2019**

| Activities | Total |
|---|---|
| Number of projects funded | 18 |
| Amount of funding allocated | $90,000 |
| Amount spent so far | $68,414 |
| Native planting projects | 9 |
| Established bush fencing projects | 1 |
| Combination (fencing and planting) projects | 8 |

# #03 CASE STUDY | HE TAUIRA

## Restoring Turihaua Stream

Paul and Sarah Williams of Turihaua Angus Stud have planted four water reservoirs with funding from Council's Natural Heritage Fund in 2017 and 2018. Six hectares of native wetland and tree species were planted along the reservoirs' riparian margins and are now well established. Pest control and repeated release spraying of the plantings was essential.

Three kilometres of the Turihaua Stream flows through Turihaua Angus Stud, terminating in Turihaua Bay. Ten minutes from Gisborne, Turihaua Bay is utilised by day trippers, campers, and recreational and commercial fishers. Concerns have been raised about the poor water quality of the stream flowing into the bay. An ecological restoration plan is being implemented which includes pest control, fencing and riparian planting along the entire length of the stream which will minimise bank erosion, help filter the farm's run-off, and protect the water quality of the lagoon.

The Williams anticipate long-term benefits of the planting including shading of the stream to support its animal and plant life and providing a corridor for native birds between bush blocks. As custodians of the land for future generations, the Williams are committed to preserving and enhancing their land.

# NATIVE FAUNA

Our region was once the home of many native species including a diverse range of coastal, forest and wetland birds, frogs, skinks, geckos, bats and insects. Many of these have been affected by human activity and their numbers have declined. DOC, QEII National Trust, Council and other agencies support landowners and communities working to protect our native fauna and restore their habitats.

Tairāwhiti is still home to an array of fauna, particularly avifauna (birds). Some species, such as the whio or blue duck, were once common in our clear fast-running rivers but are now rarely seen, but areas of indigenous forest still have numerous tui and bellbirds and some – such as the North Island fantail – still thrive. Weka, once abundant, are starting to recover in inland areas such as the Motu.

Common in both open wooden areas and waterways are the sacred kingfisher, while shore birds such as the rare New Zealand dotterel are present in small numbers but gradually spreading in distribution. Other species like the variable oystercatcher are common. The dabchick, a relative of the better known crested grebe, is widespread but with low numbers in lowland ponds and small lakes within our region.

*Less common in Tairāwhiti than the tui, the bellbird can still be heard on Titirangi and in other areas of indigenous cover*

# #04 CASE STUDY | HE TAUIRA

## Finding bats at Wharekopae

*Long-tailed bat — Photo credit: Department of Conservation*

*Short-tailed bat — Photo credit: Department of Conservation*

Bats are New Zealand's only native land mammal, of which there were just three species: the long-tailed bat, the lesser short-tailed bat, and the greater short-tailed bat (thought to be extinct).

The long-tailed bat is classified "nationally critical", while the lesser short-tailed bat subspecies range from "nationally vulnerable" to "recovering". They are in danger of extinction in the medium term if nothing is done to reverse their declining population and are a high priority for conservation.

As part of the Wharekopae River Restoration Project, monitoring was done by the community with the help of the Department of Conservation.

Bat monitors were set overlooking the Wharekopae River in areas of low water movement and during a period of good weather. The monitors pick up calls at different frequencies (40kHz for long-tailed bats and 28kHz for lesser short-tailed bats).

The study found long-tailed bats at two locations in the catchment, one on the Wharekopae River and one on the Makaretu Stream, both areas with riparian native bush. Further surveys are planned to identify where exactly the bats are living.

**Long-tailed bats used to be common throughout New Zealand in the 1800s, but by 1900-1930 they were becoming scarce in many districts.**

# #05 CASE STUDY | HE TAUIRA

## MOTU KIWI CRECHE
## Saving the kiwi


In 2019, Council sponsored the delivery of a brown kiwi chick, Viv, back to its Motu home. Viv was found soon after hatching in a burrow at Whinray Scenic Reserve in March 2019. She was taken to Rainbow Springs Nature Park in Rotorua, under a programme called Operation Nest Egg, where kiwi eggs / chicks are taken from their wild nests until they reach about 350g. New kiwis taken from the Whinray Reserve are then returned to the kiwi crèche, a 1.4ha predator -proof fenced area in Motu township, where they stay until they reach 1,100g, a size when they can defend themselves from predators.

Transporting Viv was nerve-wracking for Council staff. A cable tie was secured around the handle of the "Kiwi On The Move" box so Viv couldn't burst out during the trip. During the four-hour journey, numerous taps of the beak and rustles amongst the dirt and ferns in the bottom of the box could be heard.

On arrival, Fiona Fisher, a member of the Whinray Ecological Charitable Trust and experienced kiwi handler, opened the box, revealing Viv to a small group of excited Motu residents. A transmitter was then attached to Viv's leg at the MotuVation Café, followed by a short walk up the hill to the crèche to be released into an artificial burrow.

Viv's arrival meant it was time to release Quirky the kiwi into the Whinray Reserve. Named after DOC ranger and longtime Whinray supporter Jamie Quirk, Quirky was released by the man himself. At 1,300g, Quirky has an excellent chance of reaching adulthood in the reserve.

The Whinray Ecological Charitable Trust supports the protection and conservation of kiwi and other birds and wildlife.

Community volunteers and sponsors make their work possible.

### Protecting our national icon

The Whinray Ecological Charitable Trust was formed not only to restore our national icon, the kiwi, but to help protect the Whinray Scenic Reserve and conserve other endangered bird and wildlife species living in the area such as North Island robin, weka, falcon, whio, kaka, rifleman, hochstetter's frog and long tailed bats.

The Trust's success is down to the determined and passionate community and a wide range of volunteers and generous sponsors. The Trust employs fulltime trappers who cover the reserve's 430ha of pristine podocarp native forest and about 200ha of surrounding farmland to control mustelids, cats, possums, ship and Norway rats, and hedgehogs.

For more information, please visit **www.facebook.com/MotuKiwiProject.**

Malcolm Rutherford

# BIOSECURITY

Pest animals or plants classified as "eradication species" in the Regional Pest Management Plan are those we want to eliminate from the region. There are 15 pest species in this category – one animal and 14 plants. Council conducts regular inspections of known sites and investigates any new reports applying direct control to eliminate any of these pest species.

| Pest animal | Infected properties | Sites | Active | Inactive |
|---|---|---|---|---|
| Rook | 1 | 1 | 5 | - |
| **Pest plant** | | | | |
| African feathergrass | 2 | 2 | 1 | 1 |
| Apple of Sodom | 1 | 13 | | 13 |
| Cape tulip | 2 | 2 | 2 | - |
| Californian stinkweed | 6 | 7 | 2 | 5 |
| Climbing spindle-berry | 6 | 6 | | 6 |
| Horse nettle | 1 | 1 | | 1 |
| Lagarosiphon | 1 | 1 | | 1 |
| Mediterranean fanworm | 1 | 1 | 1 | - |
| Monkey comb vine | 1 | 1 | 1 | - |
| Pennisetum | 23 | 23 | 6 | 17 |
| Red cestrum | 6 | 14 | | 3 |
| Spiny emex | 33 | 33 | 4 | 29 |
| Velvet leaf | 1 | 2 | - | 2 |
| White edged nightshade | 2 | 2 | 2 | - |

*Lagarosiphon*

*Eradication pest plant horse nettle only known site is located in the Matakaoa ward on a property in the Waikura Valley. Recent monitoring of this site has found no active regrowth*

# Eliminating rooks

Rooks are a declared eradication category pest bird in the Gisborne region and Council's focus is to eliminate all rooks.

At present we have only one small population of four adult birds north of Te Puia Springs and one possible lone bird near East Cape.

Attempted control of rooks near Te Puia Springs in 2018 and 2019 was unsuccessful. Monitoring to date has confirmed they are still present. Follow-up control of the rooks near East Cape resulted in one rook being shot and no other rooks observed.

Council will conduct site monitoring of both locations in August and September 2020 to confirm numbers and any nest-building activity. Control actions will be considered and undertaken between late September and November 2020.

| Year | Rooks sighted | Rooks destroyed |
|---|---|---|
| 2016 | 2 adult and 2 juvenile birds | 4 |
| 2017 | 4 adult birds near Te Puia Springs and 2 reported near East Cape | 0 |
| 2018 | 5 (4 near Te Puia Springs and 1 near East Cape) | 1 |
| 2019 | 5 adult birds near Te Puia Springs | 0 |


# Reducing goats

Uncontrolled feral goats can significantly damage indigenous vegetation and have wide-scale pervasive effects on indigenous biodiversity. Feral goats are managed as "site led pest animals" in the Regional Pest Management Plan.

Together with Environment Bay of Plenty, Department of Conservation and Nga Whenua Rahui, Council has established a joint goat management plan centered along our regional district boundary in the Matakaoa ward.

All partners have been actively controlling feral goat populations in and around farmland in the Waikura Valley for ten years, which has seen a reduction in goats to very low numbers.

Council does annual inspections of farms in the Waikura Valley, supported by farm owners. It is an ongoing challenge as numbers can spread from farmland outside the goat management areas.

Council has destroyed approximately 24 goats in the Waikura Valley since this collaborative management plan was initiated covering several properties.

| Year | Goats sighted | Goats destroyed |
|---|---|---|
| 2016 | 11 | 11 |
| 2017 | 0 | 0 |
| 2018 | 5 | 5 |
| 2019 | 4 | 4 |

**In 2019 there was a new arrival of fanworm at Gisborne Port when a yacht bound for South America had to be towed into port**

*View of fanworm and mussels on hull of the yacht Wahoo*

# Mediterranean fanworm

Mediterranean fanworm is a marine pest that has established in several New Zealand ports and harbours, including Lyttelton Port, the wider Waitemata Harbour in Auckland and Whangarei Harbour.

Fanworm was first detected in Gisborne by commercial divers in 2015. Since then, Council has worked with the Ministry of Primary Industries to fund an eradication programme in Gisborne Port, with over $100,000 spent to date. In March 2019 a new fanworm incursion occurred at Gisborne Port when a yacht en route for South America got in trouble when the skipper fell overboard and the yacht had to be towed into port. The yacht was quickly lifted from the water and the fanworms and other pests on the hull cleaned by Council biosecurity and Eastland Port staff.

## Fanworm facts

- They breed quickly and over an extended season which makes eradication challenging. A mature female can produce more than 50,000 eggs at a time and the reproductive season can occur from May until late September in our region
- In New Zealand, worms longer than 120mm are considered sexually mature, however, there is evidence suggesting that they can reproduce earlier
- They are capable of rapid growth and able to regenerate damaged body structures
- They have wide environmental tolerances and lack predators
- They are habitat generalists and can live in most artificial and natural habitats
- There is a high chance of natural dispersal due to their extended larval duration (up to three weeks) and ability to delay settlement if unsuitable environmental conditions are encountered

## Tips to stop fanworm

- Keep your boat bottom and niche areas clean (no more than light slime, all the time)
- Keep your anti-fouling paint fresh – manufacturers usually recommend replacement every 1-2 years
- Check your hull before you travel to a new area, every time
- If your boat is heavily fouled, haul it out. Cleaning underwater will only spread any pests.

If you think you've seen any marine pests, call MPI on 0800 80 99 66, note the location and grab a sample if you can.

# Managing roadside weeds

The control of roadside weeds has been long overdue by those responsible for managing our local road networks.

Collaboration with New Zealand Transport Authority (NZTA) and Council under our Regional Pest Management Plan has brought about a change making each party responsible for controlling pest plants on roadsides they administer.

Council has provided a list of priority pest plants that are to be managed as agency funding allows.

Priority pest weeds to be controlled include pampas grass and blackberry along NZTA roadsides. Attention is also being given to some of Council's own roadside networks.

*Roadside weed spraying Lavenham Road*

# Spartina: introduced grass impacts marine life

Spartina is an introduced maritime grass that was planted in the Taruheru River in the 1960s by a local Gisborne Service Club to cover up the 'smelly mud flats' and beautify the river margins.

Spartina is currently present in the following waterways:

- Taruheru River
- Waimata River
- Te Wherowhero Lagoon
- Uawa Estuary
- Waikanae Stream.

Spartina forms dense swards in estuaries and other intertidal habitats. The plant was introduced to New Zealand in the early 1900s to assist with land reclamation through its ability to aid accumulation of sediments. The growth of spartina leads to large-scale physical modification of estuaries, river margins, and the loss of saltmarsh and mudflat habitats for a wide range of marine life including shellfish, fish and wading birds.

Considerable effort has been invested in this plant's control and eradication throughout New Zealand with the best and now proven effective eradication results by using the herbicide Gallant (haloxyfol).

Council has not initiated any spartina control work during this reporting period.

# #06 CASE STUDY | HE TAUIRA

## RESTORING OUR MAUNGA
## Titirangi weed control

Titirangi, also known as Kaiti Hill, will soon be covered in native plants as part of a restoration project.

Titirangi maunga is a significant regional reserve, a major landmark with deep historical, archeological, recreational and cultural importance.

In partnership with Ngati Oneone, Council's four-year project is underway to restore Titirangi. A key part of the project is to replace pine forests with natives.

"In order to restore her mana, to restore her mauri, she needs to be clothed appropriately – we believe that is in native flora," says project manager Ranell Nikora.

"There is a lot of weeding involved. We planted over 60,000 native plants on the hill between 2015 and 2016. They need a considerable amount of care and we want to make sure that they are going to grow nice and big and healthy."

A team – "Whaia Titirangi" – has been employed for further clearing and planting (another 3,500 plants), along with weed control.

Volunteers, school groups and other organisations are participating in the restoration of this important taonga.

Ranell says Titirangi Domain was a place to be enjoyed by everyone.

"We have mana whenua responsibility both to the community to make sure she is looked after, and for future generations."

Other developments include the planned replacement of the existing observatory with a multi-use community centre and extensive walkways.

# #07 CASE STUDY | HE TAUIRA

## Protecting and enhancing Waingake, our water catchment

Waingake, also known as "Waterworks Bush", comprises 1,100ha podocarp-tawa-beech forest owned by Council. This important forest is the catchment area for Gisborne's water supply.

### Pest control at Waingake

Waingake has the potential to be a biodiversity haven for indigenous flora and fauna and therefore a major asset for our region. In April 2018, Council laid out the first set of mustelid (ferret, stoat and weasel) box traps in Waingake. In January 2019 more traps were added, leaving only one boundary edge without traps due to current pine forest logging. The current combined kill tally is 4 ferrets, 44 stoats, 4 rabbits, 562 rats, 79 hedgehogs, 86 mice, 16 cats and 8 possums.

In addition to the stoat box traps, permanent possum bait stations have also been set at 100m intervals around the perimeter of Waingake reserve with the exception of the area where forest harvesting is in progress. Pre-baiting with non-toxic pellet bait over three nights achieved 95% bait take by possums. One application of Feracol toxic pellets was applied with 100% of the bait consumed by possums over several nights.

The next step is to implement a possum control programme in the interior of Waingake aiming to reduce possums to at least 5% RTC (residual trap catch – ie, five possums caught for every 100 trap nights).

The plan also includes targeting feral cats, deer and pigs and expanding the current goat eradication programme to include a buffer area around Waingake.

A 1km feral goat control buffer has been established with support of surrounding farmers and forest owners. Council staff have shot 149 goats on neighbouring farmland since implementing this programme in January 2020. Collaboration with iwi and other stakeholders will see future goat control within the buffer being a coordinated effort carried out at quarterly intervals.

### Monitoring

A network of cameras has been installed throughout Waingake to detect possums, rats, cats and stoats. The results showed that possums and rats had the highest numbers detected, with significantly fewer stoats and cats.


*Two adult possums and a joey attracted to the lure at a camera trap during the survey in Waingake bush*

### Waingake is important both locally and nationally

"The largest and perhaps the most diverse piece of primary lowland forest in the eastern soft-rock lowlands of the North Island; there is no other comparable piece of lowland podocarp-broadleaf-beech forest of such size and intactness." (Whaley et al 2001)

Council has implemented a five-year animal control and monitoring programme to protect and enhance the area's biodiversity and to maintain and improve the quality of the water supply.

**Council collaboration with iwi and other stakeholders will see future goat control within the buffer of Waingake being a coordinated effort carried out at quarterly intervals**

# OUR FRESHWATER

## TŌ TĀTAU WAI MĀORI

Malcolm Rutherford

## HIGHLIGHTS

Tairāwhiti has several large freshwater catchments, including the Waipaoa (2,165km$^2$), Waiapu (1,730km$^2$) and Motu (700km$^2$).

70% of our freshwater swimming spots are classified excellent in terms of bacteria levels. However, some spots such as at Rere Rockslide have regular exceedances. At Rere, Council is working with the community through the Wharekopae River water-quality project to improve water quality.

Wainui and Hamanatua Streams can have elevated levels of E.coli bacteria. Signs warn against swimming at these streams. There is an increased high risk to anyone, but particularly children, swimming in these streams. To improve the water quality of Wainui Stream, Council funded a wetland in Heath Johnston Park. Investigations into sources of contamination at Hamanatua Streams are planned.

Water quality in the Motu catchment is affected by increasing intensification of pastoral farming and cropping. This has seen the river deteriorate significantly in recent years with negative effects on native fish and trout. Council will begin working with the community to develop the Motu Catchment Plan in 2020.

High sediment loads are a key feature of the Gisborne region, owing mostly to our soft sediment geology. This can also lead to increased levels of phosphorus.

There is 37,6812,000m$^3$ of water allocated a year for irrigation. There has been a 51% increase in the area consented for irrigation since 2016, with 7,120ha now consented to be irrigated, predominantly on the Poverty Bay Flats.

The Managed Aquifer Recharge Trial is investigating whether it's possible to take water from the Waipaoa River in times of high flow to recharge the Makauri Aquifer.

Many shallow bores on the Poverty Bay Flats and at Wainui have recorded E.coli indicating that shallow groundwater should not be used for drinking water without adequate treatment. All Council water supplies from shallow groundwater are treated, which includes chlorination to make it safe to drink.

Urban streams around Gisborne are heavily impacted by the urban area. Key issues are high bacteria, nutrients and some heavy metals. Council's DrainWise project is helping fix stormwater and wastewater issues. The Waipaoa Catchment Plan includes projects to improve the water quality in the Taruheru and Waikanae catchments. Read about Enviroschools WaiRestoration at Waikanae Stream on **page 72**.

# OUR FRESHWATER

The sustainable management of our freshwater is critical to our region. Our Freshwater Plan was notified in October 2015 and sets our region's freshwater management framework. Our rivers and streams are important places for recreation, the collection of kai, fishing, kayaking, exercise of cultural practices and enjoyment. Council monitors stream groundwater levels of our main aquifers, river flows, water quality and freshwater ecology at a range of sites across the Gisborne region.

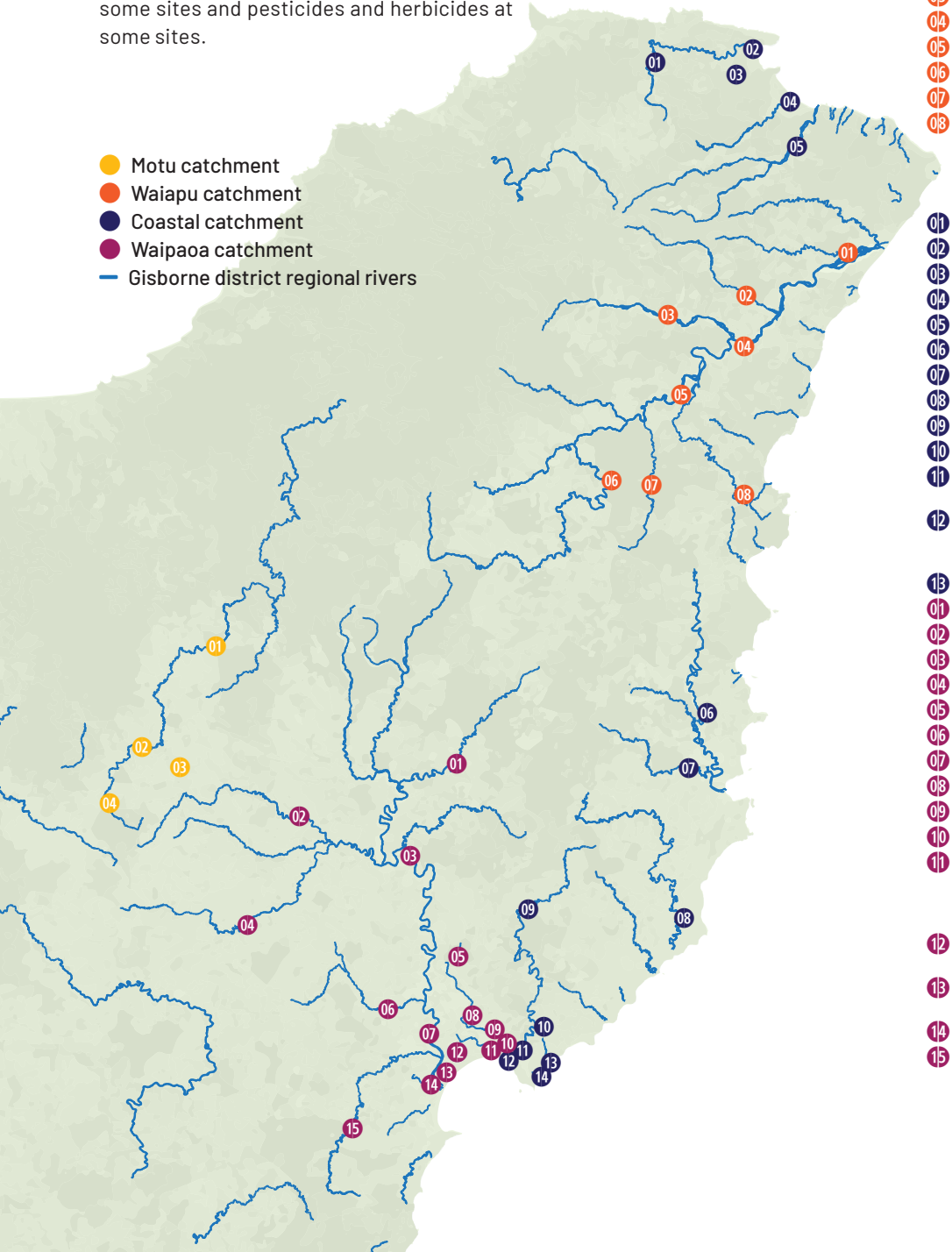
Data on Gisborne water quality can be viewed at **www.lawa.org.nz**.

Further in-depth water quality analysis can also be found in ***Our freshwater - technical report***.

# SURFACE WATER QUALITY

## Catchments

There are 45 freshwater quality monitoring sites across the Gisborne region that are sampled on a monthly basis for a range of chemical parameters. These are primarily freshwater, but include a number of estuarine sites that are influenced by the tide to varying degrees. Water quality sampling tests for a range of chemical parameters, including physical measurements such as water temperature and dissolved oxygen, nutrients such as nitrogen and phosphorus, bacteria such as E.coli, heavy metals at some sites and pesticides and herbicides at some sites.




01 Motu River above Falls
02 Motu River at Kotare Station Bridge
03 Matawai Stream at Tawai
04 Matawai Conservation Area
01 Poroporo River at Rangitukia Rd Bridge
02 Mangaoporo River at Tutumatai Bridge
03 Tapuaeroa River at Tapuaeroa Rd
04 Waiapu River at Rotokautuku Br (SH35)
05 Mata River at Aorangi (Makarika Rd)
06 Mata River at Pouturu Bridge
07 Ratahi Lagoon at Sh35 Culvert
08 Ihungia River at Ihungia Rd Bridge

01 Oweka River at SH35 Bridge
02 Wharekahika River U/S of Wharf Bridge
03 Mangatutu Str at Sh35-Waipahuru Bridge
04 Karakatuwhero River at SH35 Bridge
05 Awatere River at SH35 Bridge
06 Hikuwai River at Willowflat
07 Mangaheia River at Paroa Road Bridge
08 Pakarae River at Pakarae Station Bridge
09 Waimata River at Monowai Bridge
10 Waimata River at Goodwins Rd Bridge
11 Taruheru River at Peel St Bridge
Waimata River at Grant Rd
12 Turanganui River at Gladstone Rd Bridge
Kopuawhakapata Stream at Hirini St
Waikanae Creek at Grey St Bridge
13 Hamanatua Stream at Okitu Bridge
01 Waingaromia River at Terrace Station
02 Waikohu River at Mahaki Station
03 Waipaoa River at Kanakanaia
04 Wharekopae River at Rangimoe
05 Waihirere Str at Domain
06 Whakaahu Str at Brunton Rd
07 Waipaoa River at Matawhero Bridge
08 Taruheru River at Tuckers Rd Bridge
09 Taruheru River at Lytton Rd Bridge
10 Taruheru River at Wi Pere Pipe
11 Taruheru River at Peel St Bridge
Waikanae Creek at Grey St Bridge
Turanganui River at The Cut
Waikanae Creek at Stanley Rd Bridge
12 Sisterson's Drain Site 1at Wetland Inflow Point
13 Awapuni Drain Site 6 U/S Of Rayonier at Fenceline
14 Waipaoa River at Railway Bridge
15 Te Arai River at Pykes Weir

The Waipaoa catchment is the largest catchment in Tairāwhiti (2,165km2). It is subject to the Waipaoa Catchment Plan, which sets water-quality objectives and limits. The plan also includes the Taruheru and Waikanae catchments. The catchment is divided into four Freshwater Management Units (FMU: Hill Country, Te Arai, Poverty Bay Flats, Gisborne Urban) and the objectives and limits are different in each FMU. There are 17 monitoring sites in the catchment plan (including Taruheru, Waikanae and Te Arai catchments).

The Motu River covers a catchment area of 700km$^2$ in our region. It is Tairāwhiti's only truly upland river – rising in the Waioeka Range and flowing through Matawai to Motu and eventually draining into the Bay of Plenty region. It is often described as an 'upside-down' catchment with farmland in the headwaters and a lot of native forest surrounding the lower reaches that drain into the Bay of Plenty region. Council has four water-quality monitoring sites on the river – starting with a native bush catchment reference site at the top of the catchment and the lowest site being above the Motu Falls.

The Waiapu catchment is the second largest in our region, with a catchment area of 1,730km$^2$. There are seven water-quality monitoring sites within the catchment. The catchment is one of the most erosive in the district and consequently has typically high suspended sediment and turbidity levels, and low visual clarity.

*Waiapu River at Rotokautuku*

# FRESHWATER QUALITY

## Rivers

### Nutrients

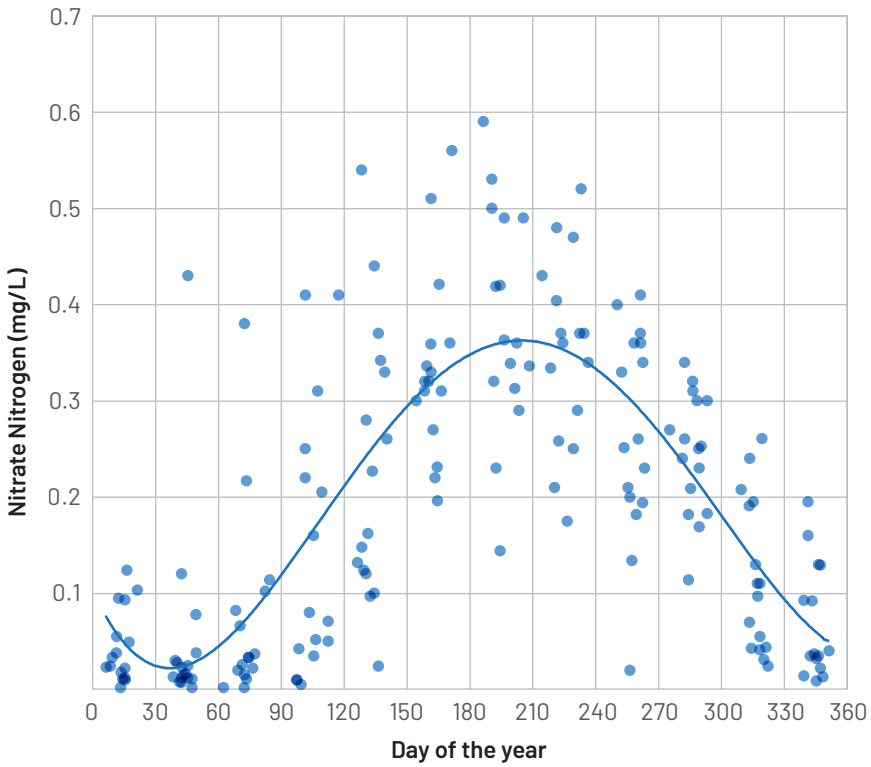
Nutrients are an important factor that controls primary production in a stream. This primary production you might know as periphyton and algae blooms, or as freshwater plants. Organisms that live in the stream are dependent on this growth to eat and live on. However, too much growth can cause detrimental effects in stream health such as unhealthy low dissolved oxygen levels causing fish to struggle to survive, nuisance algae blooms which can cause skin irritations or make dogs sick, a reduction in the clarity of the water which doesn't look very nice, or the choking of a stream with weed.

In general, nutrients in our region's rivers are typically low compared to other regions in New Zealand, but there are hotspots caused by human activities. These are primarily related to the Taruheru River that drains intensive horticultural lands; streams in the Awapuni Moana area subject to disrupted hydrology and commercial practices, other streams around the urban Gisborne city area that are impacted by urban stormwater runoff as well as acute and chronic wastewater leakage. The main sources of nutrients are suspected to be accumulated effects from fertiliser use and rotting organic matter, and urban related wastewater issues. The latter includes septic disposal systems, illegal wastewater connections into wastewater drainage networks, and damaged wastewater piping.

Seasonality is often observed in nutrient concentrations at a lot of sites. The graph is an example of this seasonality, clearly showing this pattern from monthly water samples collected at Motu River at the Kotare monitoring site. There are higher concentrations of nutrients in winter than summer. Sites that show generally high nutrients in particular (such as those in the graph below) often show this seasonal nutrient signal. It may be that fertilisers, rotting organic matter, deeper groundwater and stormwater runoff build up during summer and are then mobilised by higher quantities of rainfall that occur during winter and when shallow groundwater tables come up as soils become saturated. Total fluxes of contaminants (for example tonnes of nitrogen per month) leached from these catchments will be higher during winter as not only are some contaminants more concentrated, but there is more water moving through these rivers as river flows are typically elevated.

There are two key nutrient components that greatly affect stream health, phosphorus and nitrogen. Each parameter has a number of different chemical forms in which it can be present in the environment. The chart on **page 56** shows ammonia nitrogen and dissolved reactive phosphorus as indicators for nutrients across water-quality sites.

**Motu at Kotare Nitrate-N (monthly water sampling 2004-20)**



## Ammonia nitrogen

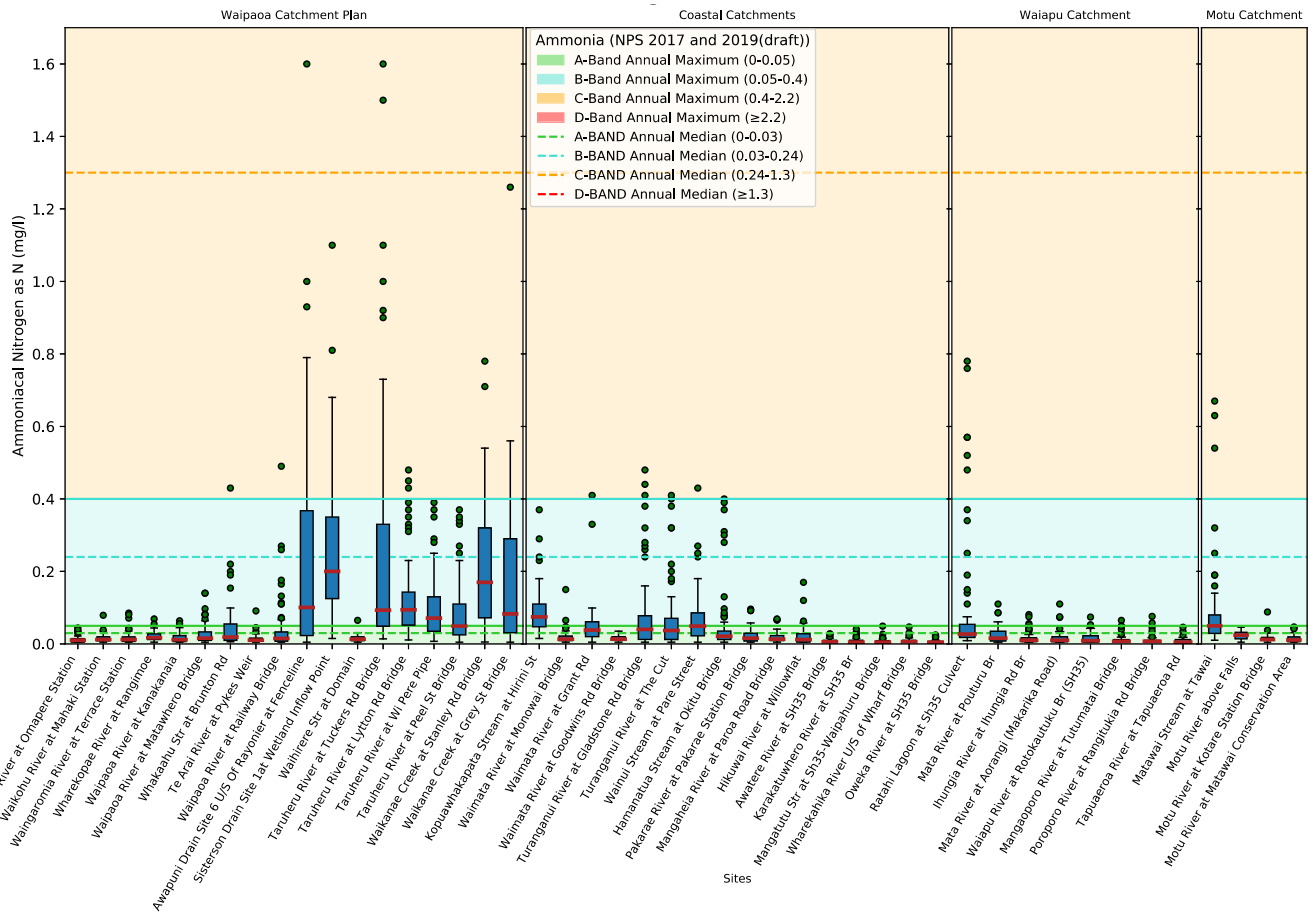
Ammonia nitrogen can be toxic to aquatic life and increasing levels can affect the ability for sensitive in-stream fauna to survive.

Sites with the highest ammonia nitrogen are those in the Gisborne city urban area (Taruheru, Waimata, Waikanae, Turanganui, Kopuawhakapata and Wainui Streams). Typical urban sources of ammonia nitrogen include raw wastewater and industrial process discharges. Other sites with high ammonia include streams of the Awapuni Moana area, as well as the Matawai Stream at the Tawai monitoring site. Awapuni Moana streams are likely influenced by disrupted hydrology of the catchment caused by its drainage scheme and its closeness to sea level, and the commercial activity discharges close to the water-quality monitoring sites. Matawai Stream at the Tawai site is below a dairy farm and is showing significant increasing phosphorus levels and turbidity, but a reduction in nitrate nitrogen over time.

Most sites in the region fall into the A band for median ammonia, with the exception of Awapuni, Sisterson's, all Taruheru and Waikanae Stream sites which have a median result that fall into the B band. No sites exhibited median results below the national bottom line (D band).

Annual maximum ammonia results are a lot more variable, with ten sites in the A band, 20 sites in the B band, and 15 sites in the C band. No sites showed ammonia results in the D band for annual maxima ammonia.

**Ammoniacal nitrogen as N (2015-20)**



## Dissolved reactive phosphorus

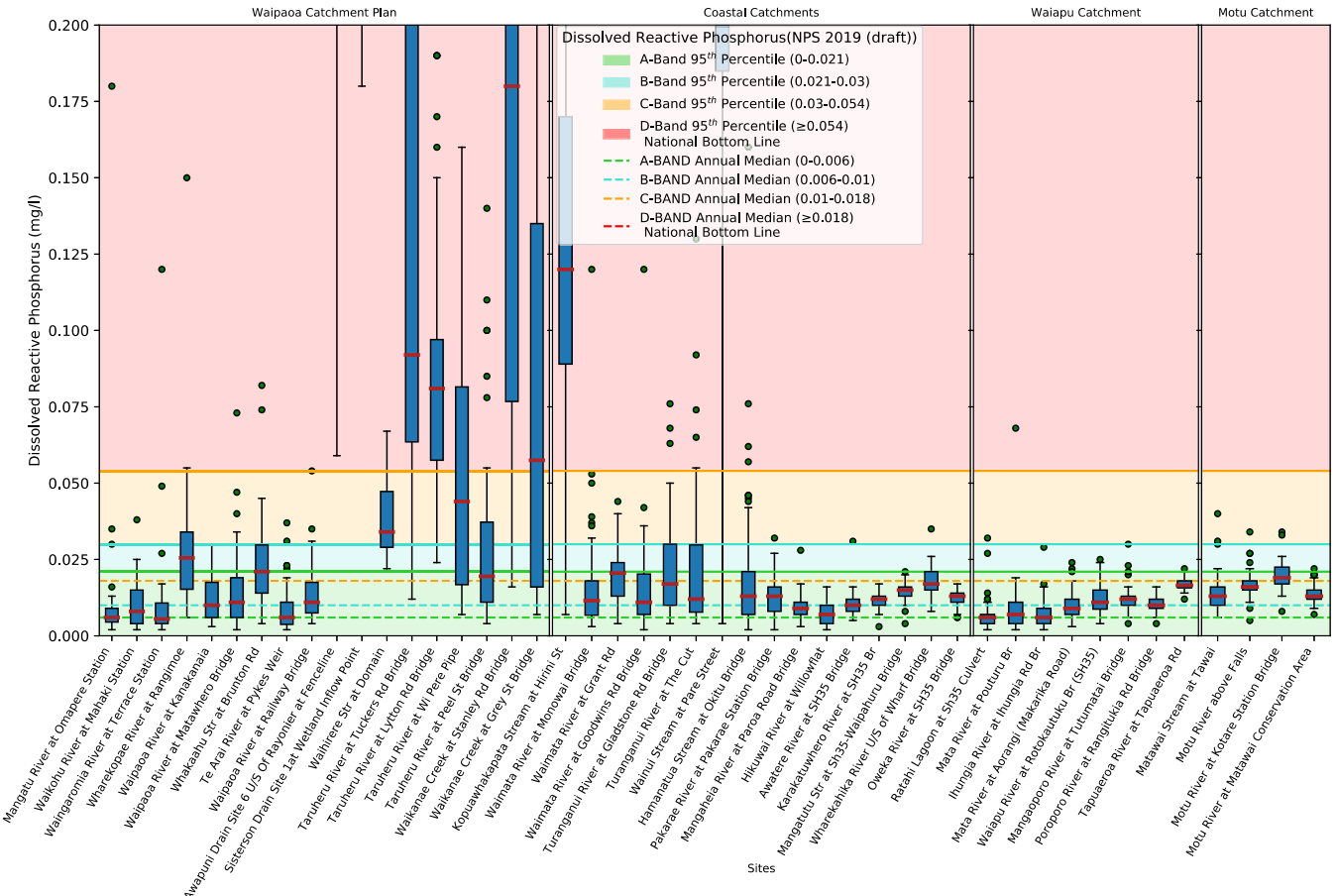
Dissolved reactive phosphorus (DRP) is a sub-component of total phosphorus in the form readily available to be used by algae and other forms of growth, otherwise termed 'bio-available' phosphorus. It readily binds to sediments and is quickly utilised in the environment.

High measurements are not visible off the top of the graph to help visualise most site data. This plot shows the extent to which the two Awapuni and Sisterson's Drain sites stand out from others in the network, which are significantly higher than any other monitoring site in the region. Land uses above the Sisterson's drain site includes a fertiliser including a fertiliser storage and distribution site, wood processing plant and horticultural landuses. Other sites that have high DRP include Taruheru at Tuckers Road, two Waikanae Creek sites, Kopuawhakapata Stream and the Wainui Stream at Parae Road. There are generally high DRP results at the Waihirere Domain site which is interesting, but this is explained when looking at the low total phosphorus results for this site suggesting that DRP is not being absorbed by green growth due to the high degree of forest shading in this stream not providing enough light for things to grow.

Twenty-nine per cent of sites (13 out of 45) exceed the national bottom line D band for the 95th percentile (incidents of high results), while one third of sites (15 out of 45) exceed the national bottom line D band for the annual median.

While absolute levels of nutrients are low compared to most other sites, there have been significant increasing trends of most nutrients observed at the Ihungia River at Ihungia Road Bridge, in particular the nitrogen species. Again, absolute levels of ammonia nitrogen are low in the the Mata River, but also has an observed trend of increasing levels.

**Dissolved reactive phosphorus (2015-20)**



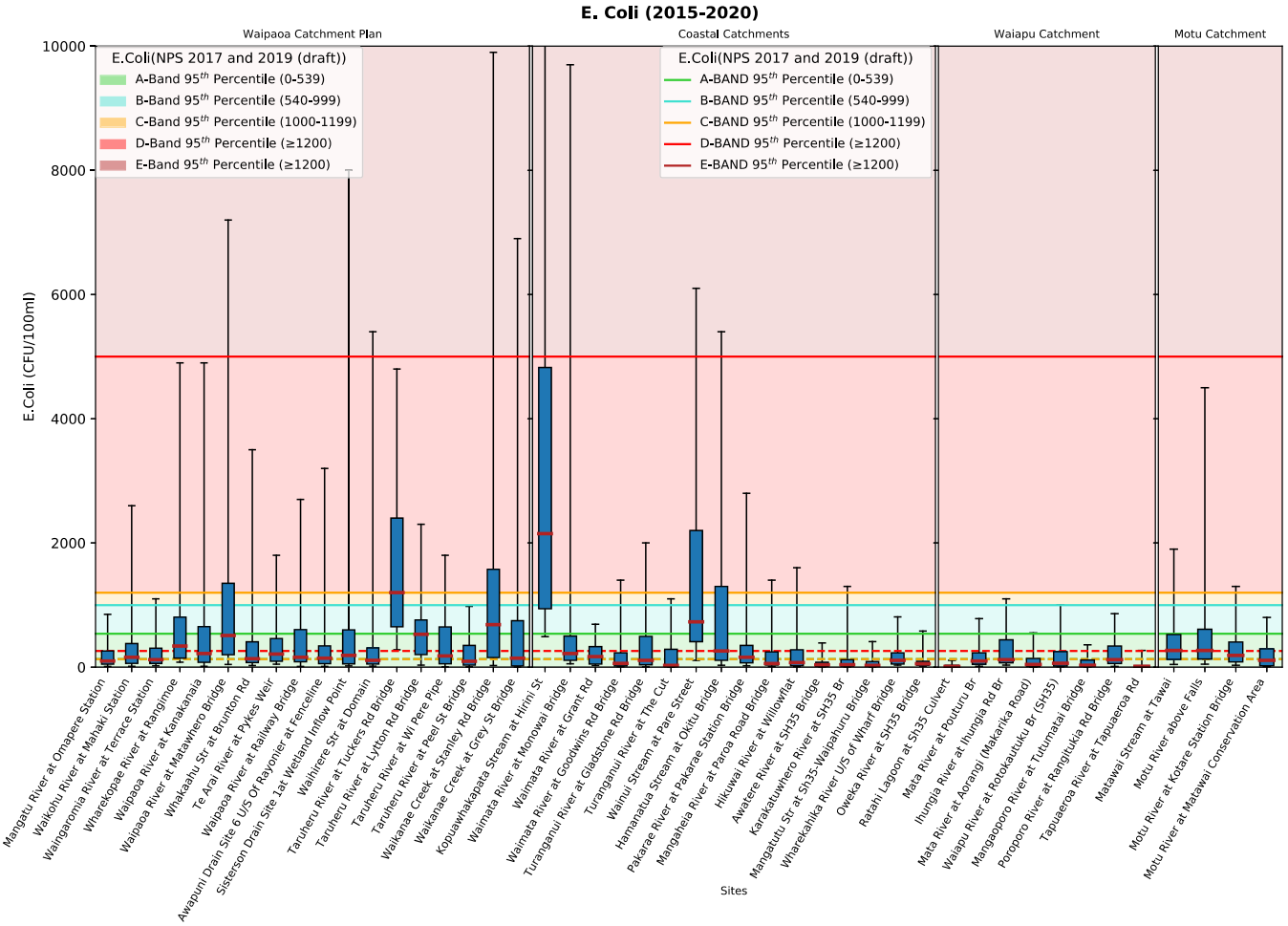
# E.coli bacteria – monthly sampling

The highest E.coli results from all streams monitored were from Kopuawhakapata Stream at Hirini Street, which is off the top of the chart at 19,700 CFU/100ml. The generally high E.coli results from this stream are thought to be due to various forms of wastewater access into the stream, such as illegal connections to the stormwater network and old wastewater pipe infrastructure in that part of Gisborne. Other sites that also had very high E.coli results were Wainui Stream at Parae Street and Hamanatua Stream at Okitu Road Bridge. These catchments are surrounded by a high density of septic wastewater treatment systems, birds are observed in the stream and particularly above the Hamanatua Stream, animals such as horses are commonly observed in the waterway.

The Cut mostly has low E.coli results likely due to the influence salt water has on de-activating E.coli bacteria. See ***Our coast and estuaries*** for recreational waters assessment of some of the estuarine sites that are also sampled using the enterococci bacterial parameter which is a better indicator in highly saline environments.

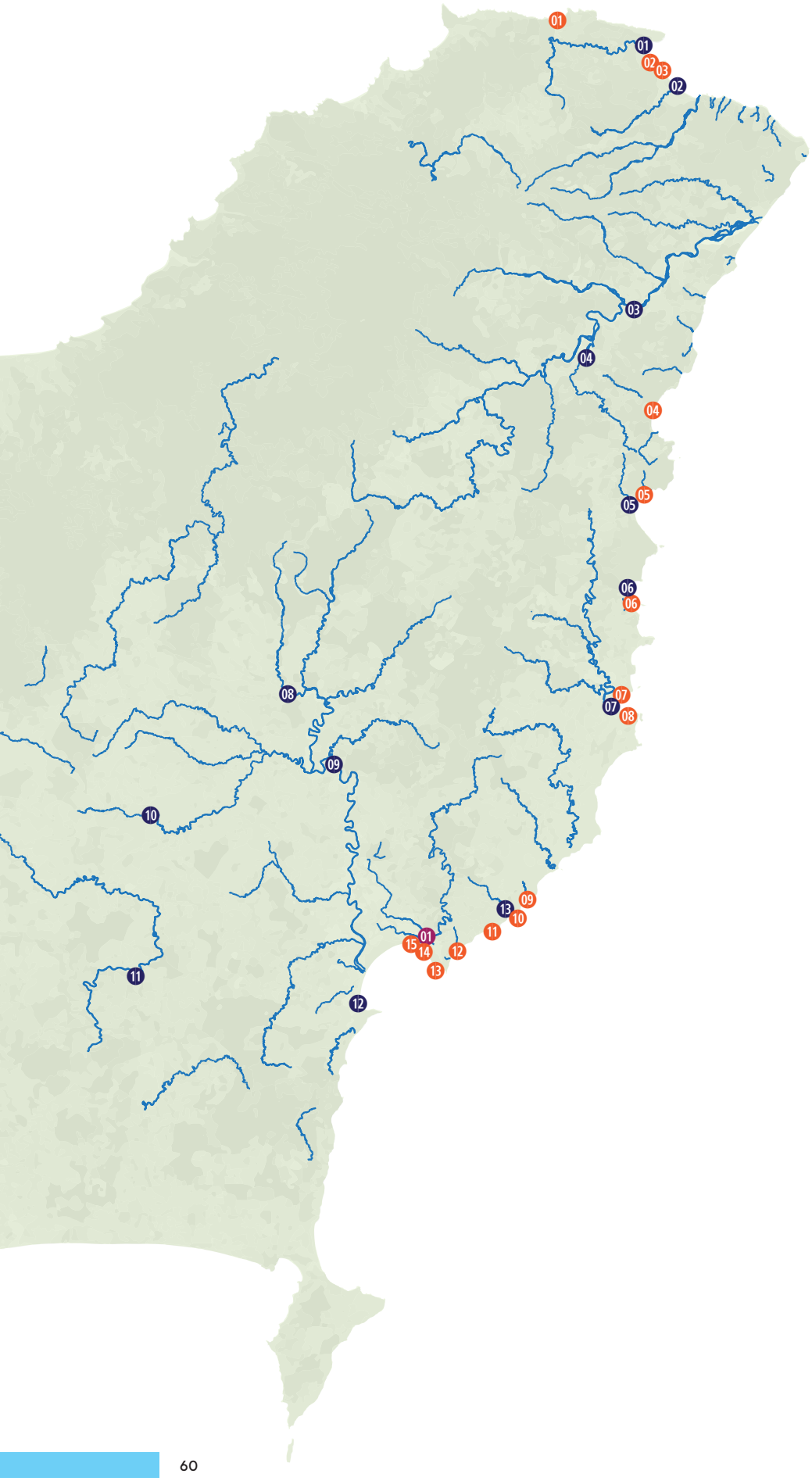
Ratahi Lagoon has the lowest E.coli result of all locations, likely due to complex environmental interactions occurring in the lake.

**E.coli bacteria (monthly sampling)**

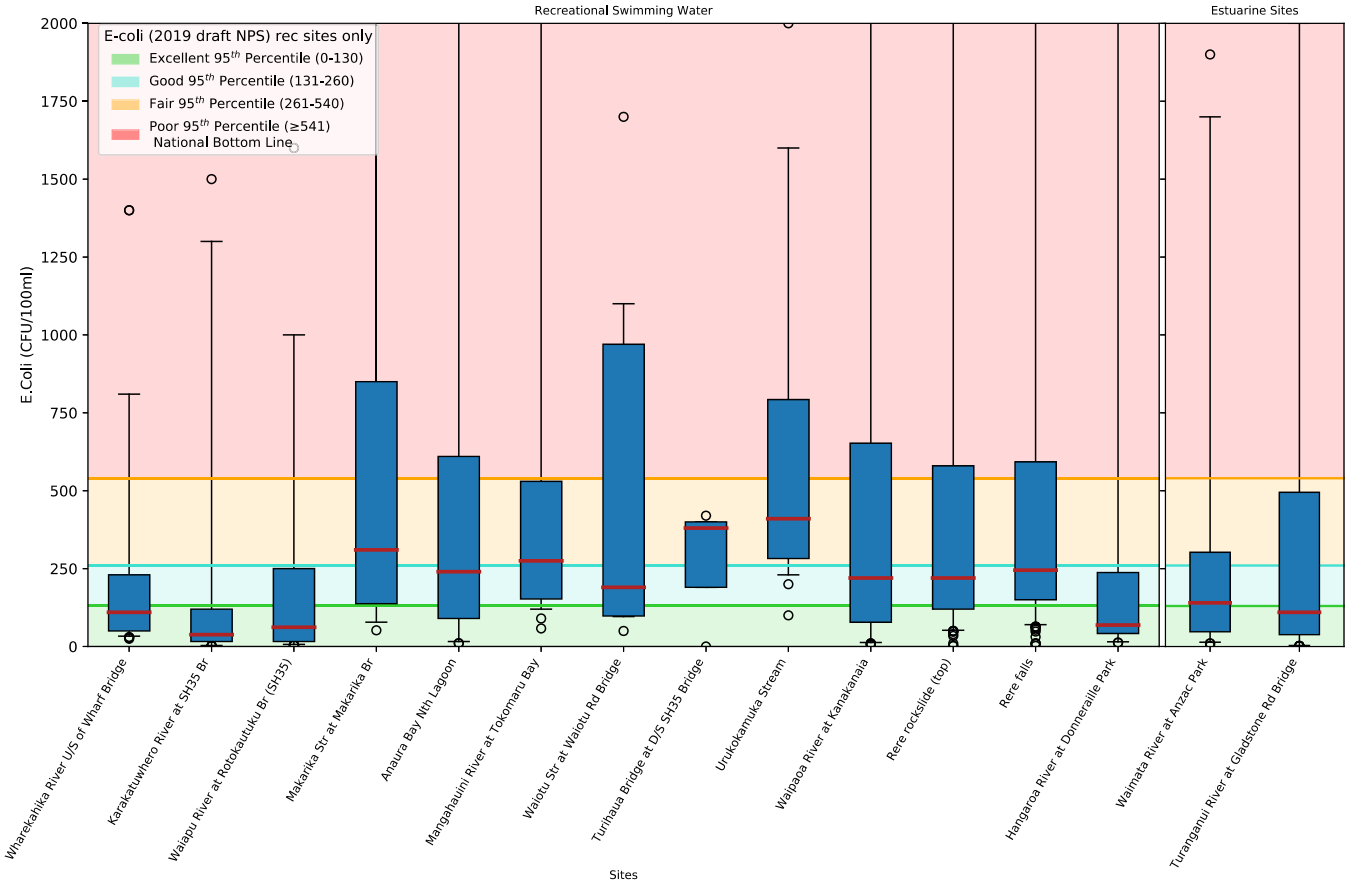


*Kerry Fox*

## Recreational water monitoring sites



## E.Coli recreational water sites (2015-20)



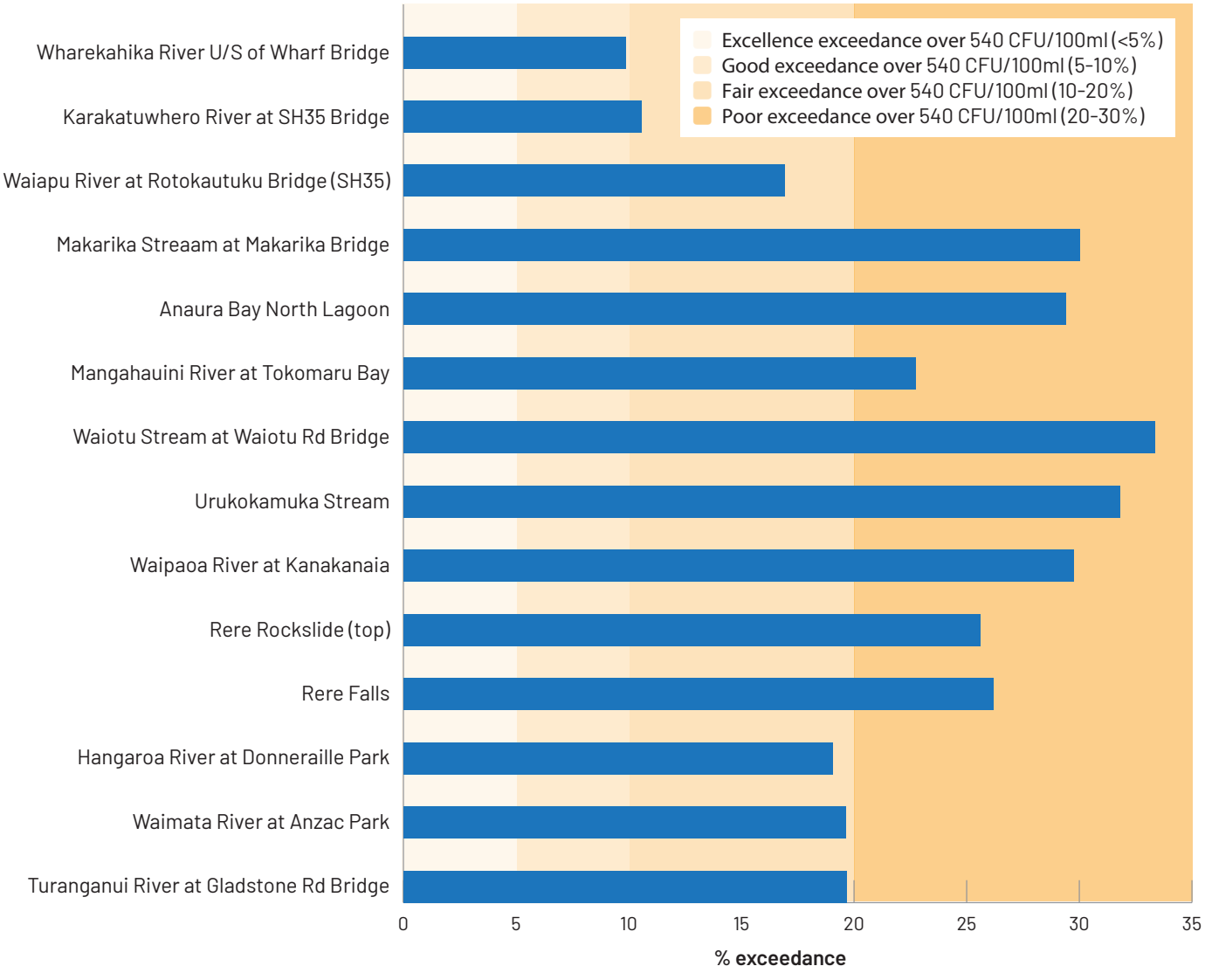
A number of high results over 2,000 CFU/100mL have not been shown on the graph below. These include one each from the Waiapu and Turanganui Rivers, two results each from Waipaoa River at Kanakanaia and Rere Rockslide (top), and three results from Rere Falls. One of these three Rere Falls high results included the highest result observed of 98,000 CFU/100mL.

An important metric to look at for bacteria is the 95th percentile which helps describe the frequency at which high results are observed. Using the NPS grading which compares the 95th percentile (top whisker) against bands, 93% of freshwater sites monitored for summer recreational waters (14 of the 15 sites) monitored fall below the national bottom line for human recreation contact during the summer bathing season in the category described as "poor". The NPS describes the "poor" category as "estimated risk of campylobacter infection as a >5% occurrence, at least 5% of the time". This means these sites represent a high risk for bacterial infection.

Another way to look at E.coli results is the percentage of the time each site exceeds 540 CFU/100mL. The categories described above represent NPS attribute bands (ie, "poor" = D band, "fair" = C band, "good" = B band and "excellent" = A band. This shows that there are a number of rivers that are used for freshwater swimming in the region which frequently exceed NPS attribute bands. Eight sites fall in the poor category with the highest being Urukokomuka, Waiotu Stream and Makarika Stream. A further five sites fall in the fair category. The safest freshwater swimming sites monitored were the Karakatuwhero River at Te Araroa, and the Wharekahika River at Hicks Bay.

Of the sites monitored, coastal swimming sites are a lot safer to swim at than freshwater swimming sites (see ***Our coast and estuaries***). Ninety per cent of E.coli samples from our region's beaches had "excellent" results, compared to only 70% "excellent" results from freshwater swimming sites.

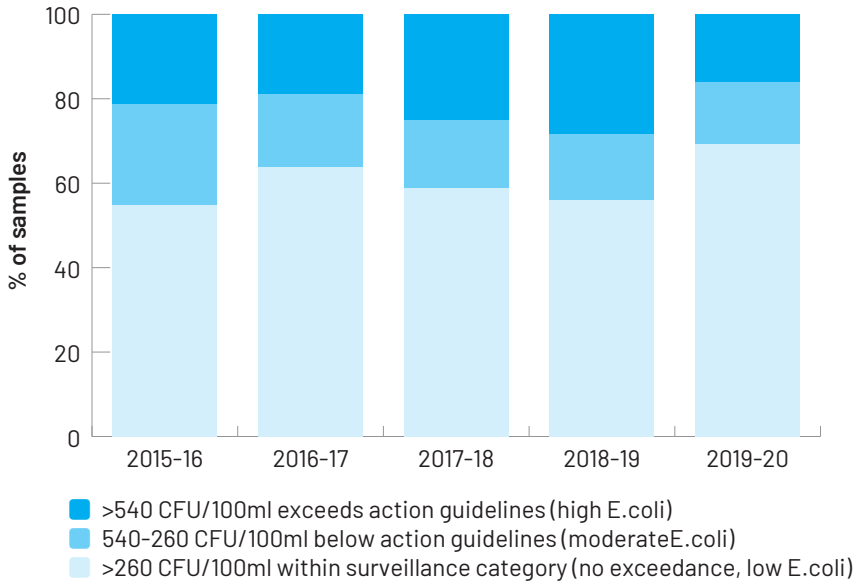
**E.coli % exceedances over 540 CFU/100mL (2015-20)**



This graph shows the percentage of samples (the percentage of time) that samples are above the action limit of 540 CFU/100mL, between the action limit and above the surveillance category (orange), or within the surveillance category 260 CFU/100mL (green), and the percentage of time that samples are below the action limit of 540 CFU/100mL. The total count of sites and samples has been variable throughout the years, with 12 new freshwater swimming sites added in 2018 that are sampled weekly during summer added in 2018. Before this, only three sites were sampled weekly during summer (Rere Rockslide, Rere Falls and Donneraille Park). The graph also includes SOE monthly E.coli results where weekly summer sampling occurs at the same location (for example Waipaoa at Kanakanaia is sampled monthly year-round, but also weekly during summer for E.coli).

The graph shows that on average, monitored freshwater swimming sites have bacteria levels considered safe to swim on average 62% of the time, and unsafe to swim 20% of the time. In 2019-20, these sites were safe to swim at 70% of the time and unsafe 16% of the time. High bacteria levels are often related to periods after rain when contaminants wash off the land and into waterways.

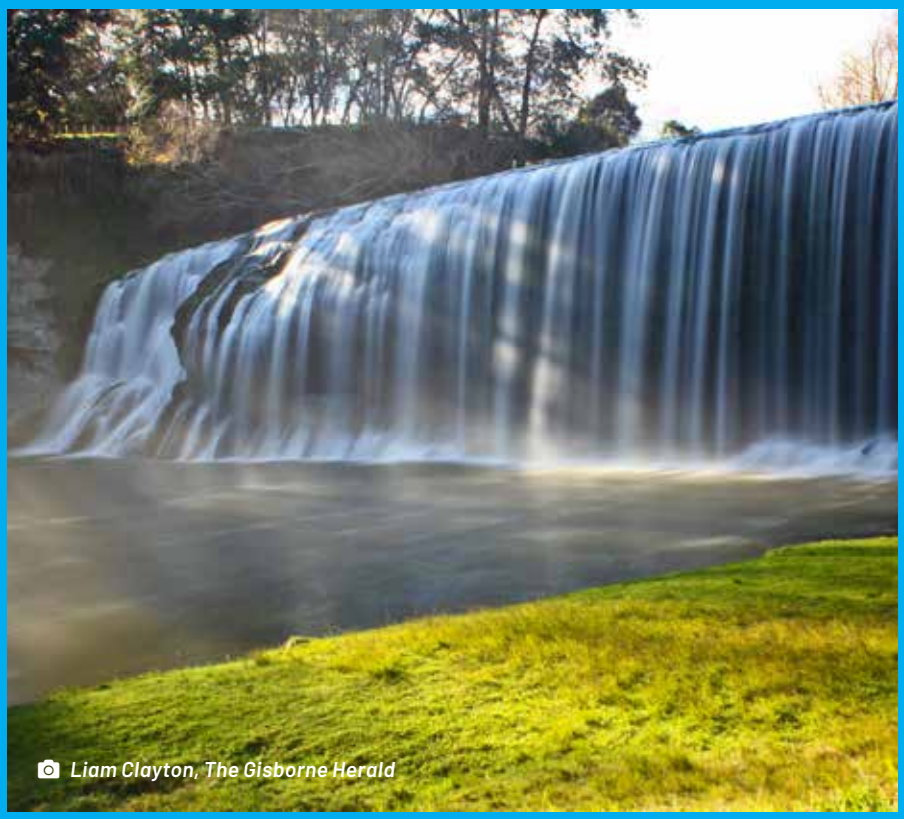
**Annual % of E.coli samples within surveillance/action guideline categories**




*Water-quality monitoring in the Awapuni Moana catchment*

# #01 CASE STUDY | HE TAUIRA

## Improving water quality at Wharekopae



*Liam Clayton, The Gisborne Herald*

The Wharekopae River has long been identified as a hotspot for E.coli levels, and this is a particular concern as both the Rere Falls and Rere Rockslide are found on the river. Intensive water-quality monitoring shows that the levels of E.coli in the river exceed the action limit (unsafe for swimming) nearly half the time at both the Rere Falls and Rockslide. However, analysis of water quality data against rainfall shows that there is a very strong correlation with rain – with water quality generally worse after rain. This was particularly evident in the wet summer of 2018-19, where rainfall was frequent and water quality in the Wharekopae River worse than the previous summer.

The Wharekopae River water-quality project was established to help improve water quality in the river. Farmers in the catchment are developing farm environment plans and undertaking actions such as fencing for stock exclusion and bridging stock crossing locations. It's expected that these actions will start to lead to water-quality improvements.

*Rere Falls (Wharekopae River); Kākahi (freshwater mussels – Echyridella menziesii) survey as part of the Wharekopae River water-quality project*

## What you can do to keep yourself healthy and safe while swimming

- Check and familiarise yourself with recent water-quality results and overall site grading information for your swimming location or a nearby swimming location. This helps you understand what the usual water quality is like and can be found at **www.lawa.org.nz**
- Avoid swimming near potential sources of contamination such as flocks of birds or stormwater outlets. This is particularly pertinent for lagoons where young children may swim as these locations are known to contain often unhealthy high levels of bacteria that can make you sick
- Avoid swimming in the 2-3 days after heavy rain as rain can wash land contaminants into streams and out onto nearby beaches
- A good rule of thumb is that if you can't see your toes in calf-deep water, it's best to wait until the water clears before taking a dip
- Stay safe and look out for potential hazards such as strong currents, underwater objects, steep drop-offs and large rapids.

# #02 CASE STUDY | HE TAUIRA

DRAINWISE

## Reducing our wastewater discharge

Our city's river water quality is significantly impacted by wastewater discharged into our rivers, particularly during wastewater overflow events. This results in health risks for our residents that use our rivers, beaches, and the sea. If we have wastewater overflows on private property, this then affects the health of that home.

Council's DrainWise project has been set up to reduce these health concerns, working together with property owners and the community to help fix the wastewater and stormwater problems that cause the overflows.

### What causes emergency discharges in heavy rain?

During intense or heavy rainfall, some parts of Gisborne's wastewater network are inundated with rainwater (stormwater) and the network can't cope with the volume of water. To prevent wastewater from overflowing onto private properties and out of manholes onto roads – which can cause significant health risks – Council must release the excess water. The only way to do this is to open valves and discharge the wastewater and stormwater into the river. The discharge is highly diluted with rainwater, but there's still a risk to health.

Council only opens the valves when it's absolutely necessary and only in the areas with issues.

### We need to work together

Council owns and manages 50% of the wastewater network. The remaining 50% is owned and managed by individual property owners.

Council is legally responsible for the wastewater network (for example, pipes and manholes) outside the property boundary, and homeowners are responsible for everything inside their property boundaries (such as pipes and gully traps).

The Council-managed wastewater network is designed to accepted New Zealand standards, and under normal conditions would be able to cope with higher wastewater volumes in heavy rainfall events.

The problem in Gisborne is that the amount of rainwater getting into the wastewater network, mostly from private properties, is extraordinarily high.

### What Council's doing about it

- Wastewater network upgrades and renewals – $17.2m over 10 years
- Stormwater public network extensions – improving public drains on private land – $6m over 10 years
- Property inspections and investigations– checking and making minor repairs, giving advice, collecting data – $4m over 10 years
- Compliance and enforcement – making it easy and affordable to fix the issues
- Education and awareness – promoting good practices, campaigns like "Only Flush the Three Ps"
- Free minor gully trap repairs.

For further information, please visit **www.gdc.govt.nz/drainwise**

# AQUATIC ECOSYSTEM HEALTH

Council monitors 81 sites across our region for aquatic ecosystem health.

- 10 sites have excellent aquatic ecosystem health – these sites are in forests high in the headwaters
- 14 sites have poor aquatic ecosystem health – these sites are in areas with cropping, urban or intensively managed pastoral land.

A full report on our region's aquatic ecosystem health is available on Council's website (**www.gdc.govt.nz**) entitled *"SOE Report 2015-2018 Aquatic Ecosystems in Gisborne Macroinvertebrate Communities. August 2018"*.

The Macroinvertebrate Community Index (MCI) is used to measure aquatic ecosystem health by measuring the bugs and critters that live in a stream. It is a wholesome measure of stream health and all the elements of stream health that combine to affect what lives in it.

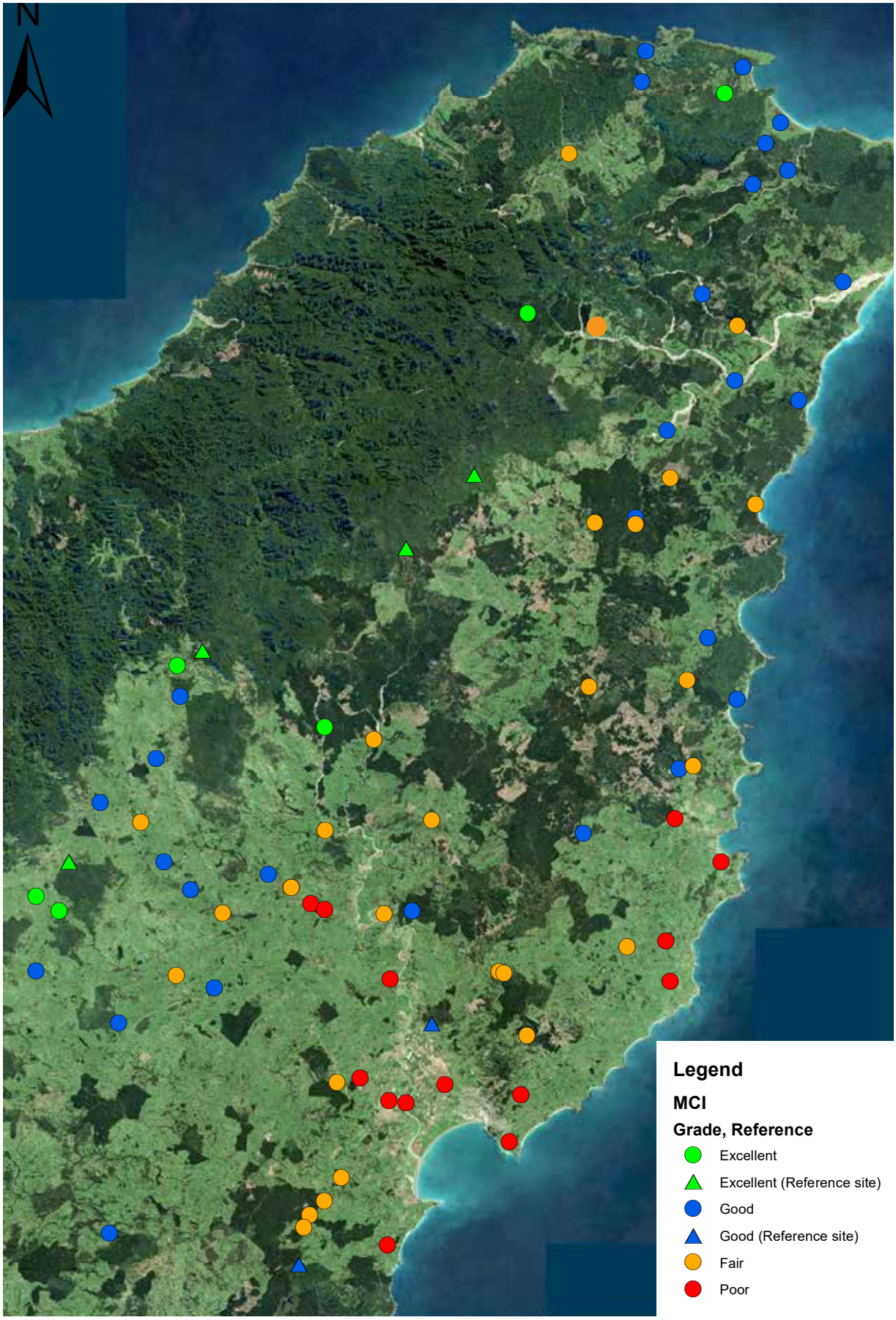
Stonefly larvae that lives in the stream is considered a sensitive species and finding these in your stream is usually a good sign your stream is healthy.

*Deposited sediment measurement using the bathyscope at Waimata River at Monowai Bridge. Deposited sediment can smother organisms that live on the stream bed and reduce the amount of available in-stream habitat for them to live in, on and under*

*Stonefly larvae (left), and its adult version (right)*

*Leaf veined slug freshwater macroinvertebrate*

**Freshwater biomonitoring sites across the Gisborne region showing average MCI score grades 2015-2018. Reference sites denote catchments containing more than 95% native vegetation.**

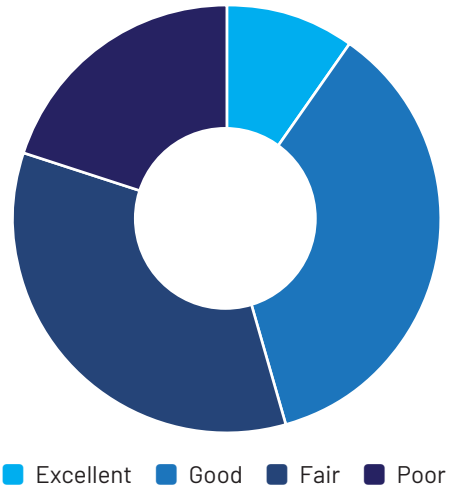


Eighty-one sites have been sampled across a range of land uses, geologies, stream and river sizes, as well as lowland and upland streams. The highest scores tended to be from sites that had little human impact and as such were surrounded by native bush, such as those in the headwaters of the Mata, or at the Matawai at the Conservation Reserve site.

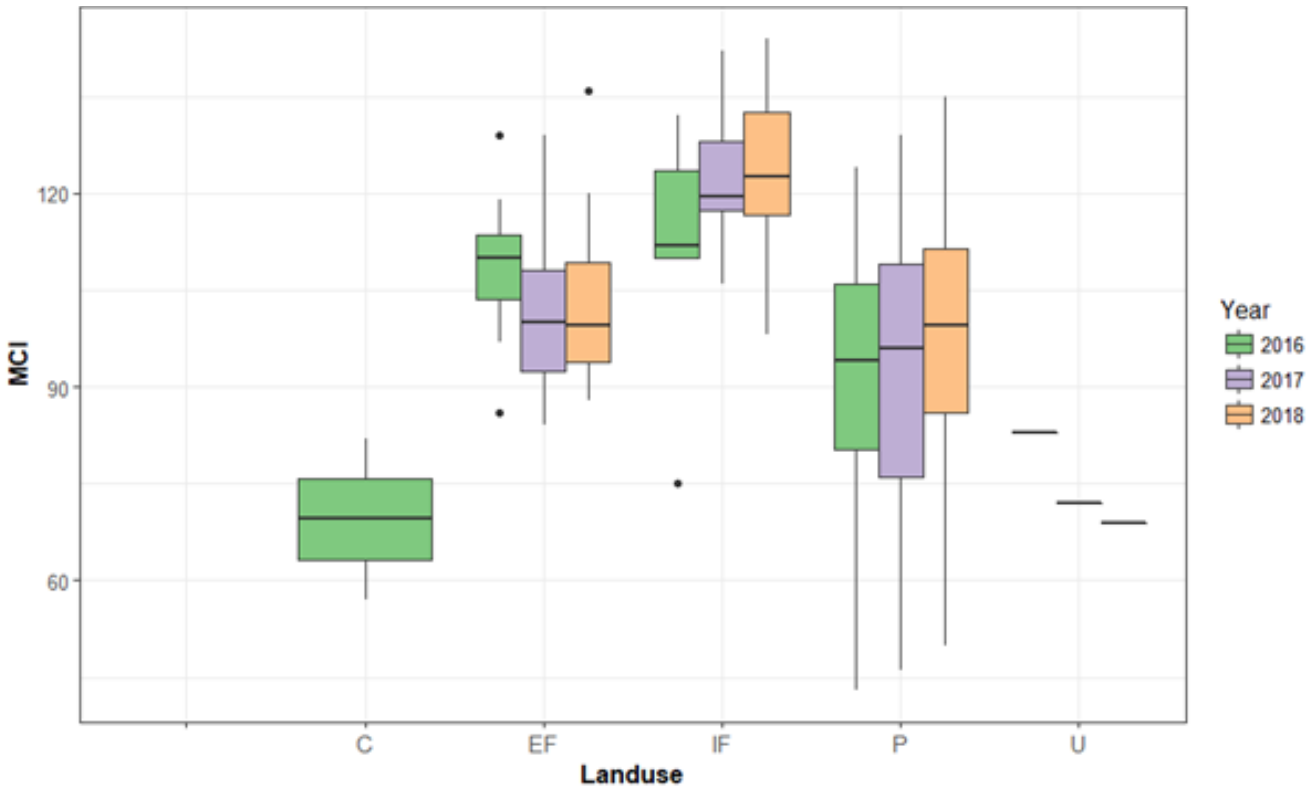
Site scores ranged from Taruheru at Tuckers Road with a "poor" MCI score of 48, up to an "excellent" MCI score of 141 from Mata Upper in the headwaters of the Mata River.

The sites that were in the "excellent" A band category above 120 are typically located in either indigenous forest or mature exotic forestry with one site being in pasture. These sites usually have good habitat such as good stream shading, don't have ready stock access to the stream and they usually have good water quality. The sites in the D band, "poor" category, were located in a mixture of pasture, urban and cropping land and had a mixture of hard and soft bottom classification. These sites usually had a lot of sediment due to erosive catchments or stock damage, get hot during summer because of a lack of stream shading, and lacked habitat for macroinvertebrates to live in and on, such as woody debris or undercut stream banks.

**MCI scores across 81 biomonitoring sites in the Gisborne region (average of 2016-19 data over 81 sites)**




**Boxplot of MCI by land use (2016-18)**




*Plot of MCI values from 81 sites in Gisborne 2015-18 and land use. Cropland (C), Exotic Forest (EF), Indigenous Forest (IF), Pastoral (P), and Urban (U)*

# #03 CASE STUDY | HE TAUIRA

## Wainui Stream water quality and Tamarau Wetland

Wainui Stream has had longstanding problems with water quality due to both urban and rural influences. Wainui Lagoon has been identified as unsafe for swimming for a long time and odour problems are common during summer. Over six months (spring to autumn) an intensive weekly water-quality monitoring programme across six sites in the catchment was undertaken and records of environmental conditions also kept. This identified that:

- 74% of the time the Wainui Stream is unsafe for swimming – with the worst water quality found at Heath Johnston Park and at Murdoch Road
- dissolved oxygen levels are so low that fish species would be very stressed 95% of the time
- sulphur is present at visible quantities at the Murphy Road site, where sediment bubbling and a strong sulphur smell was regularly observed
- faecal source tracking studies identified human sources of E.coli at both Heath Johnston Park and Murphy Road – indicating both a potential sewer cross connection and influence from septic tanks
- flow levels during summer were very low
- habitat assessments showed the habitat is very poor.

As a result of the water-quality study, Council funded the development of a wetland at Heath Johnston Park to enhance its freshwater ecological habitat, improve water quality and provide amenity value of the park. This wetland was designed to both clean the stormwater from the upper catchment, and to improve the habitat for native fish. The planting of the wetland and surrounding area has been undertaken by community volunteers, with trees supplied by the Women's Native Tree Project Trust and Rongowhakaata Iwi Trust.

The wetland and surrounding area was planted by community volunteers, with trees supplied by the Women's Native Tree Project Trust and Rongowhakaata Iwi Trust

# #04 CASE STUDY | HE TAUIRA

## Collaborating to restore our waterways and biodiversity

**Enviroschools WaiRestoration is an innovative approach to restoring waterway health and biodiversity that brings together the energy of young people, educators, farmers, kaumatua, scientists, Council and many others.**

Tairāwhiti's Enviroschools team attended the 2018 WaiRestoration Hui in Northland and returned buzzing with ideas of how the project could be adapted locally. The holistic approach of Enviroschools WaiRestoration delivers a range of positive outcomes - young people gain new skills, knowledge and employment pathways, communities come together to connect with special local places and restore waterways, Māori perspectives are celebrated and nature has the opportunity to thrive.

The first WaiRestoration waterway was Waikanae Stream, named after the kanae (mullet) that were once plentiful. Students from Gisborne Girls High School (GGHS), Gisborne Boys High School (GBHS), Campion College and Te Karaka Area School participated.

With support from Ngā Mahi Te Taiao, the students did water-quality testing which included looking at water clarity, invertebrate and fish life, as well as vegetation along the stream's edges. The study identified a need to fence off the paddocks running down to the stream from Gisborne Airport.

With tutoring from tertiary provider Turanga Ararau and funding from Gisborne Airport, students gained the skills (and NZQA credits) and resources (8-wire fencing materials) they needed to fence off approximately 500m of the upper Waikanae Stream.

The next step was a huge planting project that involved students, community and staff from Gisborne Airport, Eastland Port and Eastland Group. The Women's Native Tree Project and Gisborne Airport supplied the trees. After 1,300 trees were planted, the Department of Conservation helped lay rat and stoat traps to catch predators. There have been reported sightings of the matuku (bittern) in this area so ongoing predator control is key.

In 2019, WaiRestoration fenced and planted Pakowhai Stream (near Muriwai). This is of particular importance because it is a spawning zone for inanga (native fish caught as whitebait). GBHS and GGHS students were again hands-on with fencing.

> **"Enviroschools WaiRestoration is an awesome avenue of grassroots engagement" — Peter Hancock, Council**

Matawai School, Waikirikiri School, and Wainui Beach School propagated and grew native trees in their school nurseries. GGHS, Gisborne Intermediate School, Lytton High School and Muriwai School were involved in the planting of the Pakowhai Stream site. In addition, Waikirikiri and Wainui Beach Schools have been preparing the trees they propagated for Sisterson's Wetland and Hamanatua Stream.

In 2020, students from Campion College, GBHS, GGHS and Te Karaka Area School began a three-term WaiRestoration programme with Turanga Ararau involving fencing, pest management and propagation of native plants.

Students gathered at Waipura Station, Makauri. Morehu Pewhairangi opened the day with karakia and shared the area's whakapapa.

Council's Peter Hancock explained the threatened status of the native fish habitat, the importance of healthy waterways, how to monitor the quality of the water and how to protect waterways.

Everyone present was enthralled to see banded kōkopu which were caught in fish traps set the previous night. This added to the enthusiasm from students to begin the fencing course and protect the stream.

### To date, this initiative has had:

- Four secondary schools involved
- Approximately 35 students and their teachers engaged
- At least 12 stakeholders/partners including iwi and landowners
- 1.5km fencing built
- 1,500 natives planted.

The support of mana whenua and landowners gave students access to the land and fostered an understanding of its history and biodiversity potential.

Enviroschools Tairāwhiti is a collaboration between Council, the Williams Trusts, Eastland Group, and the Department of Conservation. If you're interested in Enviroschools, please contact Darnelle Timbs at **darnelle.timbs@gdc.govt.nz** or visit **www.enviroschools.org.nz**.

*Enviroschools facilitator Kirsty Gaddum explains the life cycle of the tuna*

*Checking out the presence of life in the water*

*Students learn stream monitoring skills that provide information about the health of their waterways*

*Appropriate native species are used to help restore the waterways. Here students learn the names of the plants*

*Turanga Ararau tutor Pete Hema teaching fencing techniques to secondary students*

*Peter teaches students how to identify macro-invertebrates and use the information to assess stream health*

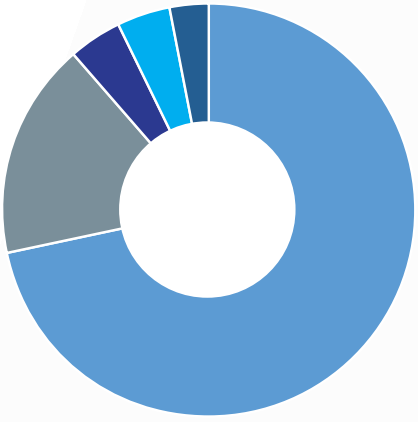
# WATER QUANTITY

**Water quantity refers to water volumes in rainfall, rivers and groundwater aquifers, and it typically becomes interesting if you end up with too much of it (floods) or not enough of it (droughts).**

## Use of water for irrigation

In 2016, there was 4,697ha consented to have irrigation water applied, this has increased to 7,120.9ha across the region – 96% of this is in the Poverty Bay Flats. This increase in irrigable area since 2016 is primarily the result of expansion and intensification of horticultural activities, particularly kiwifruit and apples, across the Poverty Bay Flats.

**Source of irrigation water and area irrigated (ha)**




## Allocation vs actual use

The Waipaoa Catchment Plan was developed through the Freshwater Plan process in 2015 and incorporates 12 major sub-catchment areas with a combined land area of 2,205km$^2$. The area is largely defined by the water catchment boundary of the Waipaoa River but also includes the separate catchment areas of the Waikanae Stream and Taruheru River. These two areas do not drain directly into the Waipaoa River but are both important components of the Poverty Bay Flats and to the Poverty Bay/Tūranganui-a-Kiwa groundwater system and are included within this catchment plan.

Irrigation is essential to the Gisborne region due to the low rainfall and high summer temperatures. The Waipaoa Catchment Plan has set limits around the amount of water that can be allocated for each waterbody in the Poverty Bay Flats. In order to manage the amount of water being taken from our region's rivers and aquifers, consents are granted to people which allocate the amount of water that can be abstracted. Resource consent holders are required to measure and report on the amount of water they are using throughout the growing season. There is a total of 204 current water takes that Council currently manages across the region, with over 95% (197) of them located within the Waipaoa Catchment Plan.

The majority of water take consents are granted for a five-year period which allows Council to review each consent and consider reductions in allocation to align the renewed consent closer to the consent holder's past use and ongoing need. Many of our water sources are over or fully allocated in the Poverty Bay Flats. As a result, there are no new consents being issued for those waterbodies and there are waiting lists established for the water sources. As of May 2020, there are 63 waiting list applications for a consent to take water.

# River hydrology and morphology

Water levels and river flows are monitored throughout the Gisborne district (see map on **page 76**). The red dots represent sites where both water level and flow are monitored (28 sites) and the yellow dots (seven sites) are water level sites only.

The sites have a range of catchment areas, ranging from around 10km$^2$ to more than 1,900km$^2$. The catchments include a variety of land uses, including urban, agricultural, forest and native forest.

Monitoring water levels and flows provides vital background information. This is essential when:

- setting and maintaining environmental flows to protect our waterways
- works are being carried out to existing roads, bridges and flood embankments
- new bridges are proposed, and
- interpreting water quality data.

Our river monitoring data assists when retrospectively analysing extreme events (floods and droughts) to assess event severity, and to inform stakeholders about risk. The data from monitoring also feeds into Council's flood forecasting model.

Monitoring focuses on individual sites, but also considers how different sub-catchments link and affect each other, such as how flood peaks travel downstream.

The two case studies (6 and 7) examine the Waipaoa River in more detail with respect to the June 2018 storm events and low flows (dry periods).

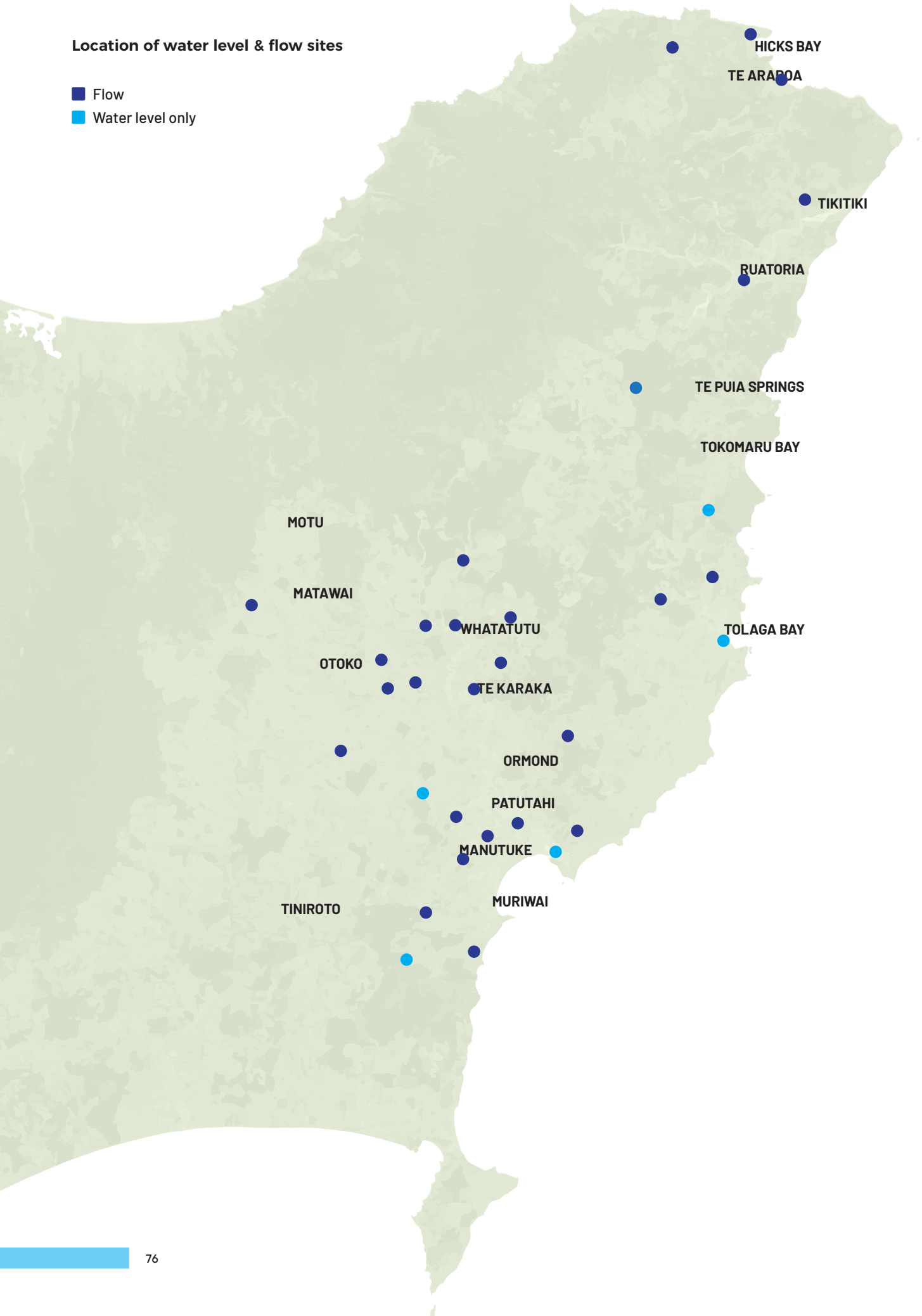
The table below summarises the maximum and median flows in selected catchments.

| No | Site | Catchment area (km$^2$) | Data used in the analysis | Maximum flow (m$^3$/s) | Median flow (m$^3$/s) |
|---|---|---|---|---|---|
| 1 | Hikuwai River at Willowflat | 307 | July 1974 to May 2019 | 1,703 | 1.96 |
| 2 | Mangaheia River at Willowbank | 41 | Aug 1988 to May 2019 | 207 | 0.25 |
| 3 | Mangatu River at Omapere | 182 | July 1983 to May 2019 | 1,254 | 3.21 |
| 4 | Te Arai River at Pykes Weir | 84 | July 1984 to May 2019 | 348 | 0.56 |
| 5 | Waiapu River at Rotokautuku Br (SH35) | 1,376 | July 1989 to May 2019 | 4,629 | 35.97 |
| 6 | Waimata River at Goodwins Rd Bridge | 213 | July 1987 to May 2019 | 1,098 | 1.24 |
| 7 | Waipaoa River at Kanakanaia | 1,580 | July 1966 to May 2019 | 5,273 | 15.84 |
| 8 | Wharekopae River at Rangimoe | 175 | July 1984 to May 2019 | 3,392 | 1.57 |

*Taruheru at Tuckers Road during normal flow (left) and during the September 2015 flood (right)*

**Location of water level & flow sites**

- Flow
- Water level only



# #05 CASE STUDY | HE TAUIRA

## Controlling floods while preserving fish passage

Council is investigating a pilot project on the Whatatuna Stream, a known inanga (whitebait) spawning area, to improve fish passage. As part of the Waipaoa flood control scheme, large gates remain closed to prevent flooding. Council is looking at the feasibility of allowing these gates to remain open until flood conditions require them to be closed to avoid potential flooding upstream, which will minimise disruption to inanga movement along the stream.

A key objective of our region's Freshwater Plan and in particular the Waipaoa Catchment Plan is to identify barriers to native fish – where stopbank improvement works are occurring on known fish barriers there is a requirement to improve fish passage.

The Waipaoa flood control scheme is a significant constructed earth stopbank designed to protect the highly productive Poverty Bay Flats and Gisborne city from floods. Resource consent was granted in late 2018 to widen and raise the height of the scheme to improve flood protection and resilience, including the requirement to identify and improve fish barriers at a number of tributaries entering the scheme.

Some tributaries are controlled by flood gates that prevent flood waters from moving up the tributaries. In tidal areas, the gates are regularly closed due to daily tidal movements. However, most of the time there is no need for the flood gates to remain closed – they could remain open and improve fish passage, only closing when required prior to flood conditions.

The Waipaoa River flood control scheme involves upgrading the existing Waipaoa stopbanks to cater for a 100-year rain event allowing for climate change effects to 2090. Stopbank construction improvement works will be occurring every summer (construction season) for the next ten years, with the upgraded scheme expected to be completed by 2031.

# #06 CASE STUDY | HE TAUIRA

JUNE 2018

## Waipaoa River Flood

*Waipaoa River at Matawhero, looking downstream (12 June 2018)*

*Waipaoa River at Kaiteratahi, 11-12 June, showing ponding areas*

*Waipaoa at Matawhero in 2018 floods*

A storm on 11-12 June 2018 produced heavy rainfall in the northern sub-catchments of the Waipaoa River, over the Whareratas and inland western areas. The soils were already saturated, so instead of soaking into the land and reaching rivers slowly, the run-off response was rapid. The storm generated the second highest water level at Waipaoa River at Matawhero since Cyclone Bola in March 1988.

The graph on **page 79** shows the peak flow at Kanakanaia and Matawhero. Kanakanaia, with a catchment area of 1,580km$^2$, is upstream of Matawhero, with a catchment area of 1,910km$^2$. The peak flow was approximately 4,700m$^3$/s at Kanakanaia and 3,400m$^3$/s at Matawhero.

The centre left picture shows the impact of design storage in the Waipaoa River system between Kanakanaia and Matawhero.

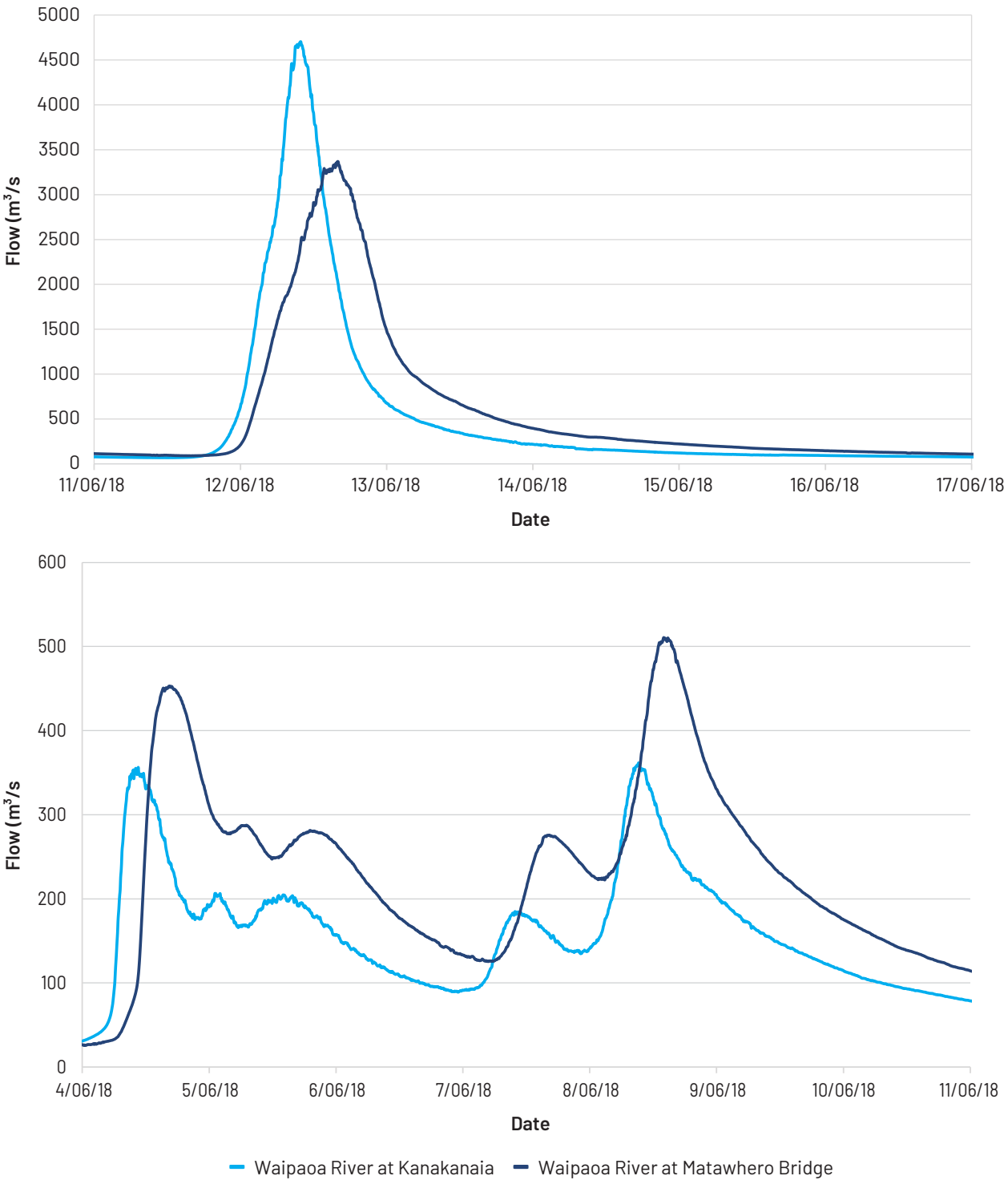
When the flood gates in the stop banks close, this shuts out most of the recharge contribution from the sub-catchments downstream of Kanakanaia. The flood scheme is designed to have some ponding areas, where water flows in at upper levels, then flows back out when the river recedes. This return from storage is much slower than main river flow, so has the effect of "shaving off" the peak flow and prolonging the release at lesser flows. There is also the natural storage effect of the water "filling" the river channel itself, then releasing it; this can be significant. The net effect is to reduce the river peak downstream at Matawhero. Ponding areas (large floodplains) can occur naturally in a catchment; the flood scheme on the Waipaoa refines this natural process. This is a good example of the importance and success of the Council-managed flood control scheme.

In this case, the peak flows at Matawhero are significantly higher than at Kanakanaia. The sub-catchments downstream of Kanakanaia are still contributing flow; the flow is contained within the river channel and the ponding areas are empty. The delay in the timing of the peak reflects the amount of time it takes the flood peak to travel down the Waipaoa River from Kanakanaia to Matawhero (around six hours).

The graph on **page 79** shows how different the 11-12 June event was compared to Bola, in terms of the volume of water (and therefore rainfall) involved.

In the 11-12 June event, the flow peaked and receded relatively quickly. The flow measured 4,000m$^3$/s or more for four hours. In comparison, there was prolonged rainfall during Bola, and the flow measured 4,000m$^3$/s or more for 36 hours.

**Comparison of flood peaks at Kanakanaia and Matawhero (June 2018)**



# #07 CASE STUDY | HE TAUIRA

## Low flows on the Waipaoa River

As the Poverty Bay Flats are used more intensively for agriculture, water availability becomes an important and often controversial issue. Planning for the future involves examining past flow records to assess water availability and also allows for risk assessment and contingency planning.

If the flow in the Waipaoa River at Kanakanaia falls below $4m^3/s$, then A Block consent holders have to stop taking water from the river; if the flow falls below $1.3m^3/s$, then B Block consent holders have to stop their water takes. This is to ensure that both flows and the ecological values are maintained.

The tables on **page 81** show the number of consecutive days where flow in the Waipaoa River at Kanakanaia (Te Karaka) fell below $4m^3/s$ and $1.3m^3/s$ between 2004 and March 2020. The "events" are grouped according to hydrological year that runs from July to June, so summer low flows are grouped together. The tables use the current best data available, but are subject to change.

The first table shows that the number of times the flow falls below $4m^3/s$ varying from one year to another, from years when this does not occur at all (2011-12) to years when this happens 141 times (2012-13). A further issue is that in years when the flows are at their lowest, the low flow "events" are not short, isolated periods, but can extend for up to 56 days. Depending on the time of year this can have significant implications for crops grown and water storage requirements, and can put significant pressure on crop owners who have investments in orchards that could die if they don't get water.

The second table shows that in most years the flow does not fall below $1.3m^3/s$ – and when it does (2012-13) it is for short periods (up to two consecutive days).

*River flow measurement on the Waipaoa River using aerial drone imagery*

**Number of consecutive days flow falls below 4m³/s (grouped according to event & hydrological year)**

| Event | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2019-20 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 6 | 2 | 14 | 5 | 3 | | 10 | 1 | 2 | 5 | 43 | 4 | 6 | 6 | |
| 2 | 2 | | 2 | 3 | 1 | 4 | 18 | | 16 | 5 | 1 | 8 | 7 | 2 | 4 | 4 | |
| 3 | 17 | | 1 | 9 | 6 | 29 | 1 | | 4 | 10 | 6 | 5 | 14 | 1 | 6 | 2 | |
| 4 | 27 | | 6 | 1 | 4 | 5 | | | 6 | 3 | 8 | 1 | | | 4 | 5 | |
| 5 | 1 | | 11 | 6 | 16 | 2 | | | 20 | 19 | 1 | 3 | | | 3 | 29 | |
| 6 | 3 | | 2 | 6 | 10 | 7 | | | 56 | 8 | 31 | | | | | 5 | |
| 7 | | | 4 | 18 | 23 | 2 | | | 13 | 3 | 44 | | | | | 3 | |
| 8 | | | 12 | 21 | 5 | 8 | | | 13 | 9 | 16 | | | | | 2 | |
| 9 | | | 20 | 3 | 6 | | | | 1 | 2 | 7 | | | | | 3 | |
| 10 | | | 16 | 2 | 6 | | | | 2 | | | | | | | 2 | |
| 11 | | | | 2 | 1 | | | | | | | | | | | 1 | |
| 12 | | | | | 1 | | | | | | | | | | | 2 | |
| 13 | | | | | 7 | | | | | | | | | | | 6 | |
| 14 | | | | | 18 | | | | | | | | | | | | |
| 15 | | | | | 1 | | | | | | | | | | | | |
| 16 | | | | | 1 | | | | | | | | | | | | |
| Total no. of days | 51 | 1 | 80 | 73 | 120 | 62 | 22 | 0 | 141 | 60 | 116 | 22 | 64 | 7 | 23 | 70 | **57** |
| No. of events | 6 | 1 | 10 | 11 | 16 | 8 | 3 | 0 | 10 | 9 | 9 | 5 | 3 | 3 | 5 | 13 | **7** |
| Maximum duration (days) | 27 | 1 | 20 | 21 | 23 | 29 | 18 | 0 | 56 | 19 | 44 | 8 | 43 | 4 | 6 | 29 | **22** |

**Number of consecutive days flow falls below 1.3m³/s (grouped according to event & hydrological year)**

| Event | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2019-20 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | 2 | | | | | | | | |
| Total no. of days | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0.1** |
| No. of events | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0.1** |
| Maximum duration (days) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0.1** |

# GROUNDWATER

## Groundwater quality

Groundwater is normally accessed from groundwater bores and mainly used in our region for irrigation and stock water, but in some areas water is used for domestic drinking water.

Council monitoring of groundwater quality focuses on water chemistry and the presence of pollutants such as E.coli and nitrates which can make water unsafe to drink.


*Groundwater bore water level monitoring*

TE HAPARA SANDS AND WAIPAOA GRAVELS

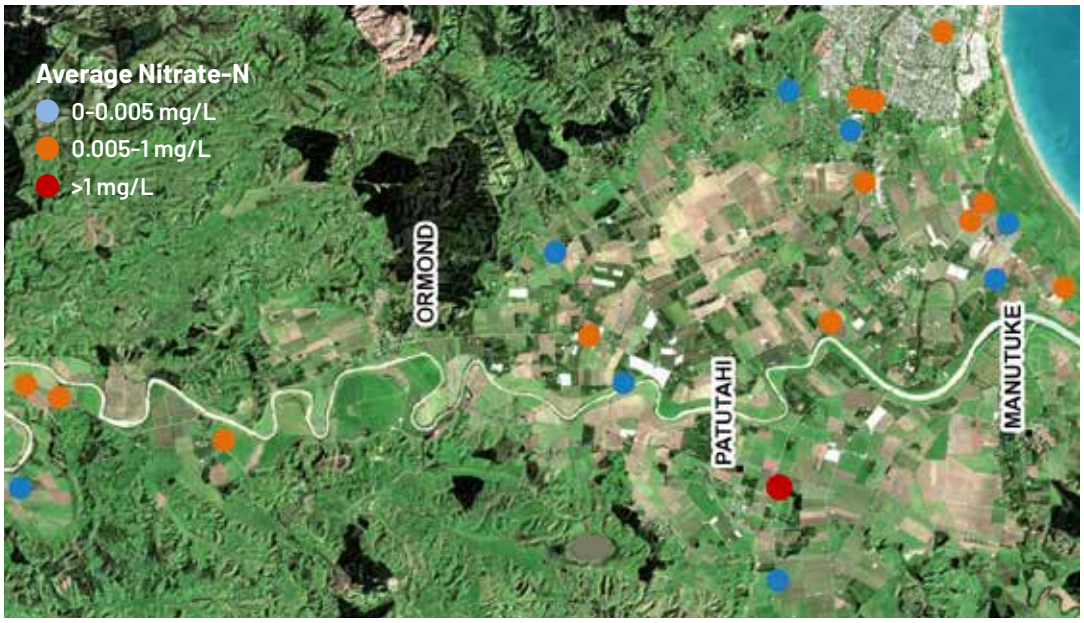
# E.coli and nitrogen in shallow bores on the Poverty Bay Flats

Monitoring of water quality in shallow bores shows that 11 bores out of 21 (52%) monitored regularly have E.coli detected and are unsafe for drinking. These bores are shown as red dots on the map below. In the case of one bore, all water-quality samples had E.coli detected and this bore also records exceedingly high levels of nitrate. While E.coli levels are low, this indicates that in general water from the shallow aquifers should not be drunk without adequate treatment such as chlorination.

Some shallow groundwater bores on the Poverty Bay Flats also show elevated levels of nitrate.

**E.coli hits in Poverty Bay Flats shallow groundwater (Te Hapara Sands + Waipaoa Gravel + Shallow Fluvial aquifers) 2014-April 2020**


**Nitrate-N in Poverty Bay Flats shallow groundwater (Te Hapara Sands + Waipaoa Gravel + Shallow Fluvial aquifers) 2014-April 2020**

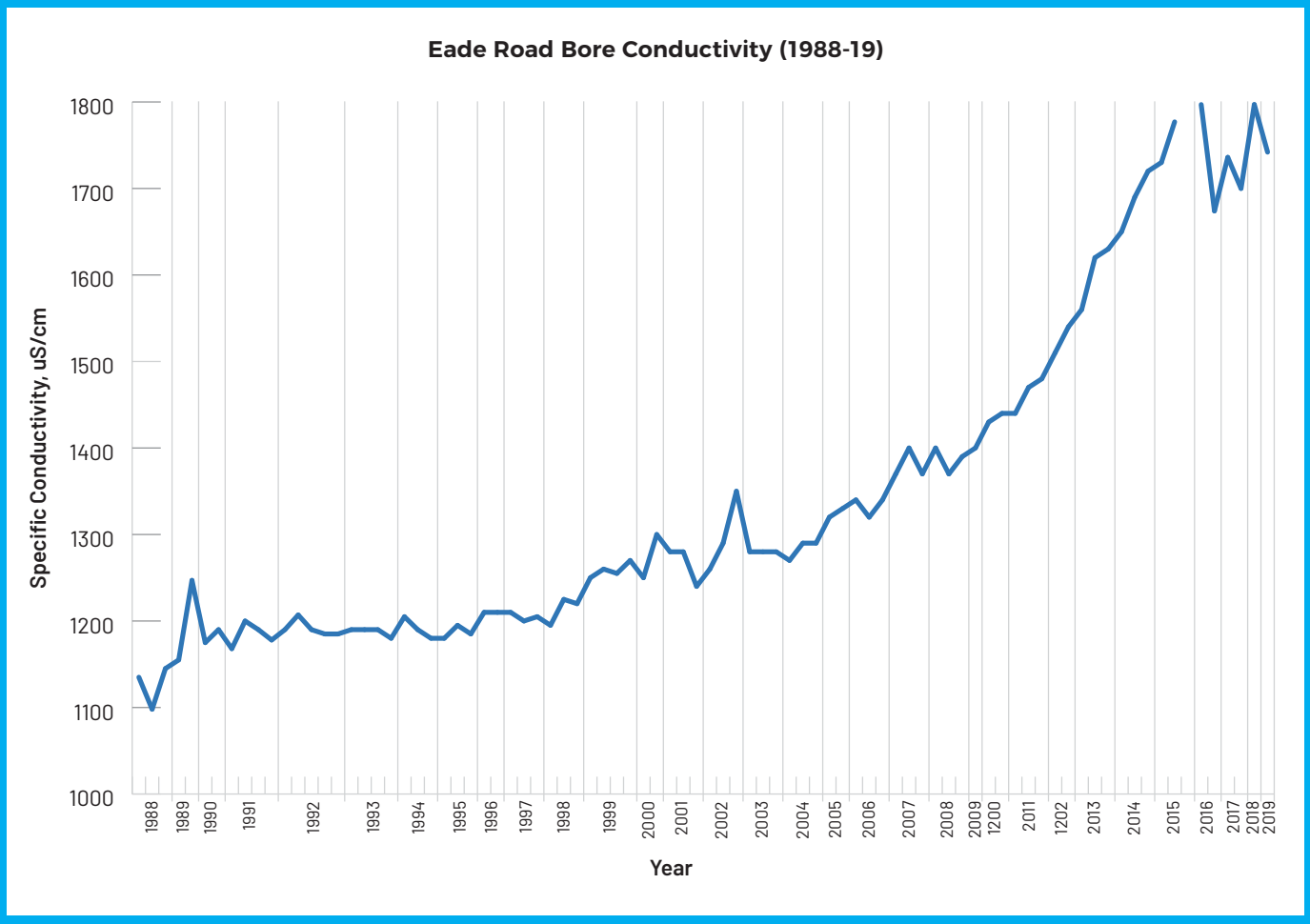


# #08 CASE STUDY | HE TAUIRA

## Increasing salinity at Eade Road Bore, Makauri Aquifer

The Eade Road Bore is located in the Makauri Aquifer, on the edge of the aquifer at Patutahi. Monitoring data since 1988 shows that conductivity (the amount of salts in the water) has increased steadily since 2008 at the rate of 1.3% per year. Alongside this the salinity of the bore has increased at 1.6% a year.

Salt water intrusion is normally a concern around intrusion from seawater, but in this case it is thought that the increased salinity is because saline water is being pulled into the edge of the Makauri Aquifer from the adjacent Western Saline Aquifer underneath the Patuhai area. It is important to do what we can to prevent saline intrusion from happening, as using water that is becoming increasingly salty can cause unhealthy crops and crop death.



MANAGING OUR WATER QUANTITY

# Managed Aquifer Recharge Trial

The Makauri Aquifer is the largest underneath the Poverty Bay Flats, extending from Kaiteratahi down to Makaraka and spanning both sides of the Waipaoa River.

The aquifer is an underground area of gravel and sand that's saturated with water. It naturally recharges as water percolates from the river and higher aquifers through the gravel into it, a slow process that happens over several decades.

Since the horticultural boom in the 1980s, crop irrigation has remained at a constant level leading to the decline of the aquifer. It has very little natural recharge from rain water and river water because of changes such as flood control, vegetation clearance, rainfall and climate change.

The Poverty Bay Flats is an area of 18,000ha and is the single largest area of highly fertile soil in the country. It's among the most productive horticultural areas thanks to a combination of high sunshine, fertile soils and mild temperatures.

Currently about one million cubic metres is taken from the aquifer each year.

Modelling shows that 660,000m3 per year is required to go back into the aquifer to stabilise it, with even more required to enable any expansion of irrigation.

Irrigation would need to be reduced by two-thirds of current use to equal natural recharge.

The Managed Aquifer Recharge (MAR) project aims to inject water from the Waipaoa River into the Makauri Aquifer for use on 3,000ha of irrigated horticultural farmland. Once complete, the trial will show if it's possible to increase water in the aquifer with minimal impact on water quality and the environment.

The trial began in 2017, jointly funded by Council, Ministry for Primary Industries and Eastland Community Trust (now Trust Tairāwhiti). During stage one of the trial (winter 2017), 75,000m3 of water was successfully injected into the aquifer, without showing any adverse side effects on the quality of the existing groundwater.

Work to fully investigate all potential risks started in winter 2019 and will run for two injection seasons – winter 2019 and winter 2020 – and aims to inject up to 360,000m3 per year, depending on river flows and clarity of water. Winter 2019 was severely impacted by river clarity and approximately 40,000m3 was injected. An increased monitoring programme based on recommendations from iwi was undertaken to look at the mauri and cultural impacts of the river and the aquifer.

The stage two trial will generate hydrological data needed to determine the number and location of injection bores in a wider MAR scheme. It will also look at the volume of injection water needed to sustain and then grow irrigation on the Poverty Bay Flats.

The information gained during the trial will be available to any party seeking to develop a MAR scheme.

A company, MAR Limited, has been set up by horticultural interests, including Mangatu Blocks, Kaiaponi Farms, Leaderbrand and some smaller firms. This group is planning how they can use the findings of the MAR trial for future development.

For further information, please visit **www.gdc.govt.nz**.

# Pesticides and emerging contaminants in our groundwater

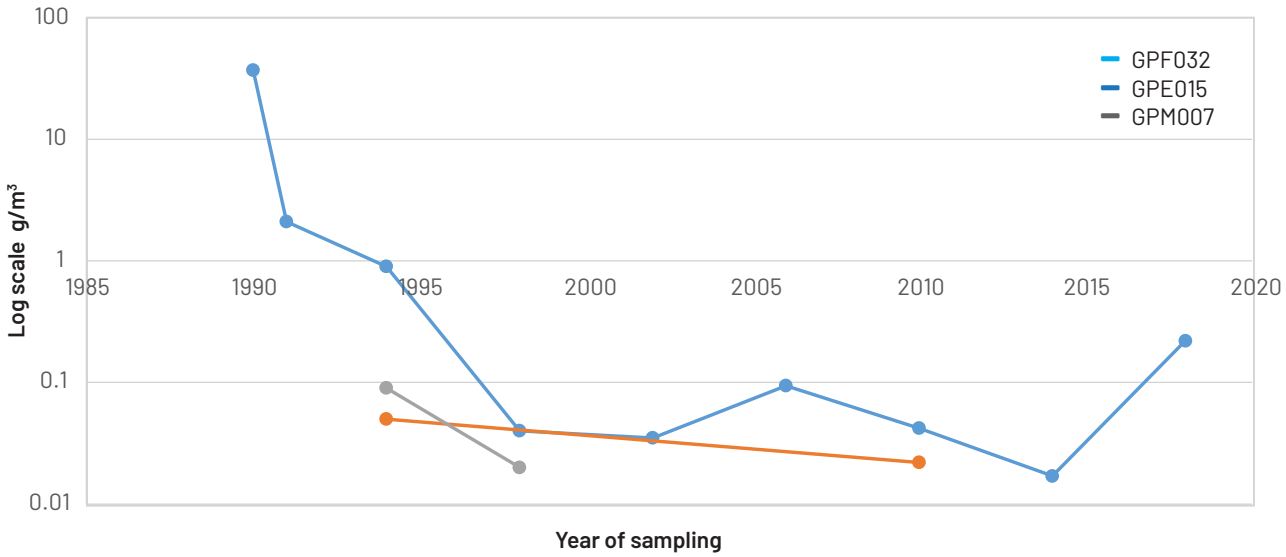
Council has participated in national groundwater quality sampling programmes for a number of years aimed at detecting and monitoring the extent and trends of pesticide and herbicide contamination in New Zealand's groundwater. Research has shown that shallow unconfined aquifers are more vulnerable to contamination than deeper aquifers and as such Council has sampled around six wells from the shallow aquifers of the Poverty Bay Flats.

The testing covers around 80 parameters used in both pesticide and herbicide application. Most detections to date have been of herbicide residues, but two pesticides residues were detected in 1990. The majority show no detection of contamination, but where contaminants that have been detected they are detailed in the table. The 2018 round of sampling also included testing for glyphosate and AMPA (a glyphosate).

In particular, atrazine is a herbicide that has repeatedly been detected in some wells, particularly in well GPF032. The first result from 1990 from this well was very high, but a subsequent re-sampling in 1991 showed significantly lower levels. The magnitude of these results seems to be reducing over time.

| Well name | Year of survey | Contaminant | Herbicide or pesticide | Result (µg/L) |
|---|---|---|---|---|
| GPF032 | 1990 | Atrazine | Herbicide | 37 |
| GPF032 | 1991 | Atrazine | Herbicide | 2.1 |
| GPF052 | 1990 | Diazinon | Pesticide | 0.03 |
| GPF052 | 1990 | Chlorpyrifos | Pesticide | 0.03 |
| GPF032 | 1991 | 2,4,5 T | Herbicide | 0.1 |
| GPE015 | 1994 | Atrazine | Herbicide | 0.05 |
| GPF032 | 1994 | Atrazine | Herbicide | 0.9 |
| GPM007 | 1994 | Atrazine | Herbicide | 0.09 |
| GPF032 | 1994 | Alachlor | Herbicide | 0.1 |
| GPF032 | 1994 | Metolachlor | Herbicide | 0.1 |
| GPF032 | 1998 | Atrazine | Herbicide | 0.04 |
| GPM007 | 1998 | Alachlor | Herbicide | 0.02 |
| GPM007 | 1998 | Desethyl Atrazine (DEA) | Herbicide | 0.03 |
| GPM007 | 1998 | Atrazine | Herbicide | 0.02 |
| GPM007 | 2002 | Desethyl Atrazine (DEA) | Herbicide | 0.046 |
| GPF032 | 2002 | Atrazine | Herbicide | 0.035 |
| GPF032 | 2006 | Atrazine | Herbicide | 0.094 |
| GPE015 | 2010 | Atrazine | Herbicide | 0.022 |
| GPF032 | 2010 | Atrazine | Herbicide | 0.042 |
| GPM007 | 2014 | Acetochlor | Herbicide | 0.021 |
| GPM004 | 2014 | Terbuthylazine | Herbicide | 0.024 |
| GPF032 | 2014 | Atrazine | Herbicide | 0.017 |
| GPF032 | 2018 | Atrazine | Herbicide | 0.22 |

**Atrazine detections from shallow groundwater in Gisborne (data from national pesticides 4 yearly sampling)**



# CHANGES IN RIVERBEDS

Our riverbed levels have been surveyed from 1956 until now. Bed levels increase when large amounts of gravel and silt erode into the bed. They decrease when storms scour the bed, transporting the gravel downstream. The analysis of riverbed levels shows for the first time since Cyclone Bola that riverbed levels are no longer continuing to rise in all monitored locations. This is likely to be because erosion plantings are starting to be effective, as well as the lack of substantial erosion events since the 1980s.

| River | Bed trend level | Implication |
|---|---|---|
| Waiapu River | Upper catchment gradually increasing | Erosion is continuing at rates where more gravel is deposited than naturally moved by the river |
| Mata River | Upper catchment decreasing, lower catchment increasing | Erosion plantings have stabilized the upper catchment, this means gravel is moving downstream |
| Tapuaeroa River | Increasing | Erosion is still very widespread in the catchment |
| Karakatuwhero River | No significant trend | The harder geology means a stable stream bed, with limited new material being created |
| Mangatu River | Gradually increasing | Erosion is continuing at rates where more gravel is deposited than naturally moved by the river |

*Waiapu River at Ruatoria*

# RAINFALL SITES

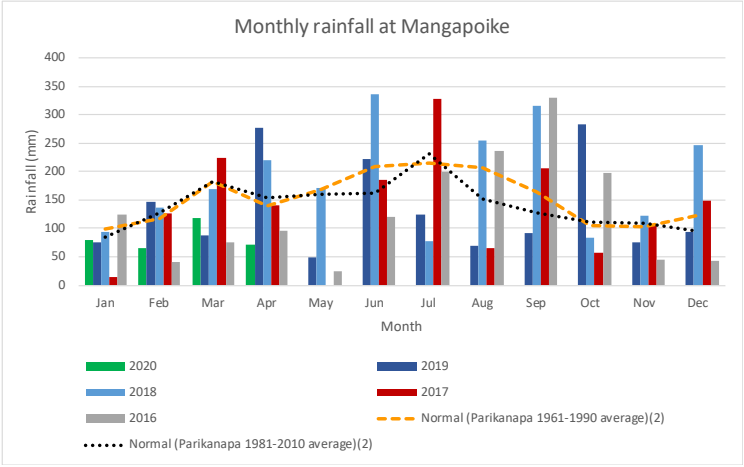
Council is responsible for over 60 rainfall sites; the map on **page 89** shows their location.

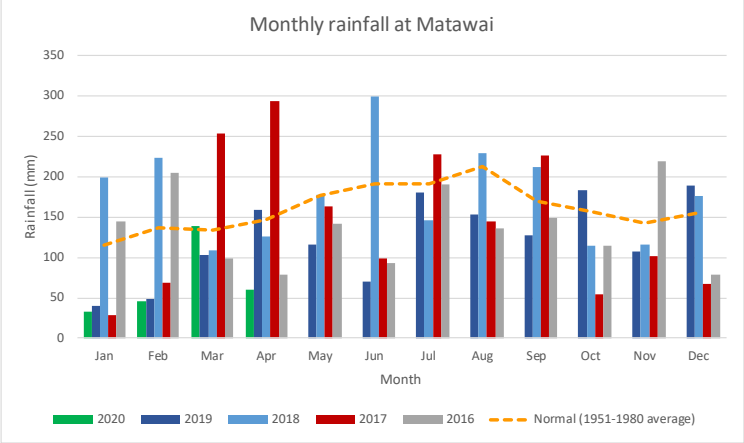
The coverage of the sites across our region (and across a catchment) is important, taking in a range of elevations, land uses and aspects. Data from a number of sites feeds into the flood forecasting model. Some sites are strategic and provide an "early warning" when a weather front is coming through. Rainfall data are also vital in assessing storm events and periods of drought.

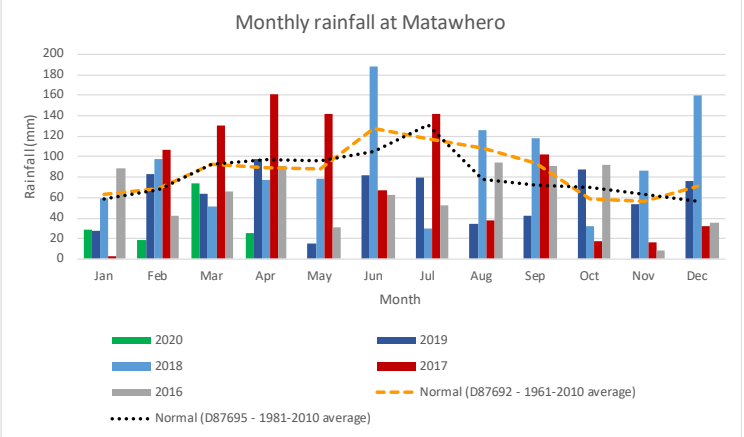
The adjacent charts show monthly rainfall at three sites for the years 2016, 2017 and 2018. The sites are Matawai Telemetry Station, Waiapaoa River at Matawhero Bridge and Ruatoria Telemetry Station at Barry Avenue. The "monthly normals" are also shown. The monthly normals are a "best estimate of station's data over a 30-year period" (National Institute of Water and Atmospheric Research (NIWA), 2019) and come from the National Climate Database (https://cliflo.niwa.co.nz/).

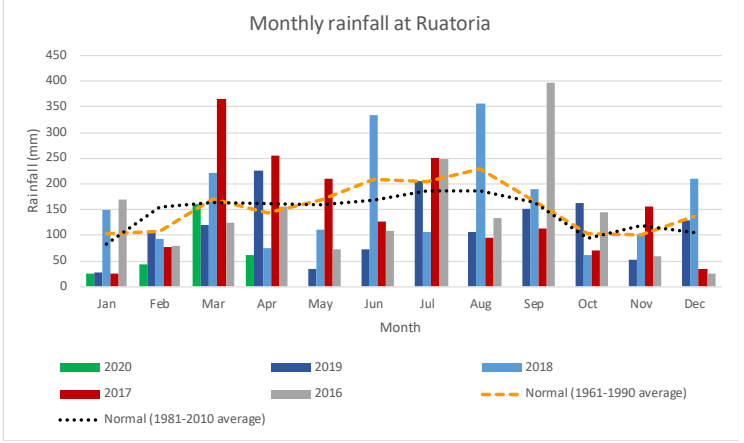
The monthly normals show the expected rainfall pattern – with rainfall peaking during the winter months (June, July and August) and reaching a minimum during spring and summer.

The actual rainfall for 2016, 2017 and 2018 does not always follow this expected pattern. There is huge variability in rainfall – from month to month, year to year, and also location to location. Summer months can be relatively wet (for example January and February 2018 at Matawai) and winter months can be relatively dry (for example May and June 2016 at Ruatoria).

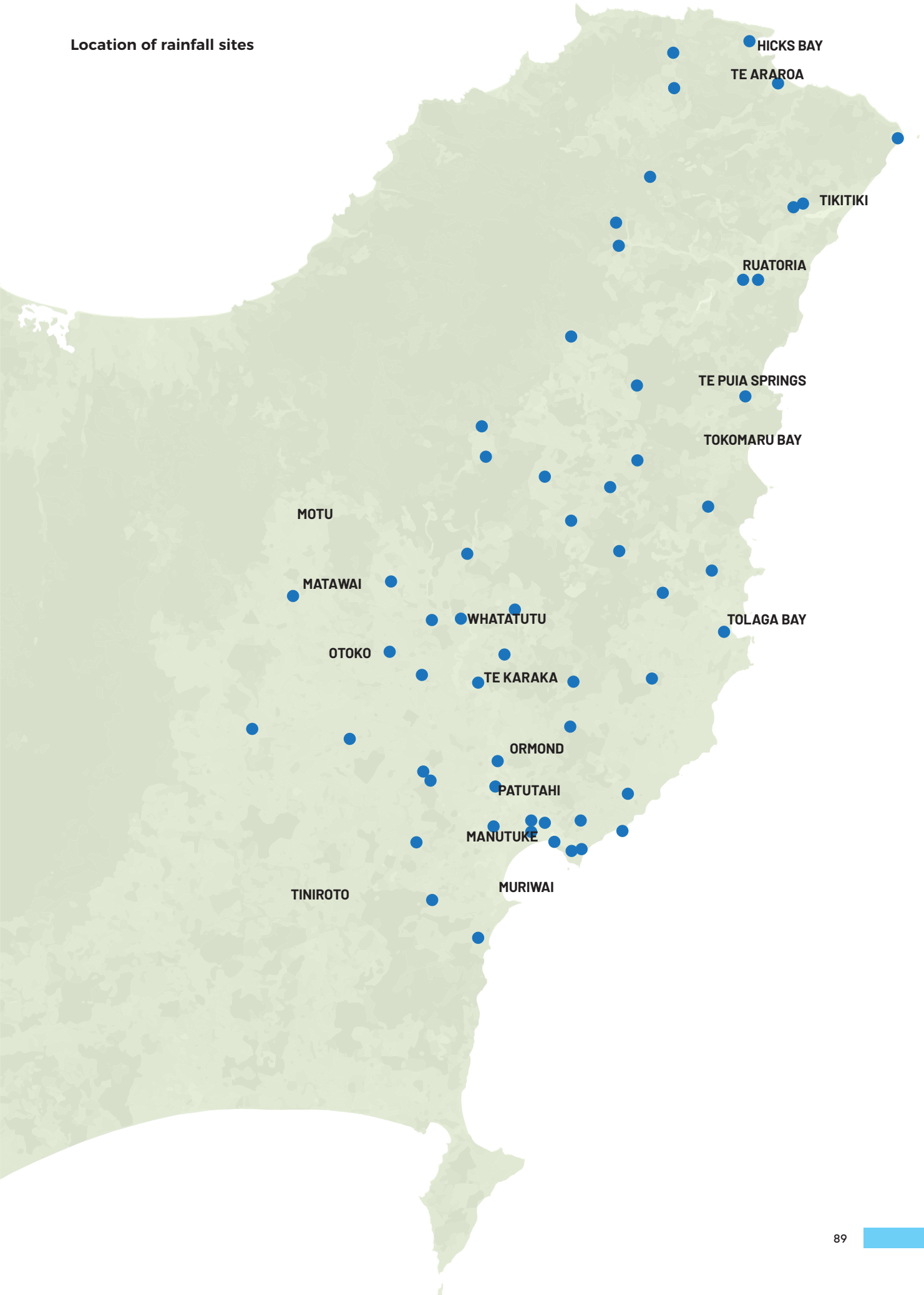


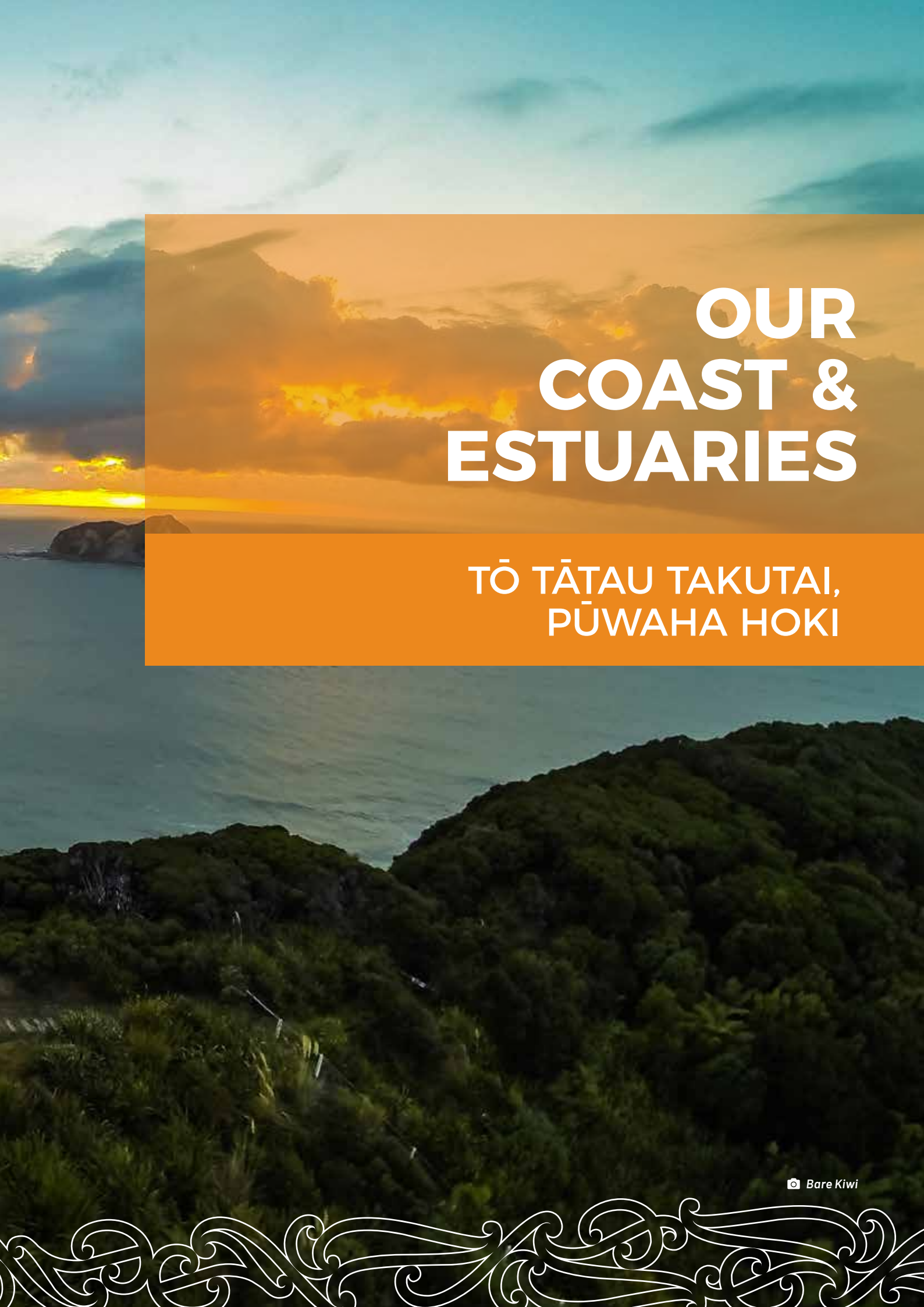



**Location of rainfall sites**



# OUR COAST & ESTUARIES

## TŌ TĀTAU TAKUTAI, PŪWAHA HOKI



Bare Kiwi

## HIGHLIGHTS

Tairāwhiti has about 700km of coastline with more than 95% of Tairāwhiti's population living within 50km of the sea.

Water quality for summer swimming at our region's beaches is excellent. All of Tairāwhiti's 17 monitored beaches have been graded as suitable for swimming. Each beach had between 97% and 100% of samples graded as being in the "suitable for swimming" category.

Gisborne Port is home to a wide range of marine life including kelps, seaweeds, mussels and starfish. It is also the location of a young crayfish puerulus (post-larva) nursery.

Between June 2015 and May 2020 there were 12 wet-weather overflows from the sewer systems into Gisborne's rivers (and then out into Poverty Bay/Tūranganui-a-Kiwa). Council's DrainWise project is working to reduce these occurrences.

Phosphorus is naturally high in our coastal waters due to sediment from our typically erosive and fine sediment geology. Beaches closer to Gisborne and the Waipaoa River have even higher levels, indicating fertiliser, wastewater and sediment discharge sources. Council is working with the community and industry to develop and implement catchment plans to improve Tairāwhiti's water quality.

Coastal natural hazards are prevalent in our region, with coastal erosion, coastal inundation and hazards exacerbated due to climate change. Council undertakes surveys at several beaches throughout Tairāwhiti each year to understand how these beaches are changing.

Sand extraction remains a valuable source for the construction industry. The amount of sand extracted from beaches remained relatively constant between 2015 and 2018.

# OUR COAST

Our region has about 700km of diverse coastline stretching from the steep volcanic headlands of Lottin Point (Wakatiri) in the north to Te Wherowhero Lagoon and coastal reef systems in the south. This diversity provides a wide variety of habitats including coastal cliffs, sandy beaches, estuaries, dunes, rock platforms and reefs.

This range of habitats supports a wide array of species ranging in size from microscopic animals in the sand and mud of our estuaries and beaches to colonies of seabirds (such as gannets, blue penguins and shearwaters), and dolphins, seals and orca who are regular residents of our coastal areas. Tairāwhiti has been associated with whales from the time of Paikea, who in Māori tradition arrived here on a whale's back.

Tairāwhiti is renowned for its beautiful, golden and uncrowded beaches. Nationally significant surf breaks are located at Makorori (Point and Centres), Wainui (Stock Route, Pines and Whales) and The Island. Pouawa is the location of the Te Tapuwae o Rongokako Marine Reserve.

Our region's geological history is plain to see in our many headlands with fractured and contorted layers of sedimentary rock.

Our coast is where many of us come to find food, earn a living, build a home, make a spiritual connection or to relax. The way we use and develop our coastal environment contributes significantly to our region's economy, arts, our social lifestyle and cultural identity. More than 95% of us live within 50km of the sea.

There are many sites and areas of significance to Māori along our coast, including mahinga kai, urupa, pa, kainga and tauranga waka.

The wharves at Hicks Bay, Tolaga and Tokomaru Bay are a reminder of when travel and transport in the region was by sea rather than land.

Our coast provides us with so much – it's our place to live, work and play, a place of relaxation and recreation as well as a source of income and food.

We have great beaches to swim, surf and explore. Diving, snorkeling, fishing, surfing, walking, camping – there are so many activities that revolve around the beach.

It's no surprise that tourism is growing and our coast is a major drawcard with activities including East Cape Lighthouse, Makarori Headland, Cook's Cove, fishing and boat tours, our historic wharves and Tatapouri Ecotours. Cruise ships are now regular visitors to Gisborne.

Our fish and crayfish have high value in the local and export markets and are enjoyed by recreational fishers too.

*Brad Hall and Tourism Eastland*

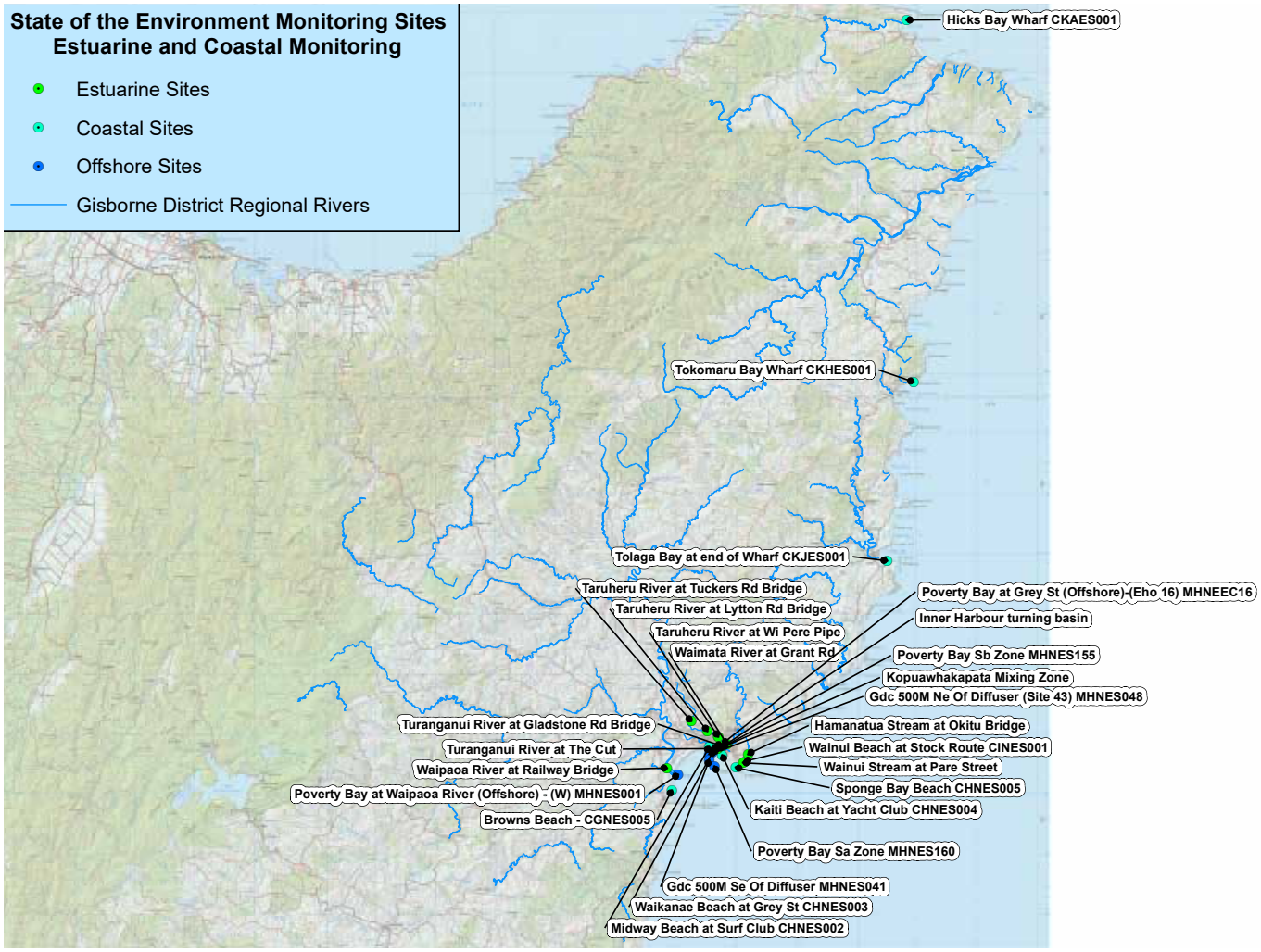
# WATER QUALITY

Good water quality is important for the health of marine and estuarine life as well as for recreational use by people. Coastal inshore waters near Gisborne city provide for a range of ecological, social, economic, cultural and recreational activities.

However, these areas are also subject to urban and industrial impacts within Gisborne and rural impacts from land-based activities and are susceptible to a number of water quality issues. Gisborne's roading and stormwater network are often directly connected to the city's three rivers which all contribute to transporting pollutants to the inshore waters of the marine environment.

Gisborne's wastewater is discharged into Poverty Bay/ Tūranganui-a-Kiwa. Council is currently progressing plans to improve the quality of wastewater discharged.

Contaminants found within city rivers and our coastal environment can contain nutrients, sediments, bacteria, viruses and pathogens, hydrocarbons, and heavy metal compounds. These contaminants can have both chronic and acute effects on marine-based species and can cause degradation of these ecosystems.




*Estuarine and coastal monitoring sites which are sampled monthly. Note it does not show coastal recreational waters monitoring sites which are sampled weekly during summer, although some of these sites are also sampled weekly during summer*

# #01 CASE STUDY | HE TAUIRA

## CONNECTING OUR PEOPLE AND THE COAST
## Oneroa Walkway

Oneroa Walkway, our award-winning beachfront cycle and walkway from Waikanae to Midway Beach is a high quality, culturally significant, scenic walkway that tells stories of navigation while improving access to our beaches.

Winner of the Keep New Zealand Beautiful Kiwi Choice Award, Oneroa Walkway was recognised as a favourite spot in New Zealand.

The walkway beautifully responds to its natural and cultural context and is truly a community project.

"The boardwalk itself acknowledges our region's navigation traditions using features like rope, concrete stenciling, timber patterning and furnishings to represent waka, heritage and navigational themes," says Council project manager Kylie Cranston.

"The design uniquely represents Tūranganui-a-Kiwa, which makes it relevant and special."

A custom-designed furniture suite was created by Council's internal landscape architect and have a copyright, meaning it will always remain unique to Gisborne.

The picnic tables, seats, showers, drinking fountains, bike racks and rubbish bins are all made with Totara recycled from the cross arms of old power poles.

Ms Cranston says since the walkway was opened in 2015 it has markedly transformed and invigorated the use of the beachfront and encourages opportunities for business, recreation and tourism.

"It's used by a considerable number and variety of users, and helps promote an active, happy and healthy community."

**The 1km long walkway linking Waikanae and Midway Beaches was built with consideration to environmental sustainability, coastal erosion and surrounding animal habitats with dune restoration and pest control a key aspect of its success**

# Our water quality for swimming and recreation

Each year during spring and summer, Council monitors popular bathing beach sites for concentrations of faecal indicator bacteria.

A high concentration of faecal indicator bacteria means it is more likely disease-causing organisms are present. These can pose an increased health hazard for recreational activities such as swimming, surfing and other water contact activities. Council uses the Ministry for the Environment guidelines for enterococci counts to assess bathing water quality risk.

Throughout spring and summer Council provides this data to the Land Air Water Aotearoa website.


## Can I swim here?

To check the current water quality of our beaches, please visit the Land Air Water Aotearoa website **www.lawa.org.nz**

# Enterococci bacteria from weekly summer swim site sampling

Coastal water quality is monitored at 17 beach sites and six estuary sites and monitoring is done weekly at sites during the swimming season (November to April) and fortnightly throughout the year at Pouawa and Wherowhero Lagoon. Three sites at the top of the East Cape area (Lottin Point, Onepoto Bay and Te Araroa) are also sampled monthly from December to February. Note that this analysis utilises data from samples collected at a regular frequency ("random"), but any data from samplings targeted at high results (such as scour overflows) have been removed unless that sampling happened by chance.

Overall Gisborne bathing beach water quality results are very good. A high percentage of "surveillance" category results combined with low median enterococci counts indicates microbiological water quality of the regions swimming beaches is generally excellent.

Of 1,632 samples collected throughout the region between autumn 2015 and the end of summer 2020, 94% were below the "action" guideline (good). This indicates that in dry weather conditions the risk of becoming ill as a result of faecal contamination of sea water during water contact is very low. Only 68 samples – 4% – were within the "action" (bad) category.

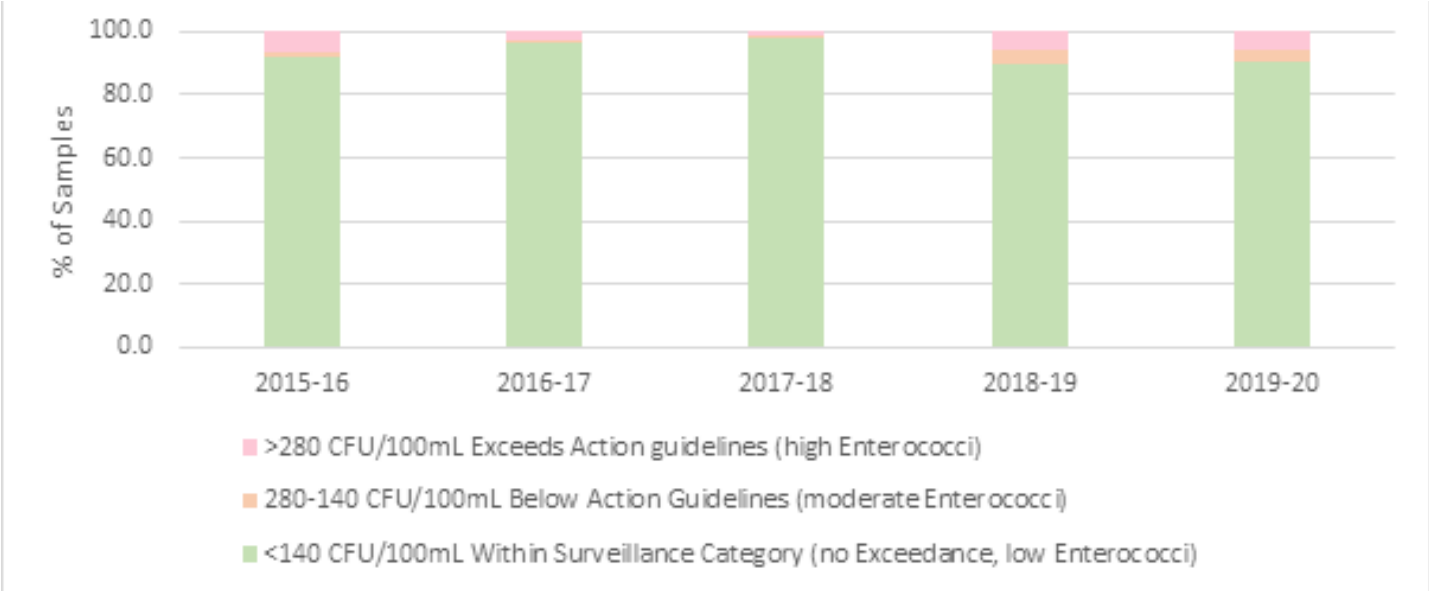
### Microbiological water quality guidelines

| Indicator | Surveillance | Alert | Action |
|---|---|---|---|
| Enterococci (cfu/100ml) | No single sample >140 | Single sample >140 | Two consecutive single samples > 280 |

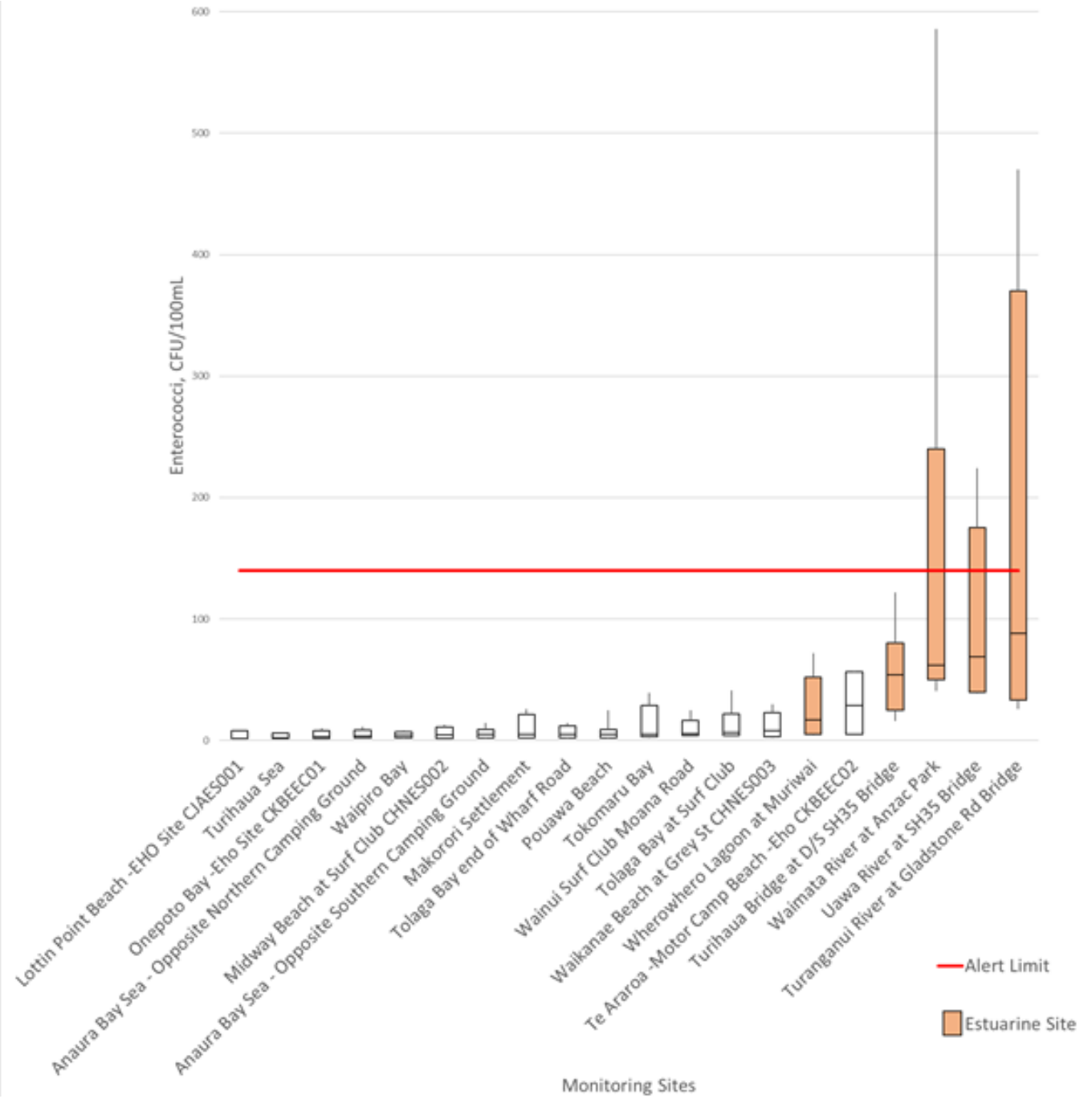
### Annual counts of samples within surveillance category and below action guideline

| Year | Samples below 140 CFU/100mL | Samples above 140 CFU/100mL | Percent below limit | Samples below 280 CFU/100mL | Samples above 280 CFU/100mL | Percent below limit |
|---|---|---|---|---|---|---|
| 2015-16 | 58 | 5 | 92.1 | 59 | 4 | 93.7 |
| 2016-17 | 316 | 11 | 96.6 | 318 | 9 | 97.2 |
| 2017-18 | 322 | 8 | 97.6 | 326 | 4 | 98.8 |
| 2018-19 | 437 | 50 | 89.7 | 460 | 27 | 94.5 |
| 2019-20 | 392 | 40 | 90.7 | 408 | 24 | 94.4 |
| **Overall** | **1,525** | **114** | **93%** | **1,571** | **68** | **95.9%** |

**Annual % of enterococci samples within surveillance/action guidelines categories**



**Enterococci levels of beach and estuarine recreational sites 2015-19**




*This box and whisker plot shows results of monitoring enterococci bacteria at coastal sites and estuaries where people commonly swim. It shows the three sites with the greatest frequency of elevated bacteria levels are estuaries – at Waimata River, Uawa River and the Turanganui River*

The majority of sites where samples have been within the "action" category have been at river sites close to urban populations, Waitou Stream at Waitu Rd Bridge in Tokomaru Bay, and the Waimata River and Turanganui Rivers in Gisborne. These high results often occur during or soon (in the three days after) rainfall. This reflects the river water quality in these catchments which is influenced by, animal grazing and urban sources such as wastewater connection to stormwater systems, as well as dog and bird faecal matter. A small number of "action" samples have also occurred at other beaches and estuaries from time to time. Generally, these have occurred where water quality has been affected by rain washing pollutants off the land and into the sea.

More information on what you can do to keep yourself healthy and safe while swimming in our region can be found in ***Our freshwater*** on **page 65**.

| Location | Number of times exceeded Action guideline | Number of times below Action guideline |
|---|---|---|
| **BEACHES** | **May 2015-April 2019** | |
| Lottin Point Beach -EHO Site CJAES001 | 0 (0%) | 15 (100%) |
| Onepoto Bay -Eho Site CKBEEC01 | 0 (0%) | 18 (100%) |
| Te Araroa -Motor Camp Beach -Eho CKBEEC02 | 0 (0%) | 19 (100%) |
| Waipiro Bay | 2 (2%) | 101 (98%) |
| Anaura Bay Sea - Opposite Northern Camping Ground | 1 (1%) | 101 (99%) |
| Anaura Bay Sea - Opposite Southern Camping Ground | 1 (1%) | 99 (99%) |
| Tokomaru Bay | 3 (3%) | 100 (97%) |
| Tolaga Bay at Surf Club | 3 (3%) | 98 (97%) |
| Tolaga Bay end of Wharf Road | 1 (1%) | 102 (99%) |
| Turihaua Sea | 0 (0%) | 47 (100%) |
| Pouawa Beach | 1 (1%) | 125 (99%) |
| Makorori Settlement | 0 (0%) | 103 (100%) |
| Wainui Surf Club Moana Road | 1 (1%) | 100 (99%) |
| Waikanae Beach at Grey St CHNES003 | 6 (4%) | 160 (96%) |
| Midway Beach at Surf Club CHNES002 | 2 (1%) | 160 (99%) |
| **RIVER ESTUARIES** | | |
| Uawa River at SH35 Bridge | 2 (10%) | 19 (90%) |
| Waimata River at Anzac Park | 11 (19%) | 47 (81%) |
| Turanganui River at Gladstone Rd Bridge | 33 (28%) | 84 (72%) |
| Wherowhero Lagoon at Muriwai | 3 (3%) | 109 (97%) |
| Turihaua Bridge at D/S SH35 Bridge | 3 (12%) | 23 (88%) |
| Waiotu Str at Waiotu Rd Bridge | 5 (42%) | 7 (58%) |
| **Average (all samples)** | **73 (4%)** | **1,637 (96%)** |

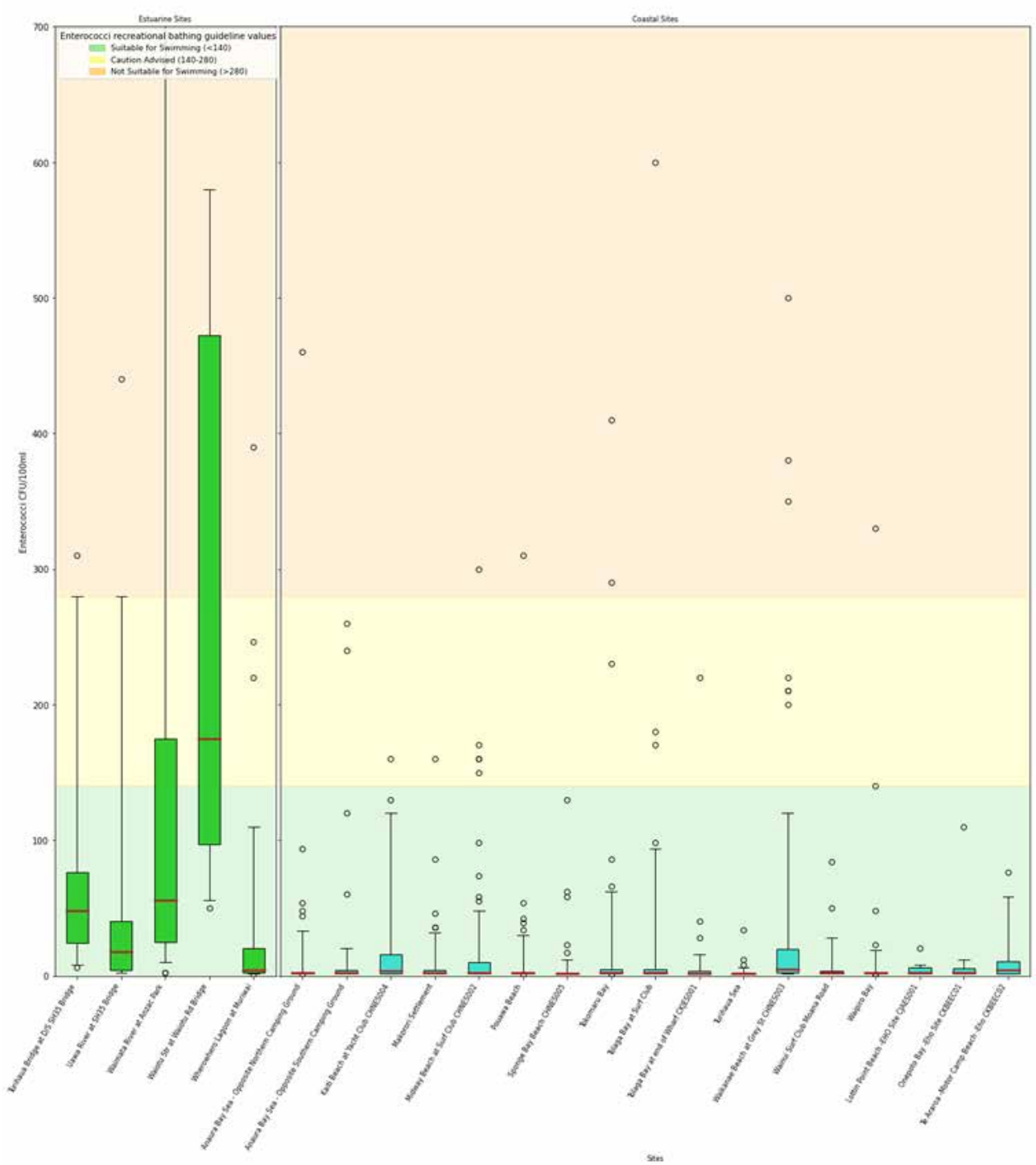
# What you can do to keep our water clean

To reduce the amount of faecal material going into our rivers and out onto out beaches, it's important farm animals are kept out of waterways, your dog poo is picked up and put in the rubbish, and that wastewater doesn't end up in our stormwater networks and then into our streams and onto our beaches. Visit **www.gdc.govt.nz/drainwise** for information on what you can do.

- Sinks are not rubbish bins
- Keep stormwater and wastewater separate
- Get to know your gully trap
- Only flush the 3 Ps – pee, poo and toilet paper.

# Enterococci bacteria – monthly sampling

**Estuarine and coastal monitoring (2015-20) enterococci CPU/100ml**




This box and whisker plot shows enterococci results from recreational water monitoring sites at coastal and estuarine sites where people commonly swim. The majority of coastal sites regularly used for swimming had good water quality. The highest enterococci bacteria results are observed at Waiotu Stream in Tokomaru Bay returning five samples (42%) out of 12 that were above the "action" limit, followed by the Waimata at Anzac Park (19% of samples above action guideline of 280 CFU/100ml. The lagoon at Turihaua Bridge, Uawa River at SH32 bridge, and Wherowhero Lagoon at Muriwai returned generally good results but had results higher than all the coastal sites.

The highest results from coastal swimming sites came from Waikanae at Grey Street and Kaiti Beach at Yacht Club.

There is a lot of high result data not visible off the top of the plot, the highest being a result from Kopuawhakapata above 18000 CFU/100mL. Note that while this graph uses swimming water quality colour bands for context, a number of these sites may not be physically suitable or safe for swimming purposes.

Similar to the E.coli results from ***Our freshwater***, the highest enterococci bacteria results are observed in estuaries around the city. The Kopuawhakapata mixing zone site is in front of the Tatapouri Fishing Club in the inner harbour area and the high results from this site align with the very high E.coli bacteria results observed in the freshwater section from the Kopuawhakapata Stream at Hirini Street monitoring site. This clearly shows the effect this stream is having on bacteria levels in inner harbour area. The bacteria levels are then a lot lower between the inner harbour area and the inner harbour turning basin area next to the port loading dock.

There is very little effect of the Gisborne city marine wastewater outfall (approximately 1.3km offshore from Midway Beach on the bottom of the ocean) on observed enterococci values from water samples taken off the waters surface above and around the outfall.

There are often high results (75th and 95th percentiles) at Grey Street (onshore and offshore), Waipaoa River mouth offshore and Kaiti Beach at Yacht Club and Poverty Bay/Tūranganui-a-Kiwa sb Zone (offshore between the port exit and Kaiti Beach) sites, likely to be related to the effects rivers close to these sites can have, particularly in the days after heavy rain. This is useful to know this as swimming advice includes avoiding swimming at beach locations close to rivers in the days after heavy rain as there is an increased chance of higher bacteria levels which may make it unsafe to swim.

# Wastewater overflows due to heavy rain

During heavy rain in Gisborne the amount of stormwater entering the wastewater system becomes too great for the size of the pipes. This can cause sewage overflows onto residential properties and into water on the streets. To prevent this contamination affecting thousands of residents, the scours are opened allowing stormwater and untreated sewage into the Taruheru, Waimata and Turanganui Rivers.

Between 2011 and 2018 Council recorded 24 incidents relating to sewage overflows during heavy rain when the scours were opened. Heavy rain can be short and intense, or less intense but occur over a long duration to cause the wastewater system to become overloaded. Council's DrainWise programme aims to reduce the need for scour openings and overflows by targeting areas where stormwater is entering the sewer system (see the DrainWise case study on **page 66** for more information).

| Discharges of wastewater to city rivers | 2011/12 FY | 2012/13 FY | 2013/14 FY | 2014/15 FY | 2015/16 FY | 2016/17 FY | 2017/18 FY | 2018/19 FY | 2019/20 FY |
|---|---|---|---|---|---|---|---|---|---|
| Number of events | 4 | 3 | 4 | 1 | 1 | 4 | 3 | 3 | 1 |

# Nutrients

Monitoring of total nitrogen and total phosphorus is undertaken at ten coastal sites in our region. These nutrients are key drivers of water quality and clarity in coastal areas. High levels of nutrients result in increased algal growth which clouds the water and reduces ecosystem health. The box and whisker plots show beaches closer to urban areas generally have higher levels of total nitrogen and total phosphorus.

Total nitrogen levels exceed Australian and New Zealand Environment and Conservation Council (ANZECC) guidelines at all estuarine sites on the Taruheru River and at the Waipaoa River estuary with horticulture being the main contributor. Wainui Stream and Hanamatua Stream also exceed the guidelines – with livestock and septic tank discharges the likely sources.

Ammonia levels are also high in the Taruheru River – this is mainly a concern because ammonia is toxic to native fish.

**Median nutrient levels of coastal and estuarine monitoring sites (May 2015-April 2019)**

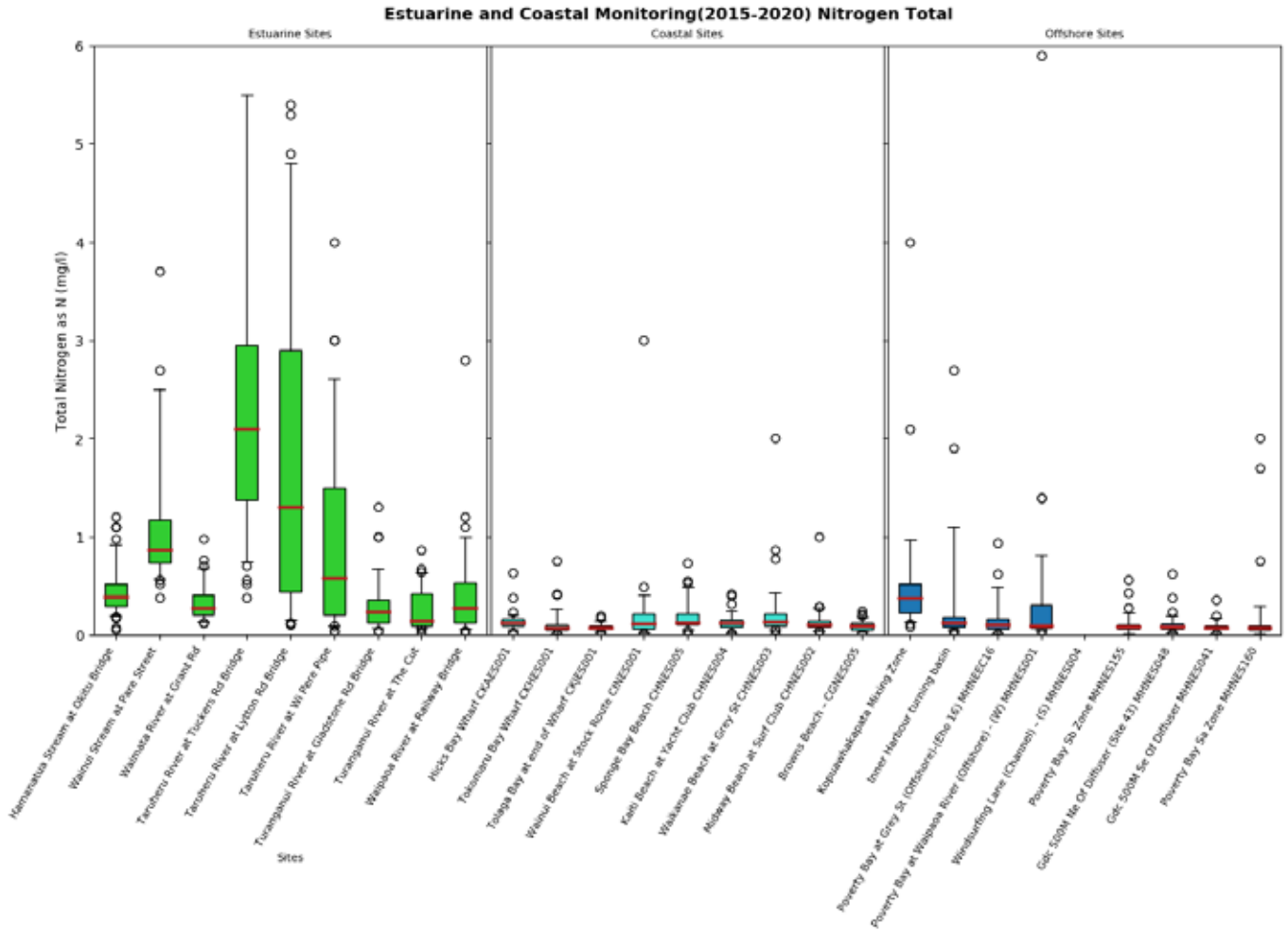
| Sites | Nitrate | Ammonia | DIN | Total N | DRP | Total P |
|---|---|---|---|---|---|---|
| Wainui Stream at Pare Street | 0.17 | 0.0575 | 0.34 | 0.905 | 0.27 | 0.35 |
| Hamanatua Stream at Okitu Bridge | 0.016 | 0.025 | 0.046 | 0.39 | 0.013 | 0.035 |
| Taruheru River at Tuckers Rd Bridge | 1 | 0.115 | 1.4 | 2.1 | 0.087 | 0.21 |
| Taruheru River at Wi Pere Pipe | 0.12 | 0.0835 | 0.55 | 0.525 | 0.066 | 0.09 |
| Taruheru River at Lytton Rd Bridge | 0.3 | 0.0965 | 1 | 1.1 | 0.0755 | 0.16 |
| Waimata River at Grant Rd | 0.0515 | 0.04 | 0.13 | 0.27 | 0.02 | 0.028 |
| Turanganui River at The Cut | 0.0355 | 0.039 | 0.0855 | 0.165 | 0.012 | 0.023 |
| Turanganui River at Gladstone Rd Bridge | 0.06 | 0.045 | 0.145 | 0.255 | 0.019 | 0.0255 |
| Waipaoa River at Railway Bridge Htl9 | 0.098 | 0.0205 | 0.24 | 0.3 | 0.011 | 0.037 |
| Tolaga Bay at end of Wharf CKJES001 | - | - | - | 0.075 | - | 0.012 |
| Tokomaru Bay Wharf CKHES001 | - | - | - | 0.078 | - | 0.013 |
| Browns Beach – CGNES005 | - | - | - | 0.079 | - | 0.057 |
| Windsurfing Lane (Channel) – (S) MHNES004 | - | - | - | 0.08 | - | 0.01 |
| Midway Beach at Surf Club CHNES002 | - | - | - | 0.1 | - | 0.0335 |
| Wainui Beach at Stock Route CINES001 | - | - | - | 0.105 | - | 0.032 |
| Kaiti Beach at Yacht Club CHNES004 | - | - | - | 0.12 | - | 0.02 |
| Sponge Bay Beach CHNES005 | - | - | - | 0.13 | - | 0.0515 |
| Hicks Bay Wharf CKAES001 | - | - | - | 0.14 | - | 0.0235 |
| Waikanae Beach at Grey St CHNES003 | - | - | - | 0.14 | - | 0.0305 |

*Orange denotes estuarine sites*

# Nitrogen

While there are no New Zealand standards for nutrients in coastal waters, compared to South Australian ANZECC Guidelines, the median total nitrogen levels indicate a low level of disturbance and are below trigger levels for investigation at Tolaga Bay, Tokomaru Bay, Browns Beach, Poverty Bay/ Tūranganui-a-Kiwa in the main channel, Midway Beach and at Wainui Beach. Higher levels of total nitrogen are found at Kaiti Beach, Sponge Bay, Hicks Bay Wharf and Waikanae Beach. Of these sites Waikanae Beach and Hicks Bay Wharf have the highest median levels (0.14mg/L total N) and Waikanae Beach has the greatest number of high nitrogen samples.

**Estuarine and coastal monitoring (2015-2020) nitrogen total**



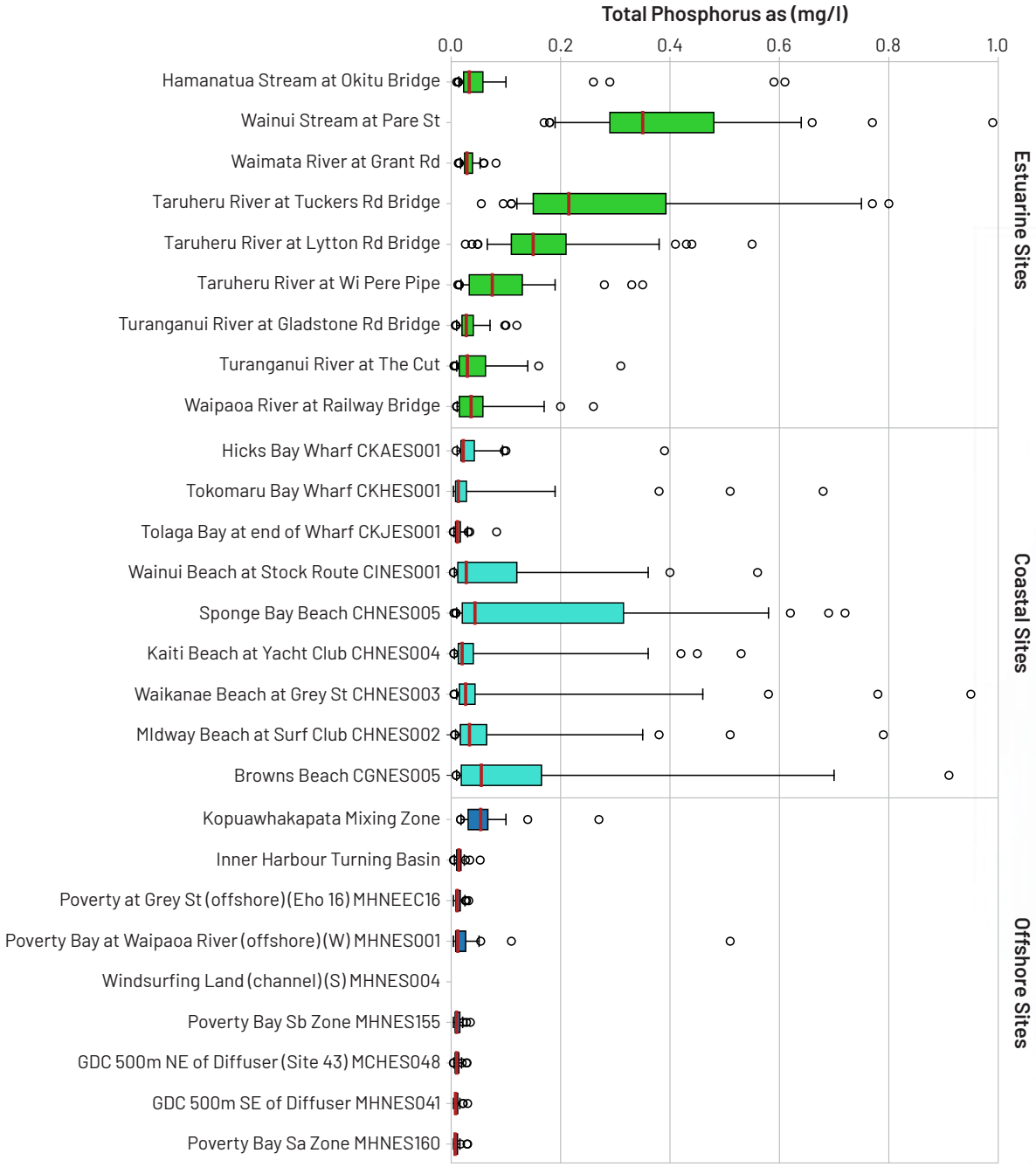
# Phosphorus

Total phosphorus levels at all coastal sites monitored are higher than ANZECC South Australian Marine waters trigger levels, largley because Tairāwhiti's geology is naturally high in phosphorus. However, levels at beaches closer to Gisborne are very elevated – reflecting the combined influence of the urban area, wastewater discharges, cropping on the Poverty Bay Flats and the huge sediment discharge from the Waipaoa River.

Gisborne is located on an estuary system and the tide flows eight kilometres inland on the Taruheru River to Tuckers Road.

Our data shows that our estuaries are progressively more nutrient-enriched further upstream. The Poverty Bay Flats horticultural area contributes significant amounts of nitrogen and phosphorus to the Taruheru River. This is gradually diluted by seawater further downstream. ANZECC South Australian guidelines trigger levels for total phosphorus are exceeded at all sites monitored. While there are naturally high levels of phosphorus in Gisborne's rocks, levels are such that human impacts are clearly seen with sites on Taruheru River and Wainui Stream having the highest phosphorus levels.

**Estuarine and coastal monitoring (2015-2020) phosphorus total**



# Other water-quality parameters

See ***Our freshwater – technical report*** on Council's website for more analyses and information on these parameters.

## Total suspended solids

Total suspended solids were typically highest in the coastal sites compared to the estuarine sites. This is likely due to the combination of water currents relocating sediment from nearby sediment sources (coastal erosion or a river sediment source) and then coastal wave energy that can help keep fine sediments in suspension in the water column. This sediment can often be seen in aerial images. These sediments will be the highest in the days after rain and during storms that stir up the ocean. Browns Beach had the highest average suspended sediment results of all the coastal sites (likely due to the significant amount of sediment that comes from the Waipaoa River), followed by Sponge Bay, Midway and Waikanae Beaches, and at Tokomaru Bay Wharf.

### Heavy metals

Four key heavy metals are tested for at estuarine and some coastal sites around the Gisborne area to ascertain effects from the urban area. These are arsenic, copper, lead and zinc. Heavy metal contaminants are important as they can bio-accumulate up the food chain, in particular to fish that may then be consumed by humans. Heavy metals can be toxic. Water sampling results show that heavy metals are generally highest in estuaries around the urban area. Sources of heavy metals in and around the Gisborne urban area are thought to be from sources such as corrugated iron roofing and guttering, and from road runoff (tyre wear debris, car brake pads), and potentially from old lead-based paint erosion.

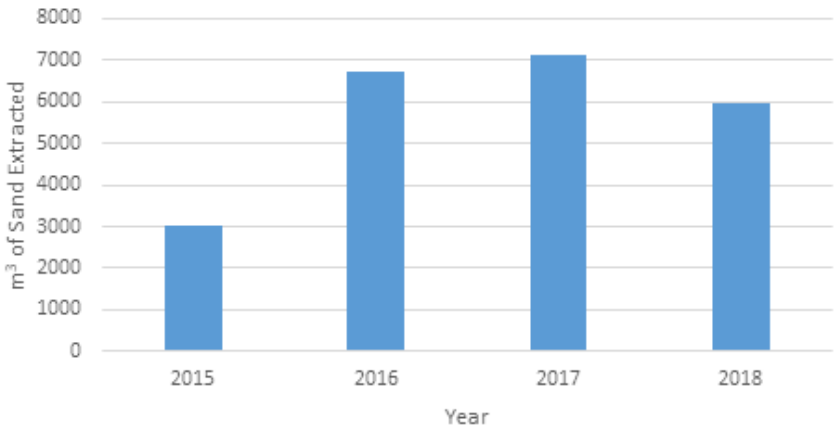
## Dissolved oxygen

Dissolved oxygen is important as it greatly affects the ability for estuarine and marine life to thrive and to survive, just as it does for humans. Lower dissolved oxygen levels can cause stress for marine and estuarine life. Using daytime oxygen observations only, dissolved oxygen levels in our coastal areas and estuaries are indicative of generally healthy ecosystems. Sites with lower dissolved oxygen concentrations were typically estuarine sites, the Taruheru River at Tuckers Road location typically had the lowest and levels gradually improved downstream through the city as the sea has an increasing influence on estuary waters closer to the ocean. Wainui at Parae Street also had low oxygen. Of the coastal sites, Tokomaru Bay Wharf had a wide range of dissolved oxygen measurements, sometimes showing high levels while other times showing low levels. Of the offshore sites, the Kopuawhakapata mixing zone site in the inner harbour had the lowest of all the coastal sites.

# SAND EXTRACTION

There are currently ten consents for sand extraction from the foreshore at the Navigation Beacon site, Centennial Marine Drive in Poverty Bay/ Tūranganui-a-Kiwa. These consents are typically granted for five years after which applicants can apply to renew their respective consents. Sand is mainly used for the construction industry so rates of extraction generally reflect construction activity.

**Annual total sand extraction 2015-18**




# GISBORNE PORT'S MARINE ECOSYSTEM

A survey of Gisborne Port was undertaken in October 2017 to provide a baseline inventory of marine species.

The survey was undertaken alongside the annual biosecurity check for Mediterranean fanworm.

The sampling involved a basic descent and assent dive profile at a chosen way point with GPS location and the use of a GoPro camera at each location to record marine species.

Results showed a predicted inventory with minimal "unsuspected" species.

Species included a range of seaweeds, gastropods and crustaceans. Some of the common species found were: ecklonia radiata (common kelp), carpophyllum flexuosum (flapjack), corallina sp. (a common red seaweed), semibalanus balanoides (acorn barnacle), perna canaliculus (green lipped mussell), Cookia sulcate (Cook's turban) and common starfish.

**Gisborne Port is home to a wide range of marine life including kelps, seaweeds, mussels and starfish. It is also the location of a young crayfish puerulus (post-larva) nursery**

*Malcolm Rutherford*

# COASTAL HAZARD MAPPING

Beach cross-sectional surveys are undertaken twice a year to understand beach volume changes at Tūranganui-a-Kiwa/Poverty Bay, Kaiti Beach, Wainui Beach and beaches in Tolaga Bay. These show trends of erosion at:

- the east end of Kaiti Beach Road
- south of Waipaoa River mouth near Te Wherowhero Lagoon
- north of Uawa River to the end of Banks Street
- from Tuahine Point Beach north to Stockroute.

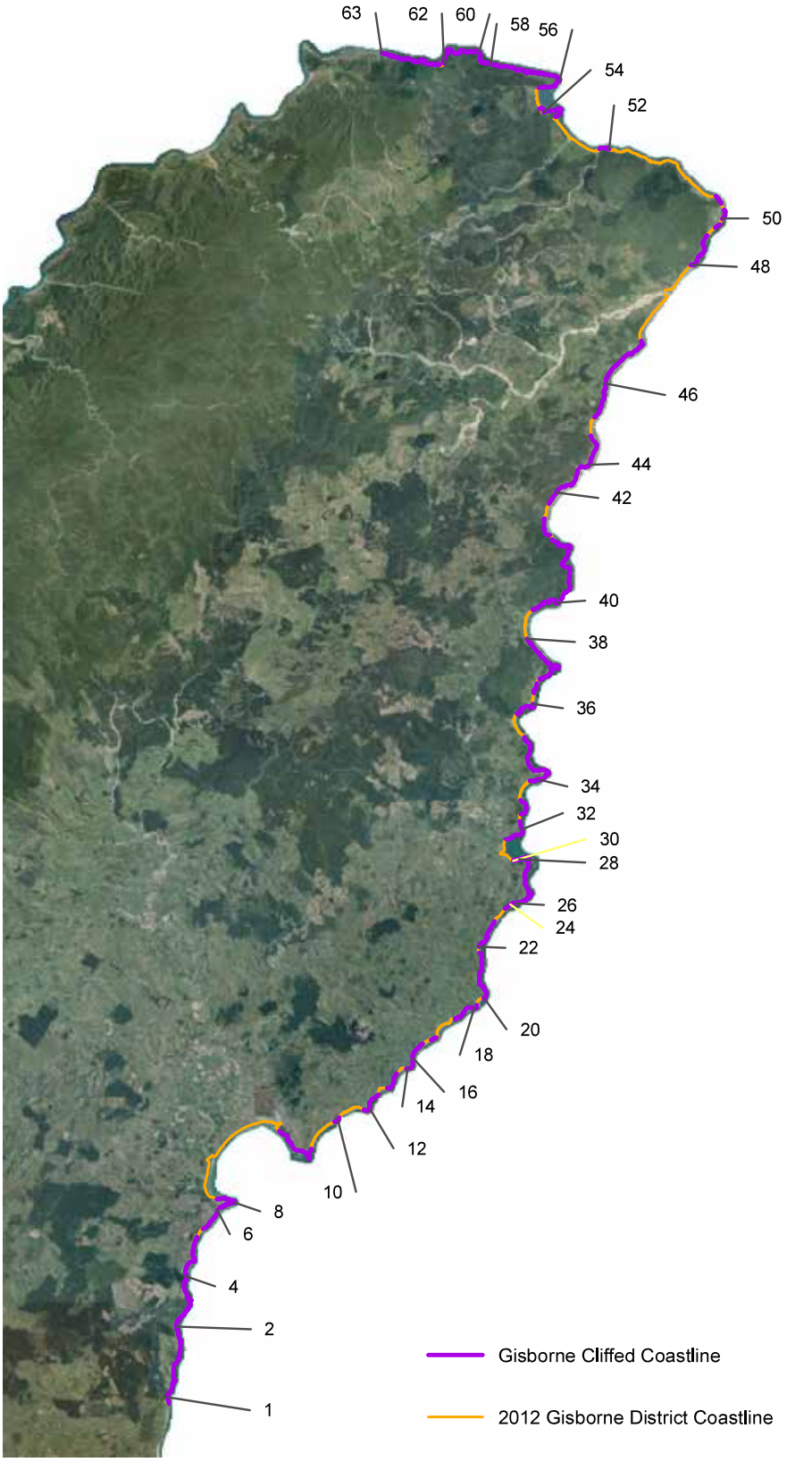
Wainui Beach is a particularly dynamic beach with sand budget and beach level trends dominated by storm events.

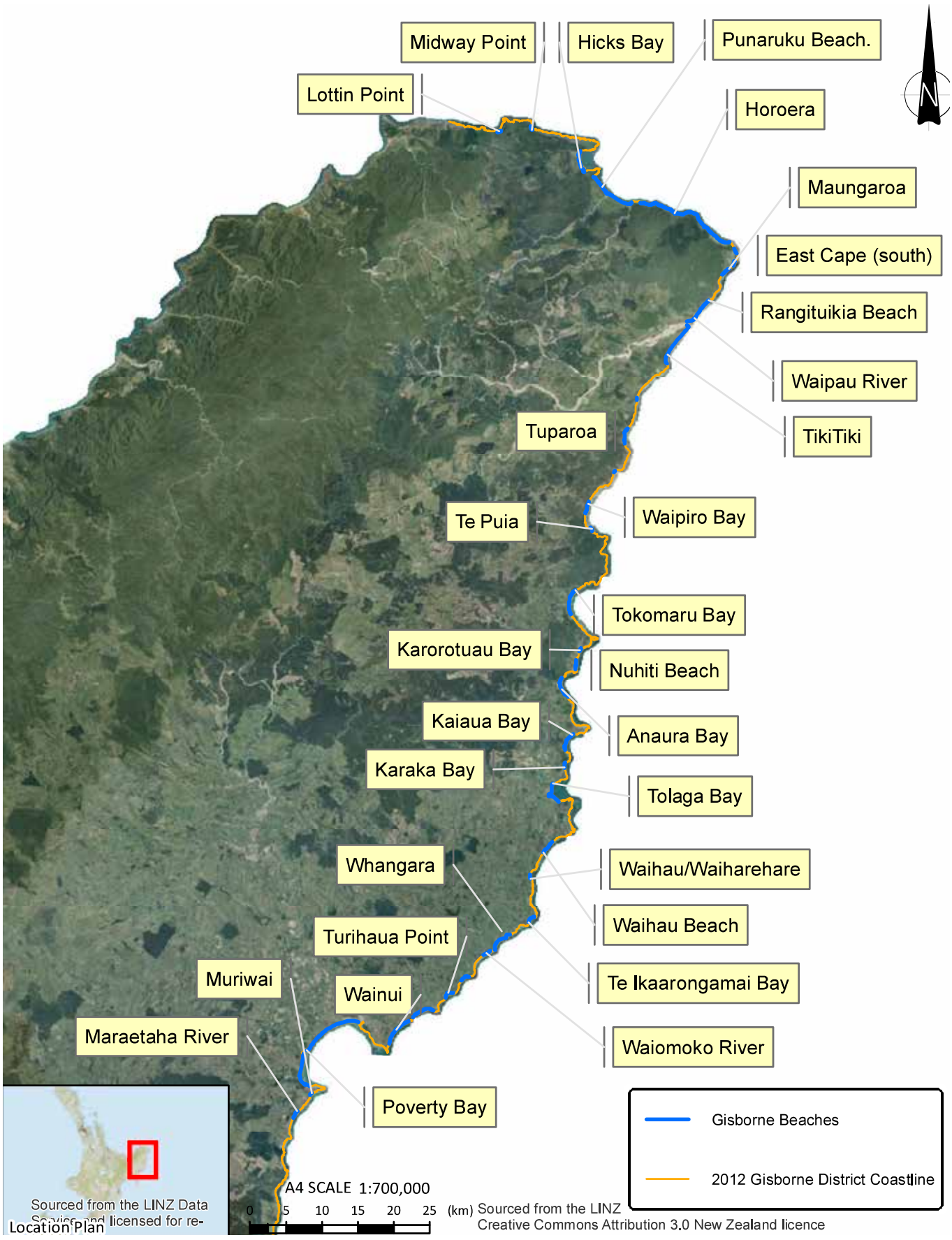
The Wainui Beach Erosion Management Strategy is being reviewed after storm surges in 2019 identified gaps in the strategy.

## Coastal inundation and coastal erosion

Coastal inundation is when coastal land is flooded by the sea. At the moment, little inundation is predicted to occur on land where people live. However, low-lying coastal areas are vulnerable to rising sea levels.

Work has been undertaken to assess and map beach and cliff areas considered susceptible to coastal erosion under different risk probability scenarios. If we look 100 years into the future, areas of susceptibility extend 60-180m inland for beaches. Rates of long-term erosion along cliffs range from 0.05 to 0.75m a year. Rates of erosion are expected to increase as sea level rises. Rates of projected sea level rise are estimated to range between 0.65m to 0.95m to the year 2115. A number of our roads are vulnerable to coastal erosion, such as SH35 at Tatapouri and the road to East Cape Lighthouse.






*Maps from report "Update of Areas Susceptible to Coastal Erosion Hazard" 2016 report prepared for Gisborne District Council. Reports on coastal hazards can be found at* ***www.gdc.govt.nz/coastal-hazard-reports***

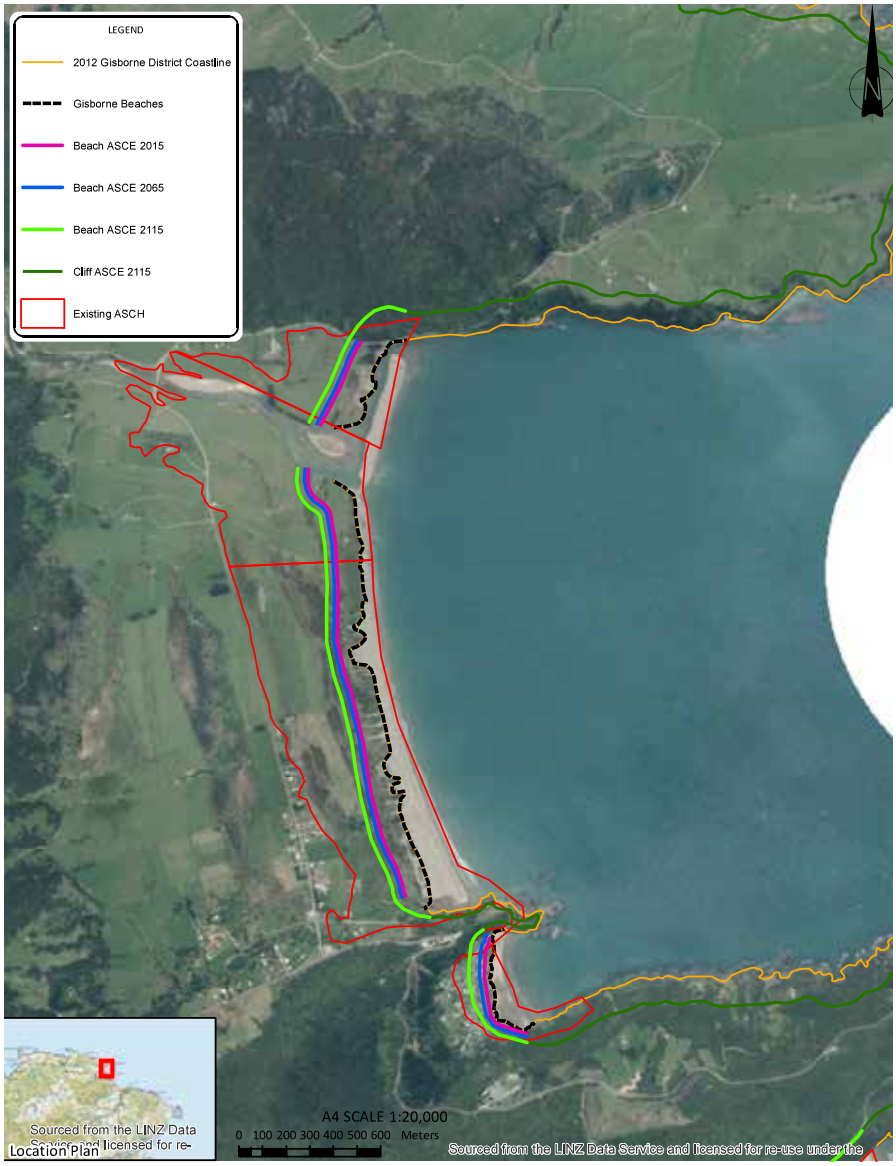
## Climate change

Climate change will influence our coastal environment. Major changes expected include:

- more frequent droughts
- increasing westerly winds during winter and north-westerly winds in summer
- more intense ex-tropical cyclones
- sea level rise – possibly around 1m by 2115.

Sea level rise may result in beaches moving further inland as coastal structures come under increasing threat. Historic sea level rise rates have been 1.7mm a year, with an average projected sea level rise rate of 9.5mm a year until 2115.

This is likely to impact on coastal structures and beach forms as well as affecting coastal ecosystems. Beach shorelines are expected to keep their shape, but to receed further inland. Coastal cliffs respond differently to beaches in that when they are eroded, they do not re-form like beaches. Coastal cliffs can erode in different ways, either by gradual retreat due to weathering or by sudden episodic failures. Coastal cliff shoreline retreat in response to sea level rise could be in the vicinity of more than 20m over 100 years for soft sedimentary rock, 5-20m for hard sedimentary rock, and less than 5m for hard volcanic rock.




*From 2016 T&T report commissioned for GDC. Example shows modelled future projections of Areas Susceptible to Coastal Erosion and modelled future beach shorelines for Hicks Bay. These future coast shoreline projections can be found on Tairāwhiti Maps which can be found at* ***www.gdc.govt.nz/property-search***

# NAVIGATION SAFETY & RECREATIONAL INFRASTRUCTURE

Our region hosts a wide variety of water users, both commercial and recreational. Our only commercial port is located in Gisborne. Eastland Port is the second largest log exporter in the country and is also home to a small commercial fishing fleet. The area beneath the commercial wharf is also home to a significant koura rua/crayfish nursery. Recreational usage is widespread throughout our region and the Gisborne-Tatapouri Fishing Club is one of the largest in the country.

Our region features seven sealed boat ramps – four within Gisborne, one at Tatapouri, one at Tolaga Bay, and one at Tokomaru Bay. Eleven water safety signs distributed throughout our region provide general information on boating safety, the Navigation & Safety Bylaw, and swimming water quality.

Our region is home to historic wharves at Hicks Bay, Tokomaru Bay, and Tolaga Bay – of these, only the one at Tolaga Bay is currently open to the public. The wharf at Hicks Bay has been closed due to substantial structural deterioration, including missing and eroded wooden piles with the adjacent boat ramp heavily damaged and no longer useable.

The wharf at Tokomaru Bay is also closed to public use due to structural deterioration. The concrete piles and causeway at the head of the wharf are heavily wasted and a substantial portion of wooden decking at the sea end of the wharf has been washed away. Both wharves will require remediation to prevent additional deterioration and to prevent them from becoming a hazard to navigation.

*Vaughan Gillard and Tourism Eastland*

# OUR AIR, CLIMATE & WASTE

## TŌ TĀTAU HAU, ĀHUARANGI, PARA HOKI

## HIGHLIGHTS

Air quality in Gisborne is generally good, with only one exceedance of the permissible level of the national environmental standard for PM10 (fine particles) in 2018 and 2019.

Our main cause of air pollution is smoke from woodburners during winter months and year-round from vehicle emissions.

Generally our air quality appears to be improving.

We are fortunate to be able to view the Milky Way, unlike 50% of New Zealanders whose ability to see the stars at night is diminished by light pollution.

A project using low-cost sensors over the winter of 2018 showed spatial differences in local air quality in Gisborne city, mostly related to proximity to main roads and residential valley terrain.

Gisborne district reflects many of the trends being seen nationally described in *Our Air 2018* published by the Ministry for the Environment[1].

Agriculture and transportation account for 95% of our district's greenhouse gas emissions[2].

Average waste sent to landfill in our region is 506kg per person per year, against a national average of 701kg.

In 2019 Council installed seven smart rubbish bins throughout our region.

# OUR AIR & CLIMATE

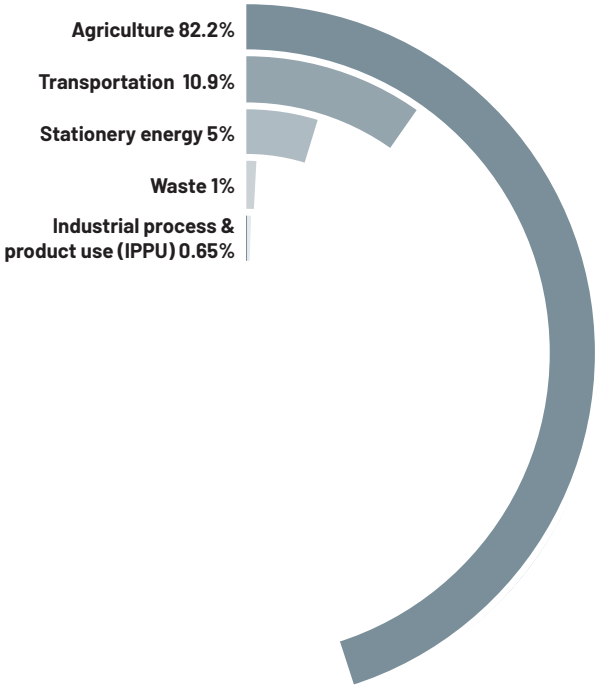
Current climate change projections for Tairāwhiti are showing a 2.1°C annual average temperature increase and a 5% reduction in annual average rainfall by 2090[3]. The frequency of frost days is expected to reduce and the frequency of hot days above 25°C is expected to increase. Expected decreases are expected to occur mostly during winter[4].

The community carbon footprint reports similar emission categories around New Zealand (for example, Wairarapa, South Taranaki and Stratford). During the 2018/19 reporting period, Gisborne district was responsible for 3,676,567 $tCO_2e$ gross emissions and 1,119,138 $tCO_2e$ net emissions (including forestry). Our population in 2018/19 was approximately 49,300, resulting in per capita gross emissions of 74.58 $tCO_2e$/person.

1 Ministry for the Environment & Stats NZ (2018). New Zealand's Environmental Reporting Series: Our air 2018. Retrieved from **www.mfe.govt.nz** and **www.stats.govt.nz**.
2 AECOM New Zealand Limited (2020). Gisborne district Council Regional GHG Inventory. A report prepared for the Gisborne district Council
3 Ministry for the Environment (2018). Climate Change Projections for New Zealand. Atmospheric projections based on simulations undertaken for the IPCC 5th Assessment 2nd edition. Retrieved from **www.mfe.govt.nz**
4 Ministry for the Environment (2018). Climate Change Projections for New Zealand. Atmospheric projections based on simulations undertaken for the IPCC 5th Assessment 2nd edition. Retrieved from **www.mfe.govt.nz**

- **Stationary energy:** Producing 112,432tCO2e in the 2018/19 reporting year, stationary energy is Gisborne's third largest emitting sector. The emission source that contributes the most to this total is electricity consumption at 339,618,582kWh followed by petrol and diesel consumption, with the district consuming 9,876,191 litres and burning of natural gas, 435,176GJ. A per capita method was used in calculating coal emissions which is less than 1% of total emissions. The biggest consumer of coal would be the steam engine. Feedback from Council suggested the biomass figure might be underestimated due to no rules around domestic wood burners and outdoor burning. It is subject to the council to further investigate.
- **Transportation:** Producing 232,647tCO2e in the 2018/19 reporting year, transportation is Tairāwhiti's second highest emitting sector. Transport-related consumption consists mainly of on-road and off-road petrol and diesel fuel, which combined represent 87% of total transport emissions. On-road and off-road petrol and diesel consumption is followed by emissions associated with Eastland Port activity and Gisborne Airport.
- **Waste (solid and wastewater):** Emissions from waste were 21,792tCO2e in the 2018/19 reporting year. Tairāwhiti is currently sending waste to two operational solid waste landfill sites – Waiapu landfill which is located within Tairāwhiti and Tirohia which is in Paeroa (Bay of Plenty). Paokahu landfill was operated between 1974 and 2004. Our region's solid waste emissions represented 80.9% of the total waste emissions. During the reporting year 2018/19, Tirohia landfill has active gas flaring for the methane produced. The remaining 19.1% of waste emissions is produced by wastewater. Wastewater treatment plants in Gisborne city and Te Karaka service 31,604 members of our district and septic tanks serve the remaining population, the majority of which are in rural areas.
- **Industrial processes and product use (IPPU):** This sector produced 13,933tCO2e in the 2018/19 reporting year, and includes emissions associated with the consumption of GHGs for refrigerants, foam blowing, fire extinguishers, aerosols, metered dose inhalers, and sulphur hexafluoride for electrical insulation and equipment production. IPPU emissions do not include energy use from industrial manufacturing, which is included in the relevant stationary energy subcategory (such as coal, electricity and/or petrol and diesel).
- **Agriculture:** Tairāwhiti's highest emitting sector, producing 1,757,949tCO2e (82.2% of our total emissions), consists of emissions from livestock, crops and fertiliser used. Our region is home to approximately 10,419 dairy and 248,151 non-dairy cattle and around 1,426,886 sheep, which produce methane (CH4) – the most significant agricultural emission source. This is followed by nitrous oxide (N20) emissions from agricultural soils and manure management.
- **Forestry and land-use change:** Tairāwhiti has a native forested area of 138,685ha, the largest proportion of this is manuka and/or kanuka and broadleaved hardwoods. Combined with exotic forests (155,617ha), our district's forestry equates to the sequestration of 6,481,992tCO2e over the reporting year and harvest emissions of 3,912,470tCO2e.

**Gisborne District Council Regional Emissions Inventory ($tCO_2e$)**

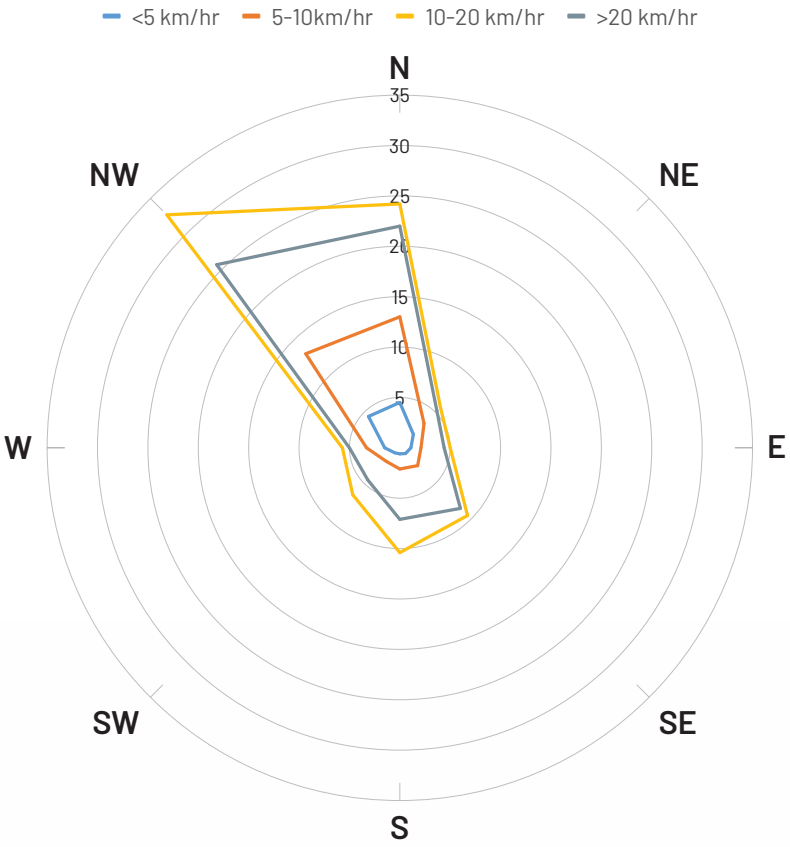



*AECOM (2020). Gisborne District Council GHG Emissions*

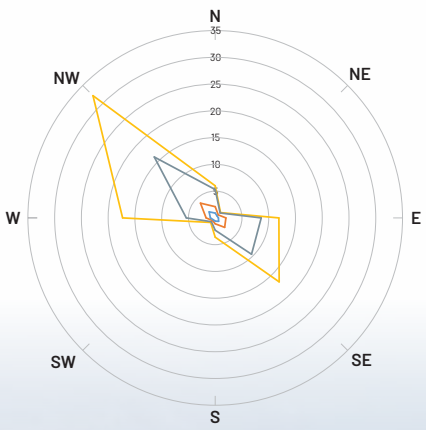
The main Gisborne environmental weather station is located at Gisborne Airport. Analysis shows that the predominant wind direction is north, north-northwest and that it blows from that direction 53% of time. The weather station data also shows that Gisborne is a gentle to moderately windy city.

The data for 2015-17 is shown as a windrose. It shows the frequency of winds by direction and strength. The bars correspond to the 16 compass points – N, NNE, NE, etc. The bar pointing vertically upwards in the windrose diagram represents winds blowing from the north (ie. northerly winds). The length of the bar represents the frequency of occurrence of winds from that direction, and the widths of the bar sections correspond to wind speed categories, the narrowest representing the lightest winds.

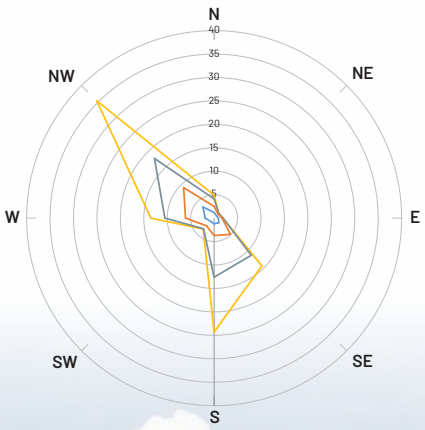
**Gisborne environmental weather station windrose (2015-17)**



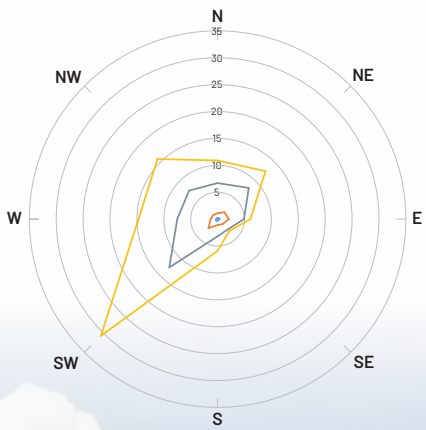

**Matawai**




**Poroporo**




**Wharerata**




# Topography of the Poverty Bay Flats

Gisborne is located in a broad valley running northwest-southeast and sits on the northern extent of Poverty Bay/Tūranganui-a-Kiwa. The terrain around the Poverty Bay Flats also influences air quality. Areas located near the coast experience sea breezes in summer, created by thermal currents from the warming of the earth surface from the sun which draws in the cooler air from over the sea helping disperse localised pollutants. In winter, less warming of the earth surface occurs particularly in valleys or areas surrounded by hill. On clear nights, cooling near the ground's surface leads to cold air near the ground being overlaid by a layer of warm air, the opposite of the normal temperature gradient. This warm air acts as a lid, trapping pollutants (both particulate matter (PM) and gaseous pollutants), and allowing them to build up as smog. Inversion events are responsible for peak PM concentrations – natural sources of PM, such as sea salt, are low under these conditions so most of the air pollution is from emissions from domestic heating and vehicles.

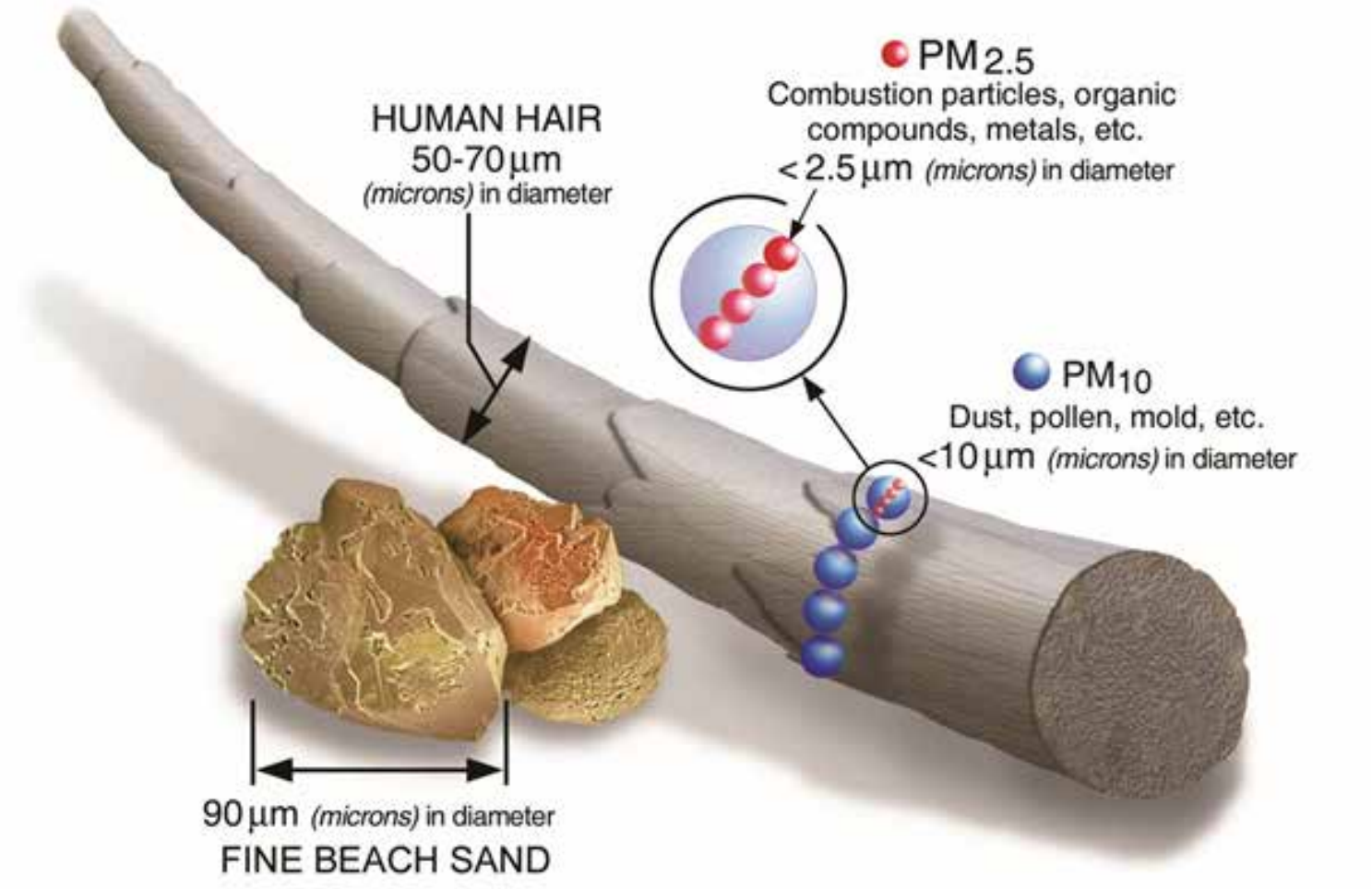
# OUR AIR QUALITY

Air pollutants are either made up of gases or have particles within them. Gaseous pollutants are primarily emitted by industrial premises and traffic. Concerning pollutants include sulphur dioxide, nitrogen dioxide, ozone and carbon monoxide.

In Tairāwhiti all trade and industrial premises discharging pollutants are required to hold resource consents or be able to demonstrate an ability to meet stringent standards to control these pollutants. Vehicle emissions (nitrogen dioxide and carbon monoxide) are controlled by legislation administered by the New Zealand Transport Authority. As we do not have a large industrial base and we have a smallish urban area, our air quality is generally very good.

Sources of PM include windblown pollen, dust from agricultural practices and roads (particularly unsealed roads), smoke from controlled burn-offs/bush fires, domestic home heating using woodburners, cooking and sea salt. In Tairāwhiti, as our air quality is so good, unlike elsewhere in the country, there are no restrictions on the type of wood burner that may be installed, or on the use of backyard incinerators. This can lead to the burning of inappropriate materials such as plastics which generate odour complaints as well as discharging toxic pollutants.

Health issues related to particulate pollution largely depend on the size of the particle. The National Environmental Standard for Air Quality (NESAQ) requires Council to monitor PM10 (fine particles) due to their impact on respiratory health. As the science has developed the focus has turned to particles of PM2.5 or less as these have the ability to penetrate deep into lung



tissue. This can result in cardiovascular and respiratory problems such as heart attacks, stroke or emphysema. It can trigger asthma and wheeze in susceptible individuals, can lead to premature death and it has also been linked to cancer.

Growing evidence linking poor health outcomes to pollution from PM2.5 or less may see changes in air quality regulations in the future. These could include rules such as bans on outdoor burning in some places, use of wet wood, use of fuels high in toxins (such as treated wood), modifications to solid fuel burners or restrictions on the type of wood burner that can be installed. Modern heating technologies such as heat pumps are not only reducing local emissions, but also leverage New Zealand's predominantly low carbon energy networks that are predominantly renewable energy sources such as hydropower. Ensuring buildings are properly insulated is also a great passive way to reduce home and office heating and cooling costs throughout the year.

*Temperature inversion layer over Gisborne city showing the smoke from domestic fires being trapped under a layer of cloud*

# Monitoring our air quality

Air quality in Gisborne is monitored from a representative site at Gisborne Boys High School which was established in 2004 to measure PM10 in the city.

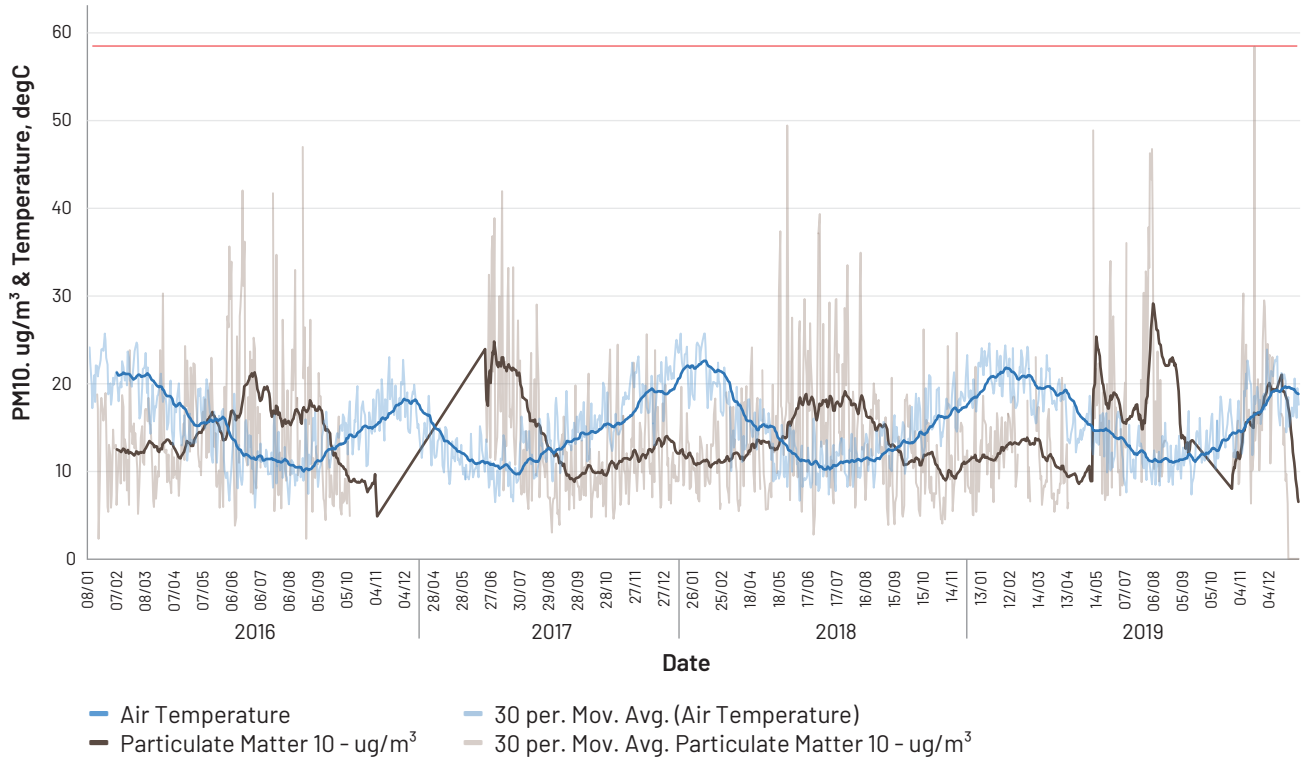
The equipment measures levels of particulate matter in the air every minute, 24 hours a day, seven days a week and we have a record of PM10 data from this equipment since 2004. This equipment was upgraded to more modern technology in early 2020 in anticipation of a review of the National Air Quality Standard and is now measuring PM2.5 as well as PM10. Along with airborne particulate measurement, a weather station can show which direction this particulate matter comes from, and how wind speeds may affect the diffusion of pollutants. Relative humidity and cooler temperatures can also trap air pollution in 'inversion' layers during those calm and cold winter nights and mornings, which tends to be when people light their fires.

The graph (overleaf) shows the seasonal variation in $PM_{10}$ levels (orange lines), with higher levels recorded during the winter months as households use their woodburners for heating as the temperature (blue line) drops. The red line is the 50µm/$m^3$ national standard annual average at which a region's air quality is described as 'polluted'.

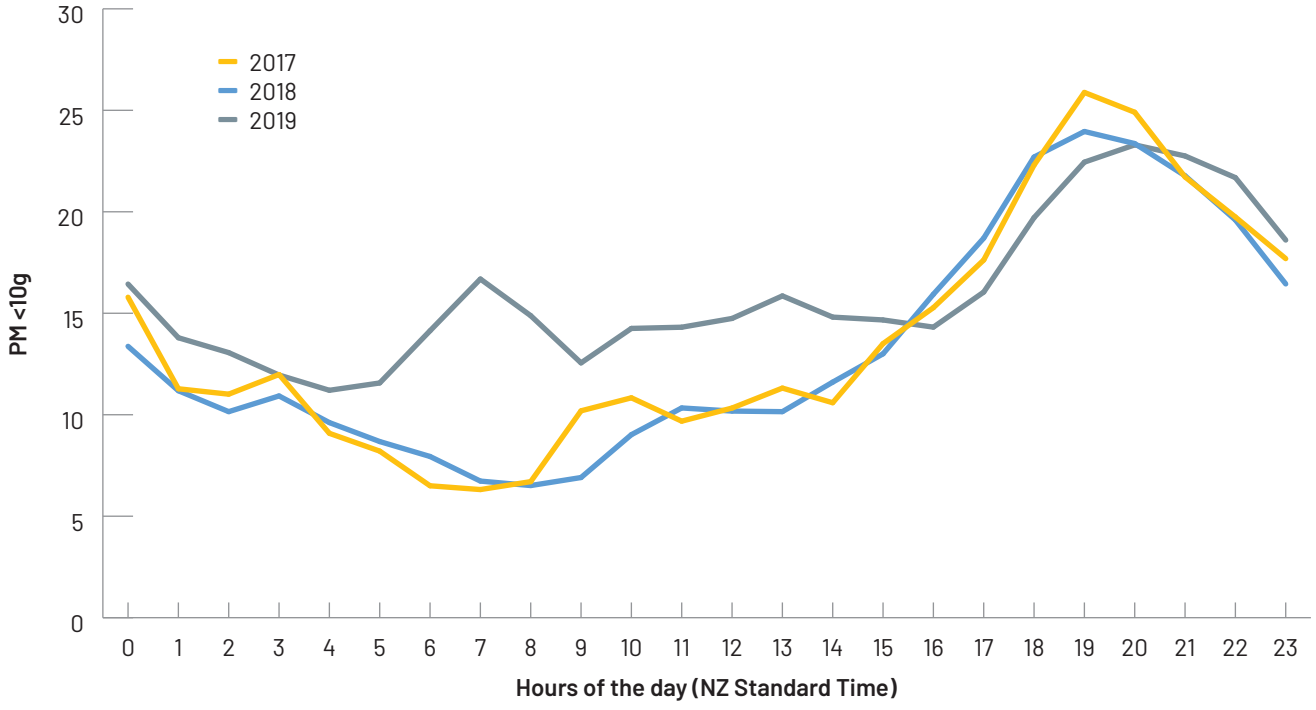
Hourly average of PM10 during winter (May - August) at the air quality site at Gisborne Boys High School (**page 121**) shows that the lowest PM10 values are typically around 7-8am, with the highest PM10 peaks occuring at around 6-9pm with average values ranging around 21-25 µg/$m^3$. There is a small peak seen at 10-11am possibly due to traffic movements during the day, but this is not as pronounced as the high morning PM10 volumes seen during ODIN monitoring on **page 123**. This site is located away from roads, so is more indicative of background air quality. This distribution reflects a typical working day for people in an urban environment.

*Gisborne Boys High School air quality measuring site*

**Annual PM10 levels January 2014 - April 2019.**




**Average PM10 by hours of the day across the whole year**



# Winter air quality screening programme 2018

Domestic woodburners are a significant source of PM2.5 which is a combustion product from burning wood. Council undertook a monitoring programme in different locations throughout Gisborne city in the winter of 2018 to understand whether the spatial data reflected the data seen from the representative site at Gisborne Boys High School.

*Outdoor Dust Information Nodes (ODINs)*

## ODIN air quality sensor study

The programme placed 17 low-cost sensors called Outdoor Dust Information Nodes (ODINs) at various locations within Gisborne city with the aim of measuring PM (both 2.5 and 10) and nitrogen dioxide ($NO_2$) from vehicle exhausts every five minutes. Monitors were attached to lamp posts at an approximate height of 2.5m. $NO_2$ was recorded from 16 May to 16 August 2018 and particulates were measured from 22 June to 16 August 2018.

### Particulate matter in winter

The ODINs recorded several nights with localised PM10 values greater than the National Environmental Standard for Air Quality limit of 50 µg/m$^3$. However, our regulatory equipment at Gisborne Boys High School recorded no exceedances of the NES during this period. Although the low-cost monitors are not as accurate as the regulatory equipment, the study showed that there is wide spatial variation in air quality of Gisborne, with areas between Outer and Inner Kaiti and Whataupoko recording higher PM concentrations than the area around the measurement site at Gisborne Boys High School. The highest concentrations were recorded at the site located in Wainui Road which is not surprising given the large volume of traffic (particularly diesel vehicles) that use this road.

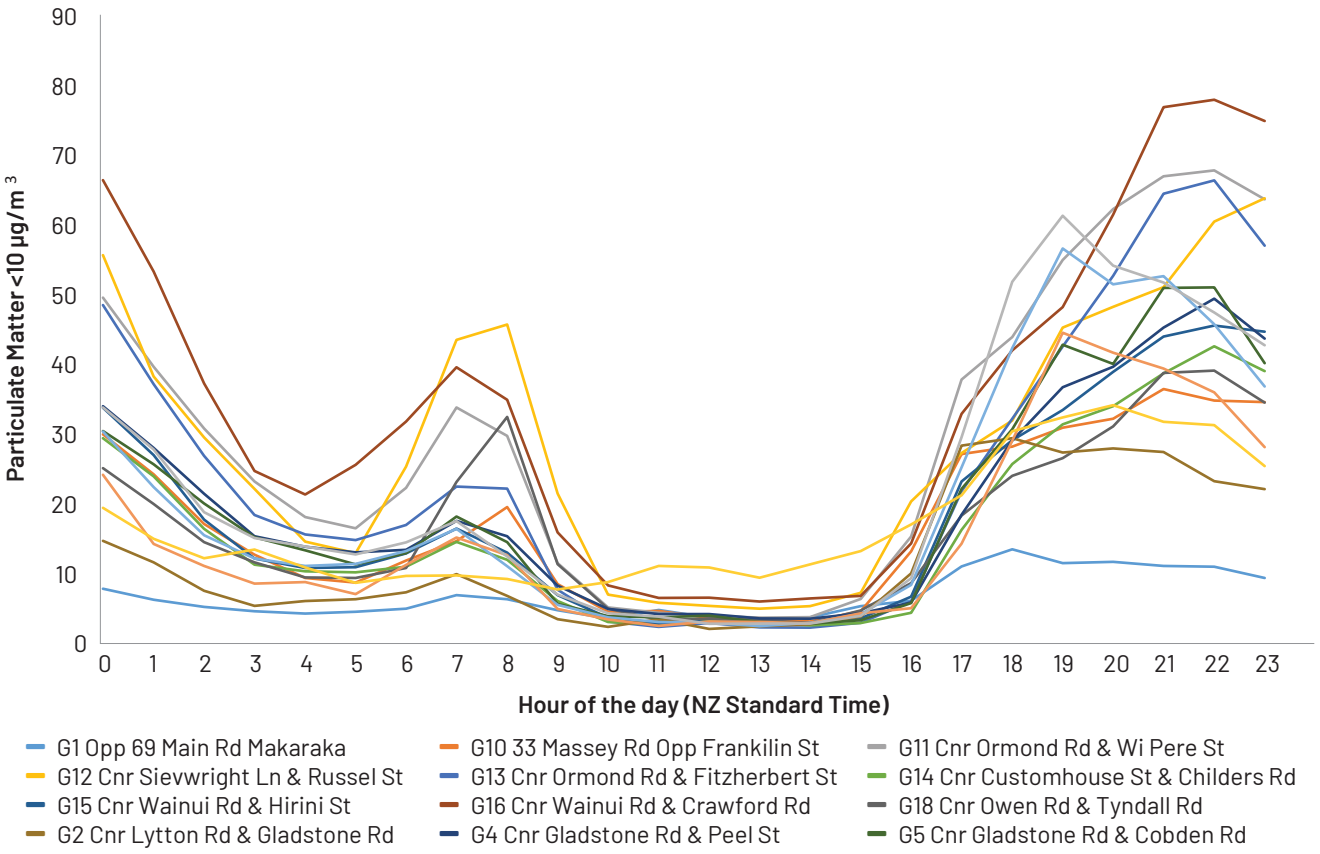
As a result of the 2018 study, two additional low-cost monitors were installed in two locations in Whataupoko and Kaiti during winter 2019. Data from these monitors shows that although on occasion there was some difference to that recorded at the Gisborne Boys High School site, it was not significant enough to warrant relocating the representative site and so breaking the length of record of data. As the NES is currently under review (with a signalled change to monitoring to using a PM2.5 standard), this may require some changes of Tairāwhiti Resource Management Plan rules that will address some aspects that are creating localised pockets of pollution.

### Average hourly PM10 levels June - August 2018

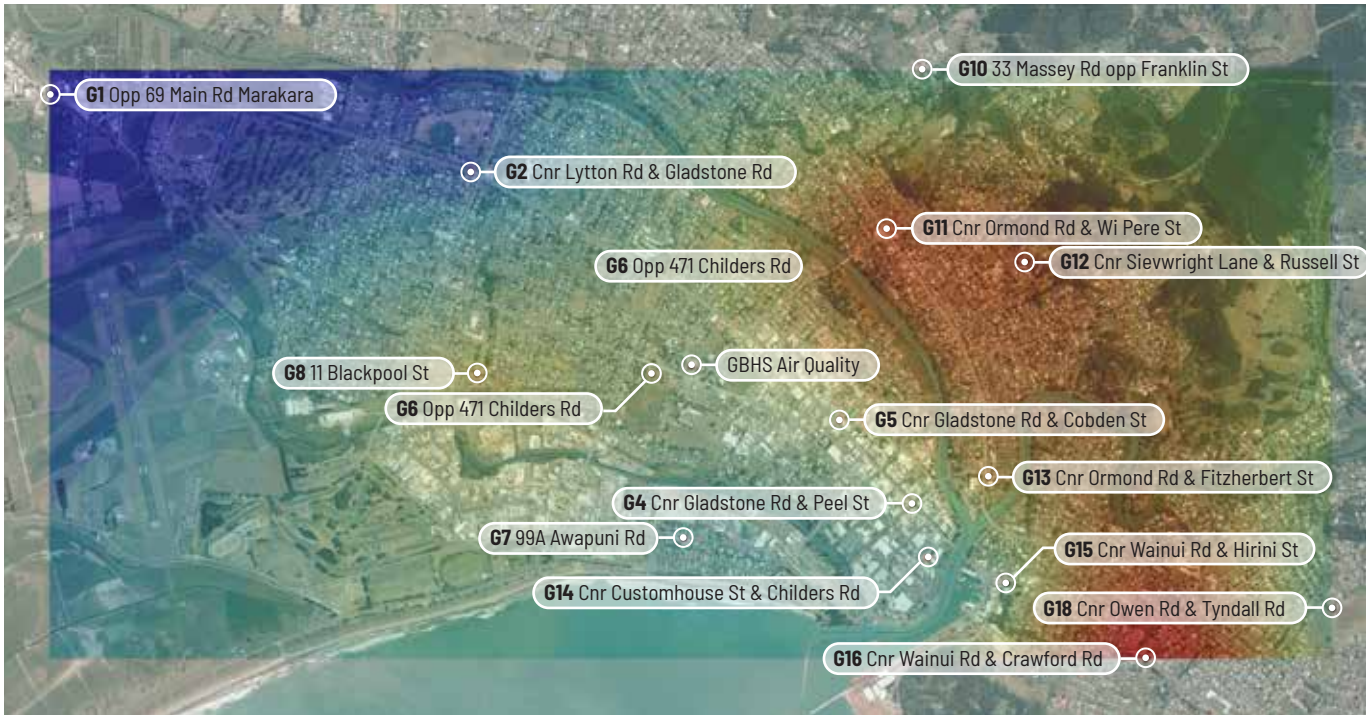
The results of our winter screening study showed two distinct peaks in average daily PM10. The first PM10 increase of the day begins at about 5am at most sites as early commuters start and some wood fires are started again to warm the house at the morning. Interestingly, this rise in the morning starts an hour earlier at the corner of Wainui Road and Crawford Road at 4am. The particulate matter then has a morning peak at most sites at 7am (except Boys High) as people commute to work and drop their children off at school. The air quality drops off to low levels during the day but increases across all sites from 3pm as school pickups begin and people head home for the day. Once people get home they may start their household woodburners which add to the air quality particulates from vehicles, and maximum particulate levels at most sites between 8pm and 10pm, gradually reducing in level until 5am the next morning.

Most of these ODIN sensors were mounted on streetlight poles next to roads, which may explain why the morning PM10 volumes are so pronounced when compared to Gisborne Boys High School. The Gisborne Boys High School location is in the middle of a city block, so its air quality can be considered more 'background' relative to the ODIN sites next to roads. This is evident in the graph on **page 123** where the morning traffic related particulate matter is not so noticeable.

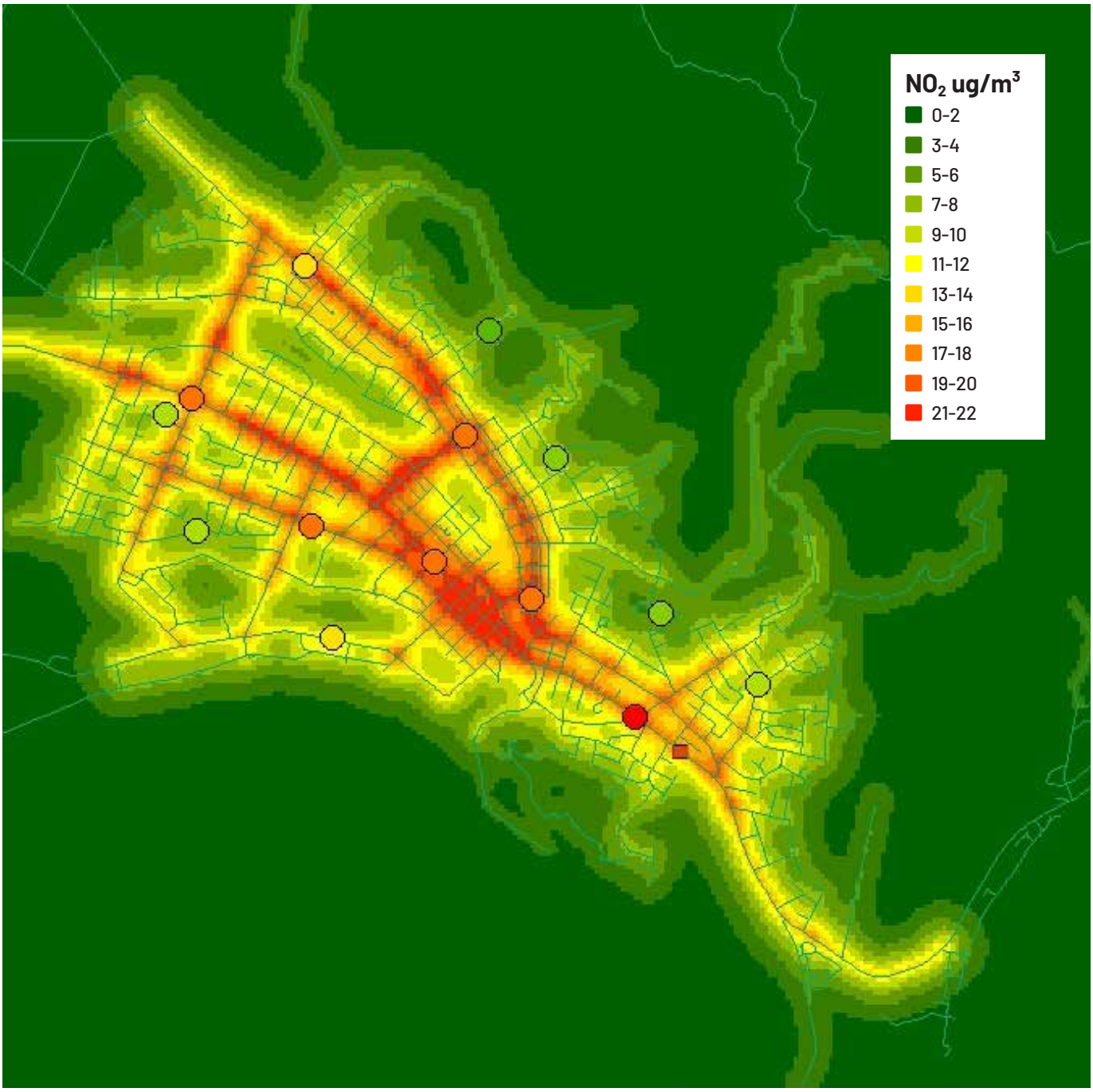
**Average PM10 by hour during ODIN study June - Aug 2018**




**Average hourly PM10 levels Jun-Aug 2018 (PM2.5 results showed a similar distribution)**



**Nitrogen dioxide ($NO_2$) monitoring**




$NO_2$ is a pollutant produced by the burning of fossil fuels, particularly diesel.

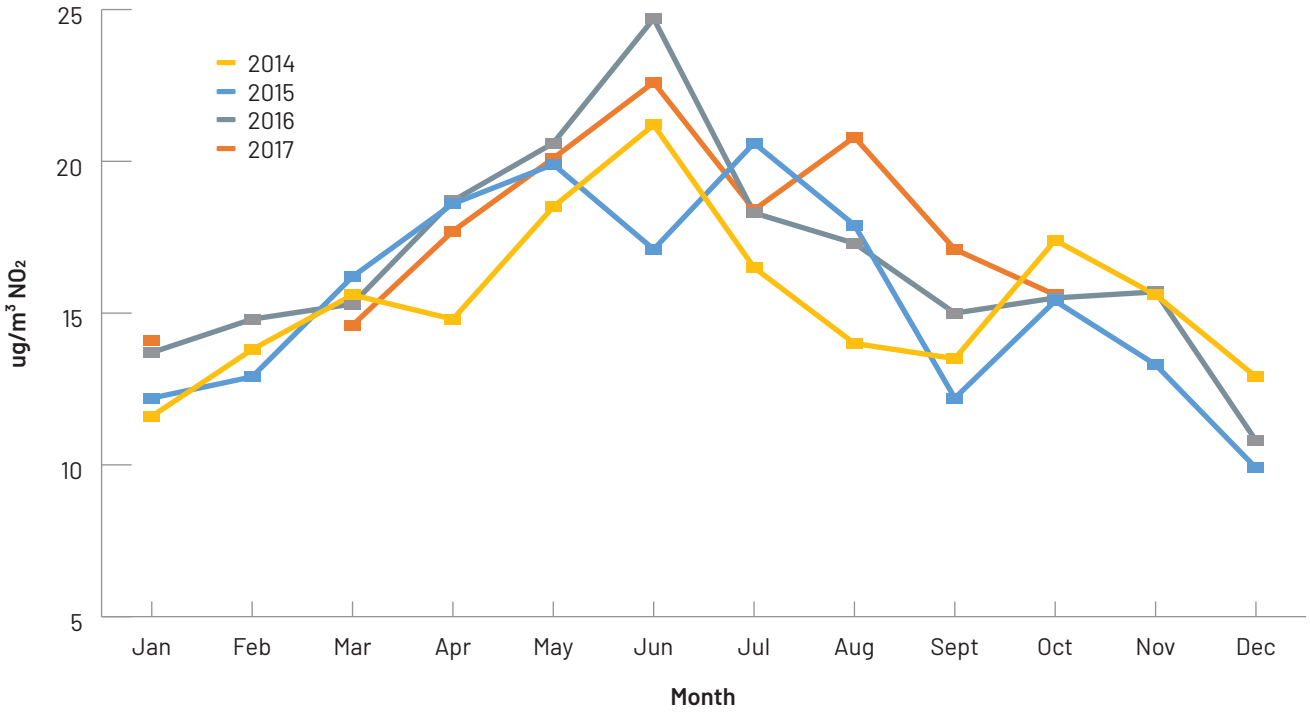
The results of the $NO_2$ monitoring during June - August 2018 reflected the expected distribution with no location breaching the World Health Organisation $NO_2$ health guideline of 40 µg/$m^3$ average per year. As expected, sites with the highest $NO_2$ were those located along arterial roads with port traffic to the east of town centre and the town centre itself. The town centre has the majority of stop-start traffic, and pollutants will linger in the area because of the taller buildings. The area to the east of the town centre has a greater proportion of heavy duty diesel traffic than other areas which is reflective of the port logging traffic.

New Zealand Transport Authority data shows that $NO_2$ levels are highest during winter, and the annual $NO_2$ average seem to be increasing since 2012.

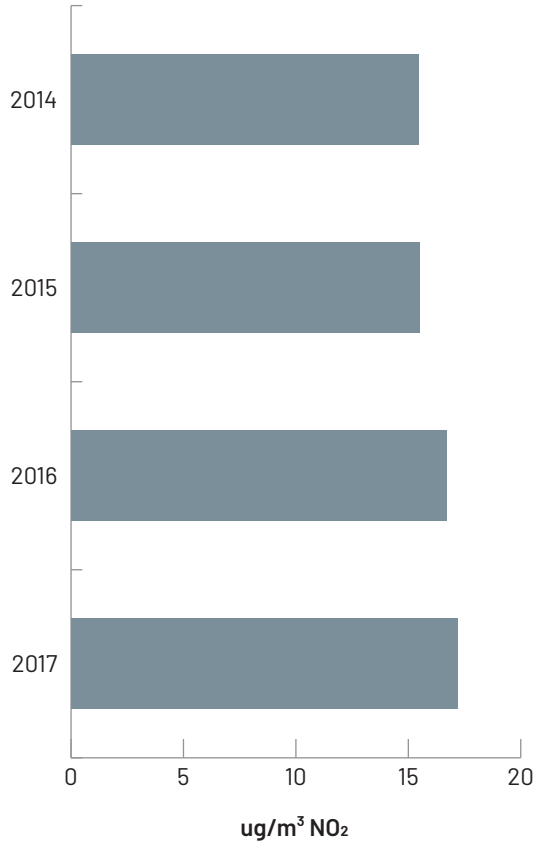
There are a number of possible reasons for this, including:

- increasing number of heavy vehicles using our roads (correlating to the increasing amount of forestry harvesting)
- people using their cars in the cooler months, rather than choosing to cycle or walk
- winter months produce temperature inversion layers in the air, which help trap pollutants so they cannot disperse.

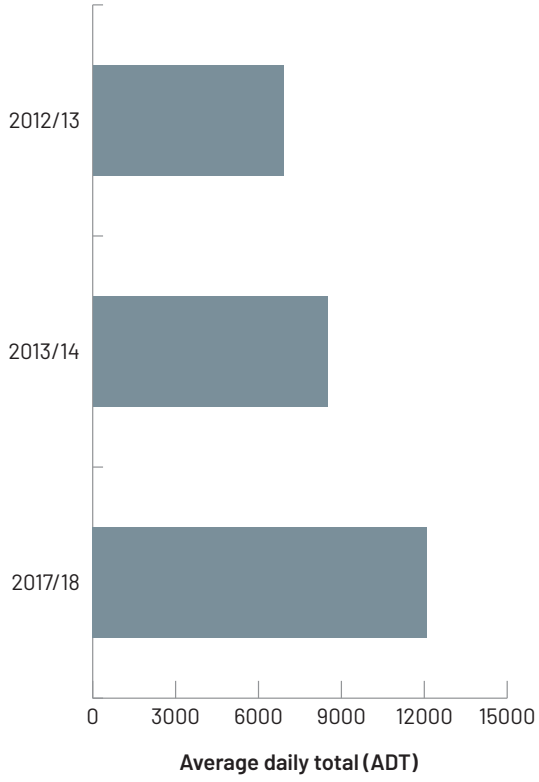
**NZTA monthly $NO_2$ data**




**NZTA annual $NO_2$ average**




**Gladstone Road vehicle counts (Tairāwhiti Roads)**




NZTA $NO_2$ data show peak levels of $NO_2$ during winter. Annual $NO_2$ average shows an increasing trend with about 12% increase from 2014 to 2017. This coincides with the observed increase in the number of vehicles using our roads from 2012 to 2018.


## Our night skies

Our region's history has been shaped by navigation. This was explored by Tuia 250 commemorations which in October 2019 recognised two extraordinary voyaging nations and cultures. Without access to the night skies, these stories would not have converged on Kaiti Beach. While over 50% of New Zealanders cannot see the Milky Way, in our region we have relatively low light pollution. In some parts of our district, the night skies are pristine and we must actively work to make sure this taonga is preserved for future generations.

PROTECTING OUR AIR QUALITY

## What next and how can you help?

Council has purchased new monitoring equipment. This equipment is able to measure both PM10 and PM2.5 which nationally is emerging as a pollutant resulting in chronic health conditions. The NESAQ review has signalled an intention to introduce a new standard for PM2.5 standards as the main regulatory tool to manage the health effects associated PM. Our air quality may not be able to comply with this standard which will require some new rules in the Tairāwhiti Resource Management Plan.

### What you can do to keep our air clean

- Burn dry, seasoned and untreated wood. Buy your firewood from trusted supplier
- Use clean home heating appliances, such as a heat pump, pellet burners or ultra-low emission burners. Don't dampen down the fire at night, let it burn out cleanly to ash
- Clean your chimney annually
- Where possible, take advantage of home insulation subsidy schemes and insulate your home
- Recycle plastics where possible. Do not burn these in your fireplace or incinerator at home. They release high volumes of toxicants such as dioxins, sulphur dioxide, furans, styrenes, heavy metals as well as particulates
- Use alternative forms of transport to a vehicle. Walk, cycle, or use public transport
- Consider buying an electric car or scooter/bike
- Keep your car tuned and running smoothly
- Have your say on air quality policies and plans. The Ministry for the Environment is currently consulting with the public on the review of the NESAQ until July 2020.

> "Why should one say that the machine does not live? It breathes, for its breath forms the atmosphere of some towns."
> — **Benjamin Disraeli**

NOTABLE EVENT

# Tolaga Bay burn-off

In June 2018, our region experienced a significant weather event with heavy localised rainfall around Tolaga Bay. This event mobilised forestry slash from the interior plantation forests and deposited a vast amount of wood on the Tolaga Bay Beach. Estimated volume of the log/woody debris was in the vicinity of 47,000m$^3$ and covered much of the foreshore. As the wood had been soaked in salt water, recovery of the wood for firewood was not an option due to the corrosive nature of the emissions and formation of dioxin that occurs at low temperature burning.

The forestry industry, principally Aratu, paid for and managed the clean-up, with consents and monitoring managed by Council. Disposal was achieved through controlled, high-temperature incineration. This method involves a large fan, coupled to a steel pipe. The pipe is directed through an earth wall into a pit dug into the ground, and blows air into the base of the pit. Once a fire is lit in the pit, the fan is turned on and logs are grappled into the pit where they burn at very high temperatures in a clean incineration process resulting in minimal smoke and low emission of dioxins. Real-time monitoring using three temporary instruments showed a correlation of an increase in levels of PM10 and PM2.5 with the lighting of the fires, but the air quality remained well within health guidelines.

*Machinery used for controlled high temperature incineration of forestry slash on Tolaga Bay Beach*

*Liam Clayton, The Gisborne Herald*

*Smoke emitted at start-up – but once the fire was burning strongly emissions were low*

# WASTE MANAGEMENT & MINIMISATION

Council ensures sustainable management of our district's waste by minimising waste generation and maximising opportunities to use waste as a resource.

## Key activities

- Urban and rural kerbside collection
- Rural transfer station operations
- Waste minimisation and education
- Recycling initiatives
- Cleaning public places
- Landfill operations and aftercare.

## Waste Management and Minimisation Plan 2018-24

Council's Waste Management and Minimisation Plan 2018-24 (WMMP) proposed the following targets:

- 20% reduction in the total waste sent to class 1 landfills by 2024
- 40% decrease in organic waste by 2024 (kerbside collections)
- 20% increase in recycling by 2024.

In 2017, 296kg of waste per person was sent to class 1 landfill from our region. Including waste sent to class 2 landfills, the total waste disposal per person increases to 506kg per year against a New Zealand average of 701kg. A total of 122kg per person, per year, was collected by our current rubbish bag collection.

There is only one class 1 landfill disposal facility in the Gisborne district at the Waiapu Landfill in Ruatoria (consented until 2025), which receives waste from the rural transfer stations at Tokomaru Bay, Te Puia Springs, Ruatoria, Tikitiki, and Te Araroa as well as Council's Ruatoria kerbside waste collection. All waste from the Gisborne Resource Recovery Transfer Station is transferred to a class 1 landfill, Tirohia Landfill (near Paeroa), 300km away.

Since 2015, there has been an increase in the amount of waste our community sends to landfill. The amount of material we recycle has also dropped slightly. This matches a national trend in increasing waste to landfill and declining recycling.

## Rural transfer stations

Our region has nine rural transfer stations. Six transfer stations are located along the coast (Tolaga Bay, Tokomaru Bay, Te Puia, Tikitiki, Ruatoria and Te Araroa), while three transfer stations are located inland (Te Karaka, Whatatutu and Matawai).

## Change to plastic recycling

2019 marked a significant change to our recycling due to global market changes that have impacted plastic recycling worldwide - since June 2019 only plastic grades 1 and 2 are accepted at kerbside collections, the Waste Management Ltd drop-off centre and rural transfer stations. Plastic grades 3-7 are now sent to landfill.

## Illegal dumping

Illegal dumping has increased considerably, with 65 tonnes in just half the 2019/20 financial year - twice the average of the past seven years.

## Waste minimisation and education initiatives supported by Council

- Rethink Centre located at the Tairāwhiti Environment Centre
- Workshops at the Tairāwhiti Environment Centre (for example, composting)
- The Rubbish Trip Tour – helping residents reduce household rubbish, held in Gisborne, Tolaga Bay, Tokomaru Bay and Ruatoria
- Waikanae Beach clean-up (Plastic Bag Free Tairāwhiti)
- Waste-free living workshop (Kate Meades)
- Tairāwhiti Enviroschools: rethinking waste workshop
- BYO Bottle campaign.

## Waste Minimisation Fund

Council provides up to $10,000 annually for community-led initiatives that reduce waste in our district.

"The funding comes from Council's share of the levy that the government puts on waste going to landfill," says waste minimisation facilitator Darnelle Timbs.

"Some of the best ideas and deliverers of waste minimisation initiatives are within our community. We look for projects that minimise, reuse, recycle, repurpose or compost waste, using resources wisely and without harm to the environment. We encourage anyone with a new initiative that reduces waste to check the assessment criteria and apply."

For more information, please visit **www.gdc.govt.nz**.

# #01 CASE STUDY | HE TAUIRA

## SUSTAINABLE DISPOSAL OF FARM WASTE

## Agrecovery rural recycling event

In September 2019, East Coast farmers and growers had the opportunity to sustainably dispose of farm waste at a recycling and recovery event in Gisborne. The Agrecovery event allowed farmers to dispose of a range of materials including agrichemical containers, unwanted agrichemicals, used motor oil, seed and feed bags, and soft plastics like silage and bale wrap. With backing from the Ministry for the Environment, Agrecovery has sustainable recovery options for waste that can't be recycled.

Feedback was overwhelmingly positive. The Gisborne event had the most registrations of similar events across the country, with 68 attendees. Gisborne had a high number of respondents disposing of agrichemicals. Unfortunately, the event will not return to Gisborne in 2020, but a good relationship has been established between Agrecovery and Council and future collaboration is in the pipeline.

| Event | Registrants | Containers (HDPE) | Chemicals | Oils | POPS* | Silage wrap (LDPE) | Fertiliser bags (PP) | Total kg |
|---|---|---|---|---|---|---|---|---|
| Westport | 17 | 699 | 344 | 87 | 0.3 | 350 | 350 | 1,830 |
| Southland | 58 | 1,200 | 1,490 | 1,410 | 4 | 4,260 | 420 | 8,780 |
| Selwyn | 61 | 1,500 | 2,705 | 820 | 75 | 875 | 1,015 | 6,915 |
| Geraldine | 42 | 1,200 | 1,726 | 1,562 | 2.5 | 765 | 990 | 6,243 |
| Matamata | 38 | 2,030 | 958 | 997 | 4 | 270 | 720 | 4,975 |
| Gisborne | 67 | 1,400** | 4,842 | 1,327 | 5.8 | 525 | 800 | 8,894 |
| Total | 283 | 8,029 | 12,065 | 6,203 | 91.6 | 7,045 | 4,295 | 37,637 |
| Average | 47 | 1,438 | 2,011 | 1,034 | 15 | 1,174 | 716 | 6,273 |

** Persistent Organic Pollutants (Included in Chemicals)* *** Gisborne Estimate as shredding unit malfunctioned at end of the event*

# #02 CASE STUDY | HE TAUIRA

ENVIROSCHOOLS WORKSHOP

## Rethinking waste through a Māori perspective

**Engaging tamariki through a kaupapa Māori lens, and sharing concepts of atua, tikanga,whakawhānaunga, and mātauranga, helped develop their understanding of sustainability.**

Enviroschools facilitators Kirsty Gaddum and Kauri Forno created a day at Titirangi (Kaiti Hill) that used examples of traditional Māori living, gardening and cooking, and created very little waste, while encouraging students to consider their daily choices.

Uncle Albie from Ngāti Oneone shared the stories of Maia bringing hue to Tūranganui-a-Kiwa, and Te Maro, the legendary gardener, growing kai for his people. This pūrākau related to the sculptures at Puhi Kai Iti and on Titirangi.

Students from seven schools participated in the day, which included a visit to the Seabin and stormwater grate at the harbour. The Seabin is emptied a few times a day as it filters mostly plastic waste from the surface of the harbour.

The stormwater grate had a Coke can and more plastic trapped in it. Students witnessed the link between how plastic travels via Tāwhirimātea (wind) and Tangaroa (water).

Schools were encouraged to stop waste entering their stormwater drains and to use art to raise awareness at their school about why it is important to keep waste out of our ocean.

The day also included a visit to a midden site where Whaia Titirangi shared their knowledge. Jordan and Mihi from Whaia Titirangi work full-time on the maunga, planting native trees, weeding and spraying, supporting education and looking after pest control.

*Uncle Albie, Ngāti Oneone, shared the story of Te Maro, the legendary gardener, growing kai for his people on Titirangi*

*Rawinia Kingi, Poutautoko from Te Aho Tū Roa, helped plan the day and ran an inspiring workshop about the story of how kūmara came to Tairāwhiti and how we can grow it*

> "The recent Enviroschools workshop gave students an opportunity to view zero waste through a kaupapa Māori lens. It incorporated the local history of the Tairāwhiti region and weaved these ideas to our present time and how we can look at reducing our waste. The students were engaged during the whole process and found the experiences relevant to the projects they were exploring in their school, which they will take back and share as inspiration... It was a great day!"
> — Emma McFadyen (Makauri School)

# #03 CASE STUDY | HE TAUIRA

SMART RUBBISH AND RECYCLING BINS TO REDUCE LITTER

## Let's put litter in its place

**In 2019, Council secured seven smart bins for our region as a part of the 'Let's Put Litter in its Place' project, a joint initiative between The Packaging Forum and Be a Tidy Kiwi.**

A series of smart rubbish and recycling bins have been installed in prominent locations around our region, as part of a nationwide campaign to reduce litter.

The smart technology and features reduce contamination, litter and make it easy for our people to recycle correctly.

Each bin is fitted with "EYEFI" smart technology that sends a signal to our contractor when the bin is full. This prevents bins from overflowing while also minimising Council costs.

The bins are bilingual and colour-coded in nationally agreed rubbish and recycling colours.

The bins can be found at the Gisborne i-Site, the Titirangi summit, Botanical Gardens, Waikanae Beach, and outside the public toilets at Te Araroa, Tolaga Bay and Matawai.

**Gisborne Mayor Rehette Stoltz tries out the set of bins at Waikanae Beach with (from left) Be a Tidy Kiwi programme manager Rick Leckinger, Andre Charbonneau of EYEFI, Tilley Group (who designed the bins) managing director Rory Bremner and The Packaging Forum project manager Lyn Mayes.**


*Liam Clayton, The Gisborne Herald*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