te kaunihera ā-rohe o
matamata-piako
district council






State of the Environment Report 2020/21

AIR 2020-2021

General Statement of Air

The management and monitoring of air pollutants is crucial to the health and wellbeing of people.

This chapter details the air quality monitoring carried out across the region by Waikato Regional Council (WRC) to maintain and improve our current levels of air quality.

Through extensive climate monitoring at sites across the region, WRC has collected data on air quality which helps guide decision-making by the Council and many other individuals and agencies including MPDC.

Exceeding safe limits of air pollution can have adverse effects on people, by causing respiratory conditions, cardiovascular issues, and irritation of the skin, nose, eyes and throat. Air pollution can also affect people's emotional and mental wellbeing.

Air is made up of nitrogen and oxygen gases, with minute amounts of carbon dioxide and other gases. Contamination of the air occurs through solid contamination such as dust and discharged particles from fires, liquid contamination such as pesticide and herbicide, and gas contamination. Some air contamination occurs naturally, through geothermal emissions but most, occurs through human activity.

In the Waikato region, emissions are mostly from house fires, agrichemicals, motor vehicle emissions, industry discharge, outdoor burning and livestock farming practices. Air is considered to be polluted when these contaminants are airborne for long enough, and at concentrations that could affect people, plants and animals. Air pollution can happen at multiple scales. Particle matter like dust and smoke, transport emission and industry discharge are influential at a regional level, but contribute to accumulative global scale pollution which culminates in adverse effects such as climate change and ozone deterioration.

Sources of pollutants

The Waikato Regional Council monitors the proportion of carbon dioxide (CO_2), carbon monoxide (CO), nitrogen oxide, sulphur dioxides and fine particle matter (PM_{10}) in the air daily, from industry, motor vehicles and domestic heating throughout the Waikato Region.

Common Sources of pollutants are:

- Carbon dioxide - is a greenhouse gas. It is thought that increasing amounts of gases will contribute to climate change.
- Carbon monoxide - is a poisonous gas that is colourless, odourless and tasteless. It is absorbed into the bloodstream of people and animals, causing health effects ranging from headaches and dizziness to loss of consciousness and death.
- Nitrogen oxides - can affect people's health by causing respiratory problems. It can be damaging to our environment by contributing to ozone loss and greenhouse gases.

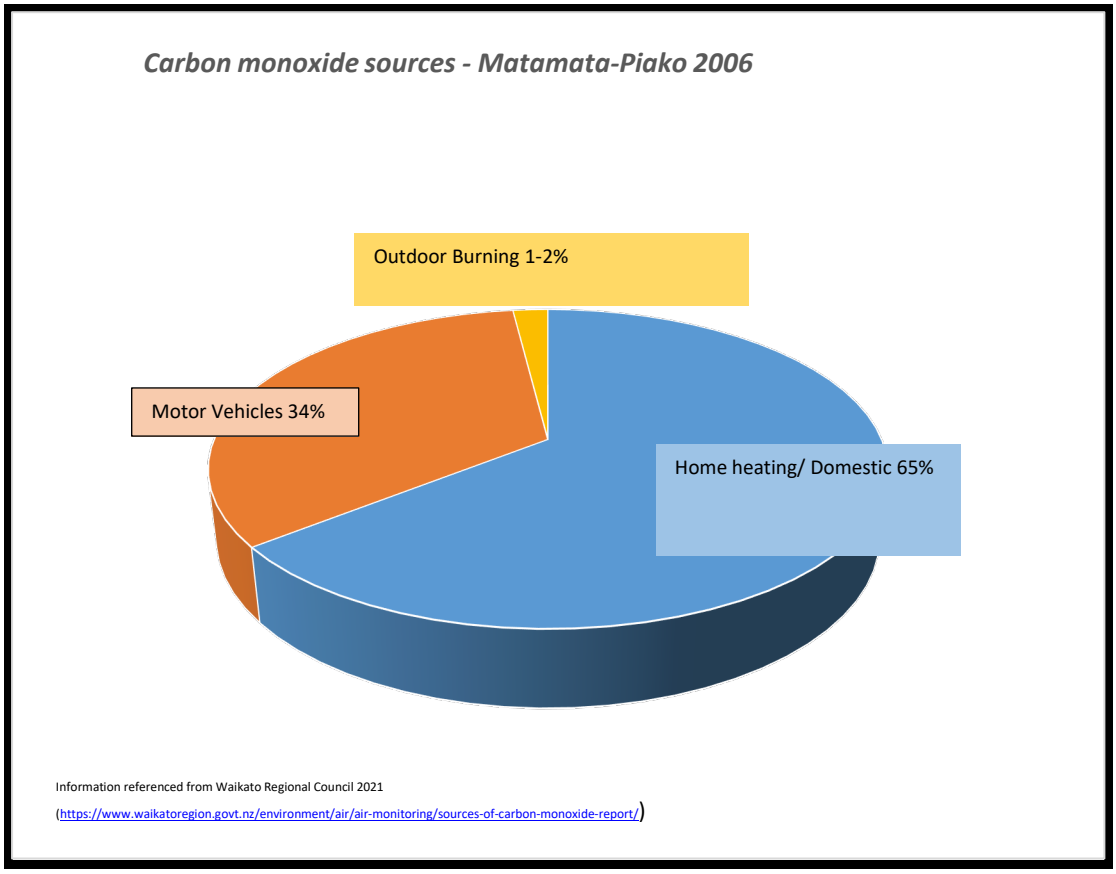
- Sulphur dioxides - have a strong, unpleasant smell, and can harm people's health and our environment.

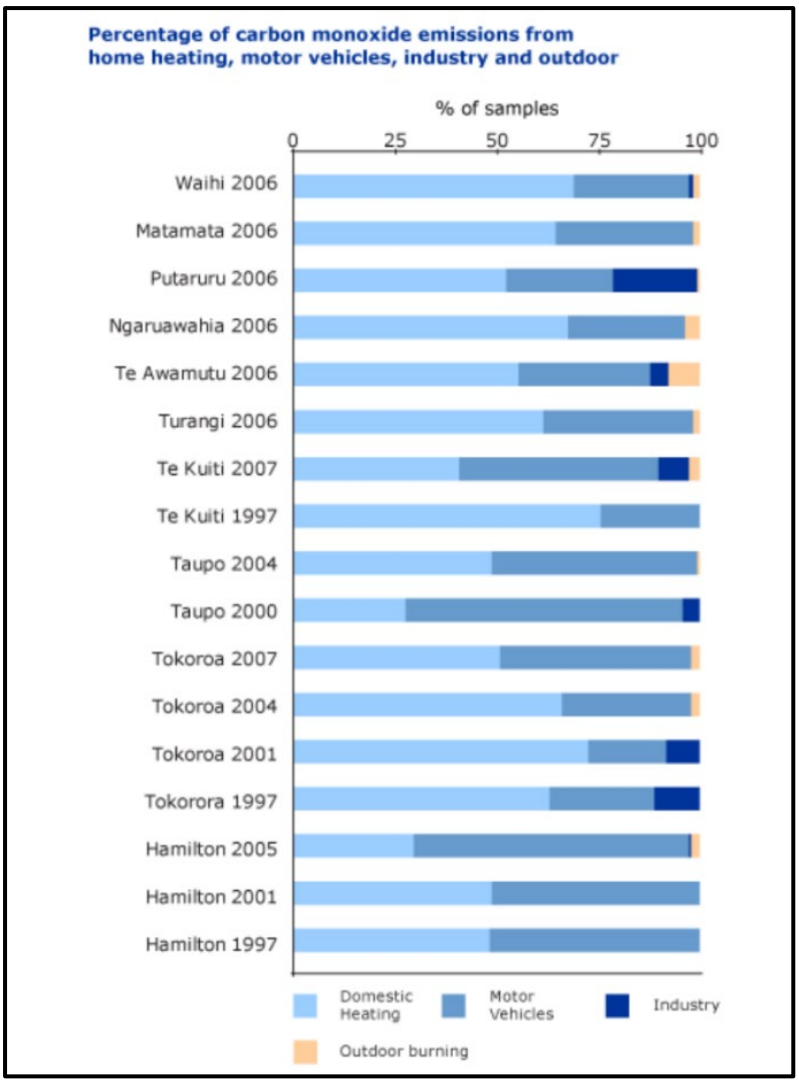
Sources of pollutants in our District

1. Carbon Monoxide

Most carbon monoxide in urban areas are sourced from motor vehicle, domestic home heating and industry. The figure below indicates the most recent published carbon monoxide readings for Matamata - 2006. 65% of all carbon monoxide pollutants, were from domestic contributions such as home fires, 34% of carbon monoxide pollutants were from vehicle use and only 2% were from outdoor burning. Waikato Regional Council carries out carbon monoxide monitoring in Hamilton only. The results of existing levels are considered 'excellent' or 'good', indicating that carbon monoxide is not of concern in Hamilton.

The results from Hamilton strongly suggest that carbon monoxide concentrations in other urban areas within districts like Matamata-Piako District Council are unlikely to be of concern as carbon monoxide is associated with high-density housing and busy roads.





Information referenced from Waikato Regional Council 2021
https://www.waikatoregion.govt.nz/environment/air/air-monitoring/sources-of-carbon-dioxide-report-card/

2. Carbon Dioxide

Measuring the amounts of carbon dioxide in the air, and identifying the sources of this gas is critical as this greenhouse gas is thought to be one of the greatest contributors to global-scale shifts such as climate change. It is critical to highlight the sources and find methods of reducing this pollutant as this plays greatly into the role of planning for large-scale changes in our natural and built environments in the future.

In the Waikato Region, carbon dioxide is sources mostly from motor vehicles, industry and home heating. Over 50% of all carbon dioxide emissions sourced from the Matamata is from domestic heating, followed by motor vehicles at approximately 40%. Carbon dioxide sourced from industry and outdoor burning equates to less than 10% of the districts total. It is important to note that industrial activities contributes approximately 5% of carbon dioxide emissions within the Matamata area.

Fine Particle Monitoring (PM_{10})

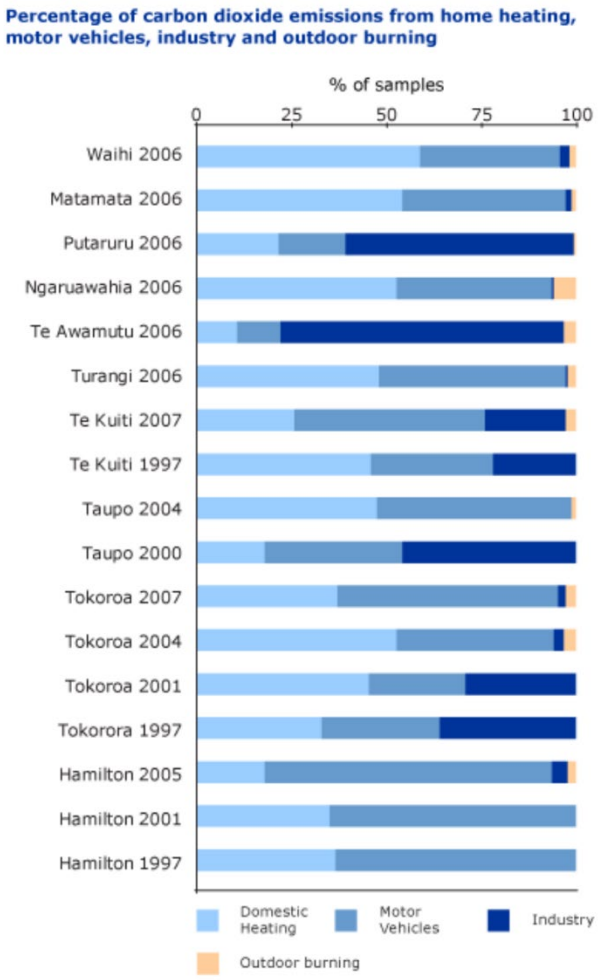
The most significant air pollutant in New Zealand are small airborne particles in our air (known as particulate matter). Particulate pollutants are of most concern in New Zealand due to high concentrations found in towns. Exposure to high levels of airborne particle pollutants has the potential to cause respiratory and cardiovascular issues. The size of these particles are smaller than 10 microns (1 micron is one-millionth of a meter), which is why is it can affect human health when inhaled.

The majority of PM_{10} in the Waikato comes from home fires, mainly burning wood. PM_{10} can cause respiratory problems, especially for asthmatics, children and the elderly, and can result in hospital admissions and premature mortality in sensitive people.

The Waikato Regional Council Reports on annual and daily PM_{10} concentrations each year.

Trends are reported for towns where they have 10 or more years of PM concentrations.

Fine Particle Matter in Our District

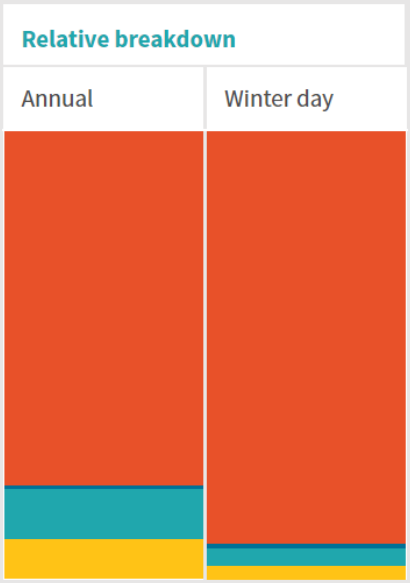


Information referenced from Waikato Regional Council 2021
https://www.waikatoregion.govt.nz/environment/air/air-monitoring/sources-of-carbon-dioxide-report-card/

In 2006, it was identified that in winter, over 90% of particles in the air in Matamata comes from home fires, followed by outdoor burning and motor vehicles which both contributed 4% of fine particle matter and industrial activities sourcing only 1% of total matters.

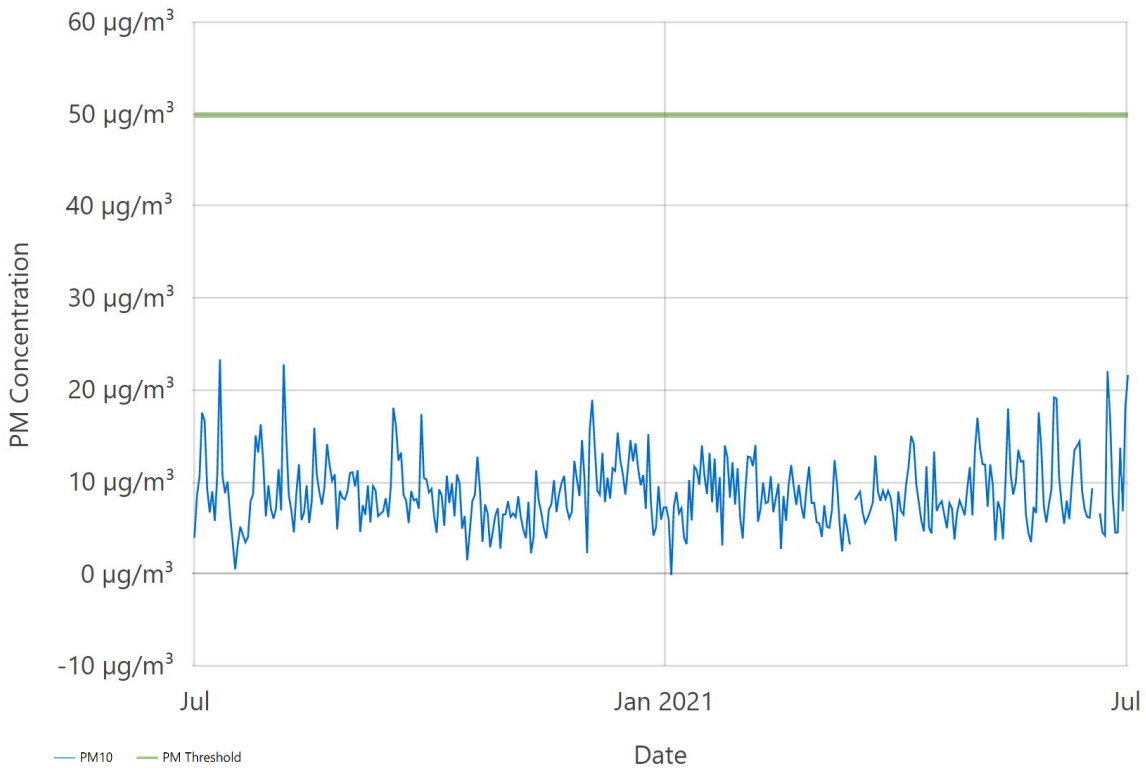
However, the annual averages show a slightly different breakdown due to the changes in activities carried out in the district. Annual averages suggest that home heating is still the largest source of fine particle matter at 79%, outdoor burning accounted for 11% of fine particle matter and 10% from motor vehicles. Industrial activity accounted for 1% in both annual and winter-day readings.

Source	Annual percentage	Winter day percentage
Home heating	79%	92%
Industrial	1%	1%
Outdoor burning	11%	4%
Traffic	10%	4%



*Sources of PM_{10} in **Matamata** from home heating, industrial activities, outdoor burning and motor vehicle use. Indoor sources and natural sources are not included in this information. Values used in this table are from Ministry for the Environment Data Service 2013. Information sourced from: LAWA, 2021 (https://www.lawa.org.nz/explore-data/waikato-region/air-quality/matamata/)*

The trend in the graph below indicates that during colder months of the year, the Matamata-Piako District produces higher PM concentrations in winter months compared to that over warmer months. Most concentrations of 15µg/m^3 or greater occurred during winter months. Given that home fires, outdoor burning, and motor vehicles are significant contributor to increased PM_{10} concentrations, it can be noted that the Matamata-Piako District experiences poorer air quality in winter compared to other months. Overall, the air quality in the Matamata-Piako District is well below the NES-AQ maximum threshold, with all concentrations of PM_{10} for the year remaining below half of the acceptable threshold. Urban areas of the Waikato Region are to meet the target of no more than one exceedance per year as from September 2016. There were no exceedances recorded for Matamata-Piako District between 2020 – 2021.



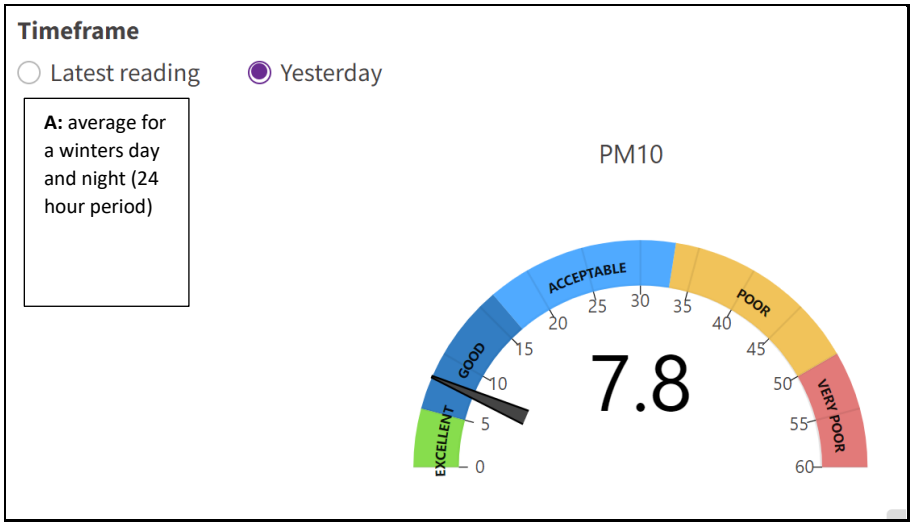
Graph showing the daily average particulate matter concentration (PM10) from 30 June 2020 to 1 July 2021, captured at the ***Morrinsville Airshed****. The green line shows the maximum limit accepted by the NES-AQ.* Information referenced from: Waikato Regional Council, 2021 (https://www.waikatoregion.govt.nz/environment/envirohub/environmental-maps-and-data/station/1022683/PM10?dt=PM+10)

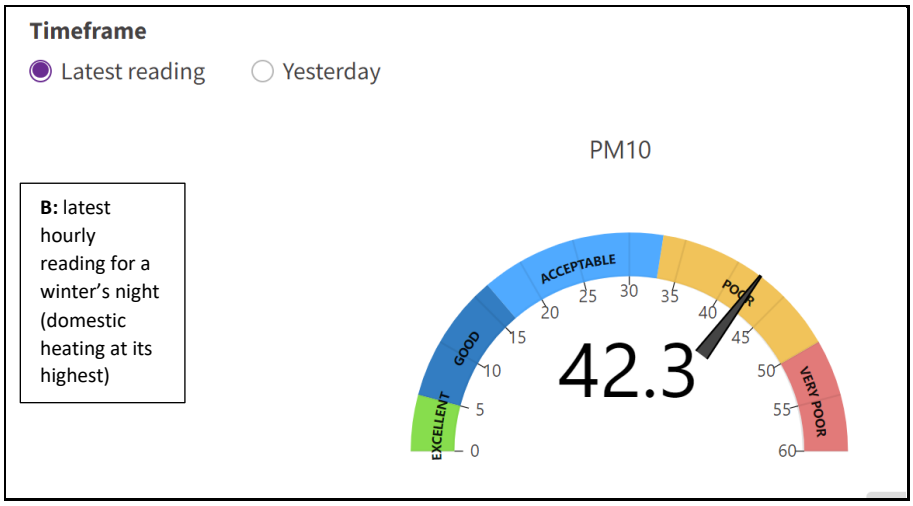
At Morrinsville fine particulate monitoring is measured every hour, demonstrated in the graph above. While there has not been a significant change in the level of average particular matter in the district, the most important pattern to take note of is the considerable fluctuations in the level of particulate matter in the different seasons in the graph above. Values from the warmer months have proved to be much lower than other months, with much fewer peaks than compared to cooler months.

Over the last 10 years there has been a decline in particulate matter present in the air, particularly in the winter months. Changes such as these suggest residents of the district are shifting from domestic fires to alternative means of warming their homes which is a positive trend. By shifting away from domestic fires as a way of heating homes, there could be a significant change in the hourly readings, therefore reducing the overall average suspended fine particle matter within the district. This could result in better health outcomes for residents by reducing the risk of respiratory illnesses caused by breathing in fine particle matter.

Similar patterns can be seen between night and day. During the day, fine particle matter at the Morrinsville Airshed demonstrate ‘acceptable’ air quality, however, the readings taken in the evening highlight the ‘poor’ air quality with high levels of fine particle matter.

The following readings are from the Morrinsville Airshed based on the average reading for the whole winter day (A) which indicates the average amount of suspended fine particles while reading B demonstrate the latest reading taken the following night which takes into account the readings from just the last hour when domestic heating is at its highest:





Information Sourced from: https://www.waikatoregion.govt.nz/environment/envirohub/environmental-maps-and-data/station/1022683/PM10?dt=PM+10

BIODIVERSITY 2020-2021 and 2021-2022

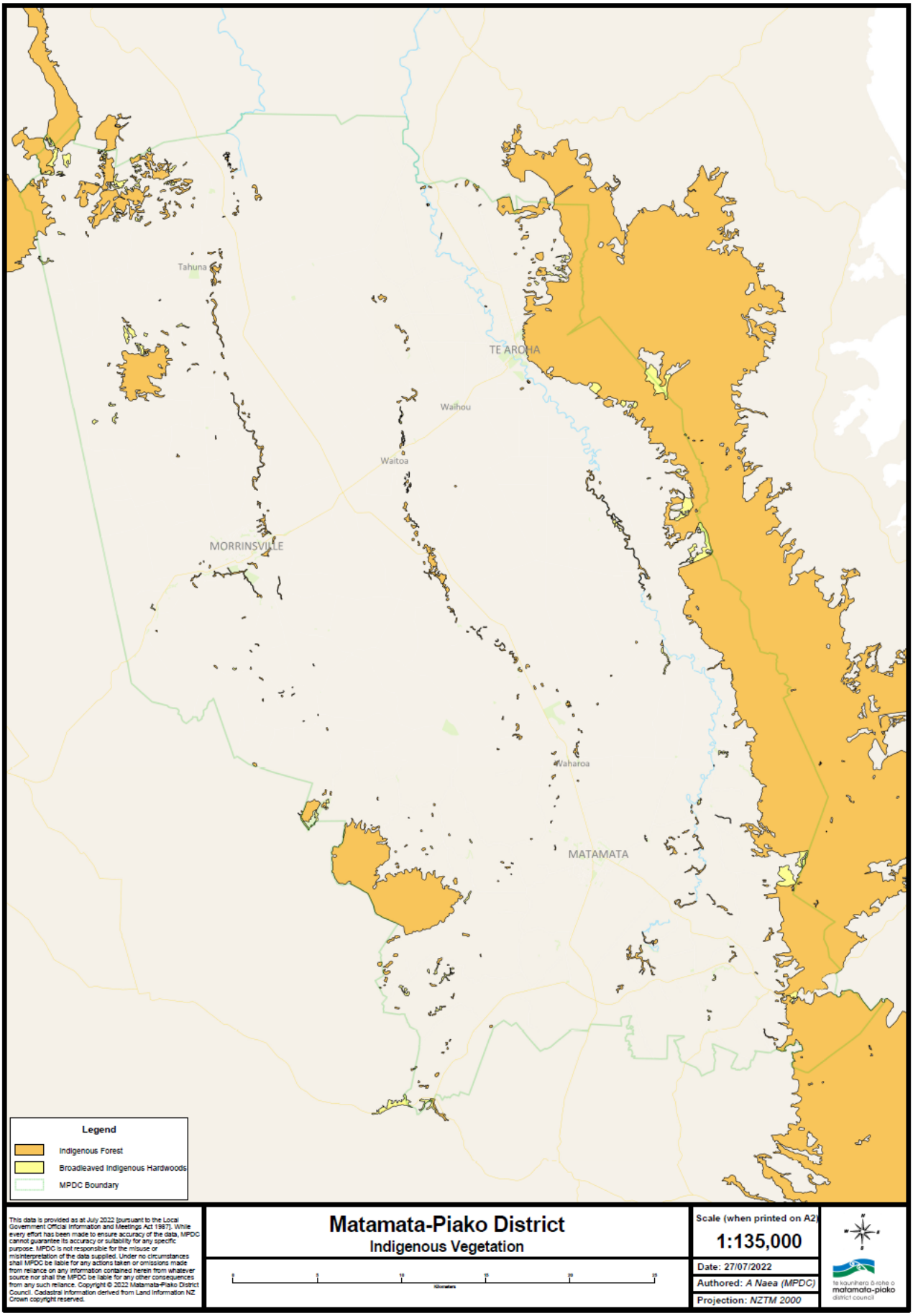
General statement

The Matamata-Piako District is fortunate to have an outstanding natural environment. Its landscape includes the Koputai Peat Dome, Hinuera Valley, the Kaimai-Mamaku Ranges and Te Aroha Mountain. It is crucial that the extent of indigenous vegetation be protect and preserved for us all to enjoy and for future generations. Like most districts in New Zealand, a balancing act has to be achieved to preserve indigenous vegetation, wetlands and biodiversity, while ensuring development is provided for. The primary activity affecting indigenous vegetation and biodiversity is land use changes such as drainage, land clearance, subdivision and development. Habitat destruction, isolation and land fragmentation are just some of the effects of land use changes, which we can try to mitigate.

Our District

Extent of indigenous vegetation and wetlands

There are 20, 890.8 ha of indigenous vegetation and 5393.13 ha of wetlands within the Matamata-Piako District. Our indigenous vegetation is made up of indigenous forest, indigenous hardwoods and manuka/ or kanuka. The map below outlines the extent of indigenous vegetation within our district. A large portion of our indigenous vegetation is within our Kaimai-Mamaku Forest Park, Kaimai Valley on the West, Te Tapui Reserve and south aspect of Maramarua forest. Within Matamata-Piako, the Kaimai Forest Park makes up an area of 14,670 hectares, and the Kopuatai Peat Dome an area of 5,313 hectares (approximately one third of the Dome is within Matamata-Piako). In addition, Te Tapui Reserve comprises 2,382 hectares. There are also 404 hectares within Matamata-Piako that are protected by covenants from the Queen Elizabeth II Trust.


Tahuna
TE AROHA
Waihou
Waitoa
MORRINSVILLE
Waharoa
MATAMATA
Legend
Indigenous Forest
Broadleaved Indigenous Hardwoods
MPDC Boundary
This data is provided as at July 2022 (pursuant to the Local Government Official Information and Meetings Act 1987). While every effort has been made to ensure accuracy of the data, MPDC cannot guarantee its accuracy or suitability for any specific purpose. MPDC is not responsible for the misuse or misinterpretation of the data supplied. Under no circumstances shall MPDC be liable for any actions taken or omissions made from reliance on any information contained herein from whatever source nor shall the MPDC be liable for any other consequences from any such reliance. Copyright © 2022 Matamata-Piako District Council. Cadastral information derived from Land Information NZ Crown copyright reserved.
Matamata-Piako District
Indigenous Vegetation
Kilometers
Scale (when printed on A2)
1:135,000
Date: 27/07/2022
Authored: A Naea (MPDC)
Projection: NZTM 2000
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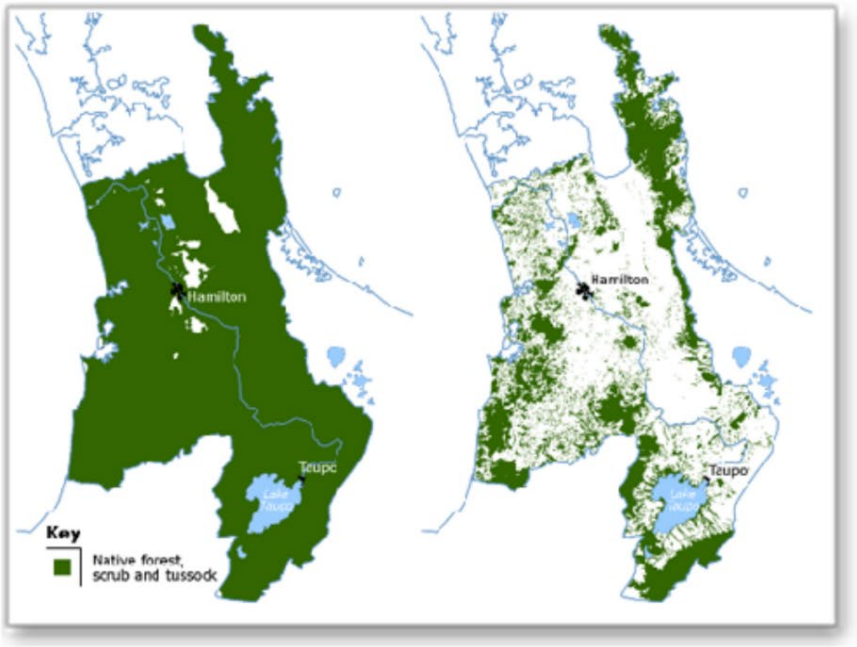
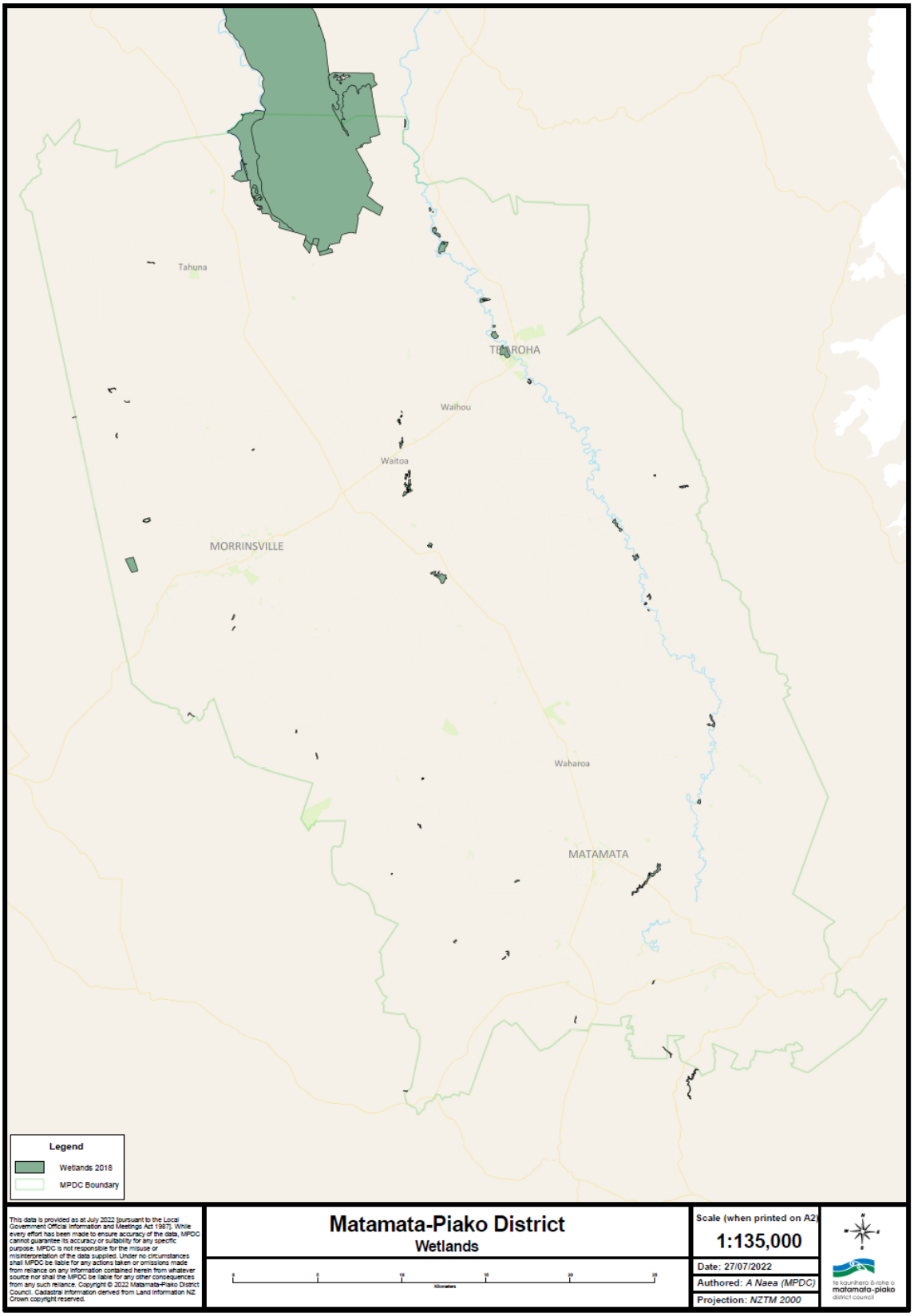
The maps below show the historic (around 1840, on the left) and current (right) extent of native forest, scrub and tussock in the Waikato Region.

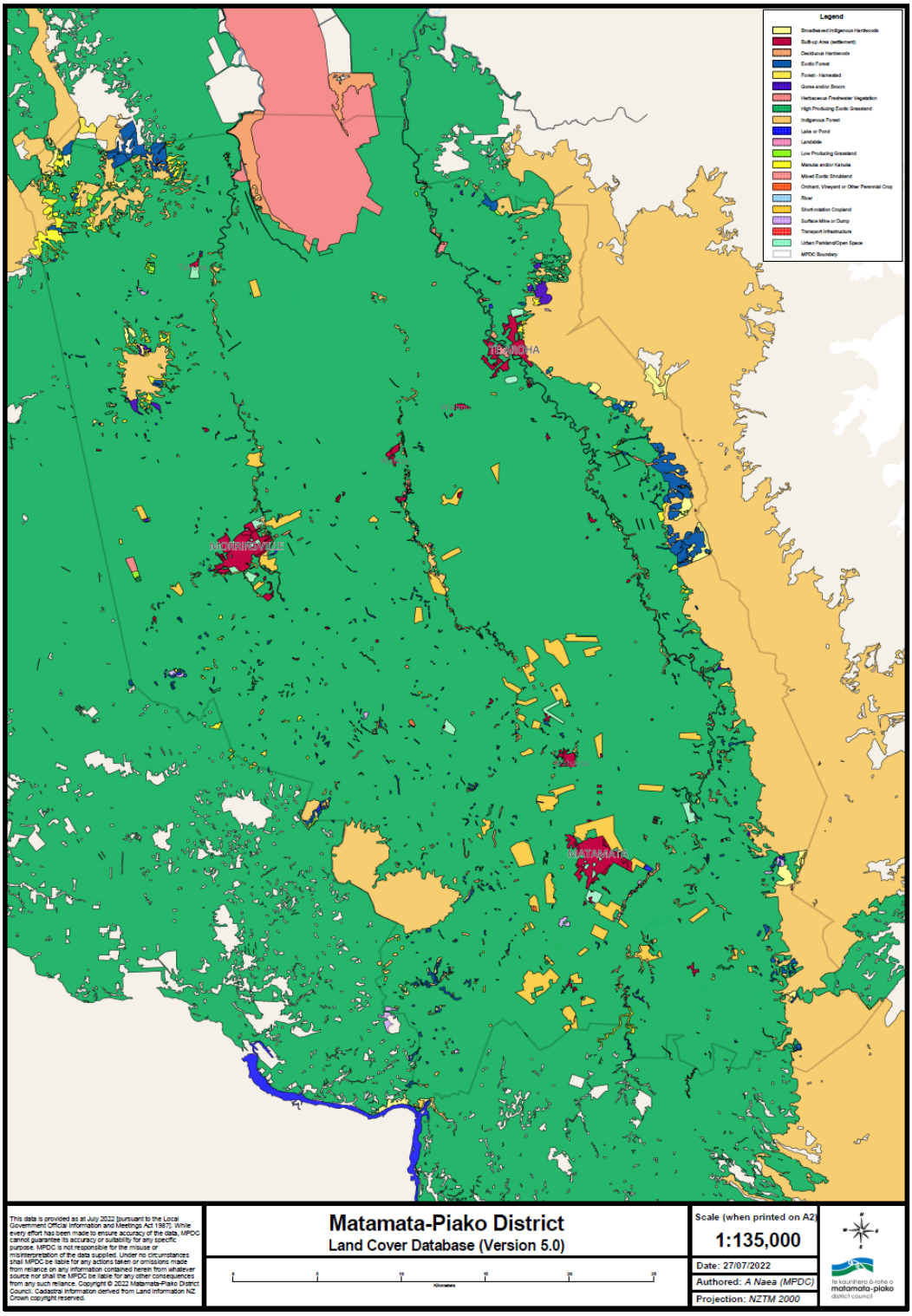


From the 2013 Waikato Regional Perception Survey, 73.5 per cent of respondents in the Matamata-Piako District were satisfied with 'community treatment of your district's natural assets'.



The map above shows that within the northern aspect of our district lies the Kopuatai wetland, which makes up the majority of the wetland hectares in our district, along with some additional hectares of wetlands located along the Waihou River.

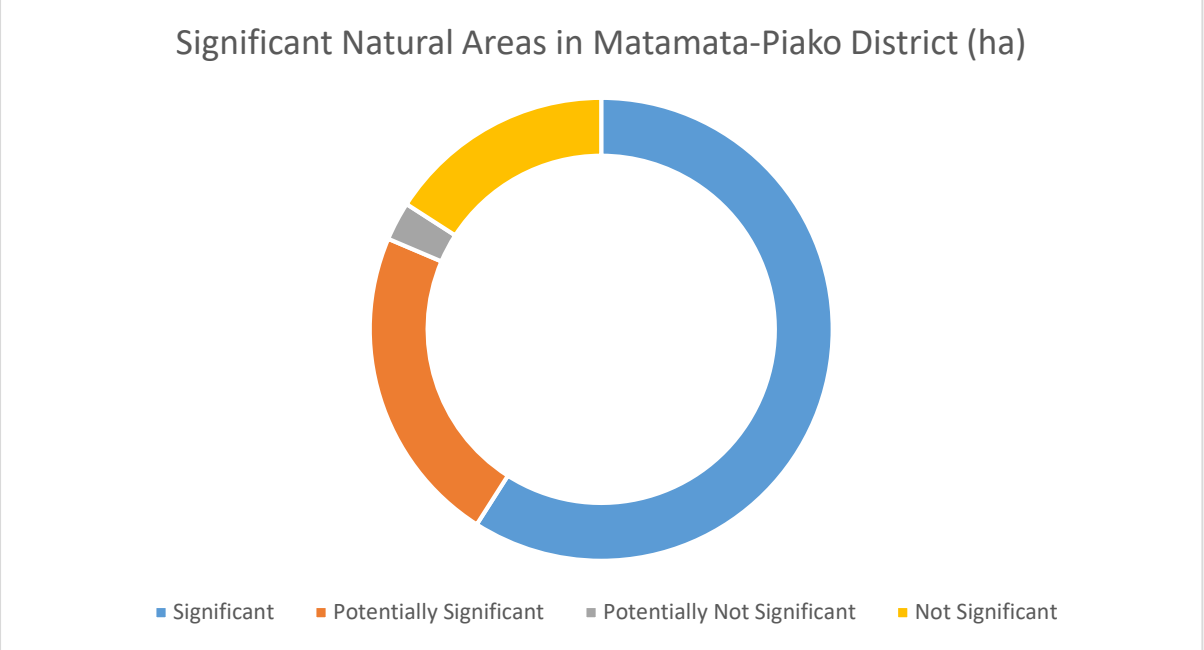
Within our district, there is also a number of other classes of biodiversity to consider the protection of. Many of these biodiversity species have been introduced to New Zealand (exotic), and have since become an integral aspect of the various ecosystems in which they exist. These include high production grasslands, exotic forests, freshwater vegetation, crops, low production grasslands, orchards and shrub land. The map below represents both indigenous and exotic biodiversity within out district, as well as our settlement areas, lakes or ponds and rivers.



Indigenous vegetation Cover of Protected Areas

There are a total of 721 ha significant natural features within the district.

In 1840, 95% of the district was covered in native vegetation; this figure is now 11.8%. A large proportion of that is held within the Kaitiaki Zone. Within our district plan, we have protected natural landscapes and features as well as four sub classes of significant natural areas – significant, potentially significant, potentially not significant and not significant. The diagram below outlines the proportion of the significant natural areas only in our district. Protecting areas, has shown to increased indigenous vegetation cover as well as support the many species that live within that ecosystem. As a result, it is positive to see that over half of these sites are considered to be significant. By protecting these features, our district has the best chance of restoring the presence of biodiversity and helps protect these unique landscapes.



Whats happening

There are pressures placed on indigenous vegetation and wetlands, resulting in reduced biodiversity. Isolated ecosystems weakens the robust indigenous biodiversity in the district, therefore through district plan provisions close monitoring of resource consents within the Kaitiaki (conservation) Zone. In addition having a focus on biodiversity corridors to connect significant areas increases the biodiversity throughout our district.

To assist in the protection and enhancement of biodiversity within the District, there is a Council fund available where sites are protected. In addition the district plan provides for an additional lifestyle lot where over 1 ha of significant biodiversity is protected. There are also a number of community groups that are contributing to biodiversity fauna and flora within our district.

Name_2018	Area (sqm)	Area (ha)
High Producing Exotic Grassland	1412542353	141254.2
Built-up Area (settlement)	16994832.1	1699.483
Indigenous Forest	191431032.9	19143.1
Exotic Forest	19364952.3	1936.495
Herbaceous Freshwater Vegetation	46674169.2	4667.417
Broadleaved Indigenous Hardwoods	8744139.9	874.414
Deciduous Hardwoods	10022556.8	1002.256
Short-rotation Cropland	28144104.1	2814.41
Lake or Pond	791894.9	79.18949
Manuka and/or Kanuka	8733077.7	873.3078
Forest - Harvested	543017.9	54.30179
River	2250852.4	225.0852
Urban Parkland/Open Space	4152142.8	415.2143
Low Producing Grassland	1217287	121.7287
Surface Mine or Dump	1145628.2	114.5628
Gorse and/or Broom	2149474.5	214.9475
Transport Infrastructure	98275.9	9.82759
Orchard, Vineyard or Other Perennial Crop	232639.4	23.26394
Mixed Exotic Shrubland	179437.3	17.94373
Landslide	46560.2	4.65602
Total Area	**1755458429**	**175545.8**
Wetlands	53,931,311.30	5393.131

LAND 2021-2022 and 2020-2021

Over the last 150 years of New Zealand's history, people have made significant changes to our land – particularly in the Waikato region which covers a span of 25,000 km. Native forests have been cleared and wetlands drained to create opportunities for different land use activities. With increased pressure on land, it is imperative to understand the effects of activities on the land, and how these can be managed.

Our soils are considered to be a non-renewable resource, like fossil fuels. It takes thousands of years for rocks to become soil, and further hundred years for the soil to build up organic matter. This organic matter is what allows soil to carry out its various functions. As people we rely on soil, and its organic matter, for survival. Depleting the soil quality and poor soil management can be detrimental. Therefore, making good decisions around our land and soil is very important to our wellbeing.

Various land types in the Waikato region, suit different uses. By using the land in a way that is not suited to the soil, we run a risk of damaging the land and subsequently having flow on effects to other part of our environment.

Soil versatility is a term used to describe what use a soil would be most suited for. Soils with greater versatility are suited to a wider range of land use activities. Soils are classed from 1 (very versatile soils) to 8 (least versatile). In the Matamata-Piako district approximately 75% of our soils are very versatile soils (soil class 1- 3) which makes up an area of over 110,000 hectares. These versatile soils have a large impact on the type of businesses in our district and also to our districts economy.

Land use in our district

Land use activities can place significant pressure on soils. Farming is known to cause increased erosion and also increase soil compaction while repeated cultivation or cropping is known to reduce soil microbial and organic matter. Root systems play an important role in providing stability on soil, however this can be undone during deforestation or harvesting as it causes soil disturbance and erosion into waterways. While this is a flow on effect from land use practices in our district, it is worth noting that efforts are continually being made to improve farming practices and mitigate the adverse effects it has on our soil structure.

According to data collected by the Waikato Regional Council (WRC) sites that were classified as being used for 'dairy farming' or 'dry stock':

- had soil compaction affecting at least 85% of sites;
- approximately 70 percent of sites across the region were considered to have excessive fertility. High fertility in soil refers to soil having excessive nutrients This is usually a result of when nutrient-dense fertilisers are added to soils to increase

nutrient levels to assist with production. There are often secondary effects of this such as excess nutrients which then leach into waterways.

On the other hand ¼ of sites are facing issues related to low fertility. Low soil fertility occurs when land use practices have used up the nutrients in the soil. When soils have reduced fertility, there has been a loss of root system growth and a reduction of bio organisms in the soil. Without strong root systems, there will be an increase in erosion and further soil structure degredation. All bio organisms in soils have a purpose whether it is breaking down biomatter or adding to the soil structure, they are essential for maintaining and replenishing our soils.

The Waikato Regional Council monitors soil quality at 25 sites throughout the district, within a 5 year period. That information feeds into this report around land uses within the Matamata-Piako District, soil quality and soil structure. The main land uses that are monitored by the Waikato Regional Council are dairy farming, beef and sheep farming (also called dry stock farming), horticulture and cropping and plantation forestry.

Soil Quality in our district

Soil quality is incredibly important to our district as it plays a key role in many of our land use classifications. Agriculture and dairy products are considered part of the district's major economic base and is a big contributor to the district's GDP. Therefore, close monitoring and proper management of soils is critical.

Good quality soils have properties that enable multiple land uses. Ideally, soils should be able to hold water and nutrients where it will be made available for plant roots to use, suppress weeds and pests, perform carbon sequestration from the atmosphere, filter water that flows through it before reaching waterways, absorb heavy rainfall which prevents flooding and support biological activity/ organisms.

- Nitrogen levels in our soils

From the data collected by the Waikato Regional Council from testing sites within the Matamata-Piako district, five (5) sites out of 11 recorded low nitrogen content in the soil, as well as soil degradation, which are two main factors in soil quality (Table: see Hot Water Nitrogen data and Hot Water Carbon data). These sites included three (3) sites that had been classified as 'cropping', another as 'dairy' and the remaining site was used for 'maize' growing. This indicates that there was insufficient nitrogen for biological activity and insufficient levels to support organisms at these sites. The nitrogen values for these five sites was below 225mg.

Interestingly, a correlation can be seen between the sites that displayed *inadequate* nitrogen content in the soil, and that of the *inadequate* carbon content in the soil. Hot water carbon is used to identify the amount of biological activity and carbon availability for microorganisms to use as food (sequestration). A value that is less than 1800mg, indicates that there is degradation of the soil structure and quality. The same five (5) sites that were flagged as having insufficient nitrogen levels above also had inadequate levels of carbon. The nature of farming maize and crops, means that the soil structure and deep root systems that would ordinarily sequest carbon from the atmosphere, is being disturbed, hence that these land uses are usually associated with poor soil structure as well. Deep root systems with low

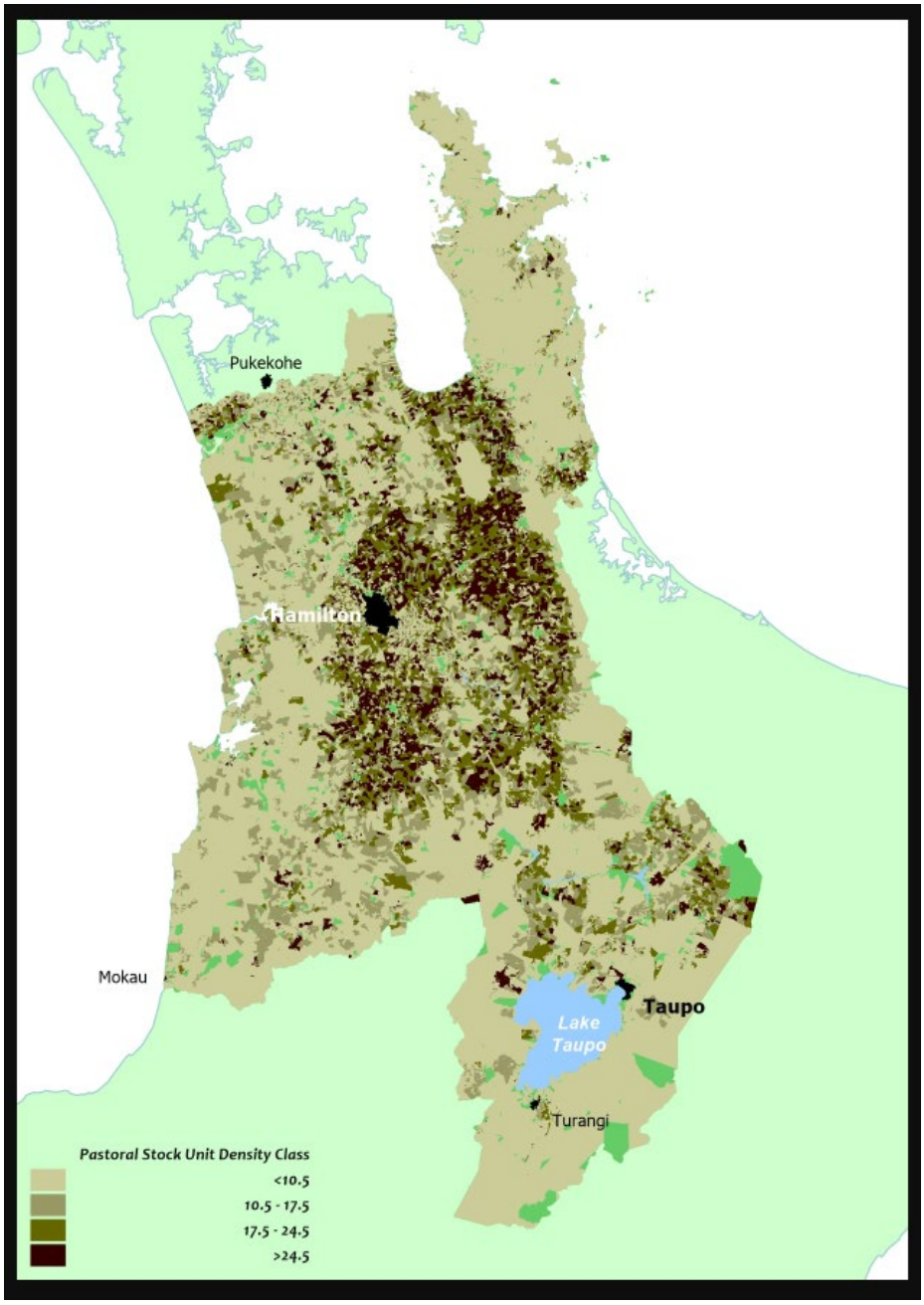
disturbance have been shown to have higher organic carbon present in the soil, therefore have higher levels of microorganism diversity and reduce erosion.

In contrast to having low nitrogen levels detailed above at the five sites, the data concludes that typically beef, dairy and dry stock farming practices have the highest levels of nitrogen and carbon in the soil. This is likely to be due to animal faeces and urine containing high levels of nitrogen entering the soil, as well as less root system disturbance. The Waikato Regional Council identified that about 70% of sites that were tested across the region were affected by excessive nitrogen fertility which leads to nitrogen leaching into waterways causing issues in streams and rivers such as algal blooms and loss of species. This is called eutrophication.

Stock Density of our soils

Stock density is one of the indicators to determine how tightly compacted the soils are as a result of livestock grazing and machinery related techniques. The soil structure becomes compromised when it is compacted, and this tight packing of soil and root systems also reduces the diversity and extent of biomatter. This consequently results in less nutrients being used and the more likely nutrients are leached into the waterways. Therefore, stock density not only has an effect on our soil structure it also has an effect on our water quality.

Matamata-Piako district is unique in that we have diversity in our landscape, with farmland, mountain ranges and rivers that lead into the Hauraki Gulf. We are also a district that is responsible for much of the national gross domestic product related to primary production. Alongside this, our district is also experiencing growth in our population and therefore development. While there is improvements to be made to our current practices, the evidence shows that this trend is typical of other farming areas where similar correlations are seen.



Map of Stock Density in the Waikato Region. Sourced: https://www.waikatoregion.govt.nz/environment/land-and-soil/land-and-soil-monitoring/riv9-report-card/.

The map above portrays classes of pastoral stock class in the Waikato Region. Of note is that there is a significant extent of high class soils and therefore high stock densities within the Matamata-Piako district. This correlates with the levels of nitrogen, E Coli and phosphorus found in our soils and waterways.

The diagram above shows that approximately 68% of farms in the Waihou/Piako catchment zones are higher stocked dairy farms. Sourced: https://www.waikatoregion.govt.nz/environment/land-and-soil/land-and-soil-monitoring/riv9-report-card/

Using the data collected by the Waikato Regional Council, we can identify that 80% of sites tested within the Matamata—Piako District displayed moderate to severe levels of soil compaction which is directly related to stock density. To measure soil compaction, a macropore indicator is used. Macropores are large soil pores, that are generally greater than 0.08 mm in diameter. Macropores drain freely by gravity and allow easy movement of water and air. They provide habitat for soil organisms and accommodate root systems. With diameters less than 0.08 mm, micropores are small soil pores usually found within structural aggregates. Soil structure is important as it related to soil functions like biological productivity, regulating water flow and nutrient storing. Soil structure is characterised by loosely packed, crumbly soil with macropores dispersed throughout the aggregate.

Four of the eight sites tested in our district, showed inadequate levels of macropores, suggesting severe soil compaction. Four sites were classified as dairy farming, two sites were classified as cropping, and the remaining sites were beef and maize. Considering that all sites that were tested are associated with farming practises, it is noted that only 50% have been identified in the ‘severe soil compaction category. There is more awareness being raised regarding soil health and how far reaching our land use practices can be. There is an increased community participation to manage or mitigate these measures through changes in business practices, methods and increased support being take up on a national and district level.

Land Use	pH Soil fertility	Total Carbon % Organic matter content. Organic matter helps to store water, nutrients	Hot Water Carbon mg Biological activity and Carbon availability for microorganism to use as food. Soil structure degraded at <1800	Total Nitrogen % Nitrogen reserves in soil. Below 0.2% is deficient for grass and crops	Hot Water Nitrogen mg Biological activity and amount of Nitrogen available for organisms. Less than 225 indicate Nitrogen fertiliser needed	Anaerobically mineralised nitrogen Below 50 is considered deficient for pasture	Olsen Soil fertility using phosphate indicator. Optimal is 30-15. Excessive is >50	Macropores Soil compaction. Needs to have >10 for root growth and water infiltration
Dairy	5.7	8.3	2776	0.85	369	146	45	3
Dairy	5.5	8.6	2116	0.94	330	157	17	6
Cropping	6.2	5.2	1050	0.54	203	60	100	11
Cropping	6.2	5.9	1291	0.59	198	72	30	6
Dry stock	5.9	8.2	2530	0.84	345	181	6	22
Dairy	6.6	5.8	1365	0.57	182	112	46	7
Maize	5.8	4.6	1144	0.50	121	66	53	10
Cropping	6.2	5.2	728	0.53	194	53	81	6
Dairy	6.5	6.4	2327	0.57	292	201	70	9
Beef	6.0	9.3	2353	0.98	373	174	12	3
Maize	5.8	6.3	1242	0.67	187	89	37	4

Table 1: Results of soil testing carried out by Waikato Regional Council across 11 Matamata-Piako District sites

There are patterns that emerged from the soil testing carried out in the Matamata-Piako district. Results suggest deficiencies within the same tested sites, and often correlations can be drawn against sites within the same land use classification. All sites had between one and three results that were outside of the acceptable / suggested parameters for good soil structure and soil quality.

WASTE 2020-2021

Our District

Waste within our district is made up of household kerbside waste collection (bags and bins), waste from industrial or commercial activity, and waste from residents and businesses taking loads to the three transfer stations, as well as waste taken directly to privately operated landfills.

While we are doing a lot of recycling, we could be doing more.

There is urgency to move away from our current high-waste society to becoming a low-waste society. This requires us all to rethink our approach, reshape our behaviours and reimagine the future of waste management.

This shift not only requires us to recover resources at the end of their use rather than disposing of them. In addition we will need to choose and use resources in ways that can ensure they do not generate waste.

The concept of recycling is not just primarily about reducing how much waste is taken to landfills but also reduces the need to extract further raw materials from the earth needed to create the product.

Para-Kore (Zero Waste)

Reframing our thinking around waste aligns with the principle of kaitiakitanga or guardianship, whereby we adopt an integrated view of the environment and protect our natural environment from degradation.

“Everything in nature is part of a closed, continuous, endless cycle” (WMMP). This is called The Circular Economy.

Modern methods of manufacturing and material sourcing have led to an increase in volume of production and in-organic material. Using the circular economy model will take us closer to the principles of kaitiakitanga.

Our vision is to embrace Zero Waste (Para Kore) and the Circular Economy (Ōhanga āmiomio) as an alternative to the traditional linear economy. Circular economies means we keep resources in use for as long as possible, extracting the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life where possible.

Waste Management and Minimisation Plan (WMMP)

Council is required to develop and adopt a Waste Management and Minimisation Plan (WMMP) under s44 of the Waste Minimisation Act 2008. Our last Waste Management and Minimisation Plan (the Plan) was adopted in 2017 in partnership with our neighbours Thames-Coromandel District Council (TCDC) and Hauraki District Council (HDC). While our Plan covered the period from 2017 to 2023, significant changes in Central Government policies, and in the waste industry sector have resulted in reviewing our Plan in 2020 to ensure it is 'fit for purpose' therefore amendments were made in 2021.

The WMMP is a collaborative model where, Council, business, Iwi, community groups and householders can all work together to build new waste minimisation services and grow local economic development, ultimately building community resilience at the same time. This plan aims to facilitate all individuals and businesses have access to recycling, resource recovery and waste management services. There is an opportunity to create more education and understanding around taking responsibility of our waste, therefore creating awareness of the value in resources being used, recycled and avoiding sending waste to a landfill.

According to our WMMP, the volume of waste sent to landfill in our district has not seen a dramatic increase in the last 10 years. While this may be the case for landfill quantities, it is worth noting that recycling rates have declined steadily which is a trend that is seen on a national and global scale.

The Future of Waste in our District

Central government have proposed a shift towards a low waste, low carbon future. In turn, there are likely to be increased costs associated with landfill disposal over the next few years.

When planning for the future in our district it is critical to identify how to implement effective waste management systems that works towards waste minimisation and resource recovery before it is sent to landfills.

We propose to do this by sequentially converting our refuse transfer stations into community resource recovery centres (CRRC) which will provide for greater separation of wastes and provide for collaboration enterprises that allow for community and business input.

These changes are fundamentally different compared to current practises. The changes suggested by central government and Council will call for changes in behaviour and practices, but will move us closer towards meeting our goals and objectives of the WMMP using a circular economy methodology.

Working towards a low-waste future and a circular economy.

One of the goals set out in the vision is to have 'a community that considers, and where appropriate, implements initiatives and innovative ways to assist in reducing, reusing and recycling wastes therefore minimising the waste that is sent to landfills' by:

- Provide sustainable waste minimisation services that are cost-effective to the community
- View waste as resource, making the necessary improvements and modifications to collections and facilities so that more materials and products can be diverted from landfill
- Making waste reduction, reuse and recovery initiatives our priority and align with other council objectives
- Reduce barriers that prevent the community from making the best use of the existing services
- Find and implement new ways that waste can be reduced, reused and recycled
- Examine feasibility options for developing community recovery centres
- Review processes and methods of waste management to keep it within the district

The second goal outlined in the WMMP vision is to 'minimise environmental harm and protect public health' by:

- Ensuring the reduction of environmental harm is understood from a holistic perspective, including tikanga and mātaurangi Māori (indigenous knowledge) as an important aspect of creating sustainable practices.
- Identifying all impacts on the environment and public health implications of all waste management options, and ultimately looking at what is most cost effective for the community

Please use the link below to access the Waste Minimisation Management Plan (WMMP):

https://www.mpdc.govt.nz/have-your-say/wmmp

How are we tracking?

There were two targets that were established as part of the WMMP for the Matamata-Piako District. These two target references:

- ***The total quantity of waste sent to landfills be reduced by 1% per person per year.***

The total waste sent to landfills for the year 2020-2021 was 153.49kg per person, which was a significant drop from 172kg per person in 2019-2020. Given the limited amount of annual data we have it is too early to draw any significant conclusion. However on the face of it, this data looks like we are heading in the right direction and the 1% reduction was achieved.

Calculation: Total quantity of waste = 372.05 (MT) / 35,000 (estimated population)

= 0.15349 (x 1000)

= 153.49kg/ person/ year

- ***A 5% decrease in kerbside household waste to landfill from approximately 62kg per person per annum to 59kg per person per annum***

It is noted that the above target was set in 2017 and at the commencement of this measure it has already been achieved. It is however still important to report on this target as we can always improve.

The total kerbside waste sent to landfills for the year 2020 – 2021 was 33.32kg. The total quantity per person was significantly lower than the previous year (2019 – 2020) which had a total quantity of kerbside waste of 45kg per person.

Calculation: Total quantity of kerbside waste = 1166.19 (MT) / 35,000

= 0.03332 (x 1000)

= 33.32kg / person/ year

WATER 2020-2021 and 2021-2022

Water is critical to all aspects of our lives. Freshwater is precious and limited, a taonga of huge significance. The Waikato Regional Council (WRC) collects information on water quality, wetlands, lakes, rivers, ground water, storm water and water allocation. For the purpose of analysing the data at a local level, the two key components examined in this report are ground water availability and river water quality for recreational use.

Groundwater

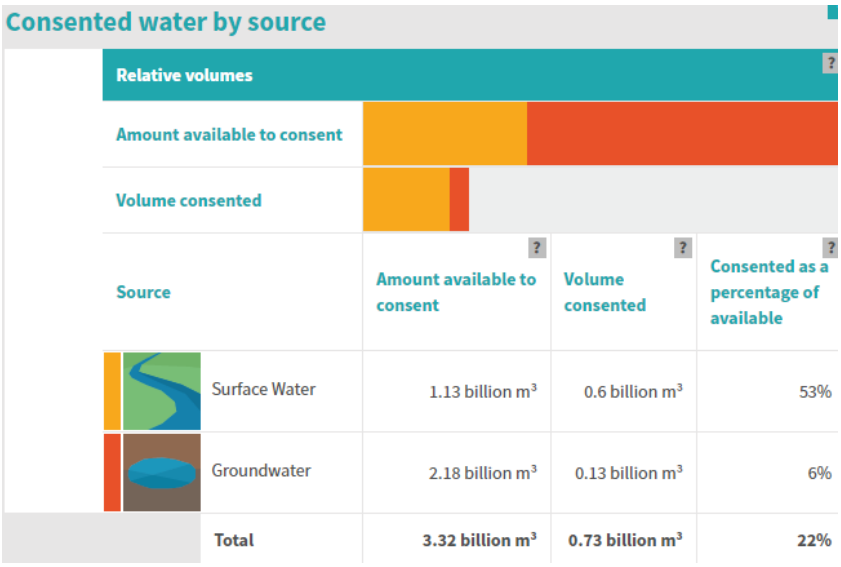
Groundwater is characterised by rainwater that has percolated through soil to underground rock fractures or porous sediment. These are known as aquifers. Groundwater accounts for 90% of the Waikato's fresh water resource. To access the aquifers, wells are drilled to pump the water away from the aquifers to where it is needed. For example, for drinking water, industrial and agricultural use. The amount, quality and usage of groundwater varies greatly within the region.

Ground water quality depends on how vulnerable the groundwater aquifers are to contamination. Contamination of groundwater can take place when pollutants travel through the soil into the aquifers. Once polluted, it can be challenging to reverse this entirely. Hence, the importance of ensuring optimal ground water protection. Contaminants in the ground water can be due to pollution from point source or non-point source. Septic tanks, leaking treatment ponds, waste disposal sites are examples of point source contaminants, while agricultural land use activities, saltwater intrusion, fertiliser and pesticide applications are examples of non-point source pollutants.

Groundwater use, also known as water allocation is monitored by the Waikato Regional Council to ensure these aquifers will sustain everyone's needs. According to Land, Air, Water Aotearoa New Zealand (LAWA), two thirds of water allocated from Waikato Region is from surface water and the remainder is from groundwater. While rainfall does naturally replace water taken from the aquifers, when too much groundwater is used, there is less water left in the aquifers – this is also known as lowering of the water table.

As populations grow, and land use activities grow, Waikato Regional Council has identified an increase in ground water allocation by 22%, from 1997 to 2002. Despite this growth, due to average regional rainfall, there are sufficient ground water resources however this is variable depending on the amount of rainfall a region experiences. This can change from district to district, and also can vary by season.

The image below is sourced from LAWA (https://www.lawa.org.nz/explore-data/waikato-region/water-quantity/). Showing the volume of water that has been consented by the Waikato Regional Council versus the amount of water that is available to consent. As stated below only 22% of the total water volume available is consented.



Source	Amount available to consent	Volume consented	Consented as a percentage of available
Surface Water	1.13 billion m^3	0.6 billion m^3	53%
Groundwater	2.18 billion m^3	0.13 billion m^3	6%
Total	**3.32 billion m^3**	**0.73 billion m^3**	**22%**

Given that water allocation is a sum of both surface water and groundwater, it is usually during the summer months where there is little rainfall that there is measures put in place to reduce water usage. While the average values for water availability may indicate that there is a significant amount of water available annually, it does not accurately portray the seasonal effects of drought or reduced rainfall in the warmer months.

Groundwater in the Hauraki Plains

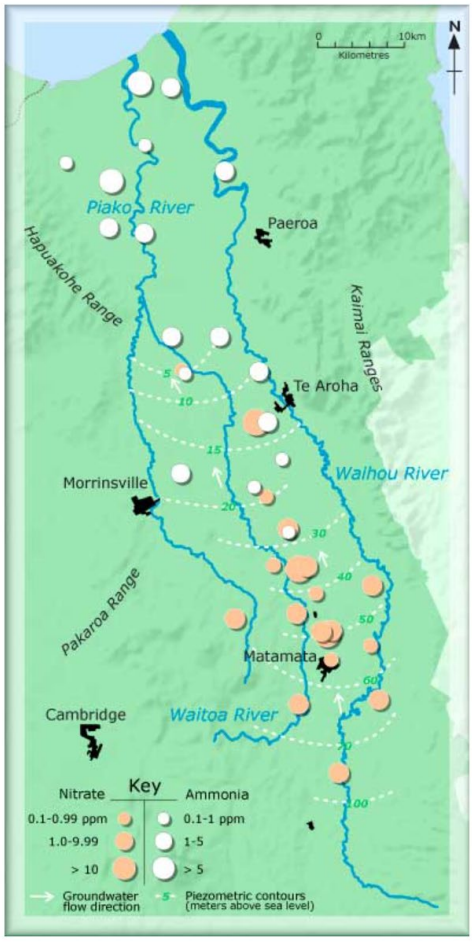
The Matamata-Piako District is made up of three rivers which feed into the Hauraki Gulf. These are the Piako River, Waihou River and Waitoa River. While territorial authorities include certain geographical features into their district, our environment in one district has effects elsewhere as these waterways pass through a number of areas. Therefore, in the data collection sets below, our districts three rivers are included in the Hauraki catchment.

Groundwater quality across the Hauraki Plains is highly variable, however there is more groundwater available than what is presently used each year. The aquifers in the Hauraki Plains are made up of gravel, sand and layers of silt or clay and located in areas of alluvial sediment.

For the most up to date information on Ground water flow in the Matamata-Piako District, please visit Waikato Regional Council's webpage for an interactive map of groundwater levels in the region. Please select Bore 64 if you would to view the latest live feed for our district:

https://www.waikatoregion.govt.nz/environment/envirohub/environmental-maps-and-data/station/15742/GWL?dt=Groundwater+Level

Concentrations of nitrogen and ammonia at sampled sites in the Hauraki Plains



Aquifers recharge by rain falling on the Southern aspect of the Plains. In doing so, the emerging groundwater feeds the streams that are upwelling on the northern low lying aspects of the plains.

Image shows nitrate and dissolved oxygen levels in groundwater are higher in the Southern parts of the Plains than compared to the north. Iron and aluminium levels display the opposite pattern however, with there being high concentrations occurring in the northern parts of the Plains due to the peat content in the soil.

Diagram extract from Waikato Regional Council showing Ground water Quality at testing sites within the Hauraki Plains:

https://www.waikatoregion.govt.nz/environment/water/groundwater/groundwater-around-the-region/

River Water Quality for Contact Recreation

Routine monitoring of rivers and streams in the region, is used to assess the suitability of the water for recreational water activities such as swimming and other water sports. Micro-organisms from human and animal faeces can get into the waterways. This can be dangerous for people exposed to these organisms. Other matter such as silts and clay can enter the waterways, reducing the water clarity.

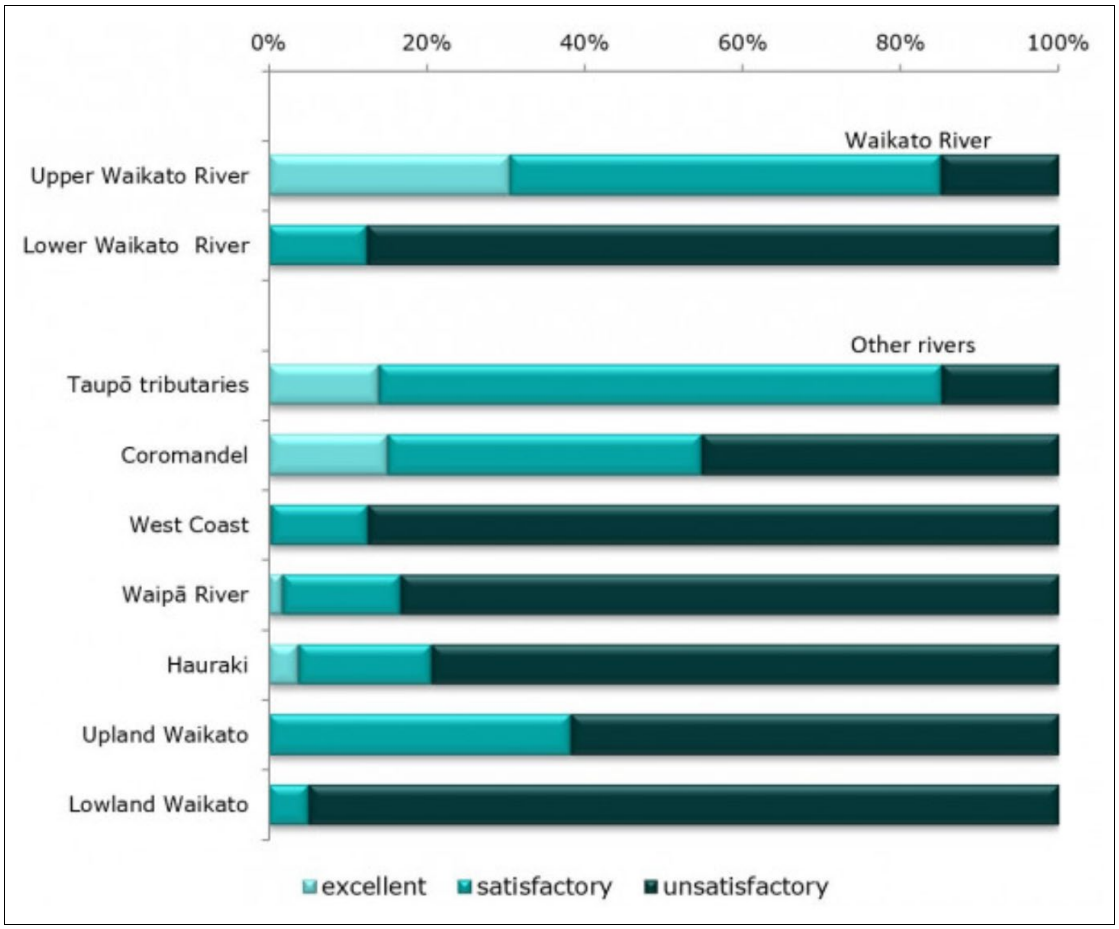
There are a total of 115 sites across the Waikato Region, where testing takes place. There are two important water quality measures taken for each site – faecal bacteria levels and water clarity. Using these values, a 'pass rate' is determined for each site.

The results paint an interesting picture. There are some parts of the region where river water quality is good, such as the upper Waikato River, tributaries of Lake Taupo and Coromandel waterways. River water quality in the lowland areas such as the Hauraki and lowland tributaries of the Waikato River aren't as good which is reflective of the greater land use activities in the lowland aspects of the region and due to waterways collecting water pollutants and creating a pooling of these contaminants. Increased levels of faecal bacteria and fine silts, and impacts of non-point source contamination from runoff are significant attributing factors.

The Waihou/ Piako catchment is not represented in the data carried by Waikato Regional Council, however from the data that is present on the Hauraki catchment we are able to derive

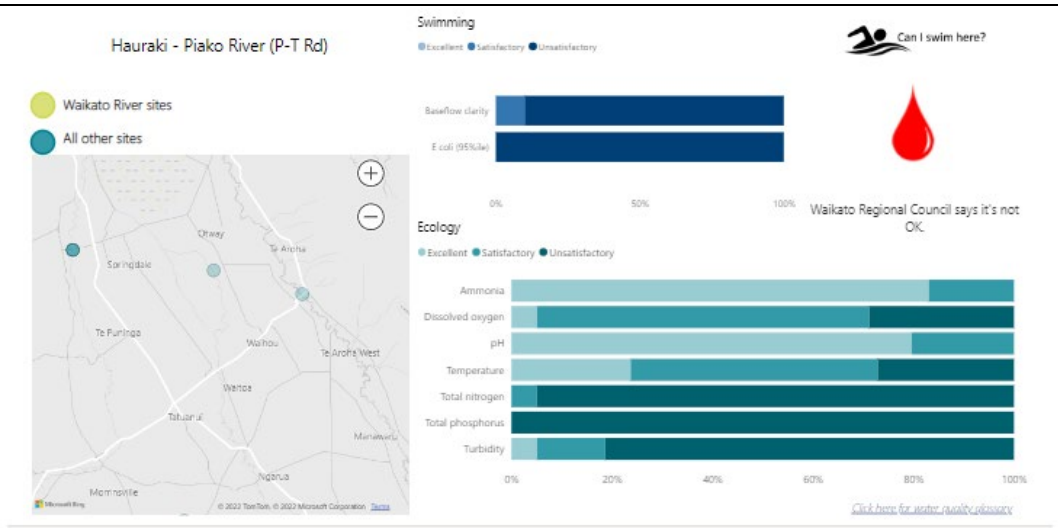
a fair picture of river quality as the Waihou/ Piako catchment feeds into the Hauraki Catchment/ Gulf.

The graph below shows the percent of samples from rivers around the region meeting or exceeding water quality guidelines for recreational use between 2015 - 2019. These are categorised as excellent, satisfactory or unsatisfactory. River samples from within the Hauraki area indicates that less than 5% of the sites sampled – proved to have excellent river water quality for recreational use. It should be noted that over 80% of sample sites from rivers within the Hauraki area showed to have unsatisfactory water quality for recreational use. Please read below for information specific to each of our three rivers in a recreational use context.



Graph sourced from https://www.waikatoregion.govt.nz/environment/water/river-and-stream-monitoring/indicator-river-water-quality-contact-recreation/

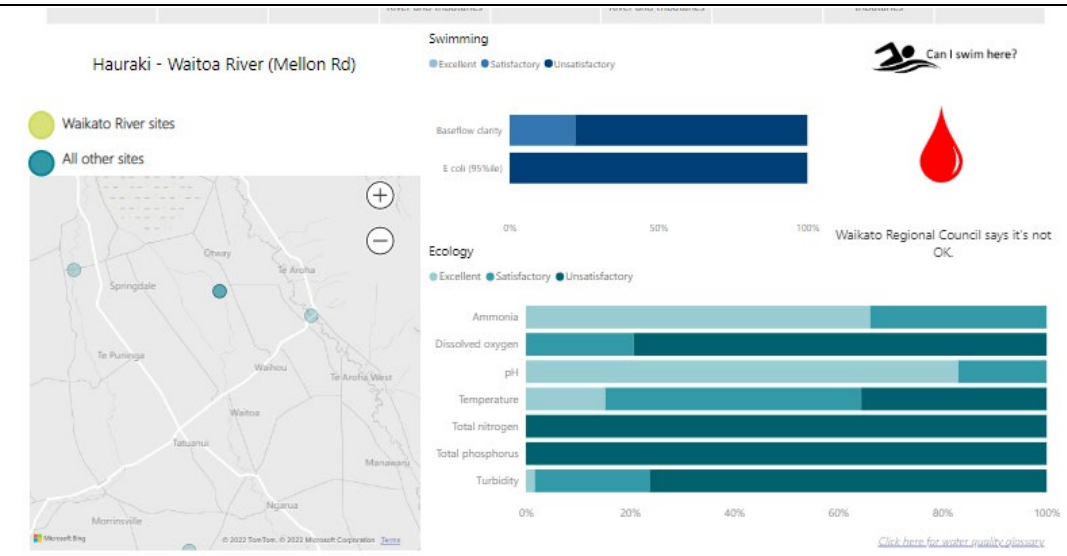
To focus on the Matamata-Piako District a little closer, below are three snapshots of river water quality for contact recreation in the Piako River, Waitoa and Waihou Rivers. Sourced from https://www.waikatoregion.govt.nz/environment/natural-resources/water/rivers/water-quality-monitoring-map/



Piako River:

The dark blue shading indicates the water sample returned an ‘unsatisfactory’ result for both baseflow clarity and presence of E.Coli. The ecology tests show that the Piako River sample contained unsatisfactory levels of nitrogen, phosphorus and high turbidity (suspended particles). There was low levels of ammonia and a suitable pH level.

Despite over half of the indicators being either excellent or satisfactory – The Waikato Regional Council deemed the Piako River unsafe for recreational use.

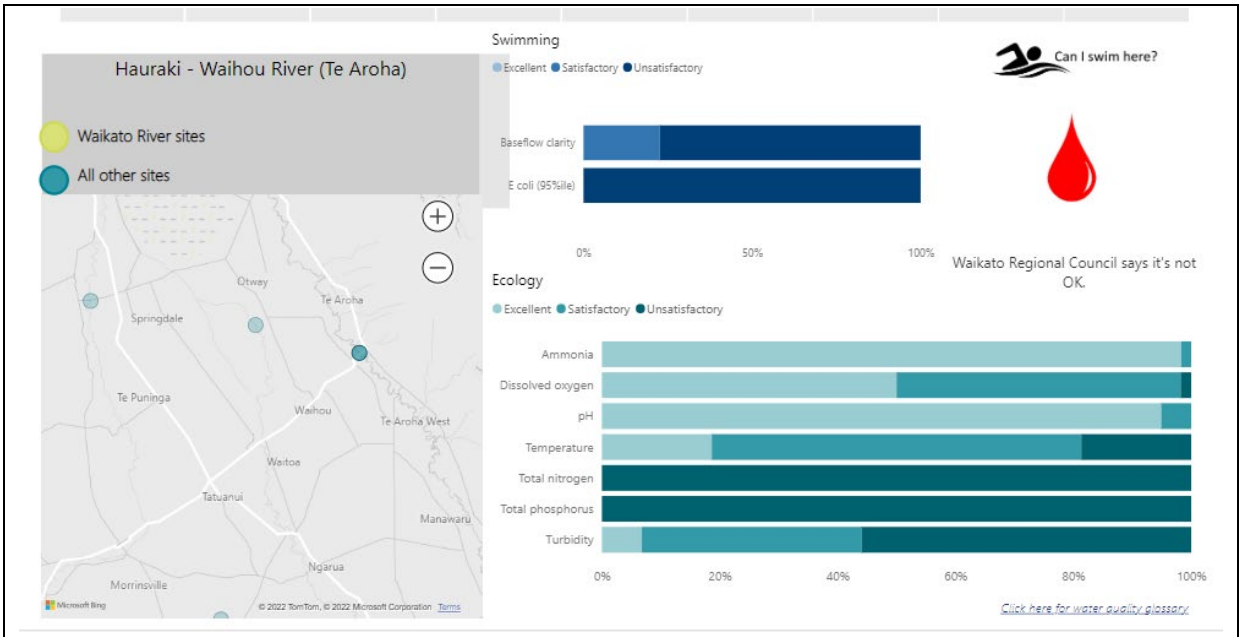


Waitoa River:

Similarly to the Piako River, both indicators showing water clarity and E.Coli levels have produced mostly unsatisfactory samples for recreational swimming.

The ecology samples from the Waitoa River show that there are still unsatisfactory levels of phosphorus present, and even higher levels of nitrogen compared to the Piako River. There is concerning levels of dissolved oxygen which suggest the water has a very poor ability to support aquatic life. There are also slightly higher levels of ammonia in the Waitoa River.

The Waikato Regional Council have deemed the river water in the Waitoa River unsafe for recreational use.



Waihou River:

The Waihou River samples have demonstrated low levels of ammonia, satisfactory levels of dissolved oxygen and excellent pH levels. Much like the Waitoa and Piako rivers, there are still very high levels of nitrogen, phosphorus and turbidity. There are also unsatisfactory levels of water clarity and E.Coli.

The Waihou River was deemed unsafe for recreational use.