

Hamilton-Waikato Metropolitan Area

# Northern Metro Wastewater

Detailed Business Case  
Mai a Para Wai ki a Para Kore



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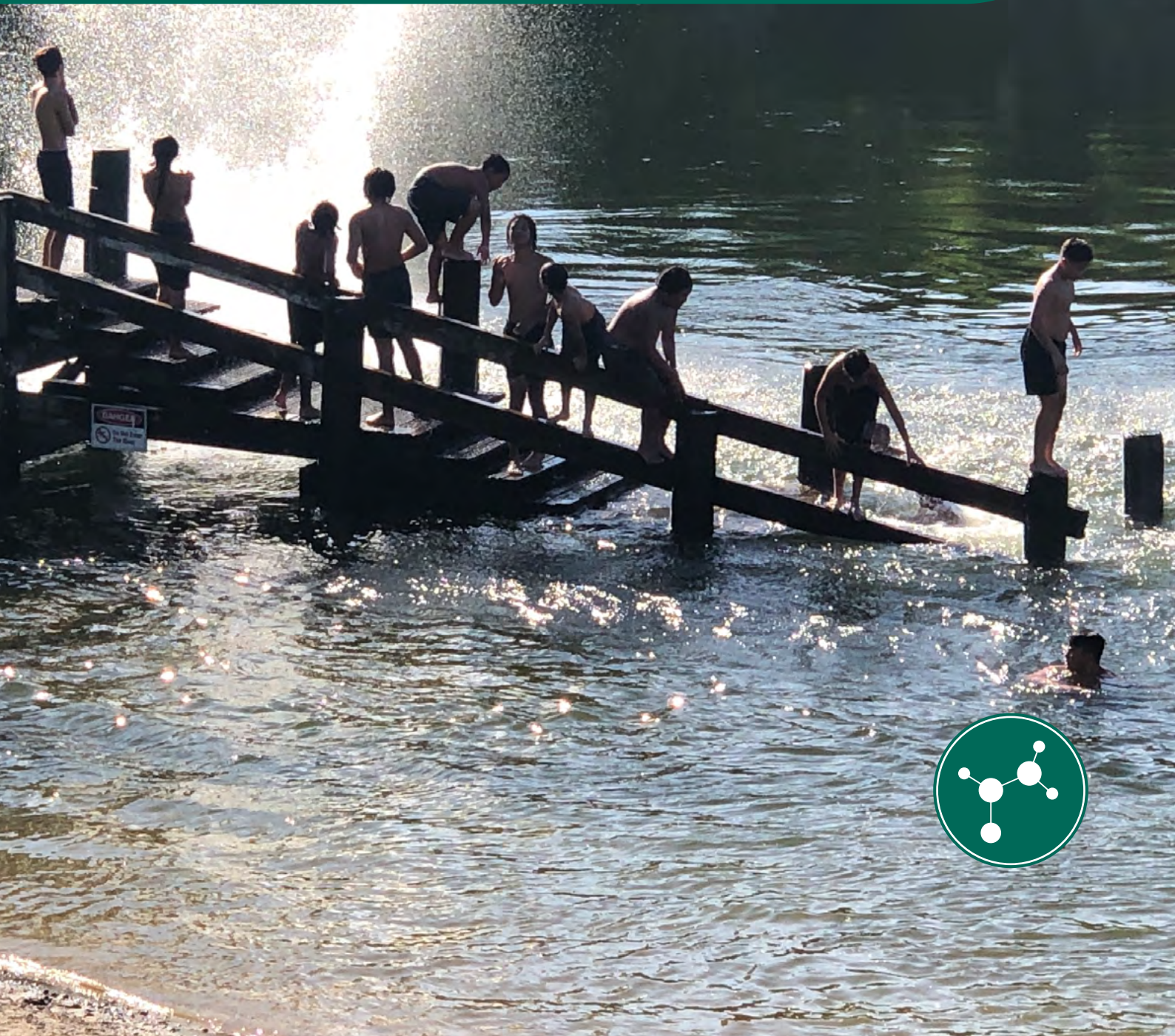
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# Strategic Case

He Keehi Rautaki - He keehi  
kaha moo te panoni



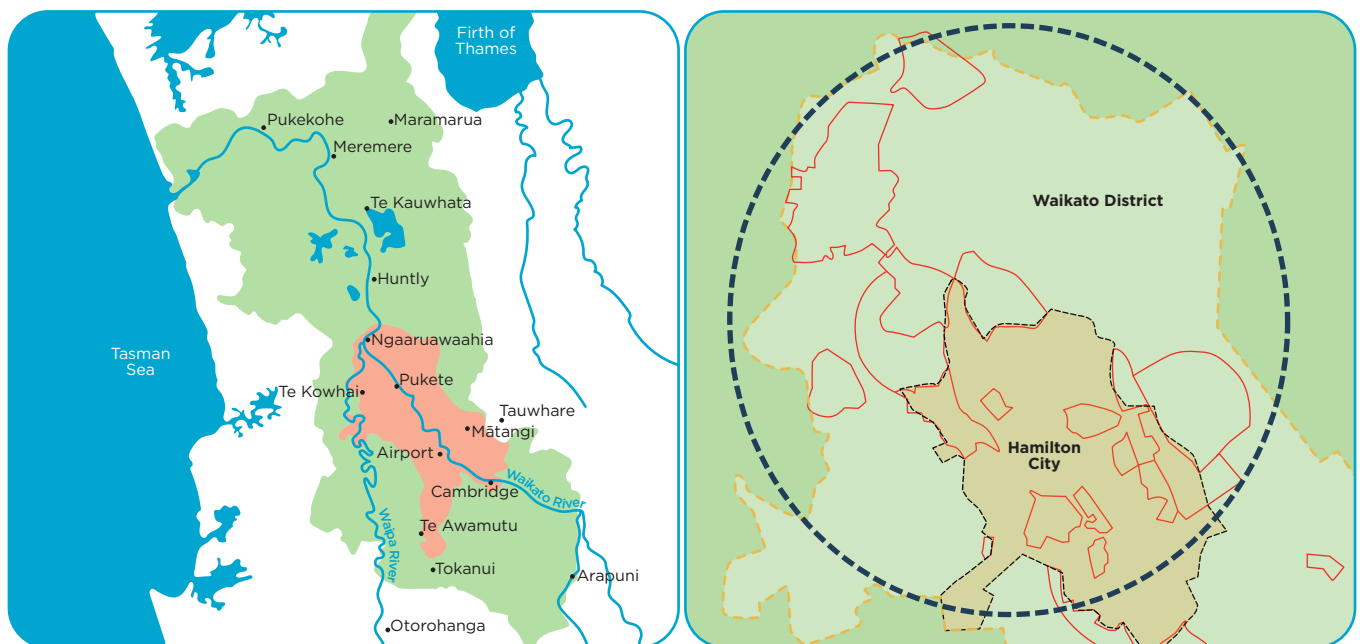
# 1. Introduction

The Hamilton-Waikato Metropolitan Area (Metro Area) is the urban sub-region of the Waikato. It is centred around Hamilton City as the core but extends from Taupiri in the north to Te Awamutu and Cambridge in the south. The Metro Area sits across three local authority jurisdictions (Waikato District, Hamilton City, and Waipā District).

This Detailed Business Case (DBC) is concerned with the Northern Metro Area, which extends from Hamilton to Taupiri including Hopuhopu, Ngaaruawaahia, Horotiu, Te Kowhai, Hamilton North and the area east of Hamilton.

The Northern Metro Area is serviced by the Ngaaruawaahia and Pukete Wastewater Treatment Plants (WWTPs). These WWTPs hold resource consents to discharge treated wastewater to the Waikato River. These consents expire in 2029 and 2027 respectively.

**Figure 1: LEFT - Metro Area shown in orange. RIGHT - Northern Metro Area**



The Metro Area is growing faster than expected. New residential areas, infill development and new mixed use and industrial developments all add to the wastewater generated and put pressure on the wastewater conveyance and treatment systems. This growth is expected to continue with the projected residential population rising from 232,000 in 2021 to 344,000 in 2061. The Hamilton Waikato Metropolitan Spatial Plan estimates up to 500,000 residents will call the Metro Area home within the next 100 years.

Wastewater network design is based on population equivalents (PE): a parameter used to estimate wastewater generation across a range of residential and non-residential activities. Between 2021 and 2061, the Northern Metro Area is expected to grow from approximately 190,000 to 316,000 population equivalents. Neither the WWTPs nor the pipe networks connecting communities to the existing WWTPs have capacity to manage this growth without significant investment.

At the same time, wastewater treatment standards are increasing. Changes to legislation and the expectations from stakeholders and the wider community mean councils cannot continue to discharge wastewater in the same way they have in the past. Our awa and whenua cannot be allowed to degrade further as a result of human activities but must be restored in accordance with Te Ture Whaimana o te Awa o Waikato – The Vision and Strategy for the Waikato River. The upcoming consent expiry, expected growth, and our desire to treat wastewater to a higher standard means we must look more strategically at how we manage wastewater in the Northern Metro Area in the long-term.

Strategic wastewater management decisions need input from local authorities and mana whenua. The project delivery structure includes equal representation from local authorities and mana whenua at all levels of the project from governance through to technical project teams.

This DBC identifies and recommends long-term wastewater treatment solutions for the Northern Metro Area and seeks formal approval to invest in a wastewater treatment solution. The DBC aims to achieve Best for River outcomes that contribute to achieving the vision and objectives of Te Ture Whaimana.

This project will aim to align with the overarching Waikato Sub-regional Three Waters vision:

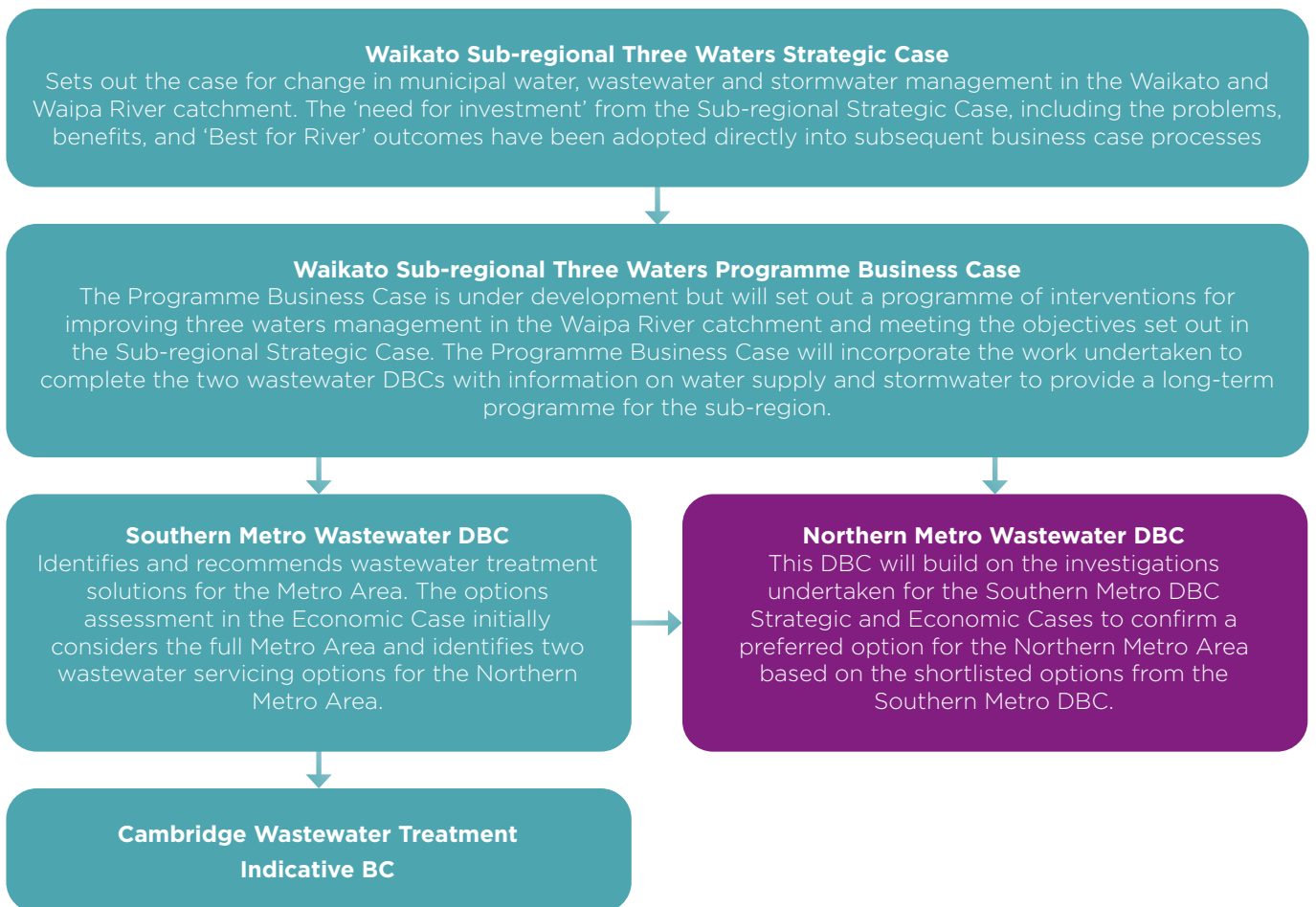
Tooku awa koiora me oona pikonga he kura tangihia o te maataamuri

**“The river of life, each curve more beautiful than the last”**

**...a future where a healthy Waikato River sustains abundant life and prosperous communities who, in turn, are all responsible for restoring and protecting the health and wellbeing of the Waikato River, and all it embraces, for generations to come.**

It builds on the Waikato Sub-Regional Three Waters Strategic Case (December 2019), Waikato Sub-Regional Three Waters Programme Business Case, and Waikato Metro Wastewater Treatment DBC (referred to here as the Southern Metro DBC), refer Figure 2.

**Figure 2: Relationship between different Business Cases**

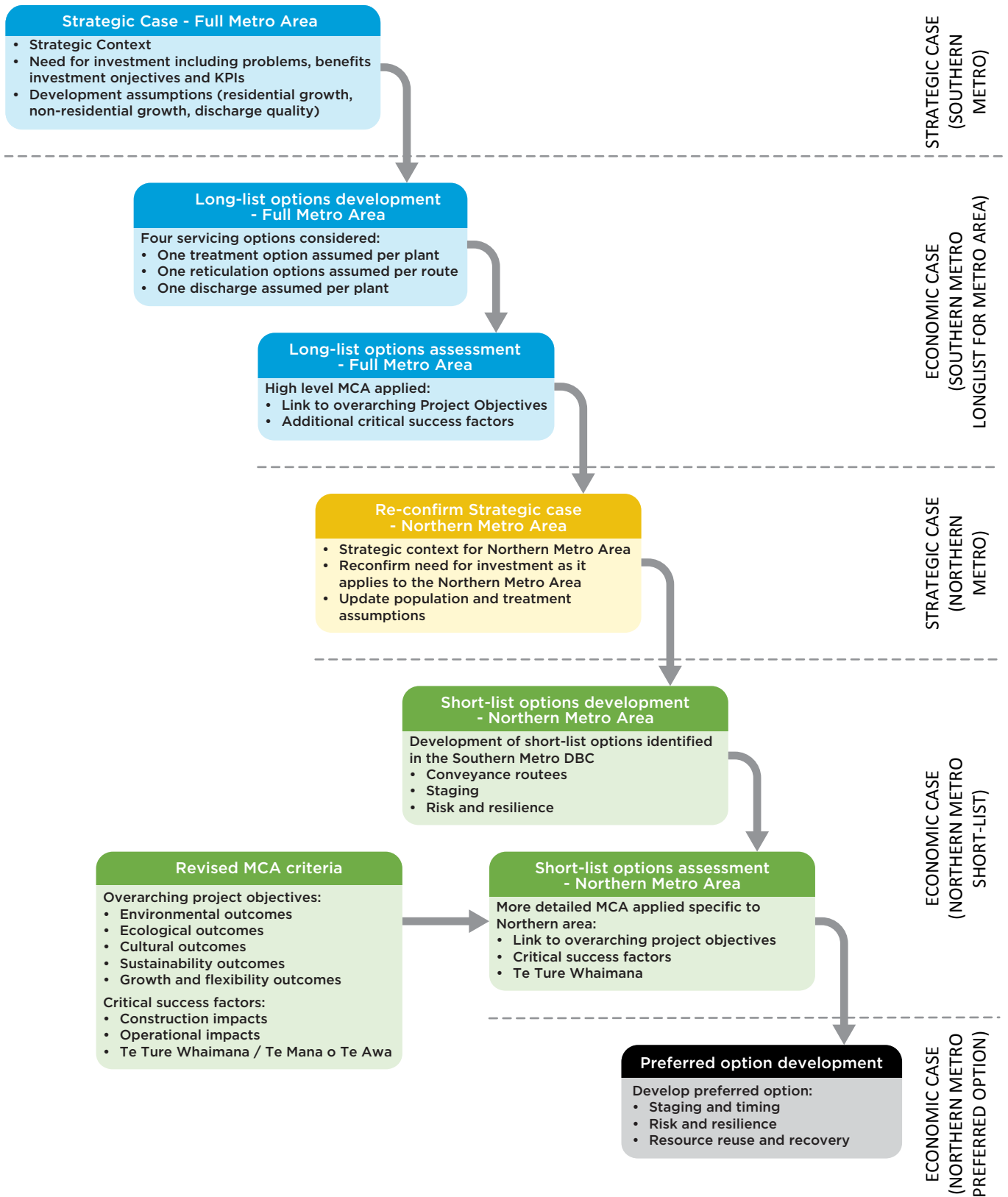


This Northern Metro DBC is one of a number of documents that map out the strategic intent for wastewater infrastructure in the Metro Area.

Where appropriate, this DBC does not repeat information set out in those previous documents. The problems, benefits, investment objectives, and key performance indicators (KPIs) have been generally adopted from the previous business cases (particularly the Southern Metro DBC).

Rather, this DBC focusses on demonstrating how those previously agreed statements apply to the Northern Metro Area and whether any adjustments are required.

Figure 2: Relationship between different Business Cases<sup>1</sup>



<sup>1</sup> The Programme Business Case is currently under development and is being reviewed in light of the Three Waters reforms. There is a process risk associated with completing a Detailed Business Case ahead of the Programme Business Case that DBC sits under. However, in this instance it is noted that the Project Partners intend to incorporate the work undertaken to date so that the investment parameters remain consistent with those used in the Southern and Northern Metro DBCs.

This DBC is split into five sections:

- The **Strategic Case** evaluates the strategic need for the project and demonstrates the case for change. This DBC will focus on reviewing and refining the case for change as already set out in the Southern Metro DBC.
- The **Economic Case** develops options and evaluates which option is most economically, environmentally, and socially desirable. This DBC starts with the short-list options identified through the Southern Metro DBC, refines these short-list options, and then uses a Multi-Criteria Assessment (MCA) to determine a preferred way forward for the Northern Metro Area.
- The **Financial Case** sets out allocation of costs, funding requirements, preferred funding and financing solutions, and affordability impacts.
- The **Commercial Case** considers the approach to packing and contracting options, the procurement plan, potential for risk-sharing, and the planned contractual arrangements
- The **Management Case** sets out the programme and project governance and management arrangements, roles and responsibilities, and change, benefits, and risk management.

In summary, the purpose of this DBC is to:

- Demonstrate the need for investment
- Identify the investment option that most effectively delivers Best for River outcomes
- Prepare the investment proposal for procurement
- Plan the necessary funding and management arrangements for the successful delivery of the Project
- Assist decision-makers to determine arrangements for implementation and funding of the Project.

Dialectal conventions: For this DBC, the double vowel dialect has been adopted, except where referring to the Waipā District and River and for direct quotes where tohūtō (macrons) have been adopted.

## A note on the Three Waters Reform

At the time of drafting this DBC, transition processes for the Government's Three Waters Reform Programme were underway with the Water Services Entities Bill having passed its Third Reading. The Three Waters Reform would see four new publicly-owned Water Services Entities set up to run New Zealand's drinking water, wastewater and stormwater services – transferring current responsibility from the councils.

Many aspects of the future state under the proposed 'Entity B' remain unknown, including those financial and operational arrangements that influence this DBC.

To respond to current capacity constraints and meet statutory requirements for re-consenting of the Pukete WWTP treated wastewater discharge, some aspects of this DBC must commence prior to the proposed transition to Entity B in 2024. The DBC has therefore been prepared based on current council arrangements while maintaining flexibility to transition to a new structure as required.

The councils are currently developing work programmes to be presented to the National Transition Unit (NTU) in the same way as they would develop inputs to their Long Term Plan. The outcomes of this DBC have been incorporated into submissions to the NTU's Asset Management Plan process. This provides some certainty to costs and financing.

However, it is recognised that significant uncertainty remains in funding, financing, and delivery models. The arrangements recommended in this DBC should be revisited if and when the transition is complete.

## 2. Ko Taupiri te Maunga, ko Waikato te Awa

The following section provides an overview of the significance of the key areas and spaces of significance to mana whenua. In particular the focus on the Waikato River, Kirikiriroa-Hamilton, Ngaaruawaahia, and Taupiri. The information provided below is generally well known by mana whenua. It informed technical workshops and was a significant factor for mana whenua in determining their preferred option for the Northern Metro DBC.

To the Iwi of Waikato-Tainui, the story is told of Tongariro and Taupiri who grew up as brother and sister in the Taupo region, the lands of Tuwharetoa. Taupiri married a rangaatira maunga named Pirongia from the Tainui region. For some years Taupiri lived happily in her new home, just north of Ngaaruawaahia, although she sometimes felt homesick for Tongariro, her friends and whaanau in Tuwharetoa. It is said that the Hakarimata Range are the children of Taupiri and Pirongia. Sadly, she separated from Pirongia, eventually fell ill and none of the tohunga (priests) could cure her. Taupiri sent forth a servant to Tongariro, to bring back some water from a tapu (sacred) spring.

After an arduous journey south, the servant and his dog found Tongariro who sent waters from the spring high up the mountainside. Tongariro commanded that the stream follow the servant on his journey, so that Taupiri should have a constant supply of the sacred waters. The stream flowed into the great crater that is called Taupo-nui a-Tia, and then overflowed northward. The people of Te Arawa tried to entice the river to flow through their land, but the servant's dog dug a ditch to persuade it to turn westward, near Te Ohaaki, and then resume its northward journey. At Piarere, it was diverted again, to flow north through the Hinuera valley. It heard the surf on the beach of the Bay of Plenty, but it was blocked by the Kaimai Range, and so it flowed on out to sea in Hauraki. The servant and his dog were unable to stop the river, so they journeyed on to the home of Taupiri with their calabashes of sweet water from Tongariro.

Taupiri recovered from her illness and the Tainui people planned a return visit to Tongariro. During the preparation for this journey the servant told her of the runaway river Tongariro had sent to her, which had escaped to Hauraki. Taupiri began a karakia and her message was carried southward by the wind. Tongariro heard it and he too began a karakia that summoned Ruaumoko, the maker of earthquakes. He woke in a terrible fury, volcanoes erupted and the land shook and split. The river did not know where to turn, but it heard the familiar sound of the servant's dog barking, and it followed that to the home of Taupiri and eventually reached the sea of the western coast, Te Puuaha o Waikato. And so the Waikato River came to flow in its present course and provide sustenance for the Waikato tribes along its lower reaches, including the people of Kirikiriroa. Without Taupiri maunga, the Waikato River would not have traversed here. Without the Waikato River to invigorate the lands and its people, we would not have Kirikiriroa-Hamilton.



## 2.1 He piko he taniwha, Waikato taniwharau: Kirikiriroa

The earliest recorded settlers in the Hamilton area were Maaori from the Tainui waka. The taangata whenua (**people of the lands**) called an area on the west bank of the Waikato River Kirikiriroa (long reaching sands), which is the Maaori name for Hamilton today.

Kirikiriroa has a history of 700-800 years of Maaori occupation and settlement, highlighted by Paa sites, gardens, soils, and agricultural features along the Waikato River and surrounding waterbodies. There were many Paa sites in Kirikiriroa, including Kirikiriroa Paa itself. The main hapuu of Kirikiriroa and the surrounding areas are Ngaati Wairere, Ngaati Mahanga, Ngaati Hauaa, Ngaati Korokii Kahukura, Ngaati Tamainupoo and Waikato-Tainui. They are Taangata Whenua.

Taangata whenua, in simple terms, are naturally the people of the lands. Tangata whenua have a historic and spiritual affiliation to the lands, waters and all the taonga that they embrace. The people and marae of Kirikiriroa continue to occupy and acknowledge their affiliation and interests to the wider Hamilton area. Taangata Whenua are representative of their marae and whaanau in matters related to local and central Government, fisheries, aquaculture, farming, education, environmental, social and other affairs. The Taangata Whenua hold political and occupational authority over Kirikiriroa that is determined by whakapapa (genealogical ties) and secured by ahi kaa (continued occupation). They have a responsibility to protect the natural resources, mahinga kai, and other values of Kirikiriroa for the benefit and use of their whaanau and people of Kirikiriroa.

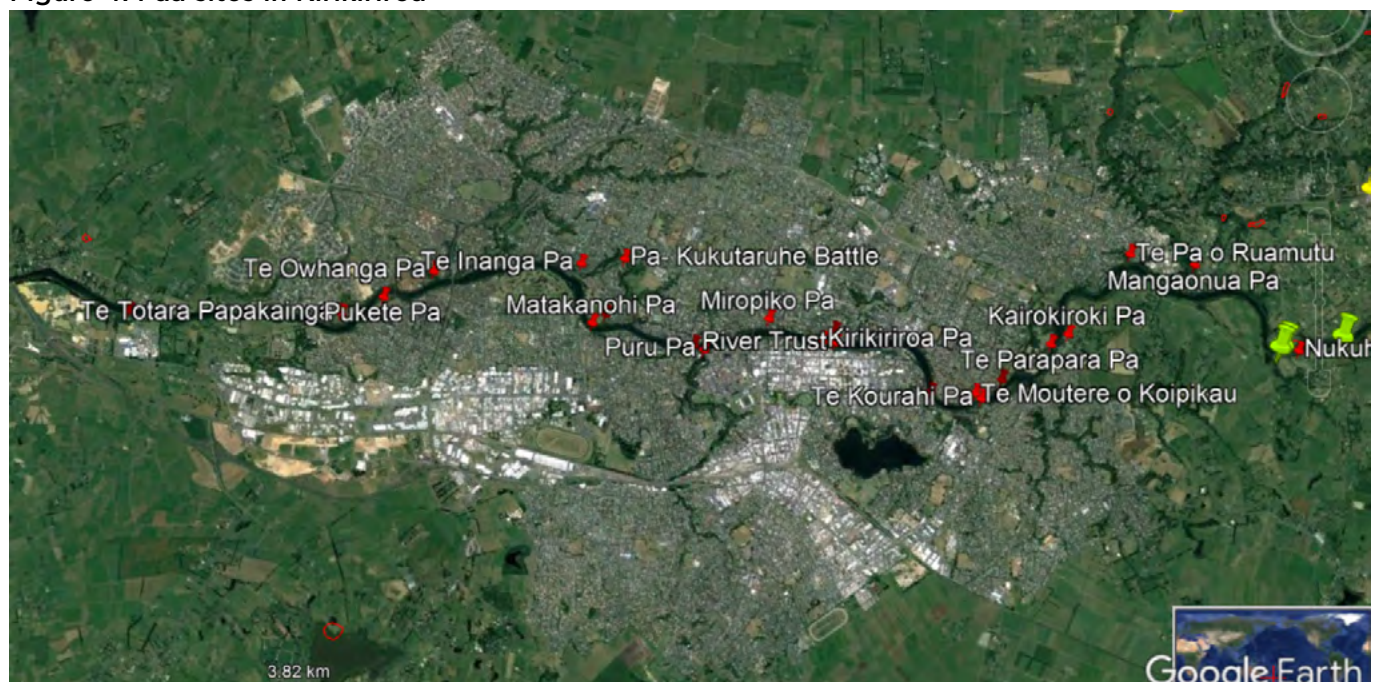
Formal European settlement was established on 24 August 1864, when Captain William Steele came off the gunboat Rangiriri and established the first redoubt near what is now known as Memorial Park.

A military outpost was set up in Hamilton East, which was originally destined to be the main street of Hamilton. Evidence of planning for the centre of the village can be seen in the 'village square' concept of Steele Park and the planting of English trees along Grey Street. The area was later renamed Hamilton after Captain John Charles Fane Hamilton, who was killed at the battle of Gate Pa in Tauranga in 1864.

The Borough of Hamilton was established in 1877 with a population of 1,245 and an area of 752 hectares. In December 1945, Hamilton became a city with 20,000 citizens.

Kirikiriroa is populated with historic paa sites, especially along the banks of the Waikato River. There are also many cultural corridors which are recognised as visual shafts (to the Waikato River or other taonga) and ara tuupuna (ancestral walkways).

**Figure 4: Paa sites in Kirikiriroa**



## 2.2 Ngaaruawaahia

The following information was provided by Kimai Huirama of Ngaati Tamainupoo, describing the commonly known story about the naming of Ngaaruawaahia.

Our story begins in the early 1600s with the chiefs, Kookako and Tuuheitia, who were mortal enemies. After Tuuheitia died of mysterious circumstances, the bitter feud continued between his son, Maahanga, and Kōkako.

Kōkako had a son with Whaeataapoko from Marokopa, who they named Tamainupō. Eventually, Tamainupō married the daughter of Maahanga, who was called Tuukotuku. After the birth of the couple's son, Wairere, peace was made between Maahanga and Kookako. According to Ngaati Tamainupoo traditions, Maahanga gifted half of his lands to Tamainupō and Tuukotuku as a peace offering. The other half was gifted to another daughter, Waitaawake. The whakapapa ties between descendants of Ngaati Maahanga, Ngaati Tamainupō and Ngaati Wairere are still acknowledged today.

Wairere married Hinemoa from Ngaati Maahanga, and they had a son named Whenu. As was the custom, Whenu's people gathered the bones of past chiefs into flax baskets and carried them to a cave in Raglan. So that this task would be remembered, Whenu named his son Keteiwi, which means "Basket of Bones." When Keteiwi grew up, he married Hinemata. She was the daughter of Paoa and Tukutuku. Paoa was another Waikato chief of that time and Tukukuku was a woman from the Hauraki region. Keteiwi and Hinemata had many children and two of their sons were Toa Kotara and Ngaere.

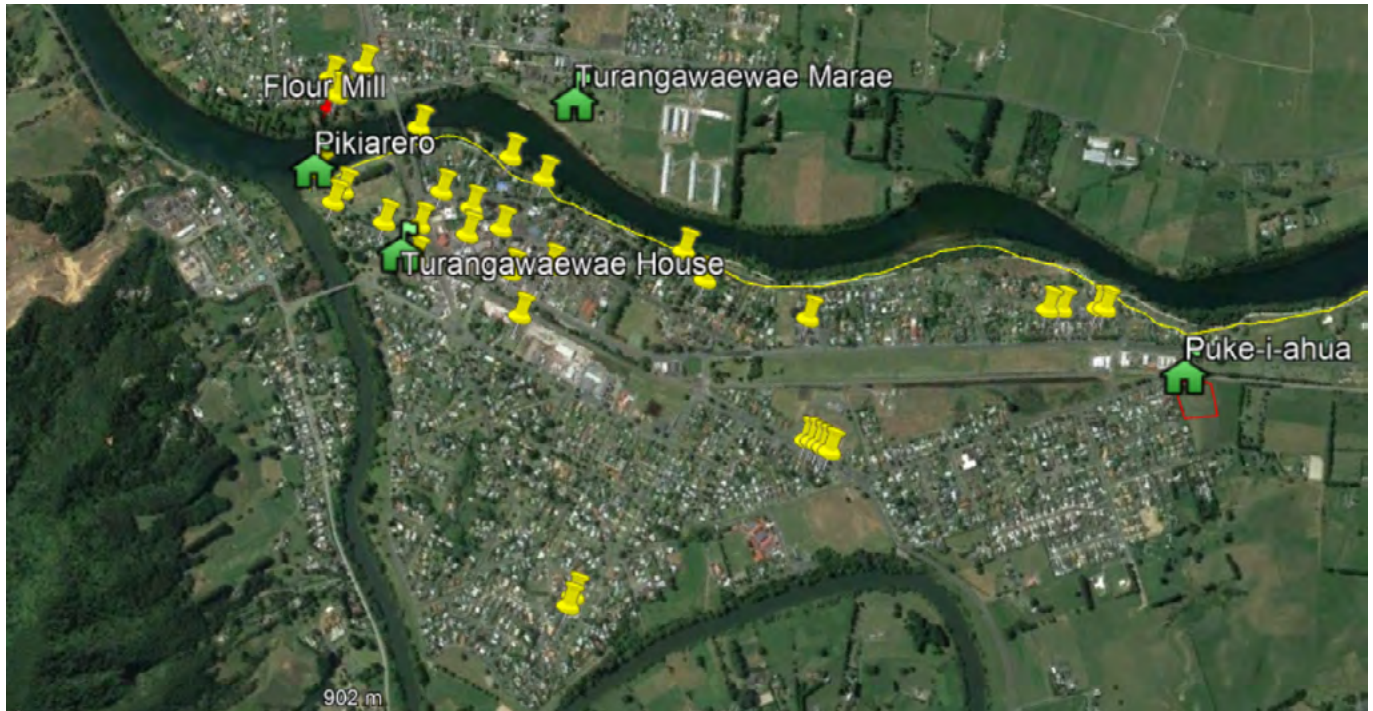
Because of the land gift from Maahanga, the traditional pou whenua (tribal boundaries) of Ngaati Tamainupō are extensive and spread across a large part of the Waikato region.

In the early 1700s, Keteiwi was chief of Pukeiaahua, the principal Ngaati Tamainupō Paa located in the area now known as Ngaaruawaahia. His eldest son, Toa Kotara, was betrothed to Hekeiterangi of Ngaati Maniapoto, daughter of a chief called Maniauruahu. When the tribe visited Hekeiterangi's people, she fell madly in love with the younger son, Ngaere, instead.

Hekeiterangi was disowned by her father for going against his wishes and she returned to Pukeiaahua as Ngaere's wife. After Hekeiterangi gave birth to their son, the couple invited her father to the child's naming ceremony to heal the rift between them. Maniauruahu accepted their invitation. As he travelled with his large group along the Waipā River, they were met with great hospitality from the villages they came across. Whenever Maniauruahu asked who their chief was, the answer was always 'Ngaere'. By the time Maniauruahu reached Pukeiaahua, he had a new-found respect for Ngaere and gave his approval for their marriage. At the ceremony, Keteiwi named the child 'Te mana o te Rangi' (the greatness of the day) because Ngaati Maniapoto had honoured them with their presence.

For the celebration feast, mounds of uncooked delicacies stretched from Te Huinga o Ngaa Wai (the place where the Waipā and Waikato Rivers meet) to Pukeiaahua. The sight of the plentiful food resembled the nearby hills, so they were given the name, Haakarimata (Haakari = feast; Mata = preserved or uncooked food). After the formalities, Ngaere called out "Waahia ngaa rua! Break open the food pits!" The feasting and celebration began and continued for many days and nights, strengthening the kinship bonds between Ngaati Maniapoto and Waikato. This is the centuries-old story of how Ngaaruawaahia got its name.

Figure 5: Sites of significance around Ngaaruawaahia



## 2.3 Taupiri

Taupiri is the foremost reason for the current position of the Waikato River. Te Mata o Tuutonga is the prominent paa on Taupiri Kuao, which is the smaller knoll of Taupiri Range, where the people of the Waikato are buried.

The area around Komakorau, with its swamps and lagoons, is described as teeming with eels and wild-fowl, which were staple food resources. Te Wherowhero, the first Maori king, lived for a time on the west side of the Waikato River at Taupiri in the early nineteenth century.

Leslie Kelly (1940 & 1949) describes the Taupiri area as **“the home of Mahuta and Paoa, the sons of Hekemaru. The former lived at Komakorau in his village Te Uapata, while the latter occupied a settlement on the bend of the Waikato immediately opposite Taupiri mountain, called Kaitotehe.”** Paoa left the district by way of the Mangawhara Stream and travelled to Hauraki, but Mahuta remained.

Mahuta’s grandsons, Wharetiipeti and Tapuae, continued to occupy the paa Te Uapata, but ultimately decided they wanted the better gardening land available on the western bank of the Waikato River, opposite Taupiri mountain at the place called Kaitotehe. Te Uapata was a swampy place, but Kaitotehe had soil better suited to kumara cultivation. By using a ruse, i.e. assisting Te Iranui and his people with planting kumara, Wharetiipeti and Tapuae were able to over-power Te Iranui and capture his tribes’ lands on the west bank of the Waikato River at Kaitotehe, opposite Taupiri mountain. Wharetiipeti and Tapuae were to remain at Kaitotehe.

Ultimately, both brothers were killed by Te Ruinga (Rangihoto’s son) and his friend Maoa as a result of their deeds.

Te Putu, the son of Tapuae, lived his life at Taupiri, with his son Tawhia-ki-te-rangi. The time came when Ngaati-Raukawa, began to encroach upon the territory of Ngaati Maahuta. Gradually moving northward, they established themselves at Nukuhau and Tamahere, at Horotiu or that part of the river between Kirikiriroa (Hamilton) and Ngaaruawaahia. Naturally this move was strongly resented by Waikato, and open hostilities broke out, with the result that Ngaati Raukawa, under their chief Ngatokowaru, paddled downstream and attacked the chief Kakeha at Te Pepepe.

Te Putu was by this time an old man, and it now fell upon his son Tawhia-ki-te-rangi to lead the people. News that Te Pepepe was besieged was soon communicated to Ngaati Maahuta and messengers

hurried off to rally their own warriors to assist in repelling the invaders. In answer to the call a detachment of Ngaati Te Ata, Ngaati Tipa and Ngaati Tahinga came up the river in the war canoe Taraweka and anchored opposite Te Pepepe, where they were joined by other canoes belonging to Tawhia-ki-te-rangi and Ngaati Mahuta.

A landing was now made, and a battle raged in the open in front of the palisades of the Paa. Seeing their enemies attacked by fresh warriors Kakeha and his people rushed forth to assist their friends; and thus assailed, Ngaati Raukawa were defeated, losing many of their men, the survivors being literally driven into the river. Numbers of prisoners were taken, and among those captured was Ngatokowaru. As he was about to be killed, he requested that he should first be allowed to see Te Putu. He was therefore temporarily allowed to live.

The Waikato victors paddled across to Taupiri, taking with them their prisoners and the heads of the slain chiefs, and these they set up on posts in a long row along the bank of the river. It is said that a hundred heads formed the grim line which started below Taupiri and stretched for over a quarter of a mile along the river. This part of the bank was from then on called Te Rauangaanga (a place of hundred heads).

The captive Ngatokowaru was conducted into the presence of Te Putu who was informed of what had transpired, and of the request made by the prisoner. The aged Te Putu, little knowing the sinister reason which actuated the request, came over to greet Ngatokowaru. Knowing full well that his life was forfeit, Ngatokowaru had concealed beneath his cloak a 'tete' or dagger made from the barb of a stingray, and as Te Putu leaned forward to press noses, he suddenly stabbed him in the throat; and as the blood gushed forth, quickly smeared it over himself. Ngatokowaru was instantly seized by the horrified warriors, but because he was covered with the sacred blood of Te Putu, he was beaten to death and his body buried instead of being eaten. This incident took place at the home of Te Putu, the name of which was Te Mata-o-Tuutonga.

Taupiri Maunga then became a resting place for the people of the Waikato, its chiefs, Maaori Kings and Te Arikiniui Te Atairangakaahu. It is a very significant place for its people.

Surrounding Taupiri are many other Paa sites and historical sites as shown on the following map.

**Figure 6: Sites of significance around Taupiri**



# 3. Strategic context

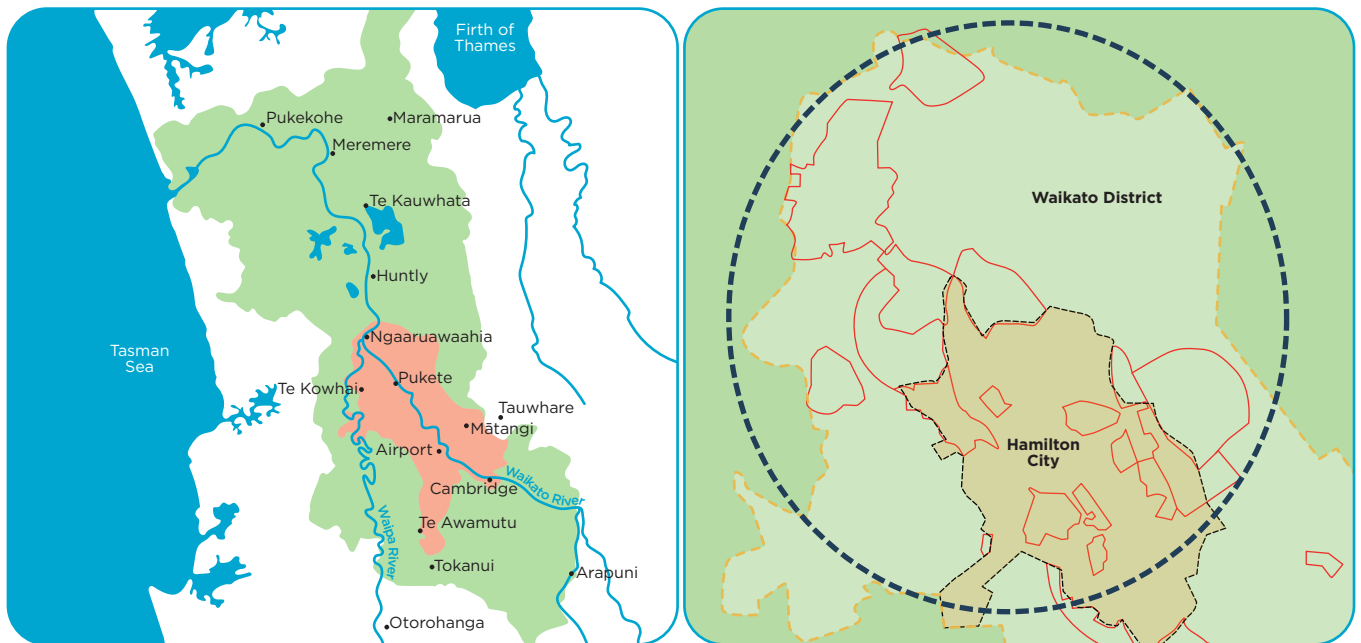
## 3.1 Hamilton-Waikato Metropolitan Spatial Plan and the Northern Metro Area

The Hamilton Waikato Metropolitan Spatial Plan (MSP) is a vision and framework for how Hamilton City and neighbouring communities within Waipā and Waikato districts will grow and develop over the next 100 + years. The MSP is delivered through the Future Proof partnership between Waikato-Tainui, Tainui Waka Alliance, taangata whenua, central Government, HCC, WDC, Waipā District Council and Waikato Regional Council.

Since 2018, councils and iwi have been working together to identify the best three waters solutions for the Waikato River catchment. The Waikato Metro Wastewater project has emerged from this partnership to deliver two DBCs - one for the southern part of the Metro Area and one for the northern part.

This DBC is concerned with the Northern Metro Area, which extends from Hamilton to Taupiri including Hopuhopu, Ngaaruawaahia, Horotiu, Te Kowhai, Hamilton North and the area east of Hamilton. It traverses the boundary of HCC and WDC. The Northern Metro Area is currently serviced by the Ngaaruawaahia and Pukete Wastewater Treatment Plants (WWTPs).

**Figure 7: LEFT - Metro Area shown in orange. RIGHT - Northern Metro Area**



### 3.2 Mana whenua and Te Ture Whaimana

Mana Whenua within the Metro Area are descended from the Tainui waka. Waikato-Tainui, Ngaati Wairere, Ngaati Koroki-Kahukura, Ngaati Hauaaa, Ngaati Tamainupoo, Ngaati Maahanga, Turangawaewae Marae (Ngaati Mahuta and Ngaati Te Wehi), Waikeri Marae (Ngaati Reko) and Taupiri Marae (Ngaati Kuiaarangi, Ngaati Mahuta, Ngaati Tai and Ngaati Whaawhaakia) hold mana with regards to decision-making associated with this DBC.

In 1858, the Kiingitanga movement originated in the Waikato region under the first Maaori King Pootatau Te Wherowhero to unite iwi and halt the alienation of Maaori land. The movement continues to this day with the headquarters of the Kiingitanga movement located at Tuurangawaewae Marae in Ngaaruawaahia, on the eastern banks of the Waikato River. It is the official residence of the current Maaori King, Tuheitia Pootatau Te Wherowhero VII.

On 12 July 1863, British troops crossed the Mangatawhiri Stream, breaching the aukati (a boundary not to be crossed) declared by the second Maaori King Taawhiao, and invaded Waikato. In 1864 and 1865 military settlements, including Hamilton and Cambridge, were established. In 1865, by Orders in Council under the New Zealand Settlements Act 1863, the Crown unjustly confiscated approximately 1.2 million acres (approximately 500,000ha) of Waikato-Tainui land from Tainui iwi in order to punish them and gain control of the land placed by them under the protection of the Kiingitanga.

New settlers occupied the confiscated lands, wetlands were drained, and farms and towns developed. The development contributed to economic growth of New Zealand but resulted in the pollution and deterioration of the health of the Waikato River and significantly impacted on the fisheries and plant life of the River.

Widespread suffering, distress, and deprivation were caused to the Waikato iwi because of the war waged against them, the loss of life, the destruction of their taonga and property, and the confiscations of their lands. The effects of the Raupatu have lasted for generations.

From the time of the Raupatu (the land confiscation), Waikato-Tainui were excluded from decision-making regarding the Waikato River.

Waikato-Tainui never willingly or knowingly relinquished their rights and interests in, or authority over, the Waikato River. From the 1860s, Waikato-Tainui continually sought justice for their Raupatu claim and protection for the River. They negotiated directly with the Crown and reached settlement of their Raupatu land claim in 1995 and their river claim in 2008.

The **Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010** gives effect to the terms and conditions of the Crown's settlement of Waikato Tainui's raupatu claim in respect of the Waikato River. The purpose of the Settlement Act includes giving effect to the settlement, recognising the significance of the Waikato River to Waikato-Tainui, and recognising Te Ture Whaimana o te Awa o Waikato – The Vision and Strategy for the Waikato River (Te Ture Whaimana).

Te Ture Whaimana is the primary direction-setting document for the Waikato River and activities within its catchment which affect it. The Settlement Act defines the Waikato River as **“the body of water known as the Waikato River flowing continuously or intermittently from the Huka Falls to the mouth of the Waikato River... all tributaries... the beds and banks.”**

It requires restoration and protection of the river – including both biophysical and metaphysical elements. Restoration and protection is a higher obligation than avoidance or management of effects and requires an element of “betterment”.<sup>2</sup>

Te Ture Whaimana is not just about the physical restoration and protection of the Awa. It is also about the restoration and protection of the relationship between Waikato-Tainui, river iwi and hapuu, the wider community, and the Awa. Taangata whenua must be directly involved in strategic decisions that affect the awa.

<sup>2</sup> Refer Puke Ltd v Waikato Regional Council

Te Ture Whaimana is deemed part of the Waikato Regional Policy Statement, and regional and district plans are required to give effect to it. The vision is for:

**“A future where a healthy Waikato River sustains abundant life and prosperous communities who, in turn, are all responsible for restoring and protecting the health and wellbeing of the Waikato River, and all it embraces, for generations to come.”**

### *3.3 Memorandum of Understanding*

A Memorandum of Understanding (MoU) for the Hamilton-Waikato-Waipā Metro Area wastewater projects has been entered into by HCC, WDC, Waipā DC, Waikato-Tainui, and taangata whenua.

The MoU sets out preliminary agreements of each party to deliver the preferred wastewater servicing option for the Hamilton-Waikato-Waipā Metro Area (Metro Area) comprising a series of projects as identified in the Southern Metro and Northern Metro DBCs and confirms each party's understandings and obligations relating to project delivery, wastewater treatment performance standards, and the ownership, and capital and maintenance funding of the assets created on completion of the Projects.

In particular, the MoU sets minimum performance standards for discharges of treated wastewater to water. Those minimum standards are adopted in the DBC.

### *3.4 Wastewater servicing in the Northern Metro Area*

There are three municipal WWTPs and several private facilities servicing the Northern Metro Area (refer Figure 8). Some communities and areas are not serviced by municipal facilities but are instead serviced by self-contained septic systems.

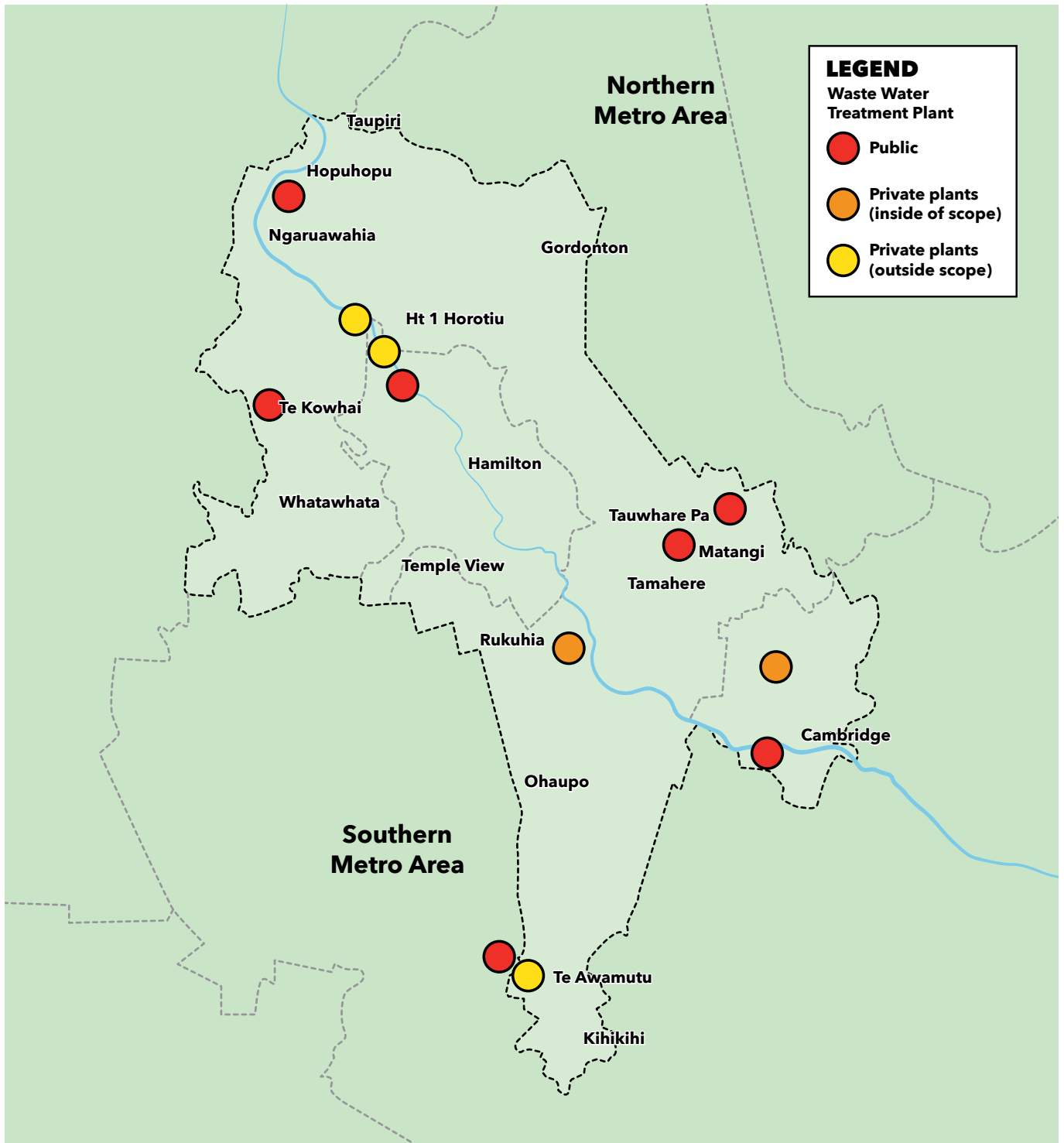
This DBC only considers the three municipal plants. Private WWTPs, including Fonterra Te Rapa and Affco Horotiu, are not included. That is because the impact of those loads would be of such significance to the nature of the treatment technology, and the scale of the plants required, that the ability to achieve the expected outcomes/objectives of this DBC would be put at risk.<sup>3</sup>

For additional background on the conveyance network and network overflows, refer to Section 2.4.1 the Southern Metro DBC Strategic Case.

HCC is undertaking various programmes of works within the Hamilton City wastewater network including upgrade to local and conveyance networks, constriction of new conveyance (eg Peacockes area), and investigation of options to avoid or minimise network overflows.

<sup>3</sup> Assumption documented the memorandum titled Wastewater Treatment Assumptions for Waikato Metro Wastewater DBC (14 August 2020) endorsed by the Project Governance Group on 29 April 2021

Figure 8 WWTPs servicing the Metro Area



### 3.4.1 Pukete WWTP

The Pukete WWTP is the largest plant in the Metro Area. It services a residential population of more than 180,000 people and commercial and industrial activity of 246,000 population equivalents. It has a treatment capacity of 60,000 m<sup>3</sup>/day.

The Pukete WWTP was commissioned in 1975/76 to replace the inadequate septic tanks that previously managed wastewater from the city. Through strategic investment (and good long-term thinking), a large site was purchased allowing planted buffer zones and giving space for the WWTP to grow to service a city of 300,000 people. Figure 9 shows the current WWTP and buffer area footprints as designated in the Hamilton City District Plan.

The site has served Hamilton well and will continue to do so in the future. However, surrounding development does constrain the ability of the site to grow - the ultimate 'build-out' capacity. The population size that can be served by the site will depend on the treatment processes and performance standards adopted as well as the space required for those processes.

**Figure 9: Pukete WWTP footprint (yellow - Designation A68) and buffer (purple dash - Designation A69)**



The Pukete WWTP is a conventional activated sludge plant with primary sedimentation, Modified Ludzack Ettinger (MLE) secondary process and UV disinfection. The site layout is complex with the hydraulic configuration crossing and doubling back on itself. The space constraints and configuration make major increases in capacity very complex unless changes are made to outfall and process design.

Treated wastewater is discharged to the Waikato River via a diffuser structure and biosolids from the process are sent to a vermiculture facility in South Waikato. The current diffuser structure extends the full width of the Waikato River with a buried pipe and multiple outlets.

Recent upgrades at Pukete aim to meet the short-term needs of the city out to around 2028. A programme of further upgrades is included in HCC's 2021-31 Long-Term Plan (LTP) and 2021-51 Infrastructure Strategy based on growth assumptions and status quo treatment standards.

HCC holds consents for discharges from the Pukete WWTP to land (biosolids) and to the Waikato River. Consents for discharges to the Waikato River expire in 2027. Te Ture Whaimana, Plan Change 1 to the Waikato Regional Plan, and the National Policy Statement for Freshwater Management 2020 require a step change in the management of discharges. Plan Change 1, which seeks to give effect to Te Ture Whaimana, requires applications for renewal of existing point source discharges to demonstrate a reduction in contaminant load proportionate to the decrease required to achieve specified short-term water quality targets or otherwise demonstrate how residual adverse effects will be offset.<sup>4</sup>

Table 1 shows current consent condition requirements and the likely best achievable discharge quality with the existing process combinations.

The Pukete WWTP is generally compliant with its resource consent conditions but has recorded past compliance issues. Between 2011 and 2017, repeated non-compliances were reported with suspended solid and nitrogen discharge limits. Changes were made to site operation and to the consent conditions to resolve the issue.

Subsequent annual reports have recorded the site as being fully compliant (including for the 2021/22 period) or having only technical or low priority non-compliances (including some missed weekly monitoring and minor exceedances of suspended solids).

Significant improvement of the discharge quality will be required to demonstrate the reduction in contaminant load needed obtain new consents past 2027.

**Table 1: Current consent requirements and performance standards achievable by the Pukete WWTP processes**

Parameter	Current consent requirement	Best achievable standard	Limiting feature
Total nitrogen (TN)	Over each 26 week period, no more than 50% of the samples shall exceed <b>450 kg/day</b> in summer and <b>1500kg/day</b> in winter	7 mg/L	Digester centrate recyclers, conventional clarifiers
Ammonium nitrogen (NH <sub>4</sub> -N)	NA	0.5 mg/L	MLE configuration, conventional clarifiers
Total phosphorus (TP)	Over each 26 week period, no more than 50% of the samples shall exceed <b>95 kg/day</b> in summer and <b>700kg/day</b> in winter	0.5 mg/L	
E. Coli	Over each calendar month, no more than 8 exceedances of E.coli over <b>126 cfu/100mL</b> . Over each quarter no more than 3 exceedances over <b>2000 cfu/100mL</b>	<126 cfu/100 ml	Conventional clarifiers
Suspended solids	Over each calendar month, no more than 8 exceedances over <b>15 g/m<sup>3</sup></b> and each quarter no more than 3 exceedances over <b>100 g/m<sup>3</sup></b>		
cBOD <sub>5</sub>	Over each calendar month, no more than 8 exceedances over <b>10 g/m<sup>3</sup></b> and each quarter no more than 3 exceedances over <b>50 g/m<sup>3</sup></b>		

4 Through Policies 11-13 of Plan Change 1 to the Waikato Regional Plan

Figure 10: Pukete Wastewater Treatment Plant



### 3.4.2 Ngaaruawaahia WWTP

Ngaaruawaahia, Horotiu, Hopuhopu, and Taupiri are serviced by a small pond-based WWTP located near the Waikato River between Ngaaruawaahia and Taupiri. It has a treatment capacity of 3,120m<sup>3</sup>/day and receives peak flows of 4,500m<sup>3</sup>/day.

The WWTP consists of inlet screens, an oxidation pond system, an Actiflo unit and a UV plant. Actiflo is very efficient in removing suspended solids and phosphorus. The treated wastewater discharges to the Waikato River via a 79m long diffuser structure.

WDC holds consent for discharges from the Ngaaruawaahia WWTP to the Waikato River which expires in 2029. Te Ture Whaimana, Plan Change 1 to the Waikato Regional Plan, and the National Policy Statement for Freshwater Management 2021 require a step change in the management of discharges. The planned MBR upgrade in around 2027 is expected to achieve the required improvements to the current discharge quality.

The WWTP was upgraded in 2014 and had a good compliance history until 2019/20. The 2020/21 annual compliance report<sup>5</sup> notes the following exceedances:

Nutrient	Consent limit	2020/21 actuals
Ammoniacal-nitrogen	20 g/m <sup>3</sup> (90 <sup>th</sup> percentile)	26.6 g/m <sup>3</sup>
Total nitrogen	25 g/m <sup>3</sup> (maximum)	30 g/m <sup>3</sup>
Total nitrogen (summer)	20 g/m <sup>3</sup> (maximum)	26 g/m <sup>3</sup>

The performance of the Ngaaruawaahia WWTP has been deteriorating over time, potentially due to build-up of sludge in the main pond and issues in operating the Actiflo system. The pond has been desludged and improvement is expected.

Table 2 shows current consent condition requirements. The conditions include limits on discharge concentrations from Ngaaruawaahia but also a combined limit from Ngaaruawaahia and the Huntly WWTPs.

**Table 2: Consent requirements and performance standards achievable by the current Ngaaruawaahia WWTP process**

Parameter	Current consent requirement
Total nitrogen (TN)	Median shall not exceed <b>20 g/m<sup>3</sup></b> (summer) Median for Ngaaruawaahia and Huntly combined shall not exceed <b>57 kg/day</b> (summer)
Ammonium nitrogen (NH <sub>4</sub> -N)	Median ammoniacal-nitrogen concentration shall not exceed <b>10 g/m<sup>3</sup></b> and 90 <sup>th</sup> percentile shall not exceed <b>20 g/m<sup>3</sup></b>
Total phosphorus (TP)	Median shall not exceed <b>8 g/m<sup>3</sup></b> (summer) Median for Ngaaruawaahia and Huntly combined shall not exceed <b>17.3 kg/day</b> (summer)
E. Coli	Median E.coli concentration shall not exceed <b>126 cfu/100mL</b>
Suspended solids	Median suspended solids concentration shall not exceed <b>30 g/m<sup>3</sup></b> and 90 <sup>th</sup> percentile shall not exceed <b>60 g/m<sup>3</sup></b>
cBOD5	Median five day shall not exceed <b>30 g/m<sup>3</sup></b> and 90 <sup>th</sup> percentile shall not exceed <b>60 g/m<sup>3</sup></b>

Perhaps more importantly, condition 10 of the consent states that:

Should the measured median concentration or 90th percentile concentration for either five-day carbonaceous biochemical oxygen demand, suspended solids, or ammoniacal-nitrogen exceed 90% of the consented limits, as specified in condition 6 of this consent, for 2 of 3 consecutive years then

<sup>5</sup> Waikato Regional Council Site Compliance Report, REG603968 (18 January 2022)

a “trigger” level will be met. The consent holder shall design, build and commission the appropriate upgrade to the treatment process within two years after the “trigger” level is reached. The upgrade undertaken shall be designed to reduce the median or 90th percentile concentration, as applicable, for the parameter for which the trigger was reached to less than 80% of the consented limit for that parameter.

Median and 90<sup>th</sup> percentile concentrations for ammoniacal nitrogen and median and summer median concentrations for total nitrogen were exceeded in compliance years 2018/19, 2019/20, and 2020/21. The trigger for treatment upgrades was therefore met on 30 June 2021. Upgrades must be commissioned by 1 July 2023 to remain compliant with this condition.

WDC’s 2021-31 LTP commits \$53 million to upgrade the Ngaaruawaahia WWTP in the period 2026-30. The planned upgrade is to a Membrane Bioreactor (MBR) plant. This upgrade would both improve discharge quality and reduce the WWTP footprint (by allowing removal of the oxidation pond).

The Waikato District Plan sets a buffer between wastewater treatment activities and buildings for sensitive land use:

Rule GRUZ-S13: Building setbacks – sensitive land use

Any building for a sensitive land use must be set back a minimum of... 300m from oxidation ponds that are part of a municipal wastewater treatment facility on another site [and] 30m from a municipal wastewater treatment facility where the treatment process is fully enclosed.

Buildings within this buffer zone are a Restricted Discretionary Activity. While this does not prevent development, it acts as an impediment and sends a message that development is not encouraged. This has acted as a constraint on the ability of Waikato-Tainui to develop their Hopuhopu site to the north of the plant and has also constrained other adjacent landowners.

**Figure 11: Approximate 300m buffer from oxidation pond (yellow dash). This buffer zone extends outside the WDC-owned property shown in grey.**



### 3.4.3 Te Kowhai WWTP

Part of Te Kowhai is serviced by a small WWTP. A system of septic tanks is followed by a re-circulating media (sand) system and discharge to land via soakage.

The Te Kowhai WWTP scheme includes 21 residential properties and a condition on the resource consent precludes the addition of new properties to the system. No industrial or commercial properties are included. Wastewater is collected in a large septic tank before being passed through a recirculating sand contractor and recirculating tank. The treated wastewater is then discharged to five soakage pits/trenches.

WDC holds a consent for discharge to land from the Te Kowhai WWTP, which expires in 2033. The conditions of that consent include a requirement to plant an area of 3,000m<sup>2</sup> if the WWTP remains operational post-2028.

The Te Kowhai WWTP has historically struggled to meet discharge volume and nitrate limits. WWTP upgrades were completed prior to re-consenting of the discharge in 2018 and the WWTP now has a high-level of compliance.<sup>7</sup>

### 3.4.4 Summary of Northern Metro area WWTPs

WWTP	Plant	Capacity (m <sup>3</sup> /day)	Current average and peak demand (m <sup>3</sup> /day)	Consent expiry
Pukete	Activated sludge, Modified Ludzack Ettinger, UV treatment	60,000	Avg. - 10,400 Peak - 240,000	2027
Ngaaruawaahia	Oxidation pond, Actiflo, UV	3,120	Avg. - 1,500 Peak - 4,500	2029
Te Kowhai	Septic tank, re-circulating media, land disposal	<100	Avg. - <100 Peak - <200	2033

<sup>7</sup> Waikato Regional Council Site Compliance Report, REG604962 (26 June 2021)

### 3.5 Alignment with strategic outcomes

Strategy/ Policy	Priorities / key outcomes	Alignment
<b>National and Regional Policy</b>		
Three Waters Reform Programme	<p>Central Government is currently undertaking a fundamental review of the way in which three waters services are managed across New Zealand. Taumata Arowai has been set up as a regulatory body which has taken over from the Ministry of Health as the nation's drinking water regulator, as well as providing monitoring functions in relation to wastewater and stormwater.</p> <p>Further to this, a new structure for the delivery of water, wastewater and potentially stormwater is being implemented, which will see this delivery moved from councils to new, larger water entities. This will significantly change the way in which three water services are delivered across New Zealand.</p>	<p>This DBC is consistent with the objectives of the Three Waters Reform, both in terms of anticipated improvements and cross-territorial authority collaboration.</p> <p>The <b>Commercial and Management Cases</b> highlight the potential for delivery of the preferred option by a new entity. Transfer to the new entity would impact on the financial (including funding arrangements), commercial and management aspects of this DBC and the recommendations contained within those sections would be reassessed at the appropriate time.</p>
Te Ture Whaimana – Vision and Strategy for the Waikato River	<p>Te Ture Whaimana is the primary direction-setting document for the Waikato River and activities which affect it. It sits ahead of any subordinate legislation and all planning documents under the Resource Management Act 1991, including any national policy statement.</p> <p>The health and wellbeing of the River is of paramount concern. Te Ture Whaimana requires restoration and protection of the River, both biophysical and metaphysical elements. In a consenting context, this includes an element of betterment in proportion to the activity being undertaken.</p> <p>Te Ture Whaimana is not just about the physical restoration and protection of the Awa. It takes a holistic approach to the restoration and protection of the relationship between Waikato-Tainui, other river iwi, the broader regional community, and the Awa. These relationships are central to restoring and protecting the mauri of the Awa.</p> <p>In the past, resource consenting processes have been used as a primary tool to assist with restoration of these relationships. But a more effective means is through early and meaningful engagement and direct involvement of taangata whenua in strategic decision-making.</p> <p>The ultimate measure of the success of Te Ture Whaimana will be that the Waikato River will be safe for people to swim in and take food from over its entire length (including tributaries).</p>	<p>Giving effect to Te Ture Whaimana is central to this DBC (to the extent possible where there is an ongoing discharge of wastewater to the Waikato River).</p> <p>The minimum discharge standards adopted by this DBC will result in a significant reduction in nutrient loading to the Waikato River, even taking into account population growth. This is consistent with betterment as it is applied to existing activities.</p> <p>Although focus is often given to the water quality aspects of Te Ture Whaimana, the relationship of people with the river has equal importance. The assessment criteria adopted in this DBC seek to recognise and provide for those relationships.</p> <p>It is not enough to simply put Te Ture Whaimana as the starting point; meaningful engagement with taangata whenua is needed to guide how the DBC should give effect to both the water quality and relationship aspects of Te Ture Whaimana.</p> <p>To this end, taangata whenua are included as project partners – both in a governance and technical capacity - and have been involved in decision-making and recommendations through the options development and assessment phases of the DBC.</p>

Strategy/ Policy	Priorities / key outcomes	Alignment
<p>National Policy Statement for Freshwater Management 2020</p>	<p>The NPSFM provides local authorities with direction on how they should manage freshwater under the Resource Management Act 1991. It seeks to manage freshwater in a way that gives effect to Te Mana o te Wai, improve degraded waterbodies and maintain or improve other waterbodies, avoid further loss or degradation of wetlands and stream, improve outcomes for aquatic ecosystems and indigenous species, and improve reporting.</p> <p>Te Mana o te Wai is a concept that refers to the fundamental importance of water and recognises that protecting the health of freshwater protects the health and well-being of the wider environment. It protects the mauri of the wai and seeks to restore and preserve the balance between the water, the wider environment, and the community.</p> <p>There is a hierarchy of obligations in Te Mana o te Wai that prioritises:</p> <ul style="list-style-type: none"> <li>(a) first, the health and well-being of water bodies and freshwater ecosystems</li> <li>(b) second, the health needs of people (such as drinking water)</li> <li>(c) third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.</li> </ul>	<p>The project delivery structure seeks to implement the six principles relating to the roles of tangata whenua and other New Zealanders in the management of freshwater: Mana whakaharere, kaitiakitanga, manaakitanga, governance, stewardship, and care and respect. Te Tiriti o Waitangi partnership is given effect in the form of equal representation between local authorities and mana whenua at all levels of the project</p> <p>Mana whenua are included as project partners and have been involved in decision-making and recommendations through the options development and assessment phases of the DBC.</p> <p>Wastewater services are critical to supporting the health of people, land, and water – especially in cities where on-site discharge is not feasible. This DBC sets discharge standards that will decrease the mass of load of nutrients discharged to water and improve the well-being of the Waikato River while continuing to provide for the health and wellbeing of people.</p>
<p>Housing intensification</p>	<p>The National Policy Statement on Urban Development 2020 (NPSUD) requires that local authorities provide infrastructure and appropriately zoned land to meet expected demand for housing and business land. The NPSUD is intended to remove barriers to development to allow growth up and out in locations with good access to existing services, public transport networks, and infrastructure.</p> <p>Similarly, the Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021 requires HCC, WDC, and Waipā DC rezone land to provide for medium density housing.</p> <p>HCC notified Plan Change 12 – Enabling Housing Supply in August 2022. Plan Change 12 will give effect to the NPSUD and the Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021.</p>	<p>Changes in density have two impacts:</p> <p>New/future developments may have more residents, high wastewater volumes, and subsequently greater infrastructure requirements than previously planned for</p> <p>Infill development may result in higher wastewater volumes generated by existing suburbs putting pressure on existing infrastructure</p> <p>Management of wastewater in the Northern Metro area must support a compact urban form. KPIs developed for the project include a requirement to be flexible and able to respond to infill development, higher intensity of development, and out-of-sequence or unanticipated development.</p>

Strategy/ Policy	Priorities / key outcomes	Alignment
<p>Waikato Regional Policy Statement and Regional Plan</p>	<p>The Waikato Regional Policy Statement: Te Tauāki Kaupapahere Te-Rohe O Waikato (RPS) identifies key resource management issues in the Waikato Region and outlines how integrated management of the region's natural and physical resources will be achieved.</p> <p>The RPS promotes a collaborative and holistic approach to resource management that looks beyond organisational and administrative boundaries.</p> <p>The proposed Waikato Regional Plan Change 1 (Plan Change 1) was targeted as the first step towards giving effect to Te Ture Whaimana and the National Policy Statement for Freshwater Management 2014 (NPSFM) within the Waikato and Waipā River catchments. Plan Change 1 was notified on the 22 October 2016 with decisions released on 18 March 2020. It remains under appeal.</p> <p>The purpose of Plan Change 1 is to reduce point source and non-point sources of contaminants - nitrogen, phosphorus, sediment, and bacteria - entering waterbodies (including groundwater) within the Waikato and Waipā River catchments. It provides location specific short term and 80 year targets for reducing contaminants. Plan Change 1 also provides a mechanism for Council to apply the best practicable option to avoid or mitigate adverse nutrient effects to freshwater. Where all adverse effects cannot be avoided or mitigated, the policy enables the offset of effects to point source discharges to occur at a different location.</p> <p>The nutrient reduction will support the restoration and protection of the Waikato River so that it is safe for people to swim in and take food from its entire length.</p>	<p>This DBC takes a boundaryless approach to wastewater management and acknowledges and provides for the relationship of Maaori and their culture and traditions with their ancestral land, water, sites, waahi tapu and other taonga.</p> <p>Both the Pukete and Ngaaruawaahia WWTPs are reaching the end of their discharge consent terms. Reconsenting of the discharges will be considered under the framework sought by Plan Change 1. A key outcome of this DBC must therefore be a preferred option that aligns with the nutrient reductions sought by Plan Change 1.</p> <p>The minimum discharge standards adopted by this DBC will result in a significant reduction in nutrient loading to the Waikato River, even taking into account population growth.</p>
<p><b>Regional Strategy and Long Term Planning</b></p>		
<p>Hamilton to Auckland Corridor Plan</p>	<p>The Hamilton to Auckland corridor is nationally significant and work is underway to develop an integrated spatial plan and establish an ongoing growth management partnership for the corridor. The spatial planning exercise is a key pillar of the Government's Urban Growth Agenda.</p>	<p>Provision of three waters infrastructure is a key enabler for sustainable development and growth in the Hamilton to Auckland corridor and region. Three waters services are:</p> <ul style="list-style-type: none"> <li>fundamental to community wellbeing and the quality of the environment</li> <li>key to unlocking economic potential in the corridor, including investment already made in the Waikato Expressway</li> <li>essential to achieving the growth and development objectives and aspirations of the Corridor Plan and the Future Proof Strategy</li> <li>key to demonstrating how urban land use and development is giving effect to Te Ture Whaimana which requires that development within the Waikato River catchment improves the quality of the environment.</li> </ul>

Strategy/ Policy	Priorities / key outcomes	Alignment
Metro Spatial Plan	<p>The Hamilton Waikato Metropolitan Spatial Plan is a vision and framework for how Hamilton City and the neighbouring communities within Waipā and Waikato districts will grow and develop over the next 100+ years, creating one of the most liveable places in New Zealand. The MSP is delivered through the Future Proof partnership between Waikato-Tainui, Tainui Waka Alliance, taangata whenua, central Government, HCC, WDC, Waipā District Council, and Waikato Regional Council</p> <p>It sets out how and where our communities should grow which will allow advance planning and delivery of future infrastructure requirements.</p>	<p>The population growth assumptions used to develop the options in this DBC are based on the Metro Spatial Plan.</p>
Future Proof Strategy 2021	<p>The Future Proof Strategy is a 30-year growth management and implementation plan specific to the Hamilton, Waipā and Waikato sub-region (Future Proof sub-region). The Strategy provides a framework to manage growth in a collaborative way for the benefit of the sub-region both from a community and a physical perspective. This sub-regional approach is needed in order to manage growth in a coordinated manner and to address complex planning issues, especially cross-boundary matters. A key principle of the Future Proof Strategy is affordable and sustainable infrastructure.</p> <p>This Strategy recognises that three waters services represent major infrastructure investment and present significant opportunity to maximise and deliver the greatest value for investment.</p> <p>An updated draft Strategy was released in October 2021. The updated Strategy incorporates the Hamilton to Auckland Corridor Plan and the Hamilton-Waikato Metropolitan Spatial Plan as well as key national documents and initiatives such as the National Policy Statement on Urban Development (NPSUD), the Government's Urban Growth Agenda, and enhancing the health and wellbeing of the Waikato River in accordance with Te Ture Whaimana.</p>	<p>The KPIs and critical success factors outlined in this DBC are consistent with the Strategy's growth management directives, including:</p> <ul style="list-style-type: none"> <li>Give effect to Te Ture Whaimana</li> <li>Positive environmental outcomes</li> <li>Investment that is cognisant of iwi economic and environmental imperatives</li> <li>Staging and timing of development that is aligned with infrastructure investment</li> <li>Promote increased density in new development and redevelopment</li> </ul>
Future Proof Sub-Regional Three Waters Strategy 2012	<p>The Future Proof partners developed a Sub-Regional 3 Waters Strategy in 2012 to set out how water, wastewater and stormwater will be managed over a 50-year period. Building on the direction of Future Proof, the 3 Waters Strategy sets a long-term strategic vision for 3 Waters in the sub-region.</p> <p>The strategy sets out justification for the strategic issues identified, which are still relevant today. The vision of the 3 Waters Strategy is:</p> <p>The delivery of integrated, sustainable and well managed 3 Waters services for the sub-region which ensures the cultural, social and economic needs of the community are met and the quality of the Waikato River is improved.</p>	<p>This DBC responds to several of the strategic issues identified in the Strategy including meeting future anticipated and planned for growth demands, integration across councils, involvement of iwi and hapuu in three water management, and ensuring protection and enhancement of the natural environment.</p>

## 4. The need for investment

The Waikato Sub-Regional Three Waters Strategic Case defines the case for change which was refined to wastewater infrastructure through the Southern Metro DBC. This section reviews the problems, benefits, objectives, and KPIs developed through those earlier processes and reconfirms their applicability to the Northern Metro Area.

### 4.1 Investment Logic Map

The Southern Metro DBC sets the Investment Logic Map for wastewater servicing in the Metro Area.

The Southern Metro DBC adopts the programme problems, benefits, and Best for River Objectives<sup>8</sup> from the Three Waters Strategic Case and presents the evidence that these problems and benefits are relevant to wastewater servicing in the Metro Area. Section 4.2 provides detail specific to the Northern Metro Area.

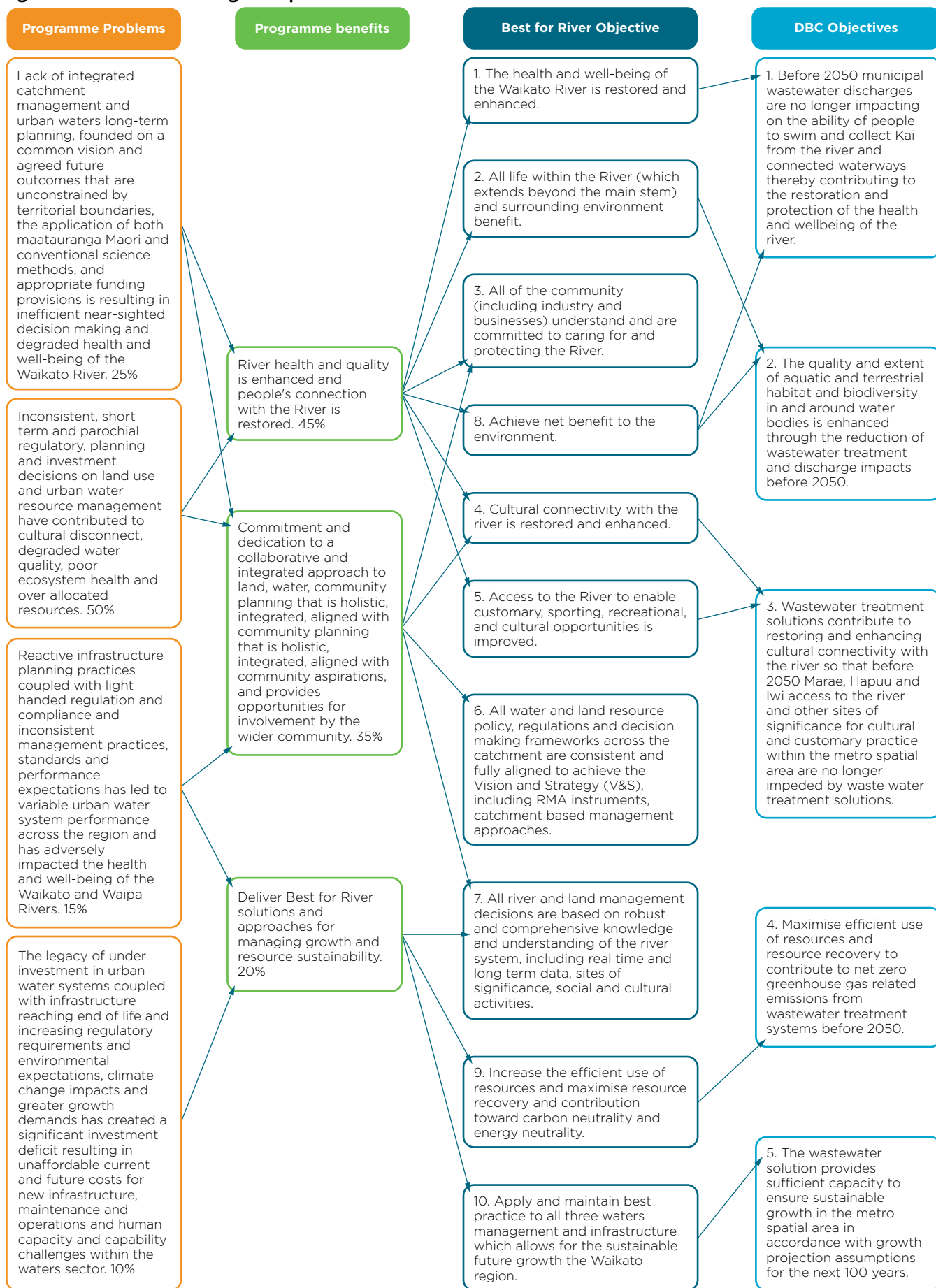
During development of the Southern Metro DBC, the Best for River Objectives were translated into Investment Objectives specific to wastewater conveyance, treatment, and discharge<sup>9</sup>.

The Southern Metro DBC Investment Logic Map has been adopted for the Northern Metro DBC.

<sup>8</sup> Section 3.4 of the Three Waters Strategic Case outlines the background to and development of the Best for River definition and subsequent Best for River Objectives

<sup>9</sup> Refer Section 3.3.2 of the Southern Metro DBC Strategic Case

**Figure 12: Investment Logic Map**



## 4.2 Problem definition

Four programme problem statements were identified in the Waikato Sub-regional Three Waters Strategic Case. The problems relate to all three waters (drinking water, wastewater and stormwater) and to the wider management of water resources and infrastructure. These problem statements were adopted in the Southern Metro DBC.

### **Waikato Sub-regional Three Waters Strategic Case: Programme Problems**

Problem Statement One: Lack of integrated catchment management and urban waters long-term planning, founded on a common vision and agreed future outcomes that are unconstrained by territorial boundaries, the application of both Mātauranga Māori and conventional science methods, and appropriate funding provisions is resulting in inefficient near-sighted decision making and degraded health and well-being of the Waikato River. (25%)

Problem Statement Two: Inconsistent, short-term and parochial regulatory, planning and investment decisions on land use and urban water resource management have contributed to cultural disconnect, degraded water quality, poor ecosystem health and over allocated resources. As a consequence, the relationships and aspirations of communities with the Waikato River and the ability of Waikato River iwi to exercise mana whakaharere or conduct their tikanga and kawa have been severely compromised. (50%)

Problem Statement Three: Reactive infrastructure planning practices coupled with light-handed regulation and compliance and inconsistent management practices, standards and performance expectations has led to variable urban water system performance across the region and has adversely impacted the health and well-being of the Waikato and Waipā Rivers. (15%)

Problem Statement Four: The legacy of under-investment in urban water systems coupled with infrastructure reaching end of life and increasing regulatory requirements and environmental expectations, climate change impacts and greater growth demands has created a significant investment deficit resulting in unaffordable current and future costs for new infrastructure, maintenance and operations and human capacity and capability challenges within the waters sector. (10%)

The Southern Metro DBC Strategic Case presents the evidence that the problem statements are relevant to wastewater servicing in the Metro Area. This section summarises the information presented in the Southern Metro DBC with a focus on detail specific to the Northern Metro Area.

The four problem statements identified in the Waikato Sub-regional Three Waters Strategic Case are very broad, general statements. Rather than providing evidence for each of the four problem statements, the following sections focus on key issues evident in the problem statements and discuss how these issues apply in the Northern Metro Area.

## 4.2.1 Lack of integrated, cross-boundary management

### Refer problem 1, 2, 3 & 4

Historically, each of the three local authorities in the Metro Area (HCC, WDC and Waipā DC) have planned and funded wastewater infrastructure separately. Each is individually responsible for three waters infrastructure and services in their respective communities.

Despite attempts at integrated planning across the Metro Area through partnerships such as Future Proof, each Council has continued to focus three waters investment on the needs of their individual communities in isolation from neighbouring councils. In the Northern Metro Area this is evidenced by:

- The lack of any major cross-boundary wastewater management investment to date, despite it appearing to be the most practical approach in some situations. As an example, the township of Horotiu is currently serviced through the Ngaaruawaahia WWTP despite being located closer to the Pukete WWTP
- Major wastewater discharges to the river at Hamilton and Ngaaruawaahia are managed separately, despite the river's hydrological catchment crossing multiple council boundaries and the relatively short distance between these discharge points
- Differing approaches to overall asset management and long-term planning (including renewals, replacement, design, funding) across the Metro Area
- Differing requirements and expectations on treatment performance/standards, operation, maintenance, iwi/manua whenua and stakeholder engagement, monitoring and reporting across the WWTPs. This has resulted in different consent standards and requirements, varying levels of compliance with resource consents and different levels of engagement.

Along with land use modification, drainage and land use activities, decisions relating to infrastructure and land development (including those made through past planning frameworks) have contributed to a current state where:

- the water quality of the Waikato River is significantly degraded and does not meet current expectations or technical targets
- in general, three waters infrastructure is inefficient and ageing, no longer fit-for-purpose, with a significant legacy of under-investment
- existing wastewater networks and treatment facilities do not have capacity for future development and intensification
- there is uncertainty around the abilities of individual councils to fund infrastructure, maintenance, and operations for future growth as well as the ability of ratepayers to afford appropriate three waters infrastructure in the future.

A particular example of past decision-making that has hindered integrated, cross-boundary wastewater management is the number of WWTPs operating in the Northern Metro Area. In the 1960s and 70s, government subsidies were put in place to provide wastewater reticulation to communities. This led to improvements in public health and environmental outcomes but also resulted in a proliferation of small, community-based WWTPs. Waikato DC inherited a number of these plants following the 1989 local government reforms.

Most of these WWTPs were based on oxidation pond treatment processes which have been upgraded over the years but have now reached an upper limit in the level of treatment they can provide. We are now seeing a step change to newer treatment processes (like MBRs) to facilitate growth and improve the level of treatment provided. The 'simple' solution is to replace the oxidation pond treatment plans with MBR plants on the existing sites. But this ignores the opportunity to think more holistically about wastewater servicing.

## 4.2.2 Exclusion of mana whenua from decision making

### Refer problem 1 & 2

Maaori express a relationship with water as kaitiaki. Maaori do not distinguish their rights and interests in freshwater from the three waters; they are viewed as a connection to the water environs and its systems.

There are many who consider the water of the Waikato River to be akin to the blood flowing through their veins and the health and wellbeing (mauri or life force) of the river being inextricably linked to that of taangata whenua who have lived along its banks. It is believed that this relationship with the river brings with it the responsibility to ensure the wellbeing of the river.

Historically, mana whenua have been excluded from strategic infrastructure planning. This has resulted in prioritisation of engineering design standards based on conventional science to the detriment of maatauranga Maaori science built up over hundreds of years. This western world view dominated the approach to wastewater management in New Zealand but is inconsistent with the guiding principles of Te Mana o te Awa and Mana Whakahaere. It also falls short of the co-governance vision of the **Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010**.

Consequently, municipal wastewater servicing across the Metro Area was designed and implemented to meet a standard and level of service acceptable from a western perspective. This has resulted in:

- A prioritisation of discharge to water
- The current treatment plant locations, which were situated as close to the river as possible for discharge purposes
- Current standards of discharge.



### 4.2.3 Degraded health and well-being of the Waikato River

#### Refer problem 1 & 3

The state of the Waikato and Waipā Rivers is discussed more fully in the Southern Metro DBC. For the purpose of this DBC, we acknowledge that both rivers are showing signs of being affected by contaminants, with an increase in algal blooms and decrease in swimability.

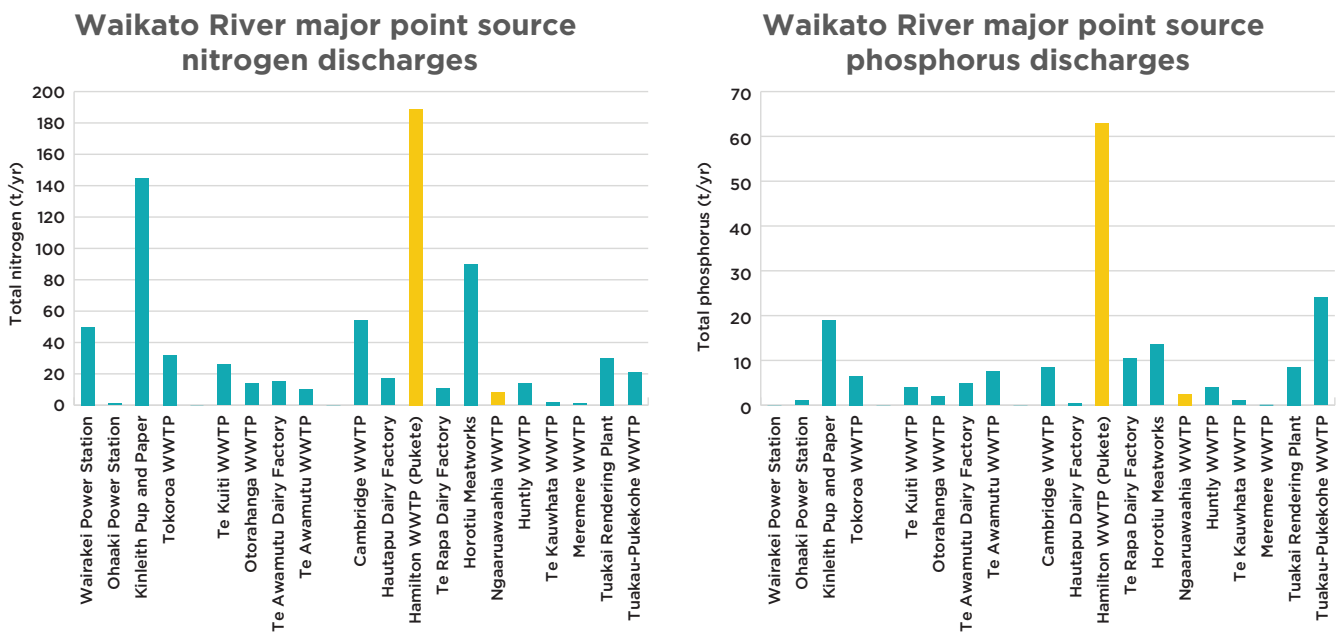
Plan Change 1 to the Waikato Regional Plan gives a concise summary of the state of the Waikato River:

**“The Waikato and Waipā Awa are degraded. Some parts of the Awa are more degraded than others, particularly a number of the lakes and tributaries, and the lower reaches of the Waikato River. The degradation has occurred over a long period of time. The Awa have been degraded due to human activity; from the discharges of contaminants directly and diffusely into the rivers, including by urban stormwater and wastewater discharges as well as agricultural and horticultural land use activities. Some degradation is the result of wildlife (including pest fish)”.**<sup>10</sup>

There are 19 major point source discharges to the Waikato and Waipā Rivers. These sources contributed about 7% of the mass flow of nitrogen and 18% of the mass flow of phosphorus carried to the sea by the Waikato and Waipā Rivers during 2003-12.<sup>11</sup> The remaining nutrient load is from non-point source discharges (including farm activities and naturally occurring processes) and smaller point source discharges.

That being said, the Pukete WWTP remains a significant contributor of nutrients to the Waikato River. Figure 13 shows nitrogen and phosphorus loads from point source wastewater discharges to the two rivers for the period 2003-12.<sup>11</sup> While the data used in these figures is old and does not capture the improvements made to discharge quality over the past decade, it highlights the scale of the Pukete and Ngaaruawaahia WWTP discharges in comparison to other wastewater discharges in the region.

**Figure 13: Nitrogen and phosphorus from point source wastewater discharges to the Waikato and Waipā Rivers<sup>12</sup>**



10 Proposed Waikato Regional Plan Change 1: Waikato and Waipā River Catchments – Te Panonitanga 1 i te Mahere Ā-Rohe a Waikato e Marohitia Nei: Ngā Riu o Ngā Awa o Waikato me Waipā. The Hearing Panel’s Recommendation Report – Te Pūrongo Tūtohunga a Te Rōpū Whakawā

11 Waikato Regional Council Technical Report 2014/56: Sources of nitrogen and phosphorus in the Waikato and Waipa Rivers, 2003-12.

12 Adapted from Waikato Regional Council Technical Report 2014/56: Sources of nitrogen and phosphorus in the Waikato and Waipa Rivers, 2003-12.

These WWTP discharges contribute to degraded water quality which, combined with the presence of diffuser structures and lack of any cultural or spiritual purification of the wastewater prior to discharge, results in on-going impacts to the health and well-being of the Waikato River. The Southern Metro DBC includes additional information on current water quality in the Waikato River.

We have an obligation to work towards restoration and protection of the awa.

#### **4.2.4 Degradation of relationship with the Awa**

##### **Refer problem 2**

Disposal of human sewage directly to water is offensive to mana whenua, destroying spiritual values and the relationship with the Awa. Waikato iwi, and many other Maaori, have a strong cultural belief that wastewater should be cleaned through contact with land before returning to water bodies and in doing so preserve the mauri of their tupuna.<sup>13</sup>

Impacts on the Awa are further exacerbated by the presence of discharge structures that pierce the bed or banks of the river.

Wastewater disposal, along with the broader discharge of waste to the river, has caused degradation of both the physical and metaphysical condition of the river. Impacts on the ability to swim in, and take food from, the river have a direct impact on the relationship of Waikato Iwi with the river. The location of wastewater treatment plants and discharge infrastructure on the banks of the river or between the river and Maaori-owned land have further severed the physical relationship of other lands with the river.

#### **4.2.5 Existing infrastructure unable to meet future needs**

##### **Refer problem 1 & 4**

We know the population base serviced by the Pukete and Ngaaruawaahia WWTPs is growing and that the requirement treatment standard will increase. The current WWTPs cannot:

1. service anticipated population growth
2. meet discharge standards required to give effect to Te Ture Whaimana and obtain new discharge consents.

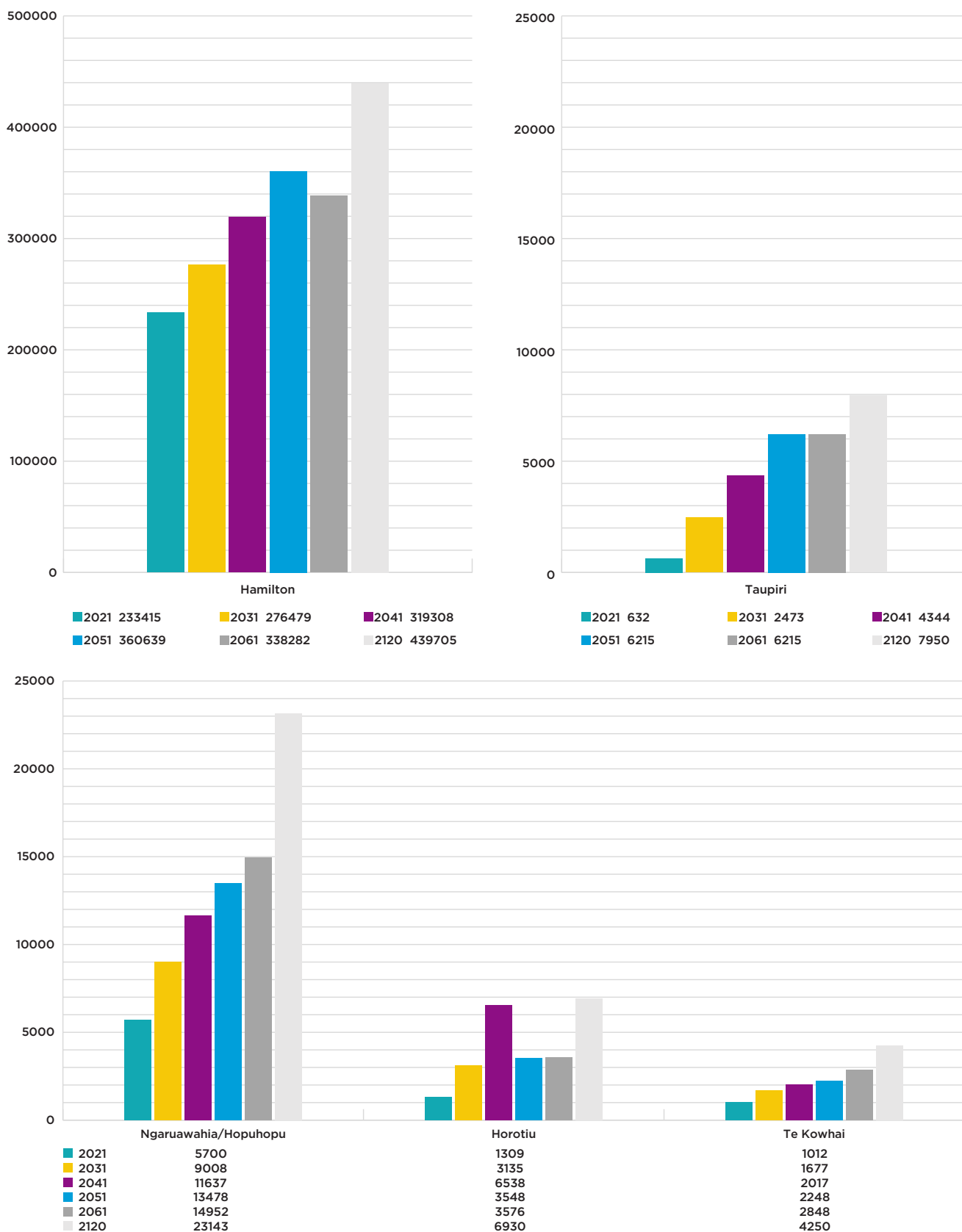
The Northern Metro Area is growing. New residential areas, infill development and new mixed use and industrial developments will add to the wastewater generated in the area.

The 2011-2021 HCC LTP forecasted that Hamilton City would reach a population of 150,000 by 2021. Hamilton City reached this level by 2016. This growth puts pressure on the city's infrastructure, including the Pukete WWTP.

<sup>13</sup> Water River Independent Scoping Study, NIWA, 2010

Figure 14: Expected growth in the Northern Metro Area shown as population equivalents.<sup>14</sup>

### Assumed population growth



14 The PE graphs show a reduction in the Hamilton population post-2051 following diversion of the Hamilton South catchment to the new Southern WWTP. The timing of that diversion is yet to be determined and may occur earlier. The area (and therefore population equivalents) to be diverted is also yet to be determined and is likely to change through detailed investigation.

Wastewater treatment plant and network design is based on population equivalents: a parameter used to give an estimate of wastewater generation across a range of residential and non-residential activities. Between 2021 and 2061, the Northern Metro Area is expected to grow from approximately 190,000 to 316,000 population equivalents.<sup>15</sup> Neither the WWTPs nor the pipe networks connecting our communities to the WWTPs have capacity to manage this growth without significant investment.

**Pukete:** At the Pukete WWTP, the existing process combinations used on the site and the site configuration present multiple barriers to achieving Best for River Outcomes. The current upgrade at Pukete (Pukete 3) is aimed at extending the capacity of the plant to 2028 based on existing discharge consent conditions. While there is space for some additional growth capacity within the plant, the footprint of Pukete WWTP is constrained by available land and buffers to surrounding land use. This is the ultimate 'build-out' capacity for the site.

The current treatment and discharge approach does not take a holistic approach to urban water management and fails to take advantage of the valuable resources (water, nutrients, energy) produced through the process. The existing plant configuration is capable of achieving a total nitrogen discharge of 7-8mg/L, significantly higher than the 4mg/L sought by this DBC (refer Section 7).

The investment required is recognised by HCC in the 2021-51 Infrastructure Strategy which includes two major upgrades in the first 10 year of the Long-Term Plan with a total budget of \$172M.

HCC has developed a conveyance network investment programme. However, the planned investment does not reflect the additional pressures and demand contemplated by MSP, the National Planning Standards for Urban Development, and the RMA (Enabling Housing) Amendment Bill. The western interceptor is already constraining development in the western and southern extents of Hamilton City.

**Ngaaruawaahia:** The oxidation ponds at Ngaaruawaahia put a restriction on development of surrounding land. This restriction is important to avoid or minimise the risk of reverse sensitivity, but it does impact on the ability of neighbouring land owners (including Waikato-Tainui) to develop their land. The WDC Infrastructure Strategy recognises the investment required at the Ngaaruawaahia WWTP and estimates that \$53M investment is required in the period 2026-30 to upgrade the plant.

**Te Kowhai:** The existing WWTP located at Te Kowhai is adequate for the current very small serviced area. It will not, however, be sufficient if and when further, more dense residential development occurs in these areas. Further, operation and maintenance of this small WWTP is not cost effective and has high per capita costs.

When considering population growth, it is not just the increase in wastewater flows that is relevant; we also need to be concerned with where those flows are originating. The Northern Metro Area includes areas either zoned for development or with significant development potential located on the periphery of existing urban settlements. Many of these areas, including Te Kowhai, currently have limited wastewater services and in some cases no servicing is planned, despite a lack of wastewater services constraining development. This means land is being zoned for development without sufficient long-term servicing solutions, or land that could unlock significant economic potential is prevented from being zoned and developed.

<sup>15</sup> Refer Economic Case for detail on population growth assumptions

## 4.2.6 Increasing regulatory and community expectations

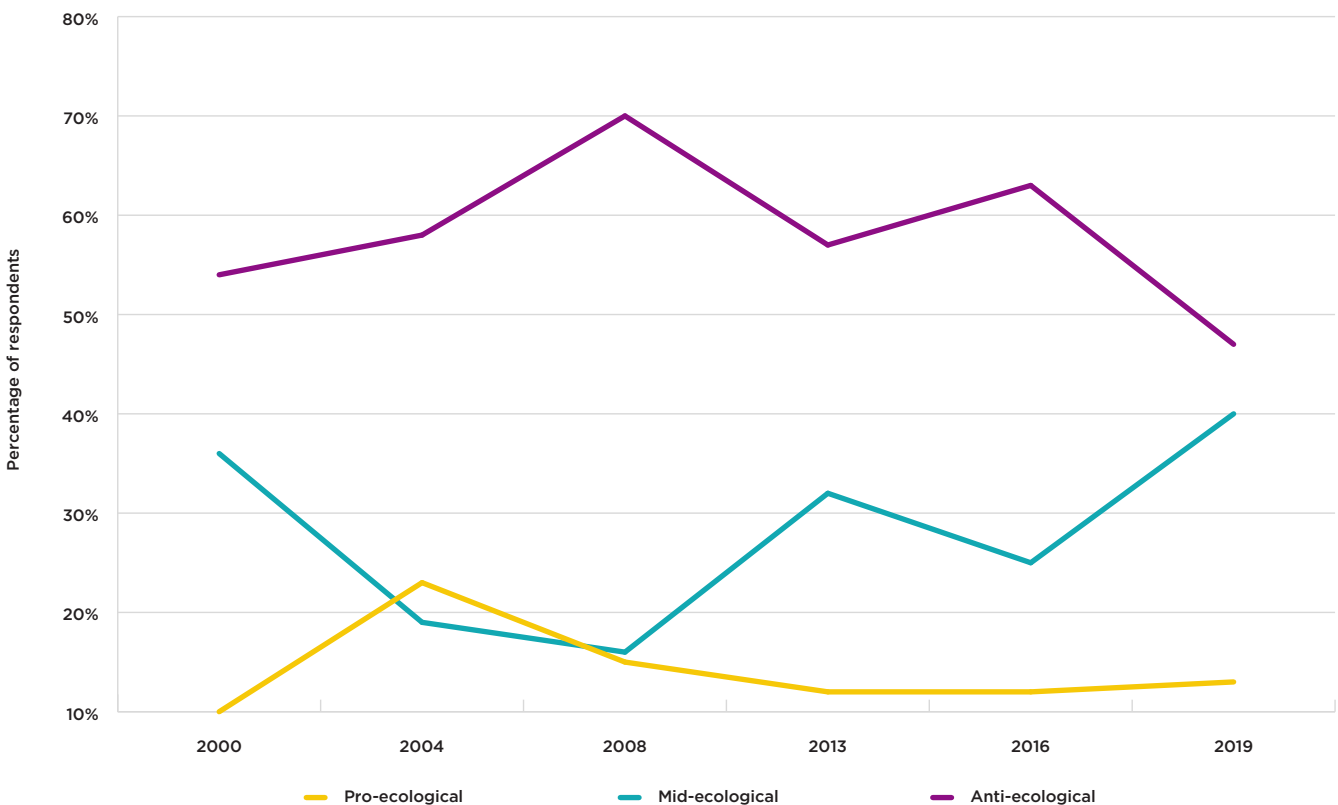
### Refer problem 3 & 4

Changes to national and regional legislation and regulation are requiring councils to provide for more housing development and intensification – with the corresponding increase in infrastructure requirements. The National Policy Statement for Urban Development requires local authorities provide sufficient development capacity to meet expected housing demand. That capacity must be “infrastructure-ready”, putting pressure on councils to develop the additional infrastructure required to meet that bar.

At the same time, the importance of the health and wellbeing of the environment is being elevated. In practice, councils must prepare to receive higher volumes of wastewater and treat that wastewater to a higher standard before discharge. Te Ture Whaimana and the National Policy Statement for Freshwater Management are lifting the bar on expected water quality and health, which requires higher levels of treatment.

In addition, community expectations are changing. Most people are identifying as being “pro-ecological” regulation (Figure 15) which suggests people have higher expectations for treatment of discharges to the environment including wastewater discharges.

**Figure 15: People’s environmental attitudes to regulation**



The resource consents for discharges to the Waikato River from the Pukete and Ngaaruawaahia WWTPs expire in the next 10 years. Historically, these WWTPs have not reliably complied with their existing consent conditions, let alone the higher discharge standards that will be required to give effect to Te Ture Whaimana and obtain new discharge consents beyond 2027.

There are significant reputational, enforcement, and relationship risks to the councils if there is either major objection to new discharge consents (especially if that objection comes from iwi partners) or non-compliance with any new discharge consent conditions, including the minimum discharge standards that have been agreed by the project partners.

## 4.2.7 Lack of appropriate funding sources

### Refer problem 1 & 4

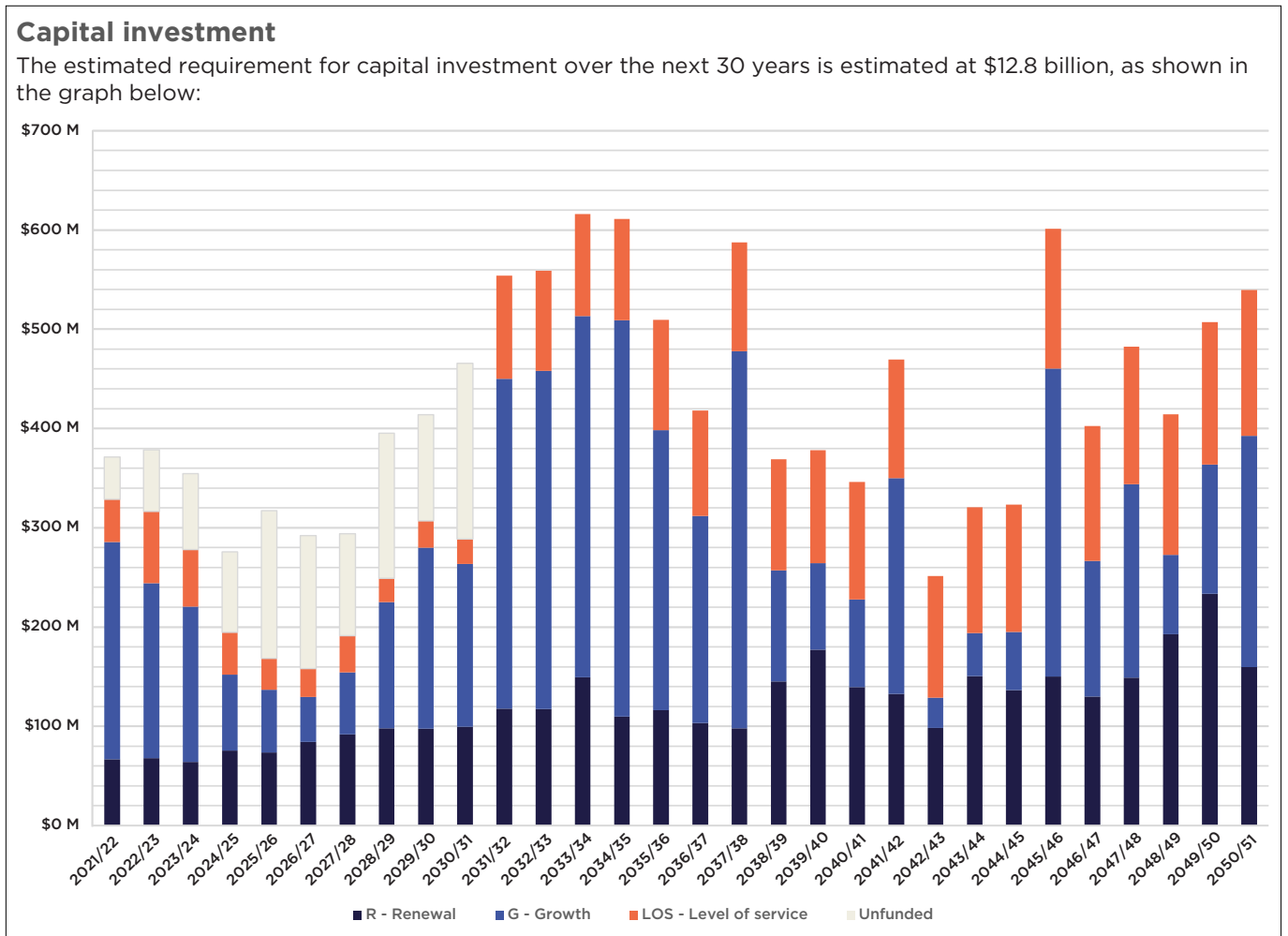
Competing priorities for territorial authority funding, and community pressure to minimise rates increases, have constrained investment in wastewater infrastructure. Significant investment is required to provide for growth and meet regulatory requirements.

There is a known misalignment between capital investment required to support development and available funding. The HCC Infrastructure Strategy (2021-2051) shows a large portion of required investment over the next 10 years is unfunded due to budget constraints (refer Figure 16).

Limited funding support from central Government has made it challenging to implement nationally set policy and priorities. As an example, land use planning directions (such as the NPSUD) require councils to enable urban land-use intensification without any consideration of the scale of investment needed in wastewater networks (conveyance and treatment) to service the land use change.

Constrained funding during long-term plan processes results in councils prioritising investment. That prioritisation is often driven by political decision-making leading to under-investment in capital and operational wastewater costs, as evidenced by a legacy of under-investment in wastewater services across the Metro Area.

**Figure 16: Estimated capital investment – Hamilton City Council Infrastructure Strategy (2021-2051)**



## 4.3 Benefits

Three programme benefit statements were identified in the Waikato Sub-regional Three Waters Strategic Case. The benefits again relate to all three waters and to the wider management of water resources and infrastructure. These benefit statements were adopted in the Southern Metro DBC. The Southern Metro DBC Strategic Case presents the evidence that the benefits identified in the Three Waters Strategic Case are relevant to wastewater servicing in the Metro Area.

### **Waikato Sub-regional Three Waters Strategic Case: Programme Benefits**

Benefit Statement One: River health and quality is enhanced and people's connection with the river is restored. (45%)





























Benefit Statement Two: Commitment and dedication to a collaborative and integrated approach to land, water, community planning that is holistic, integrated, aligned with community aspirations, and provides opportunities for involvement by the wider community. (35%)


Benefit Statement Three: Deliver Best for River solutions and approaches for managing growth and resource sustainability. (20%)

### 4.3.1 Benefit alignment with Te Ture Whaimana

The identified benefits aim to give effect to the Te Ture Whaimana by directly (give effect to) or indirectly (support) contributing to the objectives as shown in Figure 17 below.

**Figure 17: Benefits alignment with Te Ture Whaimana**

	Benefit 1	Benefit 2	Benefit 3
Objective A: The restoration and protection of the health and wellbeing of the Waikato River			
Objective B: The restoration and protection of the relationship of Waikato-Tainui with the Waikato River, including their economic, social, cultural, and spiritual relationships			
Objective C: The restoration and protection of the relationship of Waikato River iwi according to their tikanga and kawa, with the Waikato River, including their economic, social, cultural and spiritual relationships			
Objective D: The restoration and protection of the relationship of the Waikato region's communities with the Waikato River including their economic, social, cultural and spiritual relationships.			
Objective E: The integrated, holistic and coordinated approach to management of the natural, physical, cultural and historic resources of the Waikato River			
Objective F: The adoption of a precautionary approach towards decisions that may result in significant adverse effects on the Waikato River, and in particular those effects that threaten serious or irreversible damage to the Waikato River			
Objective G: The recognition and avoidance of adverse cumulative effects, and potential cumulative effects, of activities undertaken both on the Waikato River and within its catchments on the health and wellbeing of the Waikato River			
Objective H: The recognition that the Waikato River is degraded and should not be required to absorb further degradation as a result of human activities			
Objective I: The protection and enhancement of significant sites, fisheries, flora and fauna			
Objective J: The recognition that the strategic importance of the Waikato River to New Zealand's social, cultural, environmental and economic wellbeing is subject to the restoration and protection of the health and wellbeing of the Waikato River			
Objective K: The restoration of water quality within the Waikato River so that it is safe for people to swim in and take food from over its entire length			
Objective L: The promotion of improved access to the Waikato River to better enable sporting, recreational, and cultural opportunities			
Objective M: The application to the above of both Mātauranga Māori and latest available scientific methods.			

 Gives effect to       Supports

### 4.3.2 Opportunities

Opportunities were identified through the Waikato Sub-Regional Three Waters Strategic Case. These related to the benefits which could be realised through integrating river restoration and infrastructure and resourcing opportunities. These opportunities can be realised as part of this project and are outlined below.

#### River and land restoration opportunities

There is a special relationship between Waikato River iwi and the river, reflected in Te Ture Whaimana. Many Waikato communities also have strong connections to, and relationships with, rivers in the region. An opportunity exists to strengthen these relationships by contributing to the restoration of the health and wellbeing of the Waikato River (through reducing contaminant loading) and increasing the number of customary, recreation and education interactions.

Wider catchment land use management changes and investment in restoration will also be required alongside an investment in three waters servicing practices and the adoption of a more integrated approach between three waters services, land use planning and development practices. This Project will inform and be informed by the spatial planning, blue-green corridor and environmental markets work streams being delivered through the Future Proof.<sup>16</sup> Through combining these workstreams, there is an opportunity to better integrate land and water management, which will assist with identifying and prioritising restoration and enhance investment decision-making. This will deliver better outcomes for the river, accelerate progress towards restoring “the health and wellbeing of the awa” and support growth and economic prosperity within the sub-region.

Specifically, the following opportunities to invest in river restoration are available:

- Rehabilitation of existing plant sites that are no longer needed (if centralised solutions are preferred). This includes opportunities for land development at Hopuhopu, allowing Waikato-Tainui to build their relationship with that whenua and the corresponding relationship with the Awa.
- Offsetting techniques such as vegetation zones and exclusion zones
- Restoration of existing or historic wetlands

As noted below, the consolidation of wastewater treatment facilities across the Metro Area may deliver efficiencies that reduce the overall expenditure on the wastewater network, potentially increasing the availability of funding for other restoration projects.

#### Infrastructure and resourcing opportunities

The state of wastewater infrastructure and Waikato River water quality varies greatly in the Waikato sub-region. Local authorities, iwi, communities and industry face significant challenges in meeting current and future wastewater service needs efficiently, while promoting Best for River outcomes.

However, significant opportunities also come with these challenges, including economies of scale, greater network resilience and the opportunity for project partners to set strong environmental examples.

Stepping back and considering a holistic approach to wastewater servicing provides an opportunity to consider new technologies – for treatment of the wastewater stream, for re-use of treated wastewater, for processing and use of solids and other nutrients extracted during treatment, and for capture and use of energy through the treatment process. Adoption of best practice treatment would allow development of a Centre of Excellence for wastewater management, a place to train new wastewater operators (including rangatahi) and to trial new technologies in the future.

<sup>16</sup> Waikato Business News, 03 April 2019. Pioneering plan sets out blueprint for Corridor growth. Source: <http://wbn.co.nz/2019/04/03/pioneering-plan-sets-out-blueprint-for-corridor-growth/>

In 2015, the operational cost saving for adopting a holistic approach to three waters infrastructure management was estimated at around 10 per cent or \$91 million net present value (NPV) over a 28-year period (when compared to business as usual activities).<sup>17</sup> Cost efficiencies could be achieved through reconfiguration of existing sites, lower operating costs, savings in capital expenditure and innovative procurement strategies. Specific savings would depend on actual size of communities, scope of services, infrastructure spend, distances, technologies and state of existing infrastructure. The cost efficiencies realised through this approach could be utilised to expedite progress towards Best for River outcomes.

Further opportunities exist to improve overall network resilience. As outlined, the condition of three waters infrastructure in the study area varies across assets and the three councils. If greater collaboration and resource sharing is achieved, funding and resources could be shared and targeted at areas of the network that are most at risk of failure. Approaches that provide backup wastewater servicing solutions could be explored or implemented. This in turn will minimise the likelihood of negative environmental and community health and safety impacts.

A wider network approach to wastewater infrastructure will also provide greater consistency:

- Consistency in wastewater servicing and treatment
- Consistency across discharge consents – creating further efficiencies for monitoring and enforcement
- Consistency across relationships – fewer operators means fewer parties for mana whenua partners and other stakeholders to interact with
- Best for River.

Giving effect to Te Ture Whaimana o te Awa o Waikato is central to delivering Best for River outcomes. A Best for River definition and evaluative method were developed as part of the Three Waters Sub-Regional Strategic Case to ensure progress is made towards achieving Te Ture Whaimana o te Awa o Waikato and other current, and proposed, central and local Government regulatory targets. This definition is intended to be used as the basis for all three waters projects and assessments completed in the sub-regional area.

Before looking at the Best for River definition, it is important to define what is meant by ‘river’. In the context of the Treaty settlements that gave rise to Te Ture Whaimana, the Waikato River is defined as:

- a the body of water known as the Waikato River flowing continuously or intermittently from the Huka Falls (Te Waiheke o Huka) to the mouth of the Waikato River (Te Puaha o Waikato) shown as located within the areas marked A & C on SO plan 409144; and
- b the body of water known as the Waipā River from its source to its junction with the Puniu River to the extent to which
  - i the Waipā River is within the area marked C on SO plan 409144;
  - ii activities in the catchment of the Waipā River are included in a joint management agreement
- c all tributaries, streams, and watercourses flowing into the part of the Waikato or Waipā Rivers, to the extent to which they are within the areas marked [A, B & C] on SO plan 409144; and
- d lakes and wetlands within the areas marked [A, B & C] on SO plan 409144; and
- e the beds and banks of the water bodies described above<sup>18</sup>

<sup>17</sup> Cranleigh Corporate Finance and Advisory, May 2015. Business Case for Water Services – Delivery Options: Part B Detailed Report, Pg. 41, <https://web.archive.org/web/20190204173751/http://www.waterstudywaikato.org.nz/uploads/files/Part%20B%20-%20Final.pdf> (CCO Option)

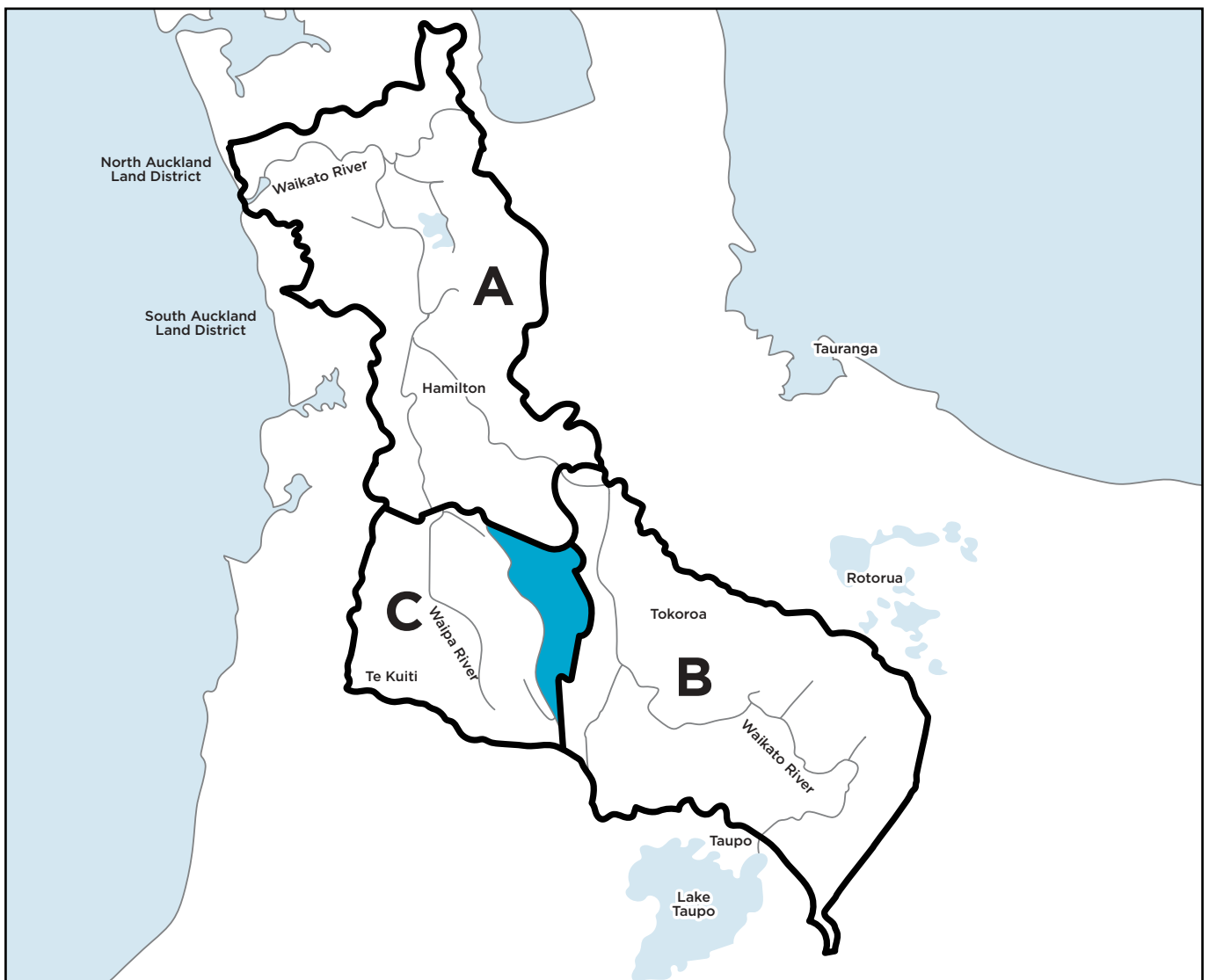
<sup>18</sup> Adapted from Ngati Tuwharetoa, Raukawa, and Te Arawa River Iwi Waikato River Act 2010 and Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010

To mana whenua and Waikato-Tainui, the following statement encompasses a full expression of the relationship and connection to the Waikato River<sup>19</sup>

**“The Waikato River is our tupuna (ancestor) which has mana (spiritual authority and power) and in turn represents the mana and mauri (life force) of Waikato-Tainui. The Waikato River is a single indivisible being that flows from Te Taheke Hukahuka to Te Puuaha o Waikato (the mouth) and includes its waters, banks and beds (and all minerals under them) and its streams, waterways, tributaries, lakes, aquatic fisheries, vegetation, flood plains, wetlands, islands, springs, water column, airspace and substratum as well as its metaphysical being...”**

The ‘River’ therefore includes the main stem, tributaries, lakes, wetlands, and interconnected areas. Activities that affect the river are not limited to those occurring within the River or on its bed and banks. Activities further afield may result in physical effects (though discharges) or may impact on the relationship of mana whenua and the wider community with the river.

**Figure 18: Plan SO 409144 outlines the extent of the Waikato and Waipā Rivers as defined under settlement legislation**



19 <https://waikatotainui.com/about-us/settlements/>

## The Best for River was translated into 10 high-level objectives:

### Best for River Objectives

1. The health and well-being of the Waikato River is restored and enhanced<sup>20</sup>
2. All life within the River (which extends beyond the main stem) and surrounding environment benefit
3. All of the community (including industry and businesses) understand and are committed to caring for and protecting the River
4. Cultural connectivity<sup>21</sup> with the River is restored and enhanced
5. Access to the River to enable customary, sporting, recreational, and cultural opportunities is improved
6. All water and land resource policy, regulations and decision making frameworks across the catchment are consistent and fully aligned to achieve the Vision and Strategy, including RMA instruments, catchment based management approaches
7. All water and land management decisions are based on robust and comprehensive knowledge and understanding of the river system, including real time and long term data, sites of significance, social and cultural activities
8. Achieve net benefit to the environment
9. Increase the efficient use of resources and maximise resource recovery and contribution toward carbon neutrality and energy neutrality
10. Apply and maintain best practice to all three waters management and infrastructure which allows for the sustainable future growth of the Waikato region.

<sup>20</sup> In this DBC we have taken “restored and enhanced” to be one step further than the Te Ture Whaimana “restored and protected.”

<sup>21</sup> In this DBC we have taken “cultural connectivity” to encompass whakapapa, relationship, and metaphysical connectivity as well as physical connection.

## 4.5 Investment objectives

The Southern Metro DBC identifies five Investment Objectives aligned with the Best for River Objectives. The objectives respond to the Best for River outcomes sought, reflect wastewater specific issues in the Metro Area and are SMART (Specific, Measurable, Attainable, Relevant and Timebound). The objectives were refined through the development of the Southern Metro DBC in consultation with project partners and the Project Governance Group.

The five Investment Objectives remain relevant to the Northern Metro DBC and, to provide consistency between the two processes, have been adopted directly.

### **Waikato Metro Wastewater DBC: Investment Objectives**

Investment Objective One: Before 2050 municipal wastewater discharges are no longer impacting on the ability of people to swim and collect Kai from the river and connected waterways thereby contributing to the restoration and protection of the health and wellbeing of the river

Investment Objective Two: The quality and extent of aquatic and terrestrial habitat and biodiversity in and around water bodies is enhanced through the reduction of wastewater treatment and discharge impacts before 2050

Investment Objective Three: Wastewater treatment solutions contribute to restoring and enhancing cultural connectivity with the river so that before 2050 Marae, Hapuu and Iwi access to the river and other sites of significance for cultural and customary practice within the metro spatial area are no longer impeded by wastewater treatment solutions

Investment Objective Four: Maximise efficient use of resources and resource recovery to contribute to net zero greenhouse gas related emissions from wastewater treatment systems before 2050

Investment Objective Five: The wastewater solution provides sufficient capacity to ensure sustainable growth in the metro spatial area in accordance with growth projection assumptions for the next 100 years

## 4.6 Key Performance Indicators and measures

The following KPIs have been adapted from the Southern Metro DBC and are identified as the best measures to reflect the Investment Objectives. These KPIs use the most up-to-date sources and real time data to ensure baselines and targets are accurate and quantifiable. There are some minor changes from the Southern Metro DBC to reflect the slightly different opportunities associated with Pukete and Ngaaruawaahia.

Changes to the KPIs from the Southern Metro DBC are shown in red underline/strikethrough. Where the data source is highlighted in grey, further work is required to develop the KPI measure.

Each KPI will be assigned an owner who will have responsibility for measuring and reporting on the KPI. These owners are set out in the Benefits Management section in the Management Case. KPI related to discharge quality will be managed by the WWTP operators, other monitoring and surveys will be managed by the Project Manager, and KPIs that relate to overall project scope (such as flexibility) will be managed by the Project Partners and Project Governance.

KPI	Data Source
<b>Objective 1: Before 2050 municipal wastewater discharges are no longer impacting on the ability of people to swim and collect Kai from the river and connected waterways thereby contributing to the restoration and protection of the health and wellbeing of the river.</b>	
KPI 1.1: Public health risks caused by the concentration of E.coli and pathogens within the WWTP discharges	Concentration of E. coli in treated wastewater discharges (compliance monitoring data).
KPI 1.2 Total nitrogen load impacting the river and connected waterways from WWTPs	Mass load (kg/day) of total nitrogen and total phosphorus in treated wastewater discharges (compliance monitoring data).
KPI 1.3: Total phosphorous load impacting the river and connected waterways from WWTPs	
KPI 1.4: Proportion of plants which are compliant against discharge quality consent conditions	Concentrations of contaminants in the Waikato River are already monitored on a monthly basis by Waikato Regional Council. WWTP compliance monitoring data sourced from local/regional councils.
Reason for changes: It is the mass load of nutrients that is more important in this context.	
<b>Objective 2: The quality and extent of aquatic and terrestrial habitat and biodiversity in and around water bodies is enhanced through the reduction of wastewater treatment and discharge impacts before 2050</b>	
KPI 2.1: Amount of algal biomass in the Waikato River as measured by chlorophyll a concentration attributable to treated wastewater discharges	Concentrations of chlorophyll a are monitored in the Waikato River by Waikato Regional Council.
KPI 2.2: Health and abundance of mahinga kai species	Surveys of mahinga kai in terms of species health, variety, and number. Sites for this will need to be determined based on sites which may be affected most by the current wastewater discharges.
KPI 2.3: Number and variety of terrestrial species at specific locations within the metro area	Surveys of terrestrial species with regards to their health, variety, and number to be developed at sites which are identified for rehabilitation.
KPI 2.4: Area coverage of native riparian and wetland vegetation surrounding water bodies and within the catchment area	Native vegetation coverage (hectares) across the metro area can be determined using GIS 2018 data sources for land cover. Coverage of wetland vegetation can also be determined using this data.  More specific data could be captured in relation to each WWTP and restoration planting etc. associated with those sites.
Reason for changes: Riparian and wetland vegetation are different and specific measurement of both is considered important.	
Further work required: Selection of sites for monitoring of mahinga kai should be informed by the Cultural Values Assessment to ensure maatauranga principles are considered,	

KPI	Data Source
<b>Objective 3: Wastewater treatment solutions contribute to restoring and enhancing cultural connectivity with the river so that before 2050 Marae, Hapuu and Iwi access to the river and other sites of significance for cultural and customary practice within the metro spatial area are no longer impeded by waste water treatment solutions</b>	
KPI 3.1: Maatauranga Maaori Cultural Health Index / Cultural impact assessment	TBD through engagement with iwi and hapuu.
KPI 3.2: Ability to physically and culturally connect to the river including: number and quality of access points, quality of cultural and recreational access and opportunities, and ability to use land (including Maori-owned land) for commercial and residential purposes	Waikato Fishing and Game website. Hamilton City River Plan. Property titles/district plan requirements (buffer zones). Other sources to be determined. Means of assessing quality of access points to be determined through engagement with iwi and hapuu and key recreational groups.
Reason for changes: The “number and quality of access points” is not strongly influenced by WWTP discharges. However, the WWTPs and discharges do impact on physical and cultural connections to the river and the ability to use the river and surrounding land for cultural and recreational purposes. Further work required: Development of a Maatauranga Maaori Cultural Health Index and completion of Cultural impact assessment	
<b>Objective 4: Maximise efficient use of resources and resource recovery to contribute to net zero greenhouse gas related emissions from wastewater treatment systems before 2050</b>	
KPI 4.1: Water reuse, water allocations and accounting Volume of wastewater reuse as a percentage of discharge volume	Currently no plant in the metro area is capable of re-using water. Data sources for capturing this will need to be established as technology is advanced for water re-use.
KPI 4.2: Decreasing greenhouse gas carbon footprint (capital and operational) / energy requirements of plant and plant systems (i.e., pumps) as a proportion of wastewater treated	Average energy consumption per plant (including pumping stations) sourced from councils. Greenhouse gas accounting systems will need to be developed in the future.
KPI 4.3: Proportion of resources biosolids that are able to be recovered for beneficial reuse safely reused for beneficial purposes	Pukete biosolids are currently vermicomposted and used as a soil conditioner. Data sources for capturing beneficial reuse will need to be established as technology is advanced.
Reason for changes: KPI 4.1 is targeting water re-use and should be more specific. KPI 4.2 should refer to all greenhouse gases (not just carbon) and should specifically include emissions from capital projects and operational activities. Linking to the volume of wastewater treated avoids the KPI being impacted by changes in wastewater volume.	
<b>Objective 5: The wastewater solution provides sufficient capacity to ensure sustainable growth in the metro spatial area in accordance with growth projection assumptions for the next 100 years</b>	
KPI 5.1: Flexibility and adaptability of solution to be staged / developed over time to meet the needs of the community	Measures can be taken by assessing the staging attributes of the option and ability to adapt the solution to changing populations and land use.
KPI 5.2: Proportion of Industrial areas which are serviced by municipal plants sustainably	Baseline the industrial areas in the Metro Area which are currently serviced by municipal plants (and those serviced by private facilities).
KPI: 5.3 Proportion of residents in the metro area serviced by municipal treatment plants sustainably	Baseline the number of households in the Metro Area which are serviced by municipal plants.
Reason for change: No changes proposed	

## Baselines and Targets

Baseline measures have been collated using the most recent available data. Water quality targets will need to be developed in line with Plan Change 1 commitments. Where the data source is highlighted in grey, further work is required to develop the measures

## 4.7 Constraints and dependencies

The following constraints and dependencies will place certain limitations on the types of solutions identified for wastewater treatment in the metro area.

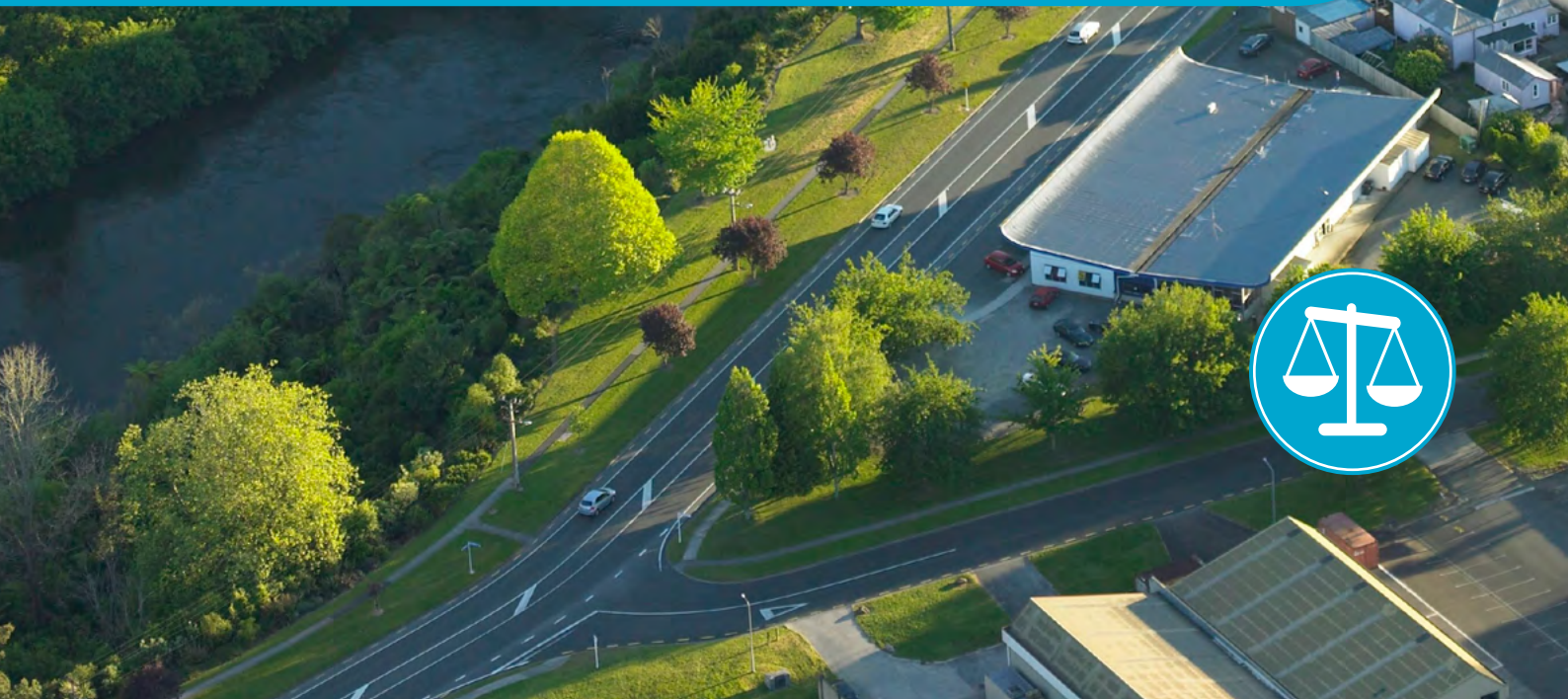
**Table 3: Key constraints and dependencies**

Constraint / dependency	Description
Funding limitations	<p>Currently each council (HCC and WDC) has budgeted LTP funding for wastewater treatment infrastructure and upgrades. Based on high level cost estimates undertaken in previous investigations, it is expected a preferred solution may require additional funding sources or a reallocation of funds.</p> <p>The current LTPs include \$172M for upgrades at the Pukete WWTP and \$53M at the Ngaaruawaahia WWTP.</p> <p>Funding limitations and constraints will be further investigated within the Financial Case and may depend on approvals though the next LTP cycle.</p>
Population growth	<p>As identified in Problem 4, the current wastewater treatment network has a limited capacity. Growth and development in the Metro Area will mean upgrades and expansions at existing plants will be necessary regardless of the outcomes of this project. Of note, upgrades are required at the Pukete WWTP (including the construction of a fourth primary sedimentation tank) to meet current population growth.</p> <p>The DBC will seek to develop an option to meet these expectations, but options will still need to be flexible to ensure the network is resilient enough to respond to changes.</p> <p>The timing of various upgrades to both treatment and conveyance infrastructure depends on the timing of population growth and the actual settlement patterns.</p>
Land use	<p>Current and future land uses across the Metro Area will shape where potential new infrastructure should be located. More detailed constraints mapping exercises will be undertaken to determine ideal locations for new infrastructure.</p>
Existing utilities	<p>Existing utilities, such as the power grid network, road network and existing reticulation network will be key constraints when determining a potential location for new infrastructure. New conveyance infrastructure needs to tie-in to existing infrastructure or that infrastructure relocated (which can be costly or sometimes not feasible) and typically follows the road network (to avoid complications associated with easements or land acquisition).</p> <p>More detailed constraints mapping exercises will be undertaken to determine ideal locations for new infrastructure.</p>
Geographical constraints	<p>Geographical constraints include soil types and topographical constraints (especially in relation to potential for discharge to land and in the context of conveyancing). Energy savings can be achieved if the reticulation network can utilise gravity where possible.</p> <p>More detailed constraints mapping exercises will be undertaken to determine ideal locations for new infrastructure.</p>
Environmental constraints	<p>Environmental features can constrain new utilities – for instance, new infrastructure may have to be diverted around wetlands or other significant ecological areas. The potential impacts of overflows or accidental discharges from existing and new infrastructure on nearby sensitive environments must be considered.</p>
Technology constraints	<p>Currently Pukekohe WWTP represents the best available treatment technology (for liquid streams) in New Zealand, expected to achieve an effluent total nitrogen of 3mg/L – this constrains the level of treatment able to be provided. New solid stream and energy efficient technologies will be further investigated as part of this Project. This may go beyond what is currently seen in New Zealand but has been demonstrated in other countries.</p>
Cross-boundary relationships	<p>Effective implementation of cross-boundary wastewater solutions and the success of this DBC relies on the relevant parties working together to achieve the project objectives.</p>



# Economic Case

He Keehi Whakarauora – he tirohanga whaanui



## 5. Introduction

The Economic Case builds on the Strategic Case and involves investigating options available to address the problems and Investment Objectives identified in the Strategic Case.

The Economic Case adopts the long list assessment and short list of options developed in the Southern Metro DBC (as summarised in Section 8). The Project Objectives and KPIs developed in the Strategic Case are used along with critical success factors, maatauranga Maaori considerations, and cost estimates to assess the short list options. The aim is to identify the option that delivers best value for the river considering wider social and environmental benefits and effects.

This report provides an overview of the preferred option, the approach to the development and assessment of options and the refinement and details of the preferred option.

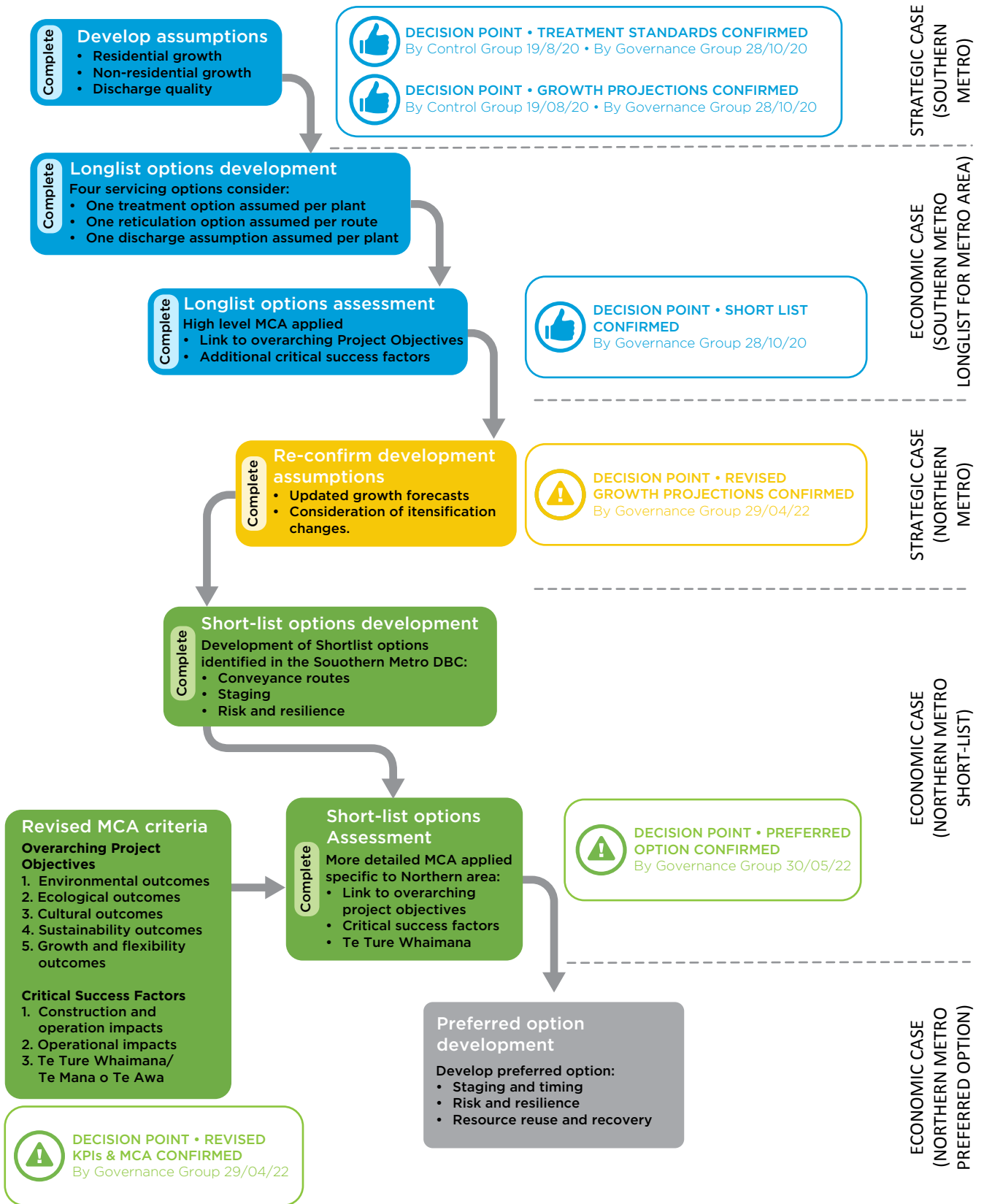
## 6. Options development and assessment methodology

The options evaluation process is set out in Figure 19 and each step explored further in the following sections. The process has been characterised by collaborative decision points where key stakeholders (including HCC, WDC, Waipā DC, and iwi and hapuu representatives) provided input into the development of the DBC. Figure 20 then shows key decision points during the process.

The options development and assessment process has been a collaborative effort between the project team and project partners (including HCC, WDC, Waipā DC, and iwi and hapuu representatives). A series of technical workshops and maatauranga Maaori hui were held with relevant parties to seek input to the options description and then options assessment. The technical MCA and maatauranga Maaori assessments were carried out in parallel and are given equal weighting in consideration of the preferred option.

A record of these meetings is provided in the *Multi-Criteria Assessment Workshop Record* in **Appendix B**. The outputs of these meetings were an assessment process, a short list, and a preferred option and are described below.

Figure 19: Options evaluation process



# 7. Key assumptions

## 7.1 Population growth

Hamilton City is the largest population centre in the sub-region with a 2021 population of around 181,500 people<sup>22</sup>. It is the fourth most populous and one of the fastest growing cities in New Zealand. Projections indicate this growth will continue for the foreseeable future.

The Waikato district has a 2021 population of around 84,300 people<sup>23</sup>. The district is projected to continue to experience strong growth, particularly in the main urban areas.

Both residential and non-residential population and growth assumptions are fundamental inputs to the DBC. They are used to determine indicative scale, timing and cost of conveyance systems and wastewater treatment plants included in the short-list options.

The growth assumptions made in the Southern DBC in relation to the full Metro Area have been used as the basis for the assumptions for the Northern Metro DBC. Those assumptions are detailed in a memorandum titled: *Growth Assumptions for Waikato Metro Wastewater DBC* (10 December 2020)<sup>24</sup>.

While those assumptions remain broadly relevant for the Northern Metro DBC, some adjustments have been made to reflect recent refinement of Metro Spatial Plan population projections by Future Proof.

The growth assumptions include:

- Existing residential and non-residential
- Infill development, including that outlined in the Metro Spatial Plan
- Planned new residential greenfield development (including Taupiri, Ngaaruawaahia, Hopuhopu, Te Kowhai, and Hamilton)
- Planned additional commercial industrial development (including Taupiri, Ngaaruawaahia, Hopuhopu, Te Kowhai, Horotiu, and Hamilton)
- Additional wet industry at Horotiu, Te Rapa North and Ruakura plus new trade waste in Hamilton

The total growth assumptions (combining residential and non-residential growth) as shown in Table 4 and Figure 21. The full population assumptions adopted for the Northern Metro DBC are set out in Section 2.1 of the Short-list Technical Report in Appendix A.

**Table 4: Growth assumption in Population Equivalents**

Area	2021	2031	2041	2051	2061	Ultimate
Taupiri	632	2,473	4,344	6,215	6,215	7,950
Ngaaruawaahia / Hopuhopu	5,700	9,008	11,637	13,478	14,952	23,143
Horotiu	1,309	3,135	6,538	6,548	6,576	6,930
Te Kowhai	1,012	1,677	2,017	2,248	2,848	4,250
Hamilton	233,415	276,497	319,308	360,693	397,908	543,338

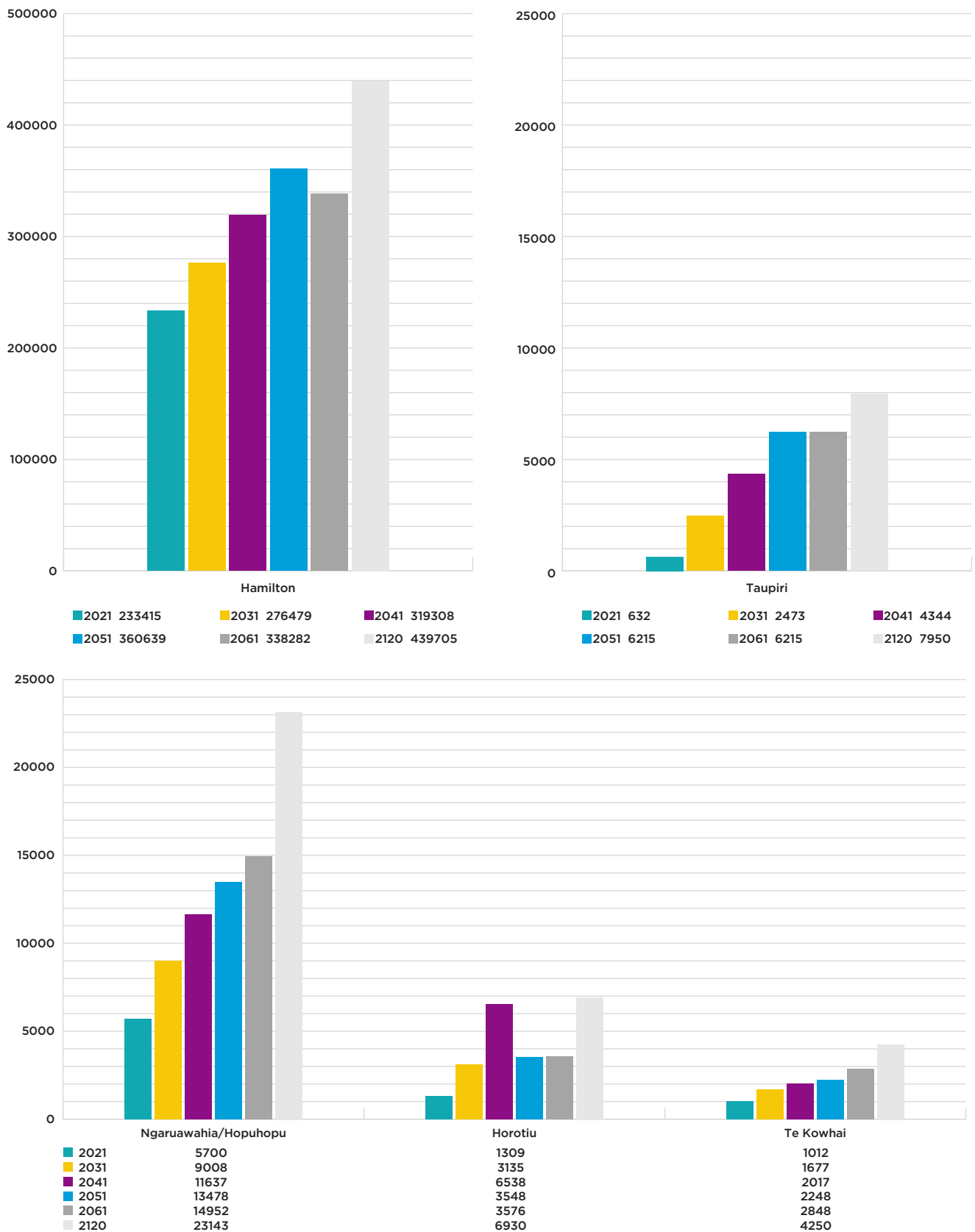
<sup>22</sup> NIDEA, 2012. Population (Low, Medium and High) 2018 projection outputs.

<sup>23</sup> NIDEA, 2021. Population (Low, Medium and High) 2018 projection outputs.

<sup>24</sup> Adopted at 28 October 2020 governance meeting

Figure 21: Growth assumption in Population Equivalents

Assumed population growth



Recent changes to the National Policy Statement for Urban Development, the Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021, and Hamilton City's proposed Plan Change 12 provide for higher levels of intensification than may have been allowed previously. The Metro Spatial Plan projections do not account for potential increased demand arising from these changes. However, the use of population assumptions for the Northern Metro DBC based on the 2021 high forecasts with an extra allowance for additional infill (as per the Southern Metro DBC assumptions) should largely account for this potential population growth.

In addition, the assumptions provide generous additional wet industrial flow allowances that double the total industry allowance compared to current state. Intensification is more likely to affect local network pipes and pump stations at peak wet weather flows than the larger transfer pump stations or the treatment plants being considered and costed in this DBC.

Regardless, sensitivity testing has been undertaken in the Management Case to understand the potential impact of, and possible responses to, different combinations of growth including answering the following:

- Is there a significant tipping point for Pukete WWTP post-MBR conversion (i.e., What are the triggers for additional upgrades and expansion?)
- What happens if development occurs faster or in different locations to those assumed? Does this impact on proposed staging? This includes Southern Links and the HT1 future growth area of the northeast of Hamilton being developed earlier than anticipated and/or additional infill and intensification within existing suburbs and the Hamilton CBD.
- What is the impact of diverting the Hamilton south catchment to the new Southern WWTP and, conversely, is there a trigger where it would be more effective to divert flows to the Southern WWTP rather than undertake the next phase of upgrades at Pukete?

The population assumptions and sensitivity tests provide sufficient headroom to account for additional intensification and growth well beyond current high population growth projections.

## 7.2 Quality of discharge

Assumptions have been made on the quality of discharge for the WWTPs. The proposed loading (based on population assumptions) and treated wastewater quality targets are used to size and cost the treatment processes included in the short-list options.

This DBC largely adopts the treatment assumptions made for the Southern DBC. Those assumptions are detailed in memorandum titled: Wastewater Treatment Assumptions for Waikato Metro Wastewater DBC (14 August 2020)<sup>25</sup>. The full discharge quality assumptions are documented in Section 2.2 of the Short-list Technical Report in Appendix A and summarised here.

### 7.2.1 Liquid stream discharge standards

In order to give effect to Te Ture Whaimana and other national and regional planning instruments, the DBC adopts a minimum discharge standard (to be met by 2031) of:

- Total nitrogen: <4mg/L (annual mean)
- Total phosphorus: <0.5mg/L (annual mean)
- E. coli: <14 cfu/100ml (annual 95th percentile)

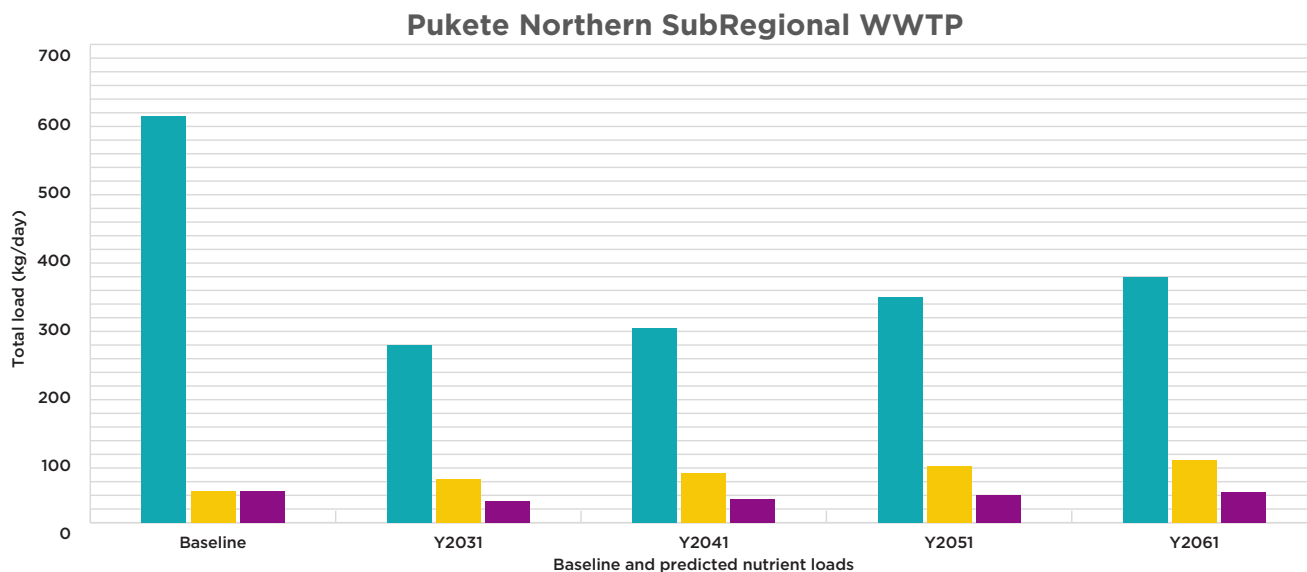
These discharge standards are derived from the Pukekohe WWTP, which has a very high level of treatment (at the limit of operating technology currently). Compared to the Southern Metro DBC, the total phosphorus concentration is slightly stricter (0.5 mg/L compared to 1 mg/L), recognising the relatively low baseline phosphorus mass load discharges for the Pukete and Ngaaruawaahia WWTPs. The total nitrogen and E. coli limits are the same as those proposed in the Southern Metro DBC.

Whilst the nutrient concentrations noted above are useful for design purposes, it is expected that those nitrogen and phosphorus concentrations will be converted into mass loads (kg/day) to be consistent with other discharge consents for the Waikato River. It is also possible that different summer and winter limits will apply, however these more detailed matters will be the subject of future resource consent processes. It is also expected that future consent process will assess and manage more typical contaminants (such as Total Suspended Solids and Biochemical Oxygen Demand) through median and upper percentile limit concentration standards.

The new discharge standards will result in a significant reduction in nitrogen and phosphorus load to the Waikato River compared with the baseline. Population growth will offset some of this reduction over time but there would still be a demonstratable improvement over the baseline in 2061 as shown in Figure 22, consistent with achieving betterment. A detailed assessment of the degree to which the proposed discharge gives effect to Te Ture Whaimana and Plan Change 1 will need to be undertaken during development of consent applications. This would include identification of whether any offset activities are required. The consent application should also include consideration of the level of effect based on the expected discharge volume and mass load at the end of the consent term (ie the maximum level of effect anticipated).

<sup>25</sup> Adopted at the 28 October 2020 governance meeting

**Figure 22: Predicted improvement in nitrogen and phosphorus nutrient loads following implementation of new discharge standards.**



This DBC also proposes to enable the reuse of treated wastewater as discussed in section 7.3.3. This is assumed to require treatment to equivalent of the Australian (Queensland, Victoria state) Class A/A+ standard as discussed in Section 2.2 of the Short-list Technical Report in Appendix A. T

Treatment of wastewater to a potable reuse standard has been excluded. Potable water reuse has public health implications, and such direct reuse would require legislative change within New Zealand's Drinking Water Regulatory Framework.

## 7.2.2 Solid stream management

A graduated scale of solids management has been adopted based on population equivalents. This would include:

- Ngaaruawaahia: No energy recovery, dewatering to 19% dry solids to allow 'last resort' temporary or permanent landfill disposal
- Pukete: Anaerobic digestion with energy recovery (e.g. co-generation engine producing heat and electrical energy, side stream digestate treatment, more advanced form of solids destruction suitable when 150,000 PE is exceeded.)

## 7.2.3 Discharges to air

Proposed provisions for atmospheric emissions are reasonably general. The costs of such initiatives are not able to be differentiated at the Class 5 estimating level and will not drive the options assessment. However, it is assumed that best practice will be implemented, including:

- **Noise:** Levels to be safe for operators and to comply with District Plan noise limits at the site boundary
- **Odour:** No objectionable odour beyond the site boundary
- **Greenhouse gas emissions:** Process units and equipment to be specified and configured to minimise the release of fugitive greenhouse gas emissions with a particular focus on minimising nitrous oxide emissions associated with nitrogen removal processes.<sup>26</sup>
- **Life cycle emissions:** Emissions will be considered to optimise life cycle emissions and, ultimately, seek zero carbon aspirations. This will be a key driver for initiatives including on-site emissions minimisation (Scope 1), energy neutral processes (Scope 2), and minimisation of emissions associated with off-site residuals management (Scope 3).

<sup>26</sup> Nitrous oxide (N<sub>2</sub>O) appears to be the key operational greenhouse gas emission source from WWTPs that remove a large amount of nitrogen. These WWTPs in turn tend to be the highest emission source for the entities that own and operate them. The science around estimating N<sub>2</sub>O release from any given plant is very imprecise and actual measurements are required to better define emissions.

## 7.3 Form of discharge

For the purpose of short-list options development and assessment, this DBC assumes a continuation of the current discharges to the river from the Ngaaruawaahia and Pukete WWTPs. Because there is no feasible (at this stage) solution that would see all of the treated wastewater discharged to land, the DBC needs to base the treatment assumptions on some portion being discharged to water. Therefore, the treatment requirements are the same regardless of whether some portion of the discharge can be discharged to land.

A high-level assessment of potential discharge options is provided in Section 4.6 of *Short-list Technical Report* in **Appendix A** and includes discharge to water, discharge to land and a variety of re-use options as described below. Consistent with the approach taken for the Southern Metro DBC, more detailed work will be undertaken to develop and evaluate potential discharge options at the resource consent stage.

### 7.3.1 Discharge to water

A discharge of treated wastewater to water could take several forms:

- Continued use of the diffuser structures (noting that neither of the existing diffuser structures are adequately sized to meet the anticipated flow)
- Indirect discharge via rock passage
- Discharge via constructed or restored wetland

This DBC assumes the form and operation of any discharge structure would be co-designed with iwi partners with the aim of reducing or removing structures in the bed or banks of the river and improving the cultural and spiritual purification of the discharge.

### 7.3.2 Discharge to land

Land discharge options remain as an opportunity part of the treated wastewater discharge but were not assessed in detail as part of this DBC. This is due to the significant complications associated with discharges to land that require further investigation before opportunities surrounding a discharge to land can be adequately considered.

These include:

- **Land capacity:** Discharges to land require large areas of well-drained soils. The minimum land area required for discharge of treated wastewater is shown below. An additional allowance would be required for buffers to neighbouring land uses and areas that cannot be irrigated (such as tracks and drains). The land requirement increases as soils and topography become less ideal. Even with large areas of land, it would be very difficult to avoid the need for some discharge to the river during the wet months and following heavy rainfall at other times of year. Such contingency discharges to the river would be necessary to avoid ponding and to maintain the soil structure and long-term sustainability of the discharge to land.

Land area required	2041	2061
Pukete	4,370 ha	4,630 ha
Ngaaruawaahia	330 ha	410 ha

- **Land location:** Finding large areas of suitable land is challenging. While land does not need to be contiguous to be suitable for wastewater discharge, the irrigation land would ideally be within a defined area to minimise pipework.
- **Land management:** Irrigation of treated wastewater to land can occur as an activity ancillary to an agricultural activity (e.g., irrigation of a dairy farm or orchard) or land can be converted such that the wastewater discharge is the primary activity (e.g., cut and carry operation). There are a range of management regimes that could be implemented but there is risk of conflict between landowner objectives and the WWTP operator's objectives.
- **Groundwater and soil quality:** Discharge of wastewater to land can impact groundwater quality and soil health – both as a result of high loading leaching directly to groundwater and as a result of long-term accumulation of nitrogen and phosphorus in soils and subsequent leaching.

- **Impacts on waterbodies:** Discharges to land can result in impacts on waterbodies, both as a result of nutrients moving through groundwater systems to surface water and as a result of overland flow in the event that soils become saturated.
- **Displacement of other land uses:** Discharges to land may displace other land uses. Ongoing efforts to reduce nutrient leaching to groundwater across the region mean that nitrogen and phosphorus application rate limitations may not allow stock and wastewater discharges to occur on the same land.
- **Acceptability** of irrigation of human waste onto dairy farm or horticultural farms: Cultural, quality and perception concerns.

Further investigations are underway to allow a subsequent decision to be made about the appropriateness of land disposal as an option for some of the discharge volume. These factors will be decided as part of the next phase of implementation via the Consenting Strategy as outlined in the Management Case. The decision whether to discharge a portion of the treated wastewater to land has limited influence on the location and method of treatment considered through the optioneering process therefore deferral to the next phase of implementation is considered appropriate.

The remainder of this DBC assumes that treated wastewater will be primarily discharged to the Waikato River but that opportunities to divert some of the discharge to land will continue to be explored. This assumption was tested with iwi partners who confirmed this is an appropriate assumption (especially given the very large area of land that would be required and the impact of displacing other land uses) so long as discharge to land options are investigated as an opportunity during the upcoming resource consenting project, leading to the Puketete consent expiry in 2027. Alternative discharge locations are considered at a high-level in the MCA process under re-use.

While there have been challenges associated with discharges to water in other parts of the country, the context here is different. A complete discharge to land from Puketete would require around 4,500ha of land (for reference, Hamilton City is around 11,000ha) in an area known for highly productive soils. Experience in the Waikato shows combining wastewater discharge to land with other agricultural activities can impact on the sustainable use of that soil resource and large scale wastewater discharges would displace other, more productive land uses.

Appendix A to the Short List Options report provides a detailed assessment of potential discharge options. Because there is no feasible (at this stage) solution that would see all of the treated wastewater discharged to land, the DBC needs to base the treatment assumptions on some portion being discharged to water.

Further, the opportunity to discharge to land is expected to impact all options and consequently, the opportunity to discharge to land is not considered to impact selection of the preferred option.

### 7.3.3 Re-use

There are a variety of re-use options for treated wastewater. Each option would have different treatment requirements:

- Potable water
- Industrial use
- Agricultural use (similar to discharge to land above)
- Other irrigation use (sports fields, golf courses, parks and reserves)

For the purposes of this DBC we have not evaluated the end use but have considered technologies that would render the treated wastewater suitable for reuse subject to standards for reuse having been set (refer treatment standards section for discussion on potable reuse standards).

Re-use options will be considered further during detailed design and consenting processes as well as on an on-going basis.

# 8. Long-list development and assessment

## 8.1 Long-list options development

Long-list options development was undertaken for the full Metro Area as part of the Southern Metro DBC and is set out in Section 3.2 of the Southern Metro DBC.

For completeness, Table 5 presents a high-level description of the long list options. While there are eight options, there are only two distinct options in relation to the Northern Metro Area:

Northern communities (including Te Kowhai and Ngaaruawaahia) serviced by Pukete WWTP (Options 2 and 3)

Northern communities (including Te Kowhai) serviced by Pukete WWTP, Ngaaruawaahia WWTP upgraded (Options 1 and 4)

The Southern Metro DBC also included a long list of discharge options including land discharge, discharge to water directly (pipe/diffuser) or indirectly (wetland/rock passage), and reuse.

**Table 5: Long list options for full Metro area as per Southern Metro DBC**

Option	Description
Option 1A (Do Minimum)	Existing plants upgraded. Two new facilities (near Hamilton Airport and Ohaupo). No provision for Fonterra Hautapu.
Option 1B	As per Option 1A with Fonterra Hautapu serviced by Cambridge WWTP.
Option 2A	Northern communities serviced by Pukete WWTP. Southern communities serviced by new southern centralised facility with Te Awamutu and Tauwhare Pa WWTPs continue as upgraded standalone plants. No provision for Fonterra Hautapu.
Option 2B	As per Option 2A with Fonterra Hautapu serviced by new southern facility.
Option 3A	Northern communities serviced by Pukete WWTP. Southern communities serviced by new southern centralised facility at the Cambridge site with Te Awamutu and Tauwhare Pa WWTPs to continue as upgraded standalone plants. No provision for Fonterra Hautapu.
Option 3B	As per Option 3A with Fonterra Hautapu serviced by new southern facility.
Option 4A	Northern communities serviced by Pukete (Hamilton and Te Kowhai) and Ngaaruawaahia. Southern communities serviced by two new facilities (near the Hamilton Airport and at the Cambridge site) with Te Awamutu and Tauwhare Pa WWTPs to continue as upgraded standalone plants. No provision for Fonterra Hautapu.
Option 4B	As per Option 4A with Fonterra Hautapu serviced by new Cambridge facility.

## 8.1 Long-list options assessment

Long-list options assessment was undertaken for the full Metro Area as part of the Southern Metro DBC and is set out in Section 3.3 of the Southern Metro DBC. For completeness, a high-level summary of the long-list options assessment process is provided below.

The long-list was subject to an Multi-Criteria Assessment (MCA) workshop attended by representatives and subject matter experts from Waikato DC, Waipā DC, HCC, Iwi and Waikato Regional Council. Subsequent to the assessments, Fonterra made a decision to progress with a new standalone WWTP at Hautapu; options including provision for Fonterra Hautapu in the municipal plants have been struck-through in Table 6 below.

**Table 6: Full Metro Area long list options ranking (unweighted)**

Rank	Option	Option description
1	Option 2A	Pukete WWTP, New Southern WWTP, Te Awamutu WWTP + Fonterra standalone
2	Option 3A	Pukete WWTP, Southern WWTP at Cambridge, Te Awamutu WWTP + Fonterra standalone
3	Option 2B	Pukete WWTP, New Southern WWTP including Fonterra, Te Awamutu WWTP
4	Option 1A	Upgrade all existing plants, new plants at Hamilton Airport and Ohaupo + Fonterra standalone
4	Option 4A	Upgrade Ngaaruawaahia, Pukete, Cambridge, Te Awamutu; new plant at Airport + Fonterra standalone
6	Option 3B	Pukete Plant, Southern WWTP at Cambridge including Fonterra, Te Awamutu WWTP
7	Option 1B	Upgrade all existing plants, new plants at Airport and Ohaupo. Includes servicing Fonterra at upgraded Cambridge WWTP
8	Option 4B	Upgrade Ngaaruawaahia, Pukete, Cambridge, Te Awamutu; new plant at Airport. Includes servicing Fonterra at upgraded Cambridge WWTP
9	Do Nothing	Operate all facilities as they are currently constructed with no additional capacity or treatment improvements.

Options 2A scored highest based on raw scores and remained the highest scoring option under all weighting scenarios tested in the Southern DBC.

For comparative purposes, it was agreed that further development of an option that contained aspects of the current servicing arrangements be carried through to the short-listing stage. Option 4A was considered more appropriate than Option 1A for this purpose.

Based on the long-list assessment, three options were taken forward to the short-list assessment:

Do nothing (for comparative purposes)

- Option 2A: Northern communities serviced by Pukete, southern communities serviced by a new WWTP and the Te Awamutu WWTP
- Option 4A: Northern communities serviced by Pukete and Ngaaruawaahia, southern communities serviced by a new WWTP, the Cambridge WWTP and the Te Awamutu WWTP

The short-list was confirmed by the Governance Group on 17 September 2020.

The Southern Metro DBC ultimately recommended a refinement of Option 4A as the preferred option for the Southern Metro Area but that the two short-listed options for the Northern Metro Area (ie conveying all flows to an upgraded Pukete WWTP or upgrading both Ngaaruawaahia and Pukete WWTPs) should be evaluated and a preferred option identified as part of the Northern Metro DBC.

# 9. Short-list options development

Building on the work undertaken for the Southern Metro DBC, two broad short-list options were identified for the Northern Metro area: conveying all wastewater to a centralised WWTP at Pukete (Option A) and retaining both the Ngaaruawaahia and Pukete WWTPs (Option B).

Option B has been broken into two conveyancing sub-options Option B1 with Te Kowhai, Horotiu and Taupiri conveyed to Ngaaruawaahia and Option B2 with Te Kowhai and Horotiu conveyed to Pukete and Taupiri conveyed to Ngaaruawaahia. A 'do minimum' Option C was also developed to provide a 'Do Minimum' baseline against which the benefits of the other options can be compared.

The short-list options were developed through engagement with the project partners including HCC and WDC technical staff and iwi with refinements made following technical workshops and hui. Inputs included:

- Preferences for siting of pump stations and pipeline routes
- Inclusion of adequate system resilience provisions, including back-up generators for pump stations and emergency storage
- Use of twin mains where possible to reduce septicity of sewage and provide resilience
- Consideration of conveyance projects already committed in Ngaaruawaahia
- Facilitation of resource recovery including energy, phosphorus, and treated wastewater re-use at Pukete WWTP
- Pukete WWTP layout to incorporate site constraints and operational requirements

The Multi-Criteria Assessment Workshop Record in Appendix B includes detail of options development discussions.

The options are described in detail in Section 3.1 of the Short-list Technical Report in Appendix A and summarised here.

**Table 7: Northern Metro DBC Short-list development**

Option	Description	
Option A	Option A assumes all wastewater is conveyed to an upgraded Pukete WWTP (ie Option 2A from the Southern Metro DBC).	Options A, B1, and B2 include upgrades to a membrane bioreactor plant at Pukete (all options) and Ngaaruawaahia (options B1 and B2).
Option B1	Option B1 assumes both the Pukete and Ngaaruawaahia WWTPs are retained and upgraded based on their current catchments (ie Option 4A from the Southern Metro DBC)	Reuse and recovery of energy at Pukete and water and biosolids at both plants.
Option B2	Option B2 assumes both the Pukete and Ngaaruawaahia WWTPs are retained and upgraded but diverts Horotiu and Te Kowhai to Pukete.	These options also include a change to existing conveyance routes to cross the Waikato River at Horotiu instead of Ngaaruawaahia.
Option C: Do minimum	<p>In developing business cases, it is best practice to include either a 'do nothing' or a 'do minimum'.</p> <p>In theory, every option should be compared with the option of doing nothing at all, that is, the do-nothing option. However, for many activities it is not practical to do nothing at all. In this instance, we know the existing WWTPs cannot be re-consented under their existing discharge standards. A true do nothing is not considered consentable and would be a fanciful consideration therefore a 'do minimum' has been adopted.</p> <p>The 'do minimum' option developed represents the minimum level of change required to maintain a minimum level of service; that is, to obtain new consents (albeit with potential for significant challenge and significant offset mitigation) and to meet anticipated growth.</p> <p>The Pukete and Ngaaruawaahia WWTPs are retained and upgraded (albeit with a lower treatment standard than options A, B1 &amp; B2). Ngaaruawaahia is upgraded to an MBR (which is already accounted for in the WDC LTP) while Pukete remains a conventional activated sludge process (with optimisation). There are no changes to conveyance.<sup>27</sup></p>	

<sup>27</sup> As the DBC developed, it became apparent that the do minimum option as defined is a very high cost do minimum. The options were costed in parallel with the Maatauranga and MCA assessments - It wasn't known at the outset that the do minimum would be more expensive than the other options (albeit with a small cost differential as a percentage). Regardless, because of the need to achieve betterment under Te Ture Whaimana and Waikato Regional Plan Change 1, there is no low cost do-minimum in this situation.

## 9.1 Pukete WWTP upgrades

There are two options for upgrading the Pukete WWTP: A Membrane Bioreactor (MBR) plant and a conventional activated sludge process plant (with optimisation). The configuration for both options is shown on Figure 23.

### Membrane Bioreactor (MBR) plant (Options A, B1 & B2):

- Fits broadly within the existing site footprint as shown on Figure 24
- Treatment standard improved to:
  - Total nitrogen: <4 g/m<sup>3</sup>
  - Total phosphorus: <0.5 g/m<sup>3</sup>
  - E.coli: <14 CFU/100mL
- A new discharge point will be required. The form of this discharge would be developed through a co-design process and is unlikely to take the form of a direct-to-river discharge through a diffuser.
- Options for reuse and recovery of energy, water, biosolids, and nutrients (eg struvite).

### Conventional activated sludge process plant (Option C):

- Does not fit within the existing site footprint and would begin to encroach into buffer areas as shown on Figure 25
- Treatment standard improved to:
  - Total nitrogen: 7-8 g/m<sup>3</sup>
  - Total phosphorus: 0.5 g/m<sup>3</sup>
  - E.coli: 126 CFU/100mL
- A new discharge point will be required
- Limited opportunities for reuse and recovery of energy, water, biosolids, and nutrients.

Figure 23: Pukete WWTP process overview

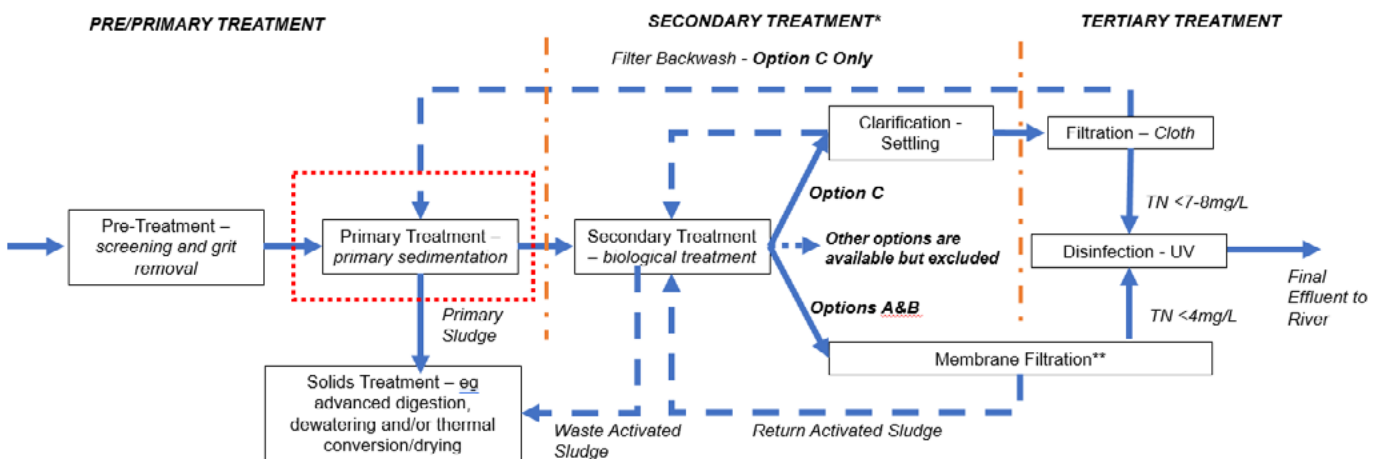


Figure 24: High-level concept layout for Pukete MBR plant

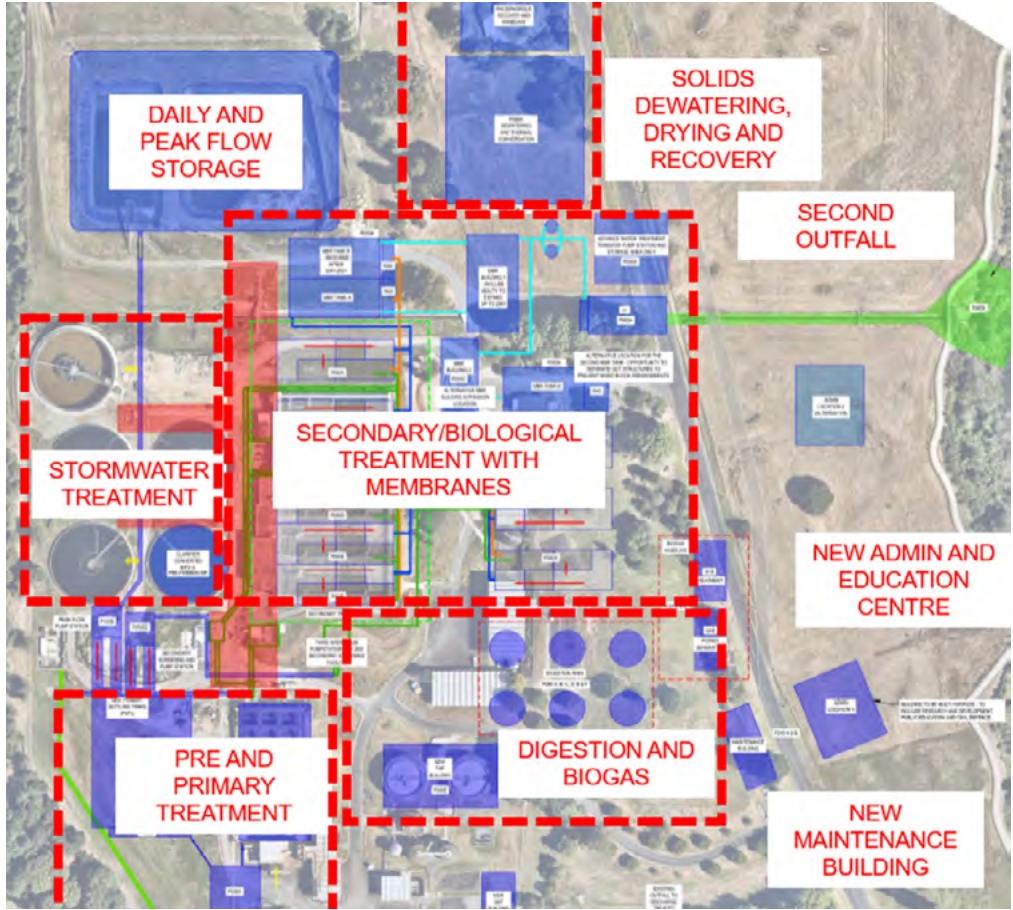
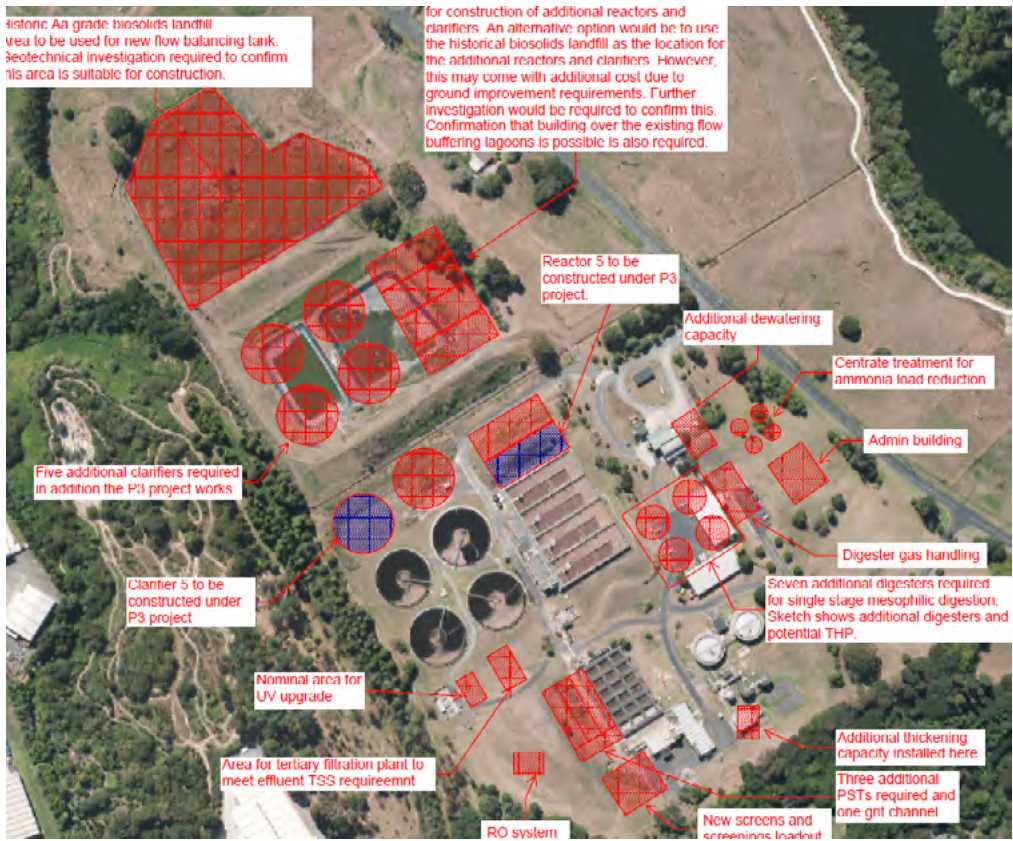


Figure 25: High-level concept layout for Pukete conventional upgrade



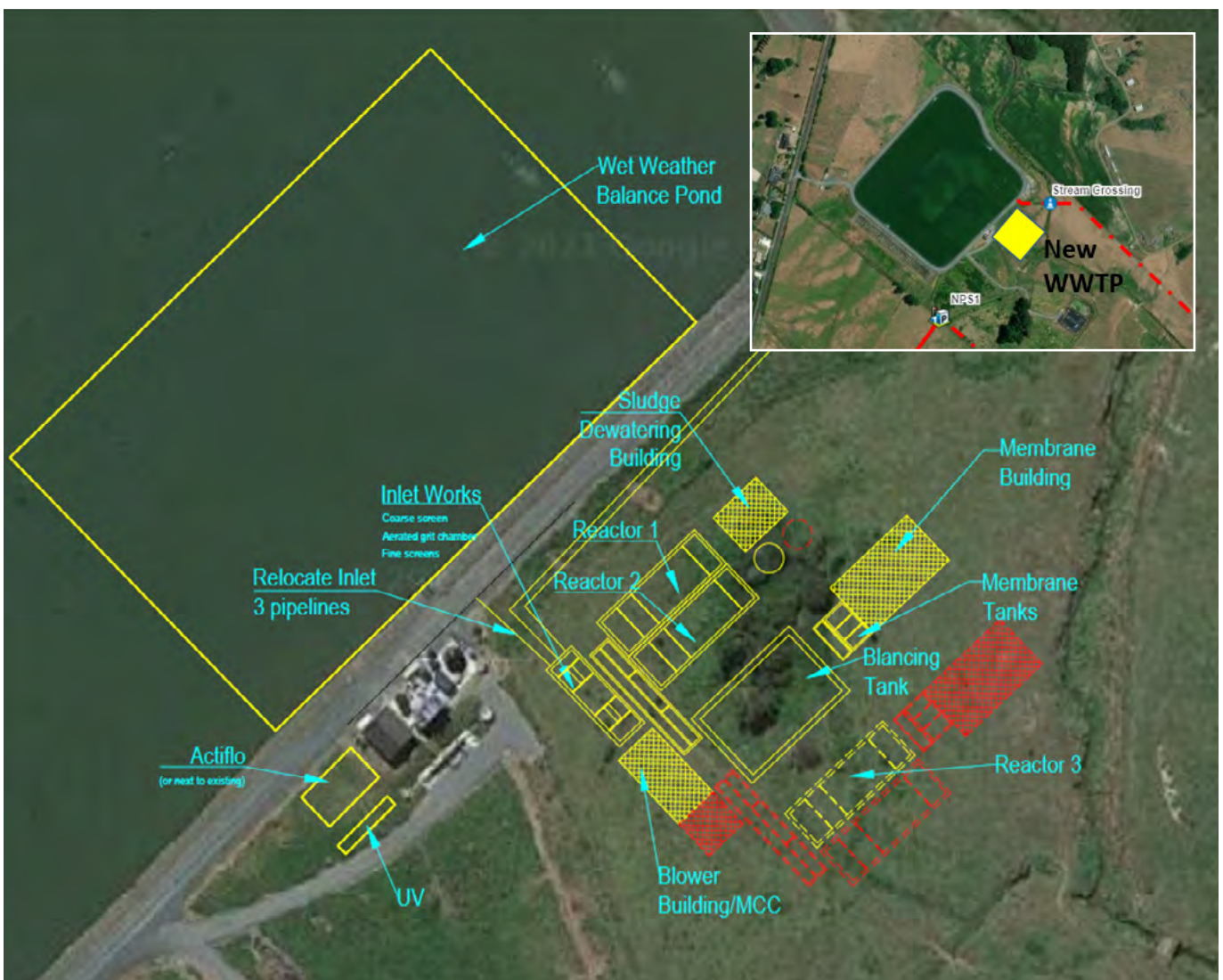
## 9.2 Ngaaruawaahia WWTP upgrade

Options B1 and B2 include an MBR upgrade at Ngaaruawaahia. This upgrade has been allowed for in the current Waikato District LTP, is reasonably likely to proceed, and therefore should form part of the do minimum option.

### Membrane Bioreactor (MBR) plant (Options B1, B2 & C):

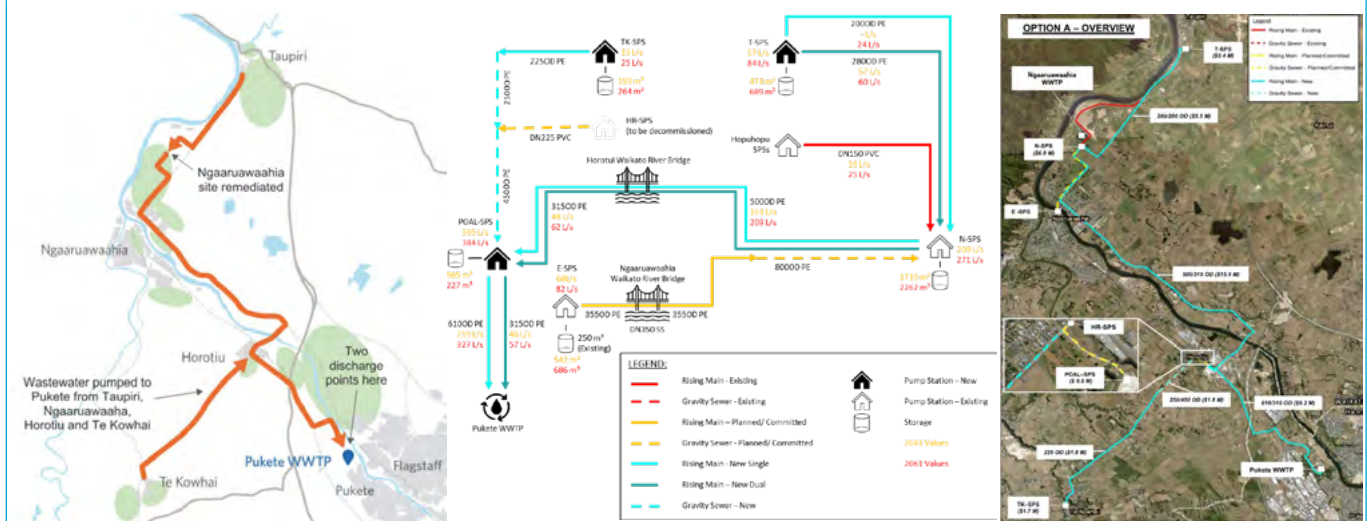
- Fits within the existing site footprint and a large area of the existing oxidation pond could be disestablished as shown on Figure 26
- Treatment standard improved to:
  - Total nitrogen: 4 g/m<sup>3</sup>
  - Total phosphorus: 0.2 g/m<sup>3</sup>
  - E.coli: 14 CFU/100mL
- Options for reuse of water and biosolids
- Limited opportunities for reuse and recovery of energy or nutrients (eg struvite).

Figure 26: Concept layout for Ngaaruawaahia MBR plant



Option A			
Treatment: Pukete (MBR)	Treatment standard: Total N: 4g/m <sup>3</sup> Total P: < 0.5 g/m <sup>3</sup>	Discharge: Two discharge points near Pukete	Delivery: Single operator

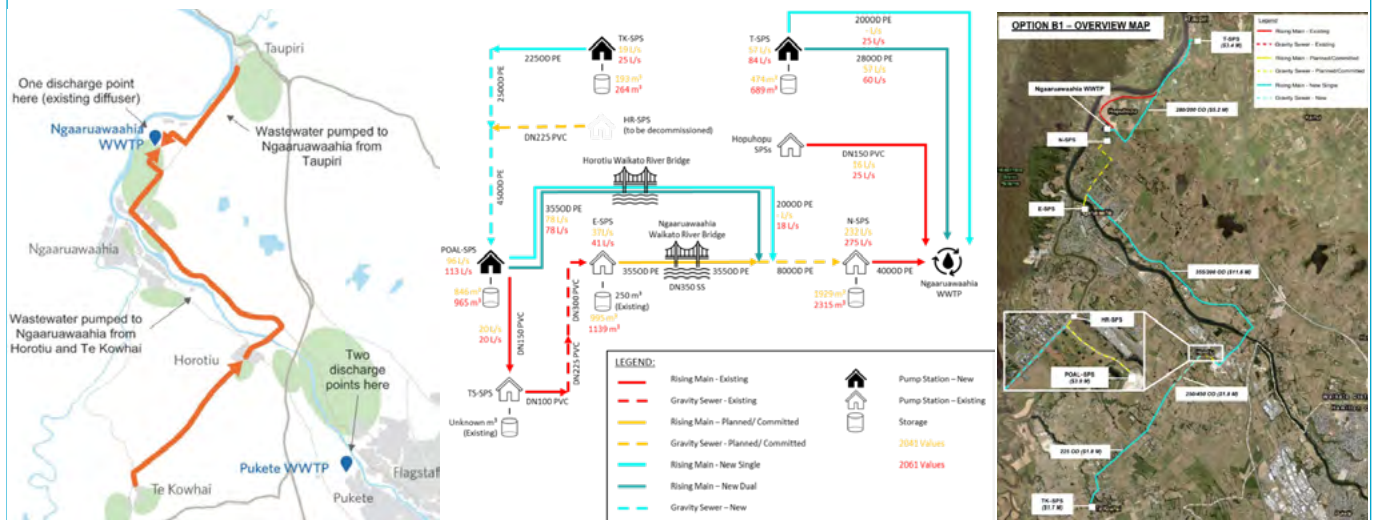
Conveyance: All WDC conveyed to Pukete, 3 new and 4 upgraded pump stations, 48km of new pipe



Reuse and recovery: Maximise resource or energy recovery opportunities (including digester and mini-hydro on outfall) Biosolids able to be reused subject to market with advanced treatment options	Footprint: Reduction in total footprint with option to provide remediation of Ngaaruwaahia site New pump stations at several sites.	Staging: Dual pipelines could be used for some of the routes e.g., Horotiu to Pukete WWTP Existing Taupiri pump stations and rising mains can be used until reach capacity
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Option B1			
Treatment: Pukete (MBR) Ngaaruawaahia (MBR)	Treatment standard: Total N: 4g/m <sup>3</sup> Total P: < 0.5 g/m <sup>3</sup> (Pukete) < 0.2 g/m <sup>3</sup> (Nga)	Discharge: Two discharge points near Pukete One at Ngaaruawaahia	Delivery: Single operator or multiple operations

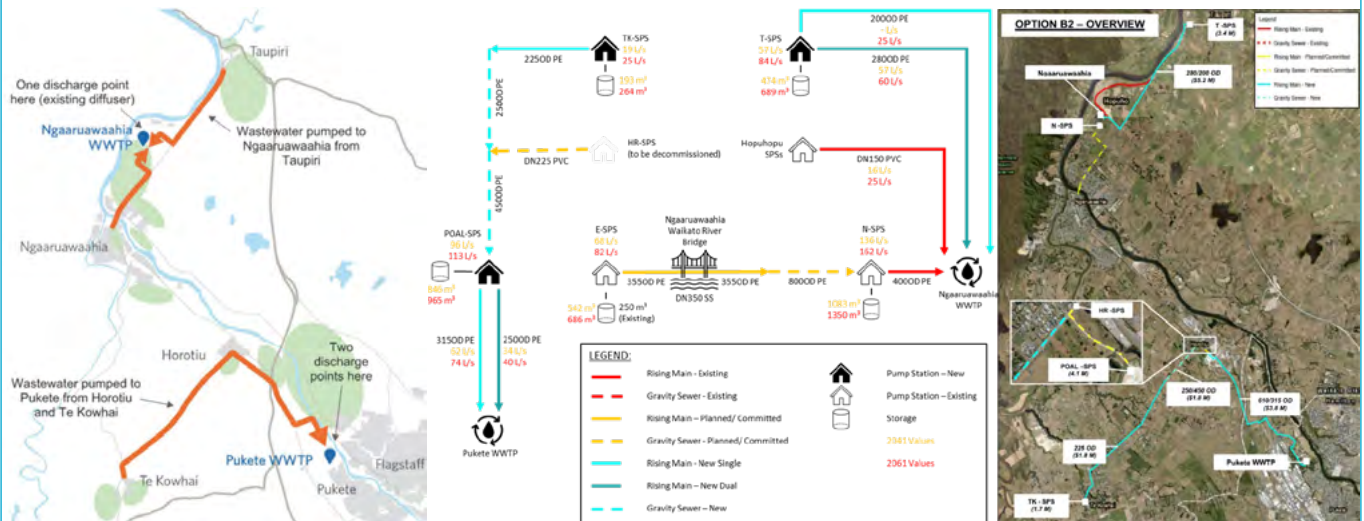
Conveyance: Te Kowhai, Horotiu and Taupiri conveyed to Ngaaruawaahia, 3 new and 2 upgraded pump stations, 33km of new pipe



Reuse and recovery: Water reuse but no/minimal resource or energy recovery at Ngaaruawaahia. Achieve ~90% of Option A recovery Biosolids able to be reused subject to market with advanced treatment options at Pukete only	Footprint: Maintain existing footprint at Pukete. Reduction in footprint at Ngaaruawaahia resulting from smaller plant and removal of most of the oxidation pond.	Staging: Install two reactors at Ngaaruawaahia to start with and then a third when flows are projected to increase beyond capacity. Existing Taupiri pump stations and rising mains can be used until reach capacity.
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Option B2			
Treatment: Pukete (MBR) Ngaaruawaahia (MBR)	Treatment standard: Total N: 4g/m <sup>3</sup> Total P: < 0.5 g/m <sup>3</sup> (Pukete) < 0.2 g/m <sup>3</sup> (Nga)	Discharge: Two discharge points near Pukete One at Ngaaruawaahia	Delivery: Single operator or multiple operations

Conveyance: Te Kowhai and Horotiu conveyed to Pukete, Taupiri conveyed to Ngaaruawaahia, 3 new and 2 upgraded pump stations, 26km of new pipe



Reuse and recovery: Water reuse but no/minimal resource or energy recovery at Ngaaruawaahia. Achieve ~90% of Option A recovery Biosolids able to be reused subject to market with advanced treatment options at Pukete only	Footprint: Maintain existing footprint at Pukete. Reduction in footprint at Ngaaruawaahia resulting from smaller plant and removal of most of the oxidation pond.	Staging: Install two reactors at Ngaaruawaahia. Existing Taupiri pump stations and rising mains can be used until reach capacity.
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# 10. Short-list options assessment

## 10.1 Maatauranga Maaori assessment

[The *Northern Metro Detailed Business Case: Mana Whenua Statement and Engagement Report* will be expected to accompany formal documentation]

Maatauranga Maaori considerations, provided by and in consultation with mana whenua, have equal importance to the MCA assessment and cost considerations in this business case. The *Northern Metro Detailed Business Case: Mana Whenua Statement and Engagement Report* that accompanies this DBC sets out those considerations in detail and should be read in conjunction with this **Economic Case** which summarises its findings.

### 10.1.1 Maatauranga considerations

Matters of significance in considering the preferred option include:

- Te Awa o Waikato: the preferred option should demonstrate several improvements, or forms of betterment, for the Waikato River. This includes environmental, cultural, physical and spiritual benefits.
- Water quality: Mana whenua are supportive of setting minimum discharge standards that will improve water quality for the Waikato River.
- Wastewater discharge: The proposed improvement in discharge standards and MBR treatment will improve water quality. Spiritual and cultural purification and ultimately the removal of mortuary waste would help ease the *mamae* (pain) but until such time that this happens, an expression or cultural and spiritual form of purification could be applied to the emerging preferred option.
- Discharge structures: There should be minimal structures in the bed and banks of the Waikato River.
- Taupiri Maunga: Option A provides numerous positive outcomes for Taupiri Maunga and its confluence with the Mangawhara and Waikato Rivers.
- Tribal assets: Option A enables the aspirations of the Iwi to utilise Treaty settlement-based assets at Hopuhopu for their intended purpose and provide for the development and growth of the Iwi.
- Conveyance: Option A and B1 require additional infrastructure to pump wastewater from Taupiri, Ngaaruawaahia and Te Kowhai to the Pukete WWTP. Mana whenua have noted that any new conveyance systems should avoid Maaori owned land (if any), sites of significance and marae owned assets.

## 10.1.2 Assessment against Te Ture Whaimana

The *Northern Metro Detailed Business Case: Mana Whenua Statement and Engagement Report* provides an assessment of the options against the objectives of Te Ture Whaimana.

**Table 8: Consideration of the options against the objectives of Te Ture Whaimana**

TE TURE WHAIMANA OBJECTIVES	OPTION 'A'	OPTION 'B1'	OPTION 'B2'
(a) The restoration and protection of the health and well-being of the Waikato River.	Based on feedback from Mana Whenua, this option achieves this objective.	Commentary below does not support this option.	Better regarded as phase 1 to achieving Option 'A'.
(b) The restoration and protection of the relationship of Waikato-Tainui with the Waikato River, including their economic, social, cultural, and spiritual relationships.	Better reduces the impact on Taupiri and River. Removes limitations on iwi assets.	Two WWTP, close proximity to Taupiri, three discharge points, no reuse or recovery.	Two WWTP, close proximity to Taupiri, three discharge points, no reuse or recovery.
(c) The restoration and protection of the relationship of Waikato River iwi according to their tikanga and kawa, with the Waikato River, including their economic, social, cultural, and spiritual relationships.	Not applicable as this objective refers to River Iwi as described under the Settlement Act.	Not applicable as this objective refers to River Iwi as described under the Settlement Act.	Not applicable as this objective refers to River Iwi as described under the Settlement Act.
(d) The restoration and protection of the relationship of the Waikato region's communities with the Waikato River including their economic, social, cultural and spiritual relationships.	Conveyance requirements may impact on private property owners.	Conveyance requirements may impact on private property owners.	Less infrastructure required.
(e) The integrated, holistic and coordinated approach to management of the natural, physical, cultural and historic resources of the Waikato River.	Better holistic outcomes if recommendations in this report are provided for.	Two WWTP, close proximity to Taupiri, three discharge points, no reuse or recovery.	Two WWTP, close proximity to Taupiri, three discharge points, no reuse or recovery.
(f) The adoption of a precautionary approach towards decision that may result in significant adverse effects on the Waikato River, and in particular those effects that threaten serious or irreversible damage to the Waikato River.	Risk weighted heavily on one WWTP if systems fail.	Continued operation of Ngaaruawaahia WWTP shares risk and load on Pukete WWTP.	Continued operation of Ngaaruawaahia WWTP shares risk and load on Pukete WWTP
(g) The recognition and avoidance of adverse cumulative effects, and potential cumulative effects, of activities undertaken both on the Waikato River and within its catchments on the health and wellbeing of the Waikato River.	Removes cumulative effects by focussing on one site at Pukete.	Cumulative effects continue and are spread over larger portion of the River.	Cumulative effects continue and are spread over larger portion of the River.
(h) The recognition that the Waikato River is degraded and should not be required to absorb further degradation as a result of human activities.	Water quality improvements are provided for all options.	Water quality improvements are provided for all options.	Water quality improvements are provided for all options.
(i) The protection and enhancement of significant sites, fisheries, flora and fauna.	Provides for restoration of Ngaaruawaahia WWTP site, less impact on Taupiri and River.	Water quality improvements only notable benefit for flora and fauna.	Water quality improvements only notable benefit for flora and fauna.
(j) The recognition that the strategic importance of the Waikato River to New Zealand's social, cultural, environmental and economic wellbeing is subject to the restoration and protection of the health and wellbeing of the Waikato River.	All options are subject to 'best for river' approach. This option provides for better restoration and protection.	All options are subject to 'best for river' approach.	All options are subject to 'best for river' approach.
(k) The restoration of water quality within the Waikato River so that it is safe for people to swim in and take food from over its entire length.	All options improve water quality. 'A' better achieves this objective at Taupiri and Ngaaruawaahia.	All options improve water quality.	All options improve water quality.
(l) The promotion of improved access to the Waikato River to better enable sporting, recreational, and cultural opportunities.	Restores cultural access at Taupiri.	Provides no real change to this objective.	Provides no real change to this objective.
(m) The application to the above of both maatauranga Maaori and latest scientific methods.	Provides for better weighting of maatauranga Maaori.	Doesn't provide full outcomes based on maatauranga Maaori.	Doesn't provide full outcomes based on maatauranga Maaori

## 10.1.2 Emerging preferred option from maatauranga assessment

The *Northern Metro Detailed Business Case: Mana Whenua Statement and Engagement Report* concludes that Option A is emerging as a preferred option but notes that Option B2 also has benefits in sharing the risk, or load, to the Waikato River. The report suggests that Option B2 could be a reasonable step towards achieving Option A by continuing to operate the Ngaaruawaahia WWTP until such time as it can be decommissioned. The report makes it clear Option B2 should be progressed only as a stage towards achieving the benefits of Option A.

## 10.2 Multi-criteria assessment

### 10.2.1 Framework

The short-list options were assessed using a Multi-Criteria Assessment (MCA) framework. An MCA process goes beyond assessing monetised or quantifiable benefits and allows for a subjective assessment of a range of environmental and social benefits. The MCA uses a scoring system to assess each option against the criteria.

MCA criteria were developed based on those used for the Southern Metro DBC. In general, the Southern Metro DBC criteria were adopted with amendments where necessary to clarify key components of the evaluation or simplify the assessment process where the factors were unlikely to result in differentiation between options. The MCA criteria are informed by the investment objectives and relate to environmental, ecological, cultural, sustainability and growth outcomes. The critical success factors included in the MCA relate to construction and operation impacts and the risk that the option will not give effect to Te Ture Whaimana or Te Mana o Te Awa.

The assessment criteria are:

Investment Objective / Critical success factor	Relevant KPI	Measure/considerations
<p>Before 2050 municipal wastewater discharges are no longer impacting on the ability of people to swim and collect kai from the river and connected waterways thereby contributing to the restoration and protection of the health and wellbeing of the river</p>	<p>KPI 1.1: Public health risks caused by the concentration of E.coli and pathogens within the WWTP discharges</p>	<p><b>Water Quality (E.coli)</b> To what extent and over what timeframe does the option reduce the E.coli and pathogen levels of the discharge compared to existing baseline?</p>
	<p>KPI 1.2 Total nitrogen load impacting the river and connected waterways from WWTPs</p>	<p><b>Water Quality (TN, TP)</b> To what extent and over what timeframe does the option reduce the mass load of nitrogen and phosphorus compared to existing baseline?</p>
	<p>KPI 1.3: Total phosphorous load impacting the river and connected waterways from WWTPs</p>	
	<p>KPI 1.4: Proportion of plants which are compliant against discharge quality consent conditions</p>	
<p>The quality and extent of aquatic and terrestrial habitat and biodiversity in and around water bodies is enhanced through the reduction of wastewater treatment and discharge impacts before 2050</p>	<p>KPI 2.1: Amount of algal biomass in the Waikato River as measured by chlorophyll a concentration attributable to treated wastewater discharges</p>	<p><b>Algal biomass</b> To what extent and over what timeframe does the option reduce the contribution towards the River's chlorophyll a concentration compared to existing baseline?</p>
	<p>KPI 2.2: Health and abundance of mahinga kai species</p>	<p><b>River / Aquatic Ecosystems</b> To what extent and over what timeframe does the option impact or improve river ecosystems and hydrology?</p>
	<p>KPI 2.3: Number and variety of terrestrial species at specific locations within the metro area</p>	<p><b>Terrestrial Ecosystems</b> To what extent and over what timeframe does the option provide the ability to improve vegetation coverage around river bed and terrestrial ecosystems?</p>
	<p>KPI 2.4: Area coverage of native riparian and wetland vegetation surrounding water bodies and within the catchment area</p>	
<p>Wastewater treatment solutions contribute to restoring and enhancing cultural connectivity with the river so that before 2050 marae, hapuu and lwi access to the river and other sites of significance for cultural and customary practice within the metro spatial area are no longer impeded by wastewater treatment solutions</p>	<p>KPI 3.1: Maatauranga Maaori Cultural Health Index / Cultural impact assessment</p>	<p><b>Discharge point</b> What potential is there for land discharge vs water discharge? How many discharge points / locations are required? What are the direct cultural impacts of the discharge points? (including as a result of location and design)</p>
	<p>KPI 3.2: Ability to physically and culturally connect to the river including number and quality of access points, quality of cultural and recreational access and opportunities, and ability to use land (including Maaori-owned land) for commercial and residential purposes</p>	<p><b>Cultural relationship</b> To what extent does the opportunity enhance and restore cultural relationship &amp; experience with the river?</p> <p><b>Access to River and land</b> To what extent and timeframe does the option increase the opportunity to improve physical access to the river and/or other waterways, lakes and wetlands for cultural and recreational activities and the ability to use land near the River for commercial and recreational purposes?</p>

Investment Objective / Critical success factor	Relevant KPI	Measure/considerations
Maximise efficient use of resources and resource recovery to contribute to net zero greenhouse gas related emissions from wastewater treatment systems before 2050	KPI 4.1: Volume of wastewater reuse as a percentage of discharge volume	<b>Water Reuse</b> To what extent and over what timeframe does the option allow for water reuse?
	KPI 4.2: Decreasing greenhouse gas footprint (capital and operational) / energy requirements of plant and plant systems (i.e., pumps) as a proportion of wastewater treated	<b>Energy / Carbon Reduction</b> To what extent and timeframe does the option consider energy neutral and low carbon technologies (not including the potential for offsetting). To what extent do options reduce relative operational carbon associated with treatment and conveyance systems?
	KPI 4.3: Proportion of resources that are able to be recovered for beneficial reuse	<b>Resource recovery</b> To what extent and over what timeframe does the option allow for recovery of resources for beneficial reuse?
The wastewater solution provides sufficient capacity to ensure sustainable growth in the metro spatial area in accordance with growth projection assumptions for the next 100 years	KPI 5.1: Flexibility and adaptability of solution to be staged / developed over time to meet the needs of the community	<b>Flexibility</b> To what extent does the option provide flexibility to adapt to growth and land use changes?
	KPI 5.2: Proportion of Industrial areas which are serviced by municipal plants sustainably	<b>Sustainable Growth</b> To what extent does this option provide additional growth opportunities which align with the sustainable and planned future growth of the Waikato Metro Area?
	KPI 5.3: Proportion of residents in the metro area serviced by municipal treatment plants sustainably	
Constructability - treatment	Construction impacts	
Constructability - conveyance	What are the relative constructability benefits, issues and risks (available space, access, existing utilities, watercourse, rail crossings, reinstatement requirements, geotechnical impacts, utility impacts, road and traffic impacts, impacts on neighbours, remediation)	
Maintenance and operations - treatment	Operational implications	
Maintenance and operations - conveyance	What is the relative ease or difficulty of operation and maintenance (includes risk, resilience, access, odour treatment, resource availability, monitoring, ongoing consenting etc.)	
Te Ture Whaimana	Te Ture Whaimana To what extent does the option give effect to Te Ture Whaimana, what is the level of uncertainty or level of risk that the option fails to give effect to Te Ture Whaimana?	
Te Mana o Te Awa	Te Mana o Te Awa To what extent does the option give effect to Te Mana o Te Awa (achieve the objectives of Te Mana o te Wai), what is the level of uncertainty or level of risk that the option fails to give effect to Te Mana o Te Awa?	

The criteria are scored using a seven-point system with scores ranging from -3 to +3. Scoring varies for each criterion but is generally based on the scoring definition outlined in the table below. More specific detail on how each criterion is scored is outlined in the Multi-Criteria Assessment Workshop Record in Appendix B.

**Table 9: Scoring definitions**

3	Significant positive impact compared with do minimum
2	Moderate positive impact compared with do minimum
1	Minor positive impact compared with do minimum
0	Very limited to no positive or negative impact (neutral)
-1	Minor negative impact compared with do minimum
-2	Moderate negative impact compared with do minimum
-3	Significant negative impact compared with do minimum

### 10.2.2 Multi-criteria assessment process

Over January and February 2022, the short-list options were subject to detailed assessments against the MCA criteria. The technical MCA was held over three online workshops attended by representatives and subject matter experts from HCC, WDC, Waikato DC and the project team. The assessments were undertaken initially by the project team and then by all attendees at the MCA workshop.

MCA scoring was undertaken using an online 'Miro' board. The criteria were pre-scored by the project team. For each criterion, the project team outlined key relevant information and provided reasoning for the proposed scoring. All participants then had the opportunity to exercise their professional judgement to indicate on the Miro board how that criterion should be scored. Differences in scoring were discussed and where possible consensus reached. Disagreements were recorded.

### 10.2.3 Multi-criteria assessment outcomes

The outcomes of the technical MCA, including workshop notes and the MCA scoring spreadsheet, are presented in the Multi-Criteria Assessment Workshop Record in Appendix B. The MCA scores are shown in Table 10.

In summary:

- **Option A** scores well
- **Option B1** scores lower than Option B2 and does not provide any benefits over Option B2. Therefore, Option B1 was not progressed further
- **Option B2** scores well
- **Option C** scores very poorly and was not progressed further (expect to demonstrate incremental costs)

Options A and B2 score similarly and are further discussed below.

**Table 10: Technical MCA scoring summary**

Measure/considerations	Option A Pukete only	Option B1 Pukete and NGA. Horotiu & Taupiri to NGA	Option B2 Pukete and NGA. Horotiu & Taupiri to Pukete	Option C Do minimum
Water Quality (E.coli)	2	2	2	-2
Water Quality (TN, TP)	2	2	2	-2
Algal biomass	2	2	2	-1
River / Aquatic Ecosystems	1	1	1	-1
Terrestrial Ecosystems	1	0	0	-2
Discharge point	2	-1	0	-1
Cultural relationship	1	-1	0	-2
Access to River and land	2	-1	-1	-2
Water Reuse	1	2	2	-1
Energy / Carbon Reduction	2	2	2	-2
Resource recovery	2	1	1	-2
Flexibility	0	1	2	-1
Sustainable Growth	2	1	2	-2
Construction impacts (treatment)	0	-1	-1	-2
Construction impacts (conveyance)	-2	0	1	0
Operational implications (treatment)	2	0	0	-2
Operational implications (conveyance)	-2	0	1	0
Te Ture Whaimana	1	0	1	-3
Te Mana o Te Awa	Not scored			
<b>TOTAL</b>	<b>19</b>	<b>10</b>	<b>17</b>	<b>-28</b>

**A note on Te Mana o Te Awa:** The parties involved in the technical MCA discussions were unable to effectively differentiate between the Te Ture Whaimana and Te Mana o Te Awa criteria and chose not to score this criterion. It was felt that:

- In the context of the NPS for Freshwater Management, Te Ture Whaimana outweighs Te Mana o Te Awa. Until such time as the RPS and Waikato Regional Plan are updated to give effect to the NPSFM in a manner consistent with Te Ture Whaimana, then Te Ture Whaimana remains more specific and sits above the NPSFM in the hierarchy
- In any event, one cannot give effect to Te Mana o Te Awa without give effect to Te Ture Whaimana – that is to say Te Ture Whaimana encompasses Te Mana o Te Awa.

### 10.2.4 Sensitivity testing

Options A and B2 score similarly; a weighting exercise is useful to demonstrate how the relative score change if different factors are considered more or less important.

The raw MCA scores are summarised in Table 11. The criteria where there is a difference in scoring between Option A and B2 are highlighted. This weighting exercise focuses on area of differentiation between A and B2.

With equal weighting, Option A (1.00) scores better than Option B2 (0.89).<sup>28</sup>

<sup>28</sup> Based on a possible range of -3 to +3

**Table 11: MCA raw scores**

MCA criteria	Raw scores			
	A	B1	B2	C
Water Quality (E.coli/pathogens)	2	2	2	-2
Water Quality (TN, TP)	2	2	2	-2
Algal biomass	2	2	2	-1
River/Aquatic Ecosystems	1	1	1	-1
Terrestrial Ecosystems	1	0	0	-2
Discharge point	2	-1	0	-1
Cultural relationship	1	-1	0	-2
Access to River and land	2	-1	-1	-2
Water Reuse	1	2	2	-1
Energy / Carbon Reduction	2	2	2	-2
Resource recovery	2	1	1	-2
Flexibility (conveyance)	0	1	2	-1
Sustainable Growth (treatment)	2	1	2	-2
Construction impacts - treatment	0	-1	-1	-2
Construction impacts - conveyance	-2	0	1	0
Operational implications - treatment	2	0	0	-2
Operational implications - conveyance	-2	0	1	0
Te Ture Whaimana	1	0	1	-3
Te Mana o Te Awa	0	0	0	0
<b>Raw score average</b>	1.00	0.53	0.89	-1.47
<b>Rank</b>	1	3	2	4

We tested three weighting scenarios:

- Conveyance flexibility is twice as important as other factors (i.e., flexibility – conveyance, construction impacts – conveyance, and operational implications – conveyance)
- Treatment flexibility is twice as important as other factors (i.e., sustainable growth – treatment, construction impacts – treatment, and operational implications – treatment)
- Factors related to the cultural wellbeing investment object are twice as important as other factors (i.e., discharge point, cultural relationship, and access to river and land)

For each weighting scenario, the three identified criteria are given a weighting of 0.09 and the remaining 16 criteria are given a weighting of 0.045 (to give a total of 1.0).

The outcome is shown in Table 12. Where conveyance flexibility is given more importance, Option B2 scores highest, in all other scenarios Option A scores higher.

**Table 12: Weighting scenarios**

Scenario	Weighted average score			
	A	B1	B2	C
Equal weighting	1.00	0.53	0.89	-1.47
Conveyance flexibility twice as important	0.68	0.50	0.95	-1.32
Treatment flexibility twice as important	1.05	0.45	0.82	-1.55
Cultural factors twice as important	1.09	0.32	0.73	-1.50

## 10.2.5 Further comparison of Options A and B2

Where two options score similarly well, it is important to consider the relative benefits and disbenefits of the options.

Option A	Option B2
<p>Option A (with a single WWTP) scores better against criteria influenced by the number and size of treatment plants:</p> <p>Lower WWTP operational requirements (lower staffing, less overall monitoring and compliance requirements)</p> <p>Greater flexibility in day-to-day treatment (more levers to pull to meet treatment standards at Pukete than at Ngaaruawaahia)</p> <p>Greater ability for treatment to respond to growth (more capacity to absorb growth without a need for short-term treatment plant upgrades)</p> <p>More opportunity for water reuse, energy recovery, and resource recovery (which are generally more feasible at Pukete and would benefit from greater flows through Pukete)</p> <p>Greater risk associated with conveyance network failure – can be mitigated to some extent by building-in resilience</p> <p>More opportunity for development and/or restoration at Ngaaruawaahia (removal of WWTP, pond, and associated buffer)</p> <p>Removal of Ngaaruawaahia WWTP may improve relationship between college at Hopuhopu and the awa</p> <p>A single discharge location at Pukete:</p> <p>Fewer discharge structures</p> <p>Removal of discharge close to Taupiri Maunga and other sensitive sites</p>	<p>Option B2 (with shorter conveyance routes) scores better against criteria influenced by the conveyance network:</p> <p>Lower operational risk associated with failure of the conveyance network</p> <p>Conveyance network is less complex to design, build, and operate (shorter mains, more gravity/less rising main)</p> <p>Lower impact in the event of significant growth at Taupiri</p> <p>Some opportunity for development and/or restoration at Ngaaruawaahia (removal of oxidation pond and reduction of the associated buffer)</p> <p>More immediate opportunity for water reuse (nursery)</p> <p>Discharges at Pukete and Ngaaruawaahia:</p> <p>Slightly lower load to the river between the two sites (including past Turangawaewae)</p> <p>Less risk of “locking in”. Option A removes the Ngaaruawaahia WWTP, which is a one way decision. If Option B2 were implemented, it would still be possible to move to Option A in the future.</p>
<p>Option A and B2 both:</p> <p>Score well on discharge quality and related factors. They have the same effective level of treatment and therefore the same level of expected effect on algal biomass and river ecosystems</p> <p>Provide opportunities for energy and carbon reduction</p> <p>Can be designed to meet future treatment capacity requirements</p> <p>Are expected to give effect to Te Ture Whaimana (to the extent that it is possible for a wastewater discharge to the Waikato River to give effect to Te Ture Whaimana)</p>	

## 10.2.6 Emerging preferred option from multi-criteria assessment

The technical MCA identifies Option A as the emerging preferred option, subject to management of conveyance risks.

Option A was preferred when all criteria were given equal weighting and in all sensitivity testing scenarios except where conveyance flexibility was given the most importance. Option A was also preferred through the comparative analysis.

The Project Team is satisfied that resilience and risk management actions can be put in place such that the potential risks of Option A are appropriately managed, and the benefits of Option A therefore outweigh any slight increase in risk over Option B2. These risks and risk mitigation actions are discussed in Section 28.

While Option A scores higher, it is not a clear preference. The Project Team has not identified any significant issues that would arise if Option B2 became the preferred option.

## 10.3 Cost estimates

High level 'order of magnitude' cost estimates for each of the short-list options are provided in Section 5 of the Short-list Technical Report in Appendix A. Comparative P50 cost estimates for Options A, B1 and B2 are provided below. The cost estimates use rates from projects in New Zealand and include allowances for cost escalation seen recently due to Covid-19 and construction market constraints.

A conceptual design of the preferred option will need to be prepared to confirm the estimated capital and operating costs. An estimating tolerance has been included to account for general unknowns in the design and for any discrepancies in the design information prepared to date. These estimates are Class 5 estimates as per the AACE Cost estimate Classification System and have an expected range of -30%/+50%.

Refer to the Short-list Technical Report for assumptions and exclusions.

Monetary benefits have not been considered as part of this assessment. Such an assessment is not considered necessary for this DBC on the basis that the monetary benefits for all options (largely related to enabling growth) are expected to be the same.

### 10.3.1 Capital cost

The P50 capital cost estimates for Options A, B1 and B2 are set out in Table 13. All costs are in \$2022.

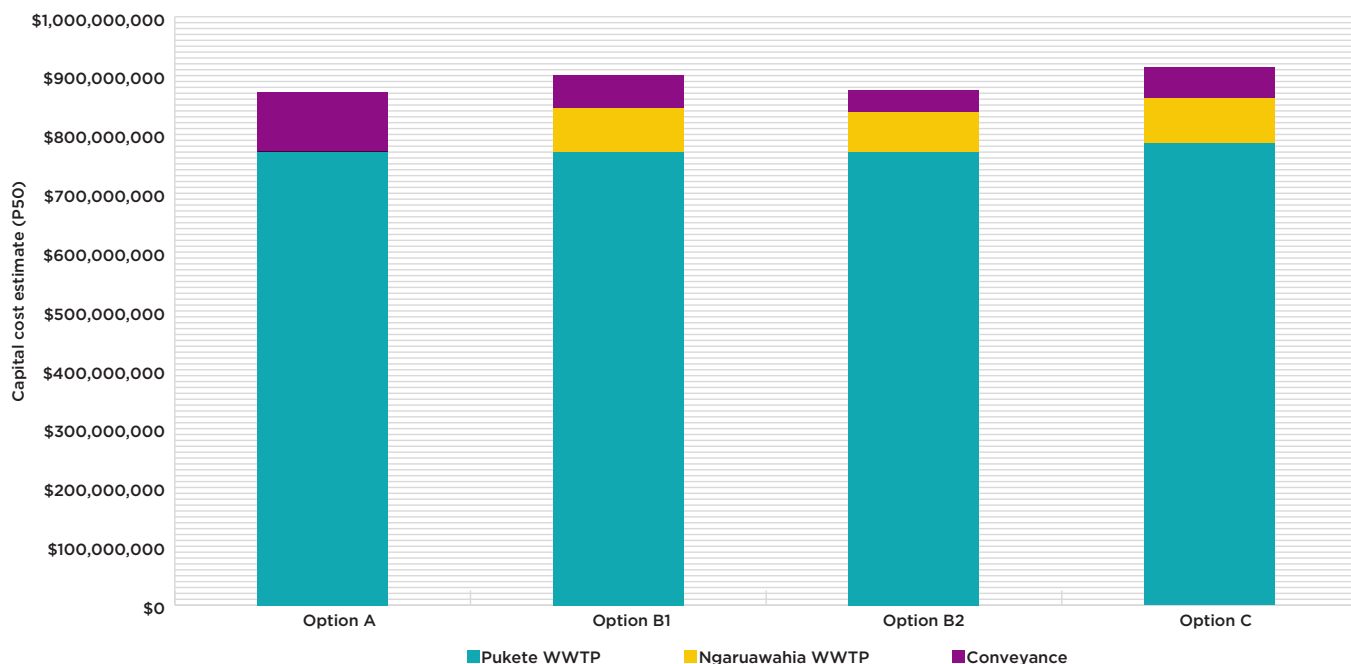
Estimated P50 capital costs for Pukete WWTP upgrades out to 2061 is \$771M with a P95 estimate of \$1.3B. The estimated P50 capital costs for the Ngaaruawaahia WWTP range from \$66M for Option B2 to \$77M for Option B1 reflecting the difference in wastewater flows treated at Ngaaruawaahia under the options.

An assessment of the breakdown between renewals, levels of service and growth-related capital expenditure for Pukete WWTP has been undertaken. Many of the upgrades provide a mixture of the different categories. Renewals makes up approximately 15% of the upgrade cost to 2061, improving levels of service 30% of cost, and growth approximately 55% of cost.

**Table 13: P50 capital cost estimates for the period 2021-2061 (\$2022)**

	Conveyance	WWTP		Total
<b>Option A</b>				
Taupiri / Ngaaruawaahia / Hopuhopu	\$103M	Pukete	\$776M	\$879M
Horotiu / Te Kowhai				
Hamilton				
<b>Option B1</b>				
Taupiri / Ngaaruawaahia / Hopuhopu	\$55M	Ngaaruawaahia	\$77M	\$908M
Horotiu / Te Kowhai				
Hamilton	-	Pukete	\$776M	
<b>Option B2</b>				
Taupiri / Ngaaruawaahia / Hopuhopu	\$16M	Ngaaruawaahia	\$66M	\$882M
Horotiu / Te Kowhai	\$24M	Pukete	\$776M	
Hamilton				
<b>Option C</b>				
Taupiri / Ngaaruawaahia / Hopuhopu	\$55M	Ngaaruawaahia	\$77M	\$923M
Horotiu / Te Kowhai				
Hamilton	-	Pukete	\$792M	

**Figure 27: Short list capital cost comparison**



### 10.3.2 Operational cost

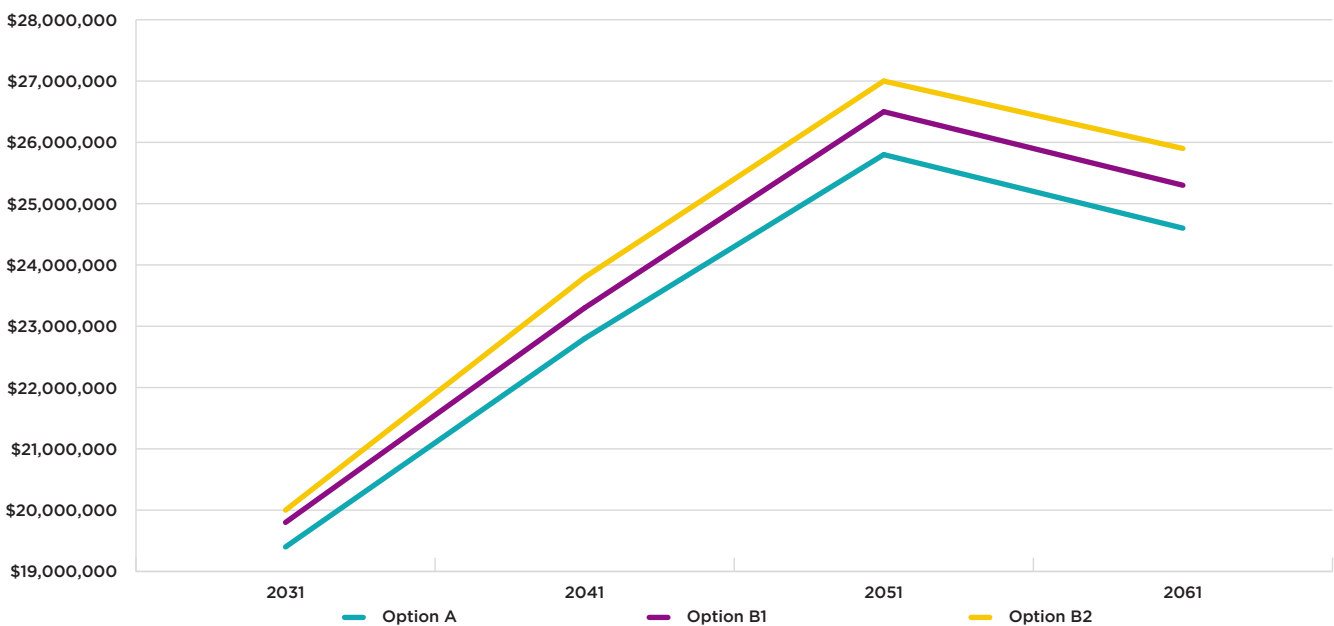
Comparative operational costs<sup>29</sup> for each option for 2031, 2041, 2051 and the 2061 flows are set out in Table 14. Over time the total operational costs increase as flows and plant loading increase. Pukete WWTP has significantly lower costs per ML than the new Ngaaruawaahia WWTP due to energy recovery potential and reduced biosolids volumes for disposal.

These operating costs assume that the proposed new Southern WWTP comes online between 2051 and 2061. The subsequent reduction in flows at Pukete results in the reduction in operating costs seen below. The timing for the Southern WWTP is yet to be determined but is considered further in the Management Case.

**Table 14: P50 operating cost estimates for the period 2021-2061 (\$2022) [From the short-list tech report]**

	2021	2041	2051	2061
<b>Option A</b>				
Pukete WWTP	\$19.0M	\$22.3M	\$25.2M	\$23.9M
Ngaaruawaahia WWTP	-	-	-	-
Conveyance	\$0.41M	\$0.49M	\$0.55M	\$0.67M
TOTAL	\$19.4M	\$22.8M	\$25.8M	\$24.6M
<b>Option B1</b>				
Pukete WWTP	\$17.9M	\$20.7M	\$23.4M	\$21.9M
Ngaaruawaahia WWTP	\$1.9M	\$2.9M	\$3.4M	\$3.6M
Conveyance	\$0.16M	\$0.22M	\$0.23M	\$0.28M
TOTAL	\$20.0M	\$23.8M	\$27.0M	\$25.8M
<b>Option B2</b>				
Pukete WWTP	\$18.2M	\$21.2M	\$23.9M	\$22.5M
Ngaaruawaahia WWTP	\$1.4M	\$1.9M	\$2.3M	\$2.5M
Conveyance	\$0.14M	\$0.19M	\$0.23M	\$0.25M
TOTAL	\$19.7M	\$23.3M	\$26.4M	\$25.3M

**Figure 28: Annual operating cost comparison**



29 These costs are based on a number of assumptions regarding current operating costs for Pukete WWTP and should be re-visited if 2021 operating costs can be confirmed.

### 10.3.3 Summary of short-list cost estimates

The major capital cost is the MBR upgrade at the Pukete WWTP. This upgrade makes up 85-90% of the total capital of Options A, B1 and B2. The remaining 10-15% is a function of the cost of upgrades at the Ngaaruawaahia WWTP vs the cost of conveying wastewater to Pukete.

Overall, the difference in capital cost of Options A and B2 is negligible within the level of accuracy of the cost estimate.

A capital cost estimate was also prepared for Option C (do minimum). The cost estimate demonstrates that Option C is not a true do minimum as it has a higher cost than all other options considered. The 'knot' in the existing Pukete process flow creates inefficiencies and presents a significant challenge as the WWTP is progressively expanded to create additional capacity increasing flows. Capacity increases based on the existing plant then become increasingly costly with those costs ultimately exceeding the cost to convert to an MBR plant.

The operational costs are similarly dominated by the Pukete WWTP. Options B1 and B2 have slightly higher operating costs relating to treatment (because of the need to operate and maintain two WWTPs) while Option A has higher operating cost relating to conveyance (because of the much longer conveyance network). However, these differences largely balance out and the difference in operational cost is again close to negligible within the level of accuracy of the cost estimate.

## 10.4 Other considerations

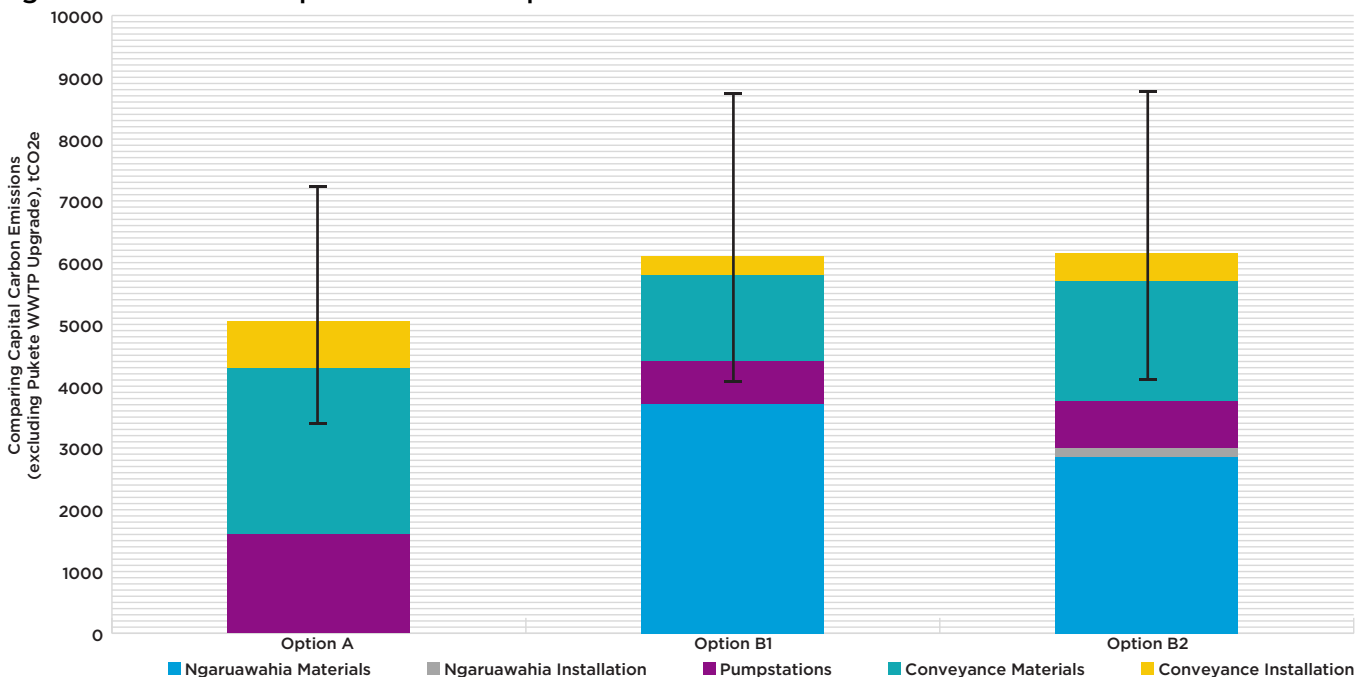
### 10.4.1 Carbon and sustainability impacts

The *Short-list Technical Report* provides a comparative estimate of capital and operational carbon emissions for the options. The calculation method and assumptions are set out in that report.

The capital carbon emissions associated with upgrading Pukete WWTP were not quantified as essentially the same infrastructure is required by 2061 for all options. Options A and B2 will require a reactor retrofit to occur slightly earlier than for option B1.

At the current level of accuracy, including the population proportionate emissions of the Pukete upgrade, it is expected all three options would have similar capital carbon emissions. The range between all three options is likely a maximum of 2,000-3,000 tCO<sub>2</sub>-e (being the balance between the additional Ngaaruawaahia WWTP materials for Options B1 and B2 vs the additional conveyance materials required for Option A).

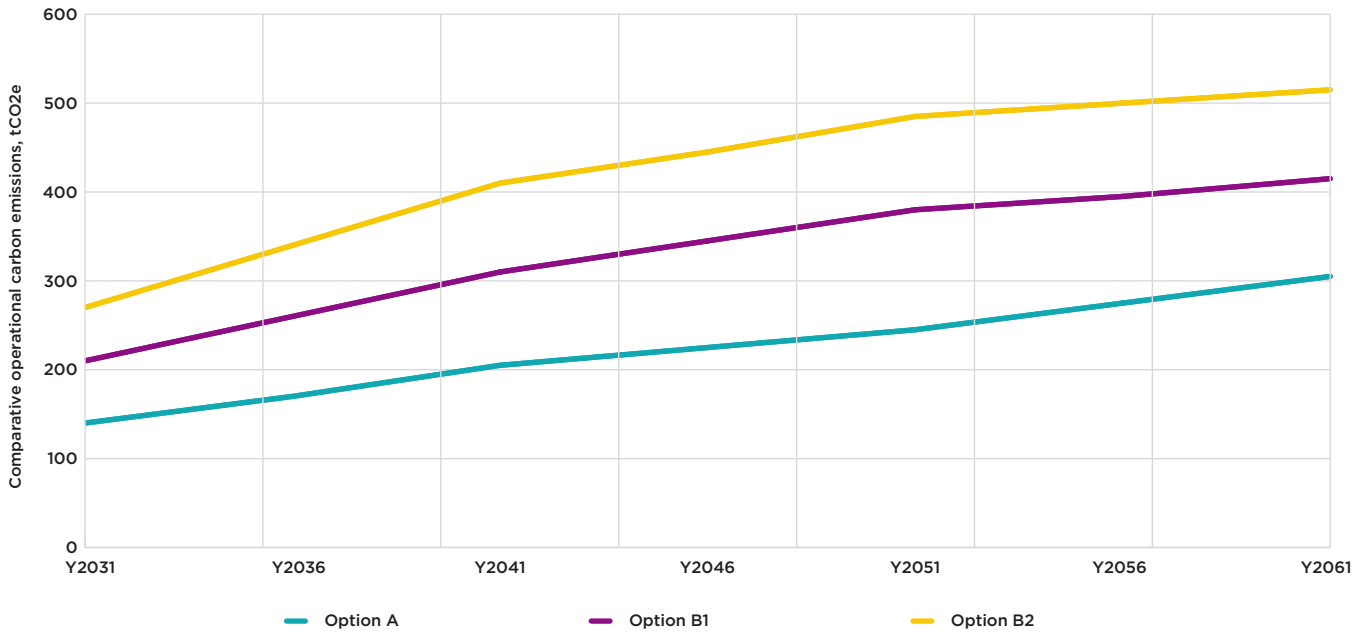
**Figure 29: Short list capital carbon comparison**



The operational carbon costs are estimated on a population equivalent basis. On a comparative basis, the operational emissions estimate for Option A is the lowest. This is driven by primary sedimentation and digestion processes in place at the Pukete WWTP, which allow for energy recovery via biogas and result in lower biosolids volumes.

Over 30 years, Option A is approximately 4,000 tonnes and 2,300 tonnes lower than Option B1 and Option B2 respectively.

**Figure 30: Short list operational carbon comparison**



Further recommendations for reducing carbon emissions are covered in the Management Case. Conveyance risk

Though both the maatauranga evaluation and the technical MCA process, a number of participants highlighted the conveyance risks associated with the longer conveyance required for Option A:

- Greater residence time resulting in a higher risk of septicity and odour
- Greater impact in the event of equipment breakdown/malfunction or pipe failure (third party damage or earthquake events)

There are mitigation activities that can be undertaken to reduce the conveyance risks:

- Use of twin mains to reduce septicity risk and increase resilience
- Provision of backup generators/pumps
- Isolation valves
- Calamity storage
- Material selection

These mitigations have been factored into the short-listed options development and costings.

## 10.5 Selection of the preferred option

The emerging preferred option was endorsed by the governance group in May 2022. Due to required project timeframes, technical work to refine the preferred option proceeded in parallel with the governance group approval process. Discussions with mana whenua continued through to late 2022 before they endorsed the preferred option.

Option A is recommended as the preferred option to take forward for refinement as part of the DBC. The recommendation is primarily made on the following rationale:

- Option A and Option B2 score similarly through the MCA process. In particular, they both
  - Score well on discharge quality and related factors. They have the same effective level of treatment and therefore the same discharge quality and level of expected effect on algal biomass and river ecosystems
  - Provide opportunities for energy and carbon reduction
  - Can be designed to meet future treatment capacity requirements based on population growth assumptions
  - Are expected to give effect to Te Ture Whaimana (to the extent that it is possible for a wastewater discharge to the Waikato River to give effect to Te Ture Whaimana)
- Option A scores better than Option B2 against criteria influenced by the number and size of treatment plants (and therefore number of discharge points):
  - Lower WWTP operational requirements (lower staffing, less overall monitoring and compliance requirements)
  - Greater flexibility in day-to-day treatment (more levers to pull to meet treatment standards at Pukete than at Ngaaruawaahia)
  - Greater ability for treatment to respond to growth (more capacity to absorb growth without a need for short-term treatment plant upgrades)
  - More opportunity for energy recovery, and resource recovery (which are generally more feasible at Pukete and would benefit from greater flows through Pukete)
  - Greater risk associated with conveyance network failure – can be mitigated to some extent by building-in resilience
  - Opportunity for development and/or restoration at Ngaaruawaahia WWTP site (removal of WWTP, pond, and associated buffer)
  - Opportunity for development of Waikato-Tainui land at Hopuhopu resulting from reduction/removal of the buffer around the Ngaaruawaahia WWTP
  - Removal of Ngaaruawaahia WWTP may improve relationship between Waikato-Tainui at their Hopuhopu properties (including the Endowed College) and the awa
- While Option B2 scores higher against criteria influenced by the conveyance network the identified risks and complexities associated with the longer conveyance routes can be adequately mitigated and managed through design.
- Option A and B2 have similar risks, except as otherwise noted above. It is considered that these risks (including risks associated with funding, construction, and consenting) can all be adequately mitigated and managed through delivery. Specific risks are covered in more detail in consideration of the preferred option (refer Section 28 of this report and Section 11 of the Preferred Option Report).
- Option A is preferred from a Maatauranga Maori perspective (noting that Option B2 could be a reasonable step towards achieving Option A by continuing to operate the Ngaaruawaahia WWTP until such time as it can be decommissioned)
- There is little difference between the costs associated with Options A and B2 either in the short term or looking out to 2061

Option A meets the project investment objectives and the Best for River outcomes as outlined in Table 15.

**Table 15: Assessment of the preferred option against project objectives and best for river outcomes**

Objectives/outcomes	Assessment of Option A
<b>Project investment objectives</b>	
Before 2050 municipal wastewater discharges are no longer impacting on the ability of people to swim and collect kai from the river and connected waterways thereby contributing to the restoration and protection of the health and wellbeing of the river.	The adopted treatment standards represent current best available technology and a significant improvement over the current situation. Option A will contribute to the restoration and protection of the river.
The quality and extent of aquatic and terrestrial habitat and biodiversity in and around water bodies is enhanced through the reduction of wastewater treatment and discharge impacts before 2050.	Under Option A, upgrades to the Pukete WWTP to meet the higher treatment standards would take place by 2032, reducing the impact of wastewater discharge well before 2050.
Wastewater treatment solutions contribute to restoring and enhancing cultural connectivity with the river so that before 2050 Marae, Hapuu and Iwi access to the river and other sites of significance for cultural and customary practice within the metro spatial area are no longer impeded by wastewater treatment solutions.	The preferred option reduces the impact on Taupiri and reduces limitations on the use of iwi assets near the Ngaaruawaahia WWTP.
Maximise efficient use of resources and resource recovery to contribute to net zero greenhouse gas related emissions from wastewater treatment systems before 2050.	The preferred option provides opportunities to maximise resource use and recovery. New biosolids handling processes will be staged over the initial phase of works with renewal and expansion of energy recovery processes including in the longer- term plans.
The wastewater solution provides sufficient capacity to ensure sustainable growth in the metro spatial area in accordance with growth projection assumptions for the next 100 years.	Infrastructure provided to cater for growth in high growth scenario plus additional infill and wet industry.
<b>Best for River outcomes</b>	
1. The health and well-being of the Waikato River is restored and enhanced	The improvements in discharge quality will improve the well-being of the river from a technical water quality perspective. Based on feedback from mana whenua, the preferred option will support restoration and enhancement of the health and well-being of the Awa.
2. All life within the River (which extends beyond the main stem) and surrounding environment benefit	The improvements in discharge quality will improve the well-being of the river from a technical water quality perspective.
3. All of the community (including industry and businesses) understand and are committed to caring for and protecting the River	The new administration building is proposed to house an education centre that would support community education on what happens to our wastewater as well as caring for and protecting the River.
4. Cultural connectivity with the River is restored and enhanced	Based on feedback from mana whenua, the preferred option better reduces the impact on Taupiri (compared with other options investigated) and removes limitations on iwi assets supporting this outcome.
5. Access to the River to enable customary, sporting, recreational, and cultural opportunities is improved	None of the options investigated have limited direct impact on access to the River. However, removal of the Ngaaruawaahia discharge point under the preferred option will improve opportunities in that area.
6. All water and land resource policy, regulations and decision-making frameworks across the catchment are consistent and fully aligned to achieve the Vision and Strategy, including RMA instruments, catchment-based management approaches	The options selection process used in the DBC is consistent with, and fully aligned to, the Vision and Strategy.
7. All water and land management decisions are based on robust and comprehensive knowledge and understanding of the river system, including real time and long-term data, sites of significance, social and cultural activities	The detailed modelling and assessment of environmental effects that will be required as part of design and consenting of the preferred option will be based on up-to-date knowledge and understanding of the river system, including real time and long-term data.  Mana whenua have been involved throughout the development of this DBC and will remain involved through the design and consenting phases to provide input on sites of significance and cultural activities and impacts.

Objectives/outcomes	Assessment of Option A
8. Achieve net benefit to the environment	The preferred option will result in a significant improvement in discharge quality resulting in a net benefit to the environment.
9. Increase the efficient use of resources and maximise resource recovery and contribution toward carbon neutrality and energy neutrality	The preferred option provides opportunities to increase the efficient use of resources and support carbon/energy neutrality. The <b>Management Case</b> includes a number of recommendations for reducing carbon. New biosolids handling processes will be staged over the initial phase of works with renewal and expansion of energy recovery processes including in the longer-term plans.
10. Apply and maintain best practice to all three waters management and infrastructure which allows for the sustainable future growth of the Waikato region.	The proposed MBR plant and treatment standards reflect the best available technology current present in New Zealand. As the design progresses, regular checks should be made to determine evolving best practice and technology.

# 11. Preferred option

## 11.1 Preferred option description

The preferred option is Option A: A single centralised WWTP at Pukete with decommissioning of the Ngaaruawaahia WWTP. The preferred option is described in detail in the *Preferred Option Technical Report* (refer **Appendix C**) and summarised below.

**Table 16: Summary of preferred option**

Conveyance	Single centralised WWTP (located at Pukete) to service Hamilton (south Hamilton diverted to the new Southern WWTP from 2061), Ngaaruawaahia, Taupiri, Horotiu, Hopuhopu and Te Kowhai.  Includes two new pump stations and upgrades to two existing pump stations.
Treatment standard	Total N: 4g/m <sup>3</sup> Total P: < 0.5 g/m <sup>3</sup>
Liquid stream treatment	Two stage screening and primary sedimentation followed by Membrane Bioreactor (MBR) and Ultra-Violet (UV) Disinfection
Reuse and recovery	Maximise reuse and energy recovery opportunities
Footprint	Reduction in total footprint with option to provide remediation of Ngaaruawaahia site.  New pump stations at Taupiri and Te Kowhai and upgrades at Ngaaruawaahia WWTP pump station and Horotiu pump station (Ports of Auckland)
Discharge point	Two (near Pukete) - new discharge point for main discharge with existing retained for future treated peak flow discharge.
Biosolids	Able to be reused subject to market.  Advanced treatment options - thickening, thermal hydrolysis (THP), digestion and thermal drying (TD).
Staging	Dual pipelines could be used for all of the routes except Te Kowhai to Horotiu. Existing Taupiri pump stations and rising mains can be used until reach capacity.
Delivery	Single operator.

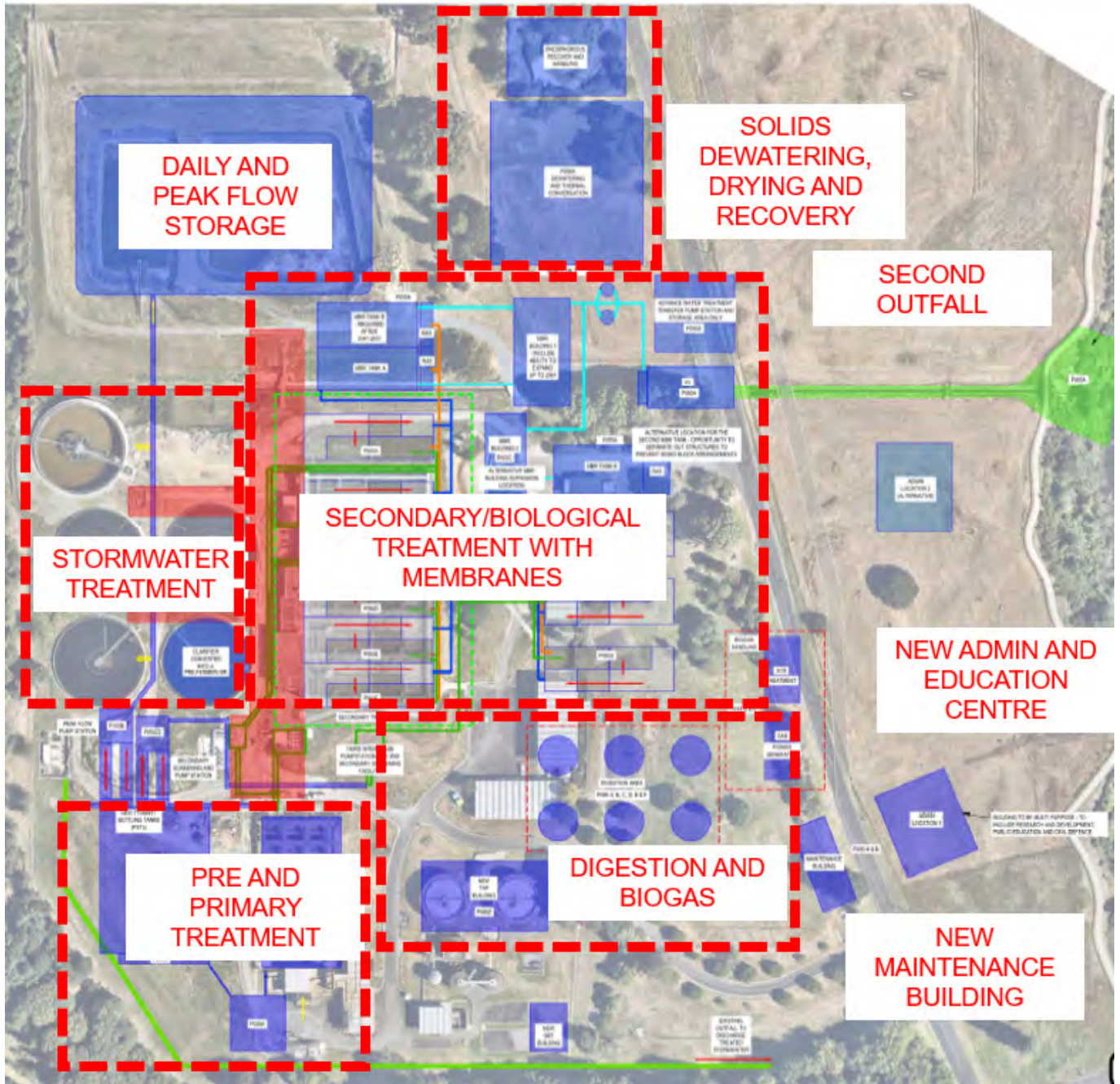
### 11.1.1 Pukete WWTP upgrade

Significant upgrades are required at the Pukete WWTP including conversion to an MBR plant. This provides an opportunity to untangle the existing site layout and provide a simple process pathway.

A proposed site layout has been developed based on identified operational constraints, maintenance preferences, flexibility to expand, ease for future renewals and minimising future pumping energy consumption. The proposed layout is shown on Figure 31.

There are a series of upgrades required to the Pukete WWTP to deliver the preferred option. These range from upgrade and replacement of existing processes to the addition of the new membrane tanks and associated plant for the MBR conversion. Table 17 outlines the changes required.

Figure 31: Preferred option Pukete WWTP site layout



**Table 17: Summary of works required at the Pukete WWTP to deliver the preferred option**

Component	Current status	Upgrade required
Inlet screening Facility	The existing facility is a seismic risk, has been degraded by corrosion from gases and is hydraulically under capacity.	Replacement of the screen facility is underway (at preliminary design phase as of July 2022).
Administration and maintenance buildings	These buildings have been identified as seismic risks and sit on land better utilised for future expansion and reconfiguration of WWTP processes.	New administration and maintenance buildings proposed on the east side of Pukete Rd. Proposed to incorporate a new public information and education facility within the administration facility.
Primary sedimentation tanks	Currently three primary sedimentation tanks in operation. Single aerated grit chamber which is at capacity.	A 4 <sup>th</sup> primary sedimentation tank is needed now. Further sedimentation tanks will be required as flows increase. Duplication of aerated grit chamber to cater for higher flows and the increasing number of primary sedimentation tanks.
Solids stream phase 1	The existing mesophilic digesters are at capacity (limited redundancy), seismically limited, and have difficult to manage floating roof technology. Biogas system does not allow for any energy recovery.	Assuming a continuation of anaerobic sludge digestion on the site, the digesters will be replaced when dictated by asset condition and capacity basis.  Biogas system to be upgraded to allow for energy recovery.
Outfall	Existing diffuser structure extends the full width of the Waikato River with a buried pipe and multiple outlets. Does not have capacity for future flows.	The existing diffuser will be retained for peak flow excess discharge with a new outfall for normal flows. The form and function of the new outfall has yet to be determined and would be co-designed with mana whenua to include an element of spiritual treatment (i.e. treatment beyond simply removing nutrients and pathogens).
Membrane bioreactors	NA replaces current clarifiers	New membrane tanks and associated plant facilities will be constructed in a largely greenfield setting on an area of 'made ground' over an un-named tributary that crosses the site from the remnant gully to the west. This would include secondary screening and interstage pumping facilities.  The clarifiers could be repurposed for wet weather flow management, pre-fermentation of sludge, or an alternate use.
UV Disinfection	The current UV system is 20 years old. It is still supported by the manufacturer (with parts) but is due for replacement.	To be replaced by a new, more efficient UV irradiation system.
Solids stream phase 2	Biosolids are processed offsite at a vermicomposting facility (no alternative other than landfill due to current treatment). No flexibility to adapt to regulatory changes eg emerging contaminants.	Three options have been included which will allow for alternative disposal pathways:  Digestion only (status quo) with digesters eventually replaced as noted above  Advanced digestion with thermal hydrolysis to maximise biogas yield  Thermal conversion (eg mono-incineration) or pyrolysis/gasification
Phosphorus removal	NA	Two options have been included:  Chemical phosphorus precipitation using aluminium sulphate  Enhanced Biological Phosphorus Removal (EBPR) process (4-stage Bardenpho or equivalent)

## 11.1.2 Ngaaruawaahia interim and decommissioning

WDC has not yet fully investigated options to improve compliance (non-compliance largely related to ammonia) of the existing Ngaaruawaahia WWTP. If a short-term extension to the existing discharge consent is needed while the Pukete MBR upgrade and required conveyance networks are put in place, it will be desirable for interim upgrades to be undertaken.

Other WWTPs have successfully used side stream processes such as MBBR to reduce ammonia (in particular) and total nitrogen in the discharge. Other considerations (likely more expensive or less effective) include MABR and Bioshells

Once the transfer to Pukete WWTP is in place, the remediation of the Ngaaruawaahia WWTP site will include:

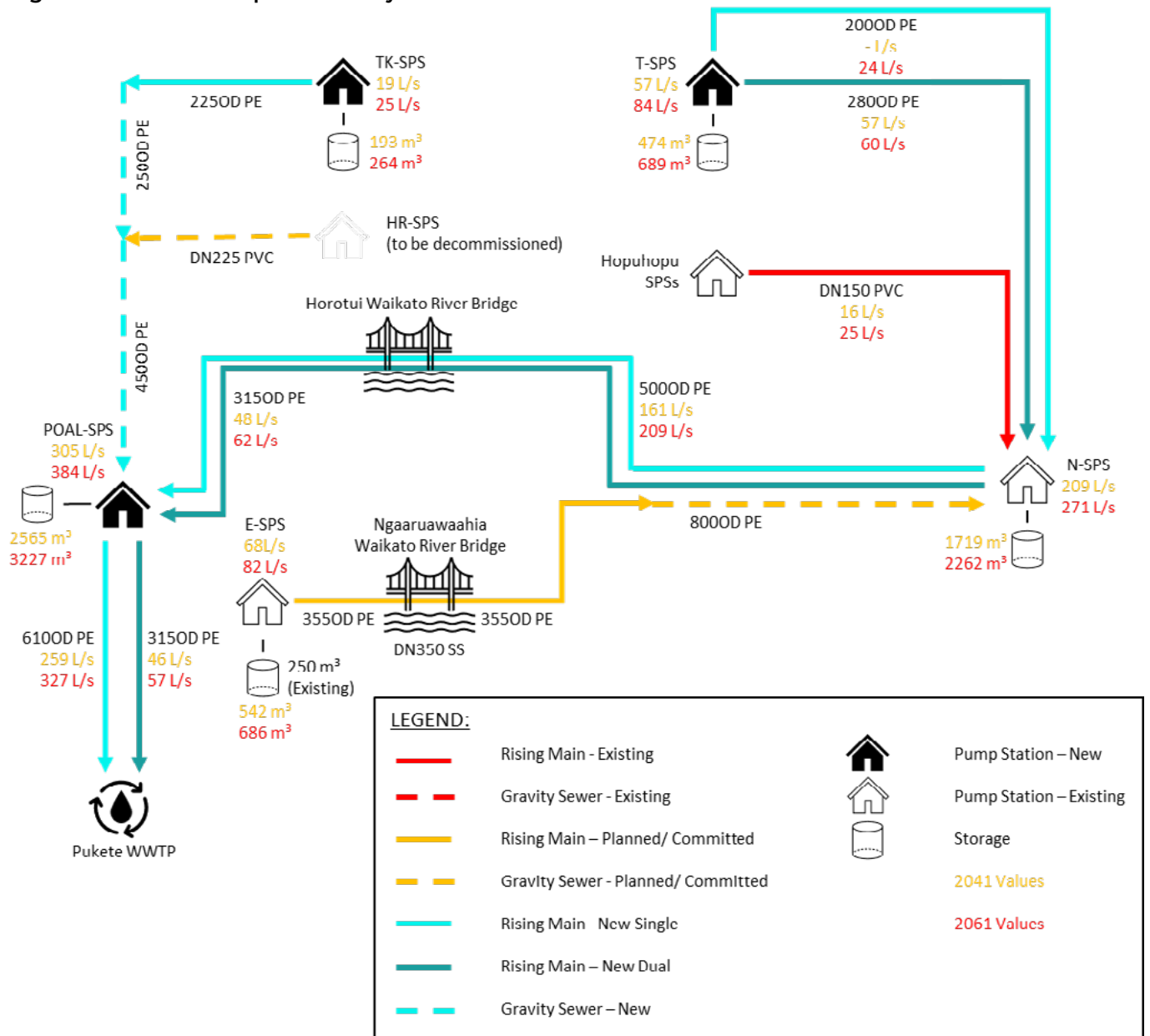
- Contaminated land assessment
- Consideration of future end uses
- Pond desludging and disposal
- Removal of disused equipment
- Re-contouring of site suited to end use
- Grassing of disturbed and reinstated areas
- It is possible that some of the pond could be used for wet weather or calamity storage for the terminal pump station.
- Adjustment of odour buffer requirements to around the pump station and emergency storage pond

## 11.1.3 Conveyance

Wastewater will be conveyed to Pukete WWTP from Taupiri, Hopuhopu, Ngaaruawaahia, Te Kowhai and Horotiu as shown schematically on Figure 32. The conveyance works required to implement the preferred option include:

- New pump stations at Taupiri (T-SPS) and Te Kowhai (TK-SPS)
- Upgraded pump stations at Ngaaruawaahia (N-SPS) and Horotiu/Ports of Auckland (POAL-SPS)
- New rising mains:
  - Taupiri to Ngaaruawaahia: 5.8km long 280 OD PE rising main with a supplementary 200 OD PE rising main required post-2041. Includes two gully crossings, two rail crossings, and one bridge crossing.
  - Ngaaruawaahia to Horotiu: 13.6km long, 315 OD and 500 OD PE twin main. Includes 3 gully/stream crossings, one rail crossing, and two bridge crossings.
  - Te Kowhai to Horotiu: 5.7km long 255 OD PE rising main and 8km long 250 OD PE gravity sewer. Includes two gully crossings.
  - Horotiu to Pukete: 13.6km long, 610 OD and 315 OD PE twin main. Includes one underpass and one rail crossing.
- New emergency storage:
  - Taupiri pump station: 474m<sup>3</sup> with an additional 689m<sup>3</sup> post-2041
  - Ngaaruawaahia pump station: 1,719m<sup>3</sup> with an additional 543m<sup>3</sup> post-2041
  - Te Kowhai pump station: 265m<sup>3</sup>
  - Horotiu/POAL: 2,565m<sup>3</sup> with an additional 662m<sup>3</sup> post-2041

Figure 32: Preferred option conveyance schematic



## 11.2 Staging

Staging of delivery of the preferred option is driven, in the short term, by the expiry of the existing Pukete and Ngaaruawaahia WWTP discharge consents in 2027 and 2029 respectively.

Significant packages of works like the Pukete MBR conversion are not typically commenced prior to confirmation of consent and associated consent conditions. It is not unusual for changes to be made to proposed processes and operations during processing of large consents, which can impact on design. Therefore, the staging assumes detailed design and procurement processes for packages of work tied to the MBR conversion are not progressed until after consents are granted.

To allow continued operation of the WWTP, renewal consent applications must be lodged six months prior to expiry of the current consents. The Pukete WWTP represents the highest point source of nitrogen and phosphorus load to the Waikato River (refer Section 4.2.4). Consent for such a major discharge is expected to be publicly notified and the staging has allowed for a two to three-year process from lodgement to grant. No contingency is included for appeals.

### Staging 2022-2040

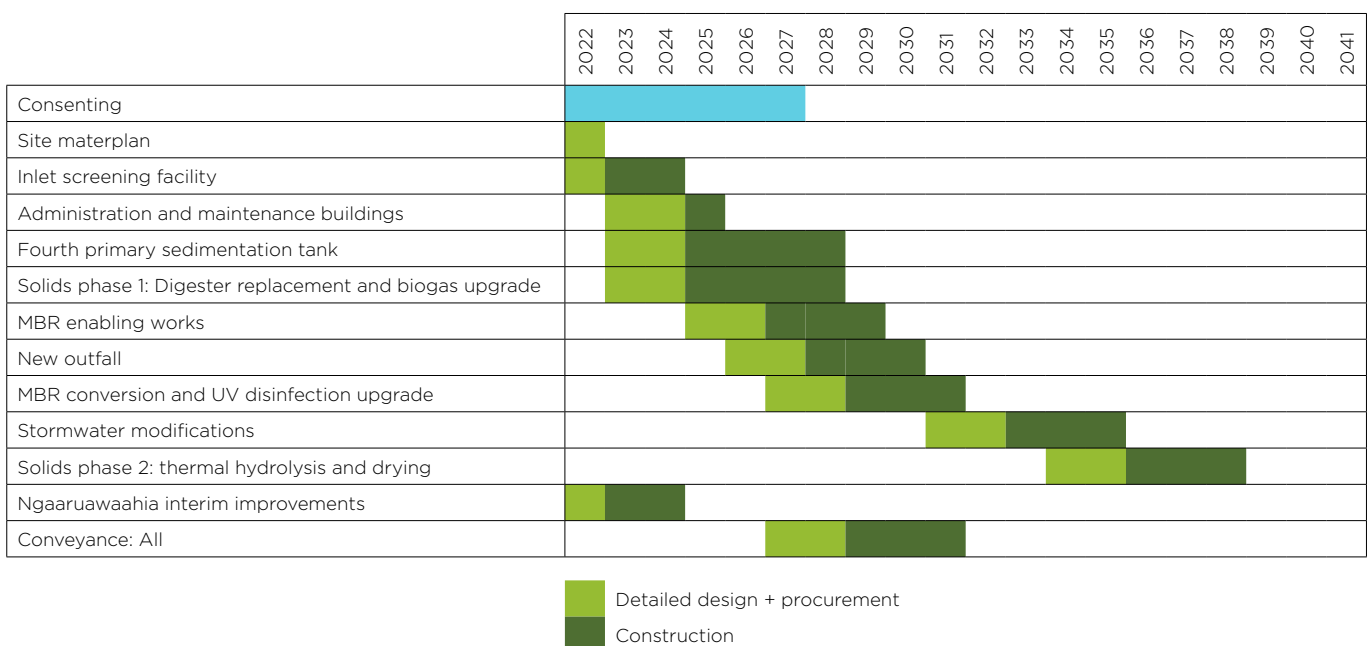
The *Preferred Option Technical Report* sets out two options for short-term staging: a 'go-fast' option and a longer option.

The **'go-fast' option** assumes a combined consent application for the Pukete discharge (long-term) and Ngaaruawaahia discharge (short-term five to seven-year transition period). The consent would be lodged in 2025, which requires concept design, technical assessments, consultation, and preparation of a consent application to commence as soon as practicable following acceptance of this DBC. The MBR conversion would be commissioned in 2031 as shown in FIGURE.

The **longer transition option** has consent being lodged in 2027, six months prior to expiry of the Ngaaruawaahia WWTP discharge consent. The MBR conversion would be commissioned in 2035, four years later than the 'go-fast' option. The 'go-fast' option seeks to improve discharge quality and give effect to Te Ture Whaimana as soon as practicable and is therefore preferred.

This DBC allows for the bulk of conveyancing works to be completed in one phase around 2029-2031. An alternative option could see new conveyancing from Te Kowhai and Horotiu completed early with the Taupiri and Ngaaruawaahia completed later (as dictated by capacity requirements). Diverting Te Kowhai and Horotiu to Pukete early has the advantage of reducing load at Ngaaruawaahia which would reduce the discharge load from Ngaaruawaahia during the interim period.

**Figure 33: Proposed staging of preferred option**



## Staging post-2041

While this DBC focusses on the initial conversion works required to deliver the preferred option, the *Preferred Option Technical Report* identifies key aspects of the continual upgrade works required to respond to growth.

- 2041-2050
  - Addition of a pre-fermenter
  - Addition of a fifth primary sedimentation tank
  - Addition of centrate treatment
- 2051-2060
  - Expand Gravity Belt Thickeners (GBT) area
  - Addition of a sixth primary sedimentation tank
- Post-2061
  - Additional membrane bioreactors
  - Additional digesters
  - Expansion/relocation of dewatering process
  - Renewal and expansion of energy recovery

## 11.3 Cost estimates

An updated cost estimate was prepared for the preferred option, which has been subject to peer review. The Preferred Option Technical Report details the assumptions used to build the cost estimate. A conceptual design of the preferred option will need to be prepared to confirm the estimated capital and operating costs. An estimating tolerance has been included to account for general unknowns in the design and for any discrepancies in the design information prepared to date. These estimates are Class 5 estimates as per the AACE Cost estimate Classification System and have an expected range of -30% / +50%.

Following development of the original capital cost estimates, independent quantity surveyors, Alta Consulting Ltd, undertook a peer review of the capital cost estimates. Alta developed parallel estimates for key items and identified potential scope items missing from the cost estimates based on their experience with similar projects. The preferred option costs were updated in response. Key changes include:

- Pukete WWTP: an increase in scope (including support services such as lighting and civils), updated costs for the Thermal Dryer, increased allowance for ground improvements, and correction of inconsistencies in cost escalation
- Conveyance: an increase in P&G allowances, pipe laying rates, and traffic management costs.

Table 18 summarises the P50 (Most Likely) and P95 capital costs for the preferred option.

The capital cost estimates do not include capital costs for any required interim upgrades to the Ngaaruawaahia WWTP prior to diversion of flows to Pukete. Capital costs associated with options to include biological phosphorus removal (extra reactors required) and incineration of biosolids are included in the P95 costs but not P50.

Table 19 summarises the expected annual operational costs at 2031, 2041, 2051, and 2061.

The operational costs assume thermal hydrolysis and thermal drying are implemented by 2041 and that Hamilton South is diverted to the new Southern WWTP by 2061.

**Table 18: Preferred option capital cost estimate**

	Conveyancing	Treatment	Total
P50 most likely cost	\$118M	\$834M	\$952M
P95 cost	\$135M	\$1,166M	\$1,301M

**Table 19: Preferred option operational cost estimate**

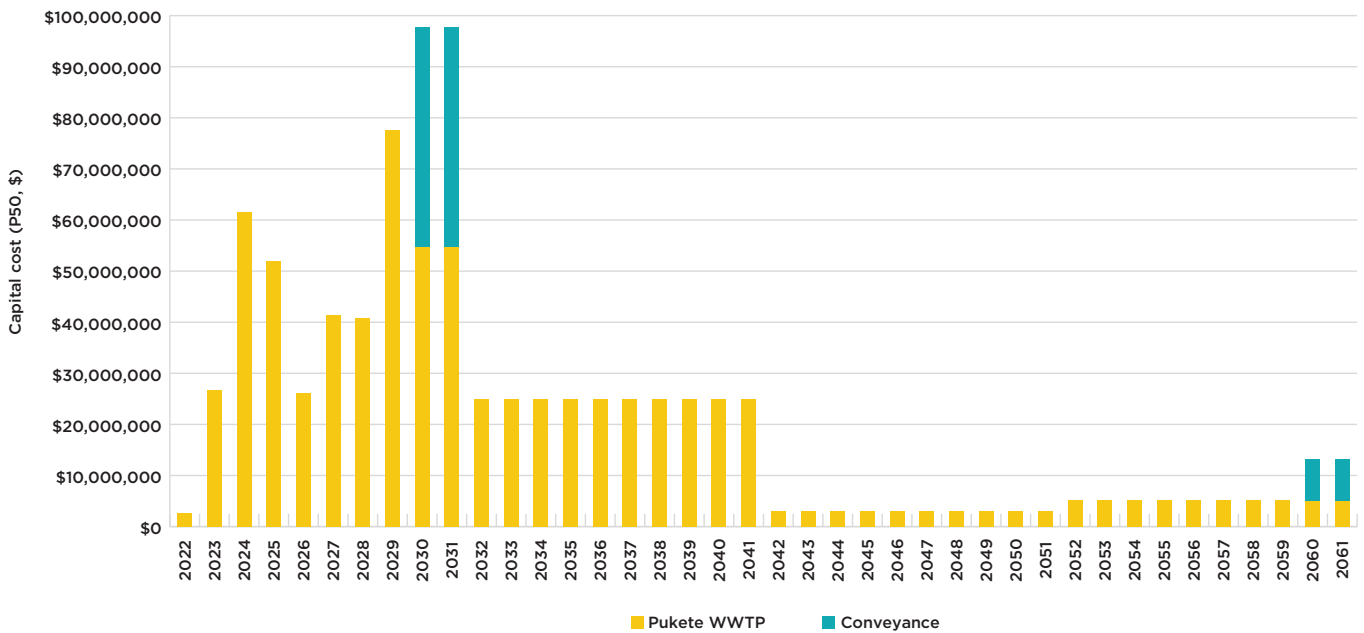
Year	2031	2041	2051	2061
Pukete WWTP	\$17.7M	\$20.3M	\$23.0M	\$21.8M
Conveyance	\$0.41M	\$0.49M	\$0.55M	\$0.67M
<b>Total</b>	<b>\$18.1M</b>	<b>\$20.8M</b>	<b>\$23.6M</b>	<b>\$22.5M</b>

**Table 20: Capital cost estimate for each 10-year period (excluding escalation/inflation)**

	2022 - 2031	2032 - 2041	2042- 2051	2052-2061
Pukete WWTP	\$465M	\$270M	\$43M	\$56M
Conveyance: Te Kowhai to Horotiu	\$6.9M			
Conveyance: Taupiri to Ngaaruawaahia	\$11M			\$7.1M
Conveyance: Ngaaruawaahia to Horotiu	\$45M			\$5.3M
Conveyance: Horotiu to Pukete	\$34M			\$5.8M
<b>Total</b>	<b>\$562M</b>	<b>\$270M</b>	<b>\$43M</b>	<b>\$74M</b>

**Figure 34: Preferred option annual capital investment estimate (excluding renewals)**

**Preferred option capital cost estimate**



# Commercial Case

He Keehi tauhokohoko –  
haha ratonga me te whai kirimana



## 16. Introduction

The Commercial Case sets out the proposed approach to packaging and contracting components of the preferred option for the Northern Metro DBC. It covers design and construction, outlines the procurement plan, sets out potential for risk sharing, and recommends contractual arrangements.

The purpose of the Commercial Case is to demonstrate the preferred option can be implemented with a viable procurement process and well-structured deal between the public sector and its service providers.

At the time of drafting this DBC, transition processes for the Government's Three Waters Reform Programme were underway with the Water Services Entities Bill having passed its Third Reading. Many aspects of the future state under the proposed 'Entity B' remain unknown, including those operational arrangements that influence this Commercial Case.

Some aspects of this DBC will commence prior to the proposed transition to Entity B in 2024. The DBC has therefore been prepared based on current council arrangements while maintaining flexibility to transition to a new structure as required. The arrangements outlined in the DBC should be revisited if and when the transition is complete.

This DBC also relies on a number of assumptions that may be revised during preparation of the Pukete WWTP site masterplan. Once the masterplan is complete, the aspects of this Commercial Case relevant to the Pukete WWTP should be reviewed and confirmed or amended as required.



# 17. Procurement rules

## 17.1 NZ Government procurement rules

Local Government Agencies are encouraged to follow the Government Procurement Rules.

The Government Procurement Rules support sustainable and inclusive procurement through the promotion of good practice for procurement planning, approaching the supplier community, and contracting.

The Procurement Strategy should align with The Principles of Government Procurement and seek to meet as many of the Charter expectations as possible. Relevant rules include those relating to open advertising, improving New Zealand business involvement, contributing to social outcomes, and providing sufficient time for tendering.

## 17.2 HCC Procurement Policy

HCC's Procurement Policy<sup>40</sup> will apply where services are contracted by HCC. The guidelines for appointing suppliers are outlined below:

- **Procurement of less than \$50,000:** may be procured through an Approved Supplier or Direct Appointment process, although competitive quotes may also be acquired
- **Procurement of \$50,000 to \$250,000:** should be engaged through a Request for Tender/Quote process (Public or Private), except when engaging an Authorised Supplier or by Direct Appointment. Any Direct Appointment should comply with one of the criteria listed in 4.3.5 and a Procurement Plan must be approved by the appropriate delegated authority.
- **Procurement of over \$250,000:** must go through a Public Request for Tender/Quote process unless engaging an Authorised Supplier or either the decision to undertake a Direct Appointment or not to go through a Public RFX process has been approved by the relevant Council Committee or full Council

The Northern Metro WWTP stage one capital costs will be in excess of \$100,000, hence a public request for tender will be required under HCC's Procurement Policy.

## 17.3 WDC Procurement Policy

Waikato DC's Procurement Policy<sup>41</sup> will apply where services are contracted by WDC. The guidelines for appointing suppliers are outlined below:

- **Procurement of less than \$50,000:** Requires single quote in writing where an existing supplier exists, or two quotes in writing where there is no existing supplier arrangement for the goods and services. Services can be engaged via electronic purchase order or appropriate minor physical works contract.
- **Procurement of \$50,000 to \$250,000:** Requires a light procurement plan, three written quotes, or public or invited request for tender process. Services engaged via contract.
- **Procurement of over \$250,000 or any high-risk level procurement regardless of dollar value:** Requires a full procurement plan, single or multi-stage request for tender process, open procurement process. Services engaged via contract.

The Northern Metro WWTP stage one capital costs will be in excess of \$250,000, hence a public or invited request for tender will be required under Waikato DC's Procurement Policy and Manual.

40 Hamilton City Council Procurement Policy / Hamilton City Council Procurement Policy and Procedures Manual (December 2021)

41 Waikato District Council Procurement Policy (April 2021)

# 18. Procurement strategy

## 18.1 Procurement strategy methodology

The preferred option can be broken up into a number of projects and work packages. Each project within the wider preferred option will be delivered by a single Council on behalf of the other Sub-regional Partners. It is expected that the Lead Council (i.e., HCC or WDC) will generally be identified by the spatial location of the project. The Lead Council will use its existing resources, policies, and procedures to deliver each project. The Lead Council structure is discussed in the **Management Case**.

This section documents the identification, evaluation, and selection of options for packaging and contracting of the works required to deliver the preferred option.

The Southern Metro DBC has been used as a starting point for consideration of contracting models (refer Section 3.1 of the Southern Metro DBC Commercial Case). The Southern Metro DBC assessed a variety of contract models but generally concluded that only Construction and Design & Build contracts were appropriate. The full range of contract models are considered at a high level in this DBC, but preferred contract options have been selected based on a qualitative assessment rather than a full MCA process.

The preferred option is comprised of four discrete projects:

- Ngaaruawaahia WWTP interim works
- Ngaaruawaahia WWTP decommissioning
- Pukete WWTP upgrades
- Conveyancing

Procurement and packaging of each project is considered below.

## 18.2 Procurement plan

The Southern Metro DBC sets out a proposed procurement plan for the projects included within that DBC. Procurement for the Northern Metro DBC should follow a consistent process. At a minimum, the proposed approach must comply with Government Principles of Procurement, the Government Procurement Rules (including consideration of Broader Procurement Outcomes) and the Lead Council's procurement policies.

Procurement is generally expected to be undertaken through a competitive tender process to ensure market tension and to drive value for money outcomes.

A detailed procurement plan will be prepared for each project by the relevant Lead Council before going to market. Subject to any lessons learned through procurement of projects under the Southern Metro DBC, the same principles for approach to the market, evaluation of offers and identification of the preferred supplier should be adopted.

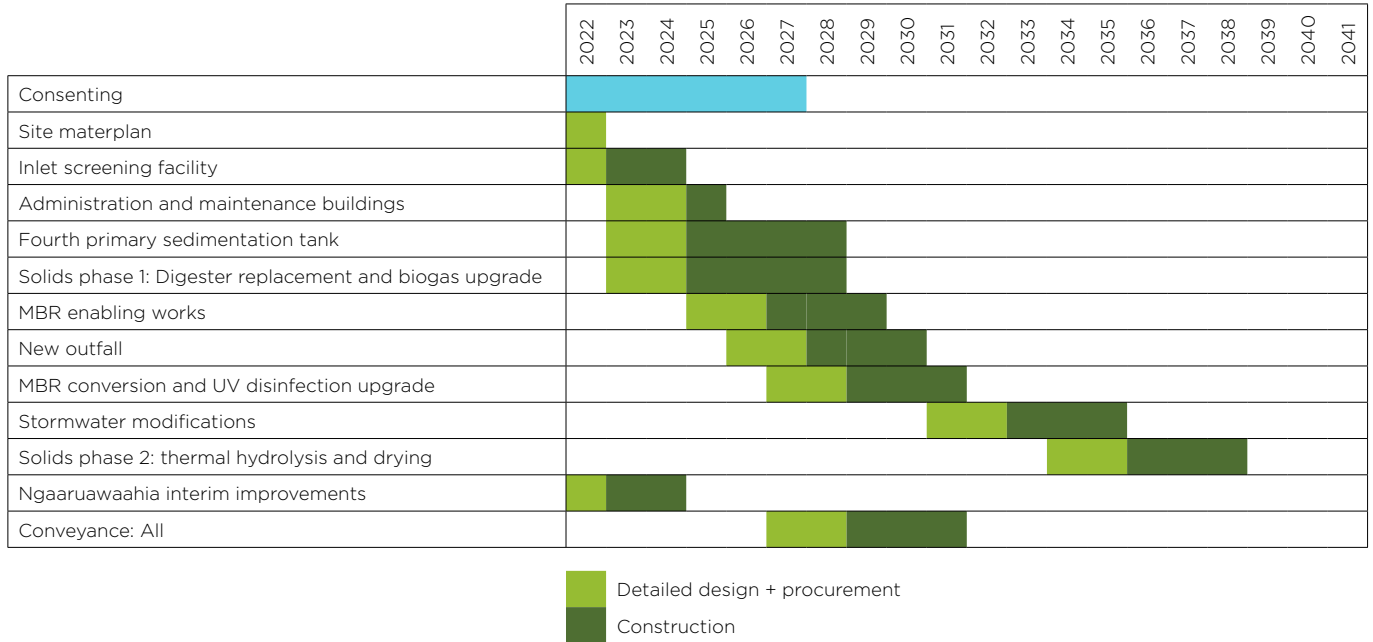
- A two-stage procurement process for each project is recommended:
- Expression of Interest (EOI)
  - publicly advertised through GETS
  - evaluated by a Pass/Fail score on non-price attributes
- Request for Tender (RFT)
  - made available to the successful EOI respondents
  - evaluated using a Weighted Attribute Method<sup>42</sup> including extensive interaction with the respondents where attributes and assignment of weighting will be set by the relevant procurement team
  - non-price attributes are expected to include environmental impacts, embedded carbon, waste reduction, material demand reduction, social responsibility, and social procurement factors
  - evaluation will be undertaken by a cross-function team with collective significant experience evaluating contracts of scale and complexity.

<sup>42</sup> The Weighted Attribute Method is a supplier selection method in which the preferred supplier meets the required outcomes set out in the RFT and provides the best value for money. A balanced decision is taken that weighs up the whole-of-life costs and/or non-financial

An independent Probity Auditor will be appointed to shadow the tender process to ensure a transparent procurement process, ensure all parties are treated equitably and ensure potential third-party risks are managed proactively.

The proposed timeline for the procurement is shown on Figure 48 with procurement expected in the second half of each of the ‘detailed design and procurement’ phases.

**Figure 48: Proposed procurement timeline**



### 18.3 Contracting options

Contracting options have been developed based on the Southern Metro DBC, NZ procurement guidelines, and comparable projects. Contracting options are considered in **Appendix F**.

## 18.4 Ngaaruawaahia WWTP interim works

The current Ngaaruawaahia WWTP consents expire in 2029. Even under the 'go-fast' staging proposed in the **Economic Case**, wastewater flows will not be diverted to the Pukete WWTP until 2031. Some level of medium-term upgrades to achieve a reduction in discharge load are anticipated to be required to obtain a new consent (and to manage anticipated growth) for the period 2029 until (at least) 2032.

Further, on-going exceedances of consent conditions for ammoniacal nitrogen and total nitrogen have triggered a consent condition requirement for short-term upgrades to the WWTP by July 2023.<sup>43</sup>

These short to medium-term upgrade works are not directly linked to any other project and there are no identified efficiencies in combining this project with the other projects. The small scale of the works does not justify segregating early works/enabling works, civils and treatment systems. Therefore, a single package for each stage is recommended: interim upgrades (short-term) and medium-term re-consenting/capacity upgrades (if required).

It is expected these works would take place under existing contract arrangements (i.e., through Watercare Waikato) using funding already committed in the WDC LTP for the Ngaaruawaahia WWTP.

Table 31 summarises the recommended packaging and contracting model for the Ngaaruawaahia WWTP interim works.

**Table 31: Ngaaruawaahia WWTP interim works packaging and contracting recommendations**

<b>Size and complexity</b>	The WWTP receives average flows of 4,500m <sup>3</sup> /day increasing to 6,000m <sup>3</sup> /day in 2031. The interim upgrades may encompass some design work that small contractors may not have the necessary skill or resource to undertake.
<b>Integration risk</b>	This is a brownfields site and upgrades will have to be undertaken while the plant is operational resulting in some integration risk.
<b>Timing</b>	There is a short-term upgrade requirement (by July 2023) to comply with existing consent conditions.  Additional improvements may be required to obtain a new discharge consent to cover the period between expiry of the current consent in 2029 and diversion of flows to the Pukete WWTP in 2031. These are works that could be completed in advance of re-consenting to demonstrate a willingness to put investment into improving discharge quality in that interim period.
<b>Packaging recommendation</b>	Two stage-based packages: interim upgrades (short-term) and medium-term re-consenting upgrades.
<b>Contracting recommendation</b>	Existing contract/procurement arrangements (and using funding already committed in the WDC LTP for the Ngaaruawaahia WWTP).

<sup>43</sup> There may be an opportunity to achieve efficiency through scoping these short-term upgrades to also achieve the level of load reduction anticipated to be required through the interim consent.

### 18.5.1 Packaging

The preferred option includes an on-going stream of works at the Pukete WWTP in response to growth. For the purpose of this **Commercial Case**, we are most interested in the works occurring over the next 10 years broadly associated with the conversion to an MBR plant. Broadly speaking, these works include:

- **Works required to respond to existing renewals and growth:** HCC is already progressing changes to the inlet including a new screening facility. A fourth primary sedimentation tank will be required before 2029, and the existing digesters require replacement by 2029 as part of Phase 1 of the solids stream upgrade.
- **The works required to achieve the proposed treatment standards:** This includes the MBR conversion, replacement/upgrade of UV disinfection.
- **A second outfall:** The existing outfall does not have sufficient capacity to meet expected growth and does not meet mana whenua design preferences. We anticipate that a co-designed second outfall will be required as a condition of a replacement discharge consent.
- **New buildings:** The existing administration and maintenance buildings have been identified as seismic risks and sit on land better utilised for future expansion and reconfiguration of WWTP processes.

In the medium-term, upgrades are required to the solids handling processes (including addition of thermal hydrolysis and drying) and existing on-site stormwater (noting that some changes to stormwater will be incorporated into other packages of work as required). A fifth primary sediment tank will also be required post-2041 (under the baseline growth assumptions).

Five packaging options have been considered ranging from fully disaggregated to a single package (excluding the inlet works that are currently being progressed). Figure 49 summarises the key pros and cons of each of the packaging options. Key considerations are:

- **Inlet works:** These works are currently being progressed and should remain a standalone package.
- **New administration and maintenance buildings:** These works require a different skill set to other packages (including architectural design) and would ideally be completed early to allow the space they currently occupy to be utilised for other processes. This DBC recommends they are completed as a standalone package.
- **4<sup>th</sup> primary sedimentation tank (PST):** This cannot be deferred until after new discharge consent is obtained and therefore cannot be packaged with the major MBR conversion works (unless the MBR conversion works are procured in advance of consenting and design which is considered too high a risk). This could be combined with the solids phase 1 works, but for the purpose of this DBC it is recommended the fourth PST is progressed as a standalone package.
- **Solids phase 1:** The proposed staging has these works occurring in tandem with the fourth PST. If they are to be completed at the same time, it may be appropriate to package these together. However, these works have not been flagged as urgent and for the purpose of this DBC, it is recommended they are considered a standalone package to allow these works to be deferred, if appropriate.
- **New outfall:** The new outfall is culturally significant and requires co-design (or significant engagement at a minimum) with mana whenua. Including the outfall as part of a wider package of works puts more focus on commercial considerations and reduces the ability to work collaboratively with mana whenua. For these reasons, the DBC recommends the outfall is progressed as a standalone package.
- **MBR conversion and UV:** The MBR conversion and UV are the primary works required to improve treatment standards. It makes sense for these works to be packaged.
- **Stormwater:** These works are not necessarily required until after the MBR conversion is completed and there are limited drivers to package these with other works. These works could be packaged with the MBR conversion works if the timing lines up.
- **Solids phase 2:** These works are not necessarily required until well after the MBR conversion is completed and there are limited drivers to package these with other works. These works could be packaged with the MBR conversion works if the timing lines up.

**Figure 49: Pukete WWTP upgrade packaging options: white boxes represent standalone works, colours show grouping.**

Disaggregated	Single package	Buildings, early works packaged, post-consent works packaged	Buildings, post-consent works packaged, other packages standalone	Buildings and MBR conversion packaged, other works standalone
Inlet works: New screening facility	Inlet works: New screening facility	Inlet works: New screening facility	Inlet works: New screening facility	Inlet works: New screening facility
New administration and education centre	New administration and education centre	New administration and education centre	New administration and education centre	New administration and education centre
New maintenance building	New maintenance building	New maintenance building	New maintenance building	New maintenance building
4th primary sedimentation tank	4th primary sedimentation tank	4th primary sedimentation tank	4th primary sedimentation tank	4th primary sedimentation tank
Solids: Digester replacement and sludge dewatering facility	Solids: Digester replacement and sludge dewatering facility	Solids: Digester replacement and sludge dewatering facility	Solids: Digester replacement and sludge dewatering facility	Solids: Digester replacement and sludge dewatering facility
New outfall	New outfall	New outfall	New outfall	New outfall
Conversion to MBR and addition of 6th reactor	Conversion to MBR and addition of 6th reactor	Conversion to MBR and addition of 6th reactor	Conversion to MBR and addition of 6th reactor	Conversion to MBR and addition of 6th reactor
Replacement of UV disinfection	Replacement of UV disinfection	Replacement of UV disinfection	Replacement of UV disinfection	Replacement of UV disinfection
Stormwater	Stormwater	Stormwater	Stormwater	Stormwater
Solids: Thermal hydrolysis and drying	Solids: Thermal hydrolysis and drying	Solids: Thermal hydrolysis and drying	Solids: Thermal hydrolysis and drying	Solids: Thermal hydrolysis and drying
<ul style="list-style-type: none"> <li>✗ Higher transactional cost associated with many contracts</li> <li>✗ Less chance to establish a longer term collaborative working relationship between owner, designers and constructors</li> </ul>	<ul style="list-style-type: none"> <li>✗ Doesn't match staging well - later works would be procured well before design is completed (4th PST required prior to consenting and design of MBR transition)</li> <li>✗ Does not recognise the different skill sets required for process vs buildings vs outfall</li> <li>✗ Very high risk of individual portion delays and therefore cost is contractual obligations already set</li> <li>✓ Single package, single procurement process, contract and contractor to manage - potentially simpler</li> </ul>	<ul style="list-style-type: none"> <li>✓ Allows 4th PST and solids phase 1 to be completed early (in advance of process re-consenting)</li> <li>✓ Separating out buildings allows for architectural design and for these packages to be progressed in advance of process re-consenting</li> <li>✗ Stormwater and solids phase 2 not required until later and may be better as separate contract</li> <li>✗ Does not recognise the different skill sets required for process vs outfall</li> </ul>	<ul style="list-style-type: none"> <li>✓ Allows 4th PST and buildings to be completed early and solids phase 1 to be completed early or deferred</li> <li>✓ Provides for the different skill sets required for process vs buildings vs outfall</li> <li>✓ Allows for the new outfall as standalone - less commercially focused, greater mana whenua involvement</li> <li>✗ Stormwater and solids phase 2 not required until later and may be better as separate contract</li> <li>✗ More packages, multiple procurement processes and contracts to manage - potentially more complex</li> </ul>	<ul style="list-style-type: none"> <li>✓ Allows 4th PST and buildings to be completed early and solids phase 1 to be completed early or deferred</li> <li>✓ Provides for the different skill sets required for process vs buildings vs outfall</li> <li>✓ Allows for the new outfall as a standalone package - less commercially focused contractor, more amenable to working with mana whenua</li> <li>✓ Allows stormwater and solids phase 2 to be completed later as standalone packages</li> <li>✓ More packages, multiple procurement processes and contracts to manage - potentially more complex</li> </ul>

## 18.5.2 Contract model

Recommendations made by the Southern Metro DBC in relation to the Southern WWTP and Cambridge WWTP have been considered. However, the Pukete WWTP works present different challenges to these projects, notably completing an MBR upgrade within a brownfields site while continuing to operate the existing WWTP processes. In this instance, there is an existing operations team in place so contract models that include operations are not considered practical.

**Table 32: Consideration of contract models for Pukete WWTP upgrades**

Contract model	Comment	Consider further
Construction only	<ul style="list-style-type: none"> <li>Lower tender costs than other options</li> <li>Provides rigour of owner's engineer undertaking design work</li> </ul>	Yes
D&B	<ul style="list-style-type: none"> <li>Well suited to simple, defined packages where design risk can be easily accepted by the private sector</li> <li>Tends to be less efficient for works like WWTPs where design is a significant component of overall costs (in the order of 25% compared to 5% on a large civils job). Results in a significant risk of paying for design twice.</li> <li>Some advantage in avoiding over-design (for example conservativeness in structural design of concrete tanks)</li> <li>Market may not be willing to accept design risk for all packages, noting this project includes significant interface elements both with existing infrastructure and future stages</li> <li>Can result in paying for design twice. A reasonable level of design is required prior to lodgement of a consent application; the consent could then be expected to take at least 12-24 months from lodgement to grant). There is an inherent inefficiency in contracting a designer to work through that process, then seek a D&amp;B contract that could have a different designer.</li> </ul>	Yes
Managing contractor	<ul style="list-style-type: none"> <li>Only applies to a disaggregated approach, which is not recommended (although the recommended option is formed of a number of packages)</li> <li>Doesn't match staging well. Later works would be procured well before design is completed (fourth PST required prior to consenting and design of MBR transition)</li> <li>Does not necessarily recognise the different skill sets required for process vs buildings vs outfall</li> <li>Very high risk of individual portion delays and therefore cost if contractual obligations already set</li> </ul>	No
Alliance	<ul style="list-style-type: none"> <li>Significant governance and management resourcing required</li> <li>Unlikely to deliver additional cost or timing certainty over construction only or D&amp;B</li> <li>Market may not be willing to accept design risk - this project includes significant interface elements both with existing infrastructure and future stages</li> <li>The Alliance model is difficult and typically less successful on brownfield sites</li> </ul>	No
DBOM	<ul style="list-style-type: none"> <li>Incentivises whole-of life-approach by combining delivery with operations</li> <li>Less appropriate for existing WWTP with existing operations and maintenance staff and procedures</li> </ul>	No
DBFOM	<ul style="list-style-type: none"> <li>Incentivises whole-of-life approach by combining delivery with operations</li> <li>Less appropriate for existing WWTP with existing operations and maintenance staff and procedures</li> </ul>	No
Private provisions	<ul style="list-style-type: none"> <li>Less appropriate for existing WWTP with existing operations and maintenance staff and procedures</li> </ul>	No

In relation to the recommended packages, the following recommendations are made:

- **Inlet works:** The design for these works is currently being progressed and it is expected that a Construction only contract model will be adopted.
- **New administration and maintenance buildings:** Buildings are commonly procured under Design & Build contracts where design risk is well understood and can be readily accepted by contractors. Either Design & Build or Construction only would be appropriate.
- **New outfall:** The new outfall is culturally significant and requires co-design (or significant engagement at a minimum) with mana whenua. Design and build contracts put a greater focus on commercial considerations and reduces the ability to work collaboratively with mana whenua. For these reasons, a Construction only contract model is recommended.
- **MBR conversion and UV:** A major consideration here is that a reasonable level of design is required prior to lodgement of a consent application. The consent could then be expected to take at least 12-24 months from lodgement to grant (assuming public notification and hearings). There is an inherent inefficiency in contracting a designer to work through that process, then seeking a D&B contract that could have a different designer. Therefore, a Construction only contract model is recommended.
- **Other process packages (Fourth sedimentation tank, solids upgrades phase 1 and 2, stormwater):** The Pukete WWTP is a complex site and the design of the various process packages will require a good understanding of the site and its operations. There is a potential advantage to engaging a single design consultant for all major design packages, regardless of whether the same contractor is used. This suggests a traditional Construction only contract model would be more appropriate for construction packages. There is also an opportunity to identify a contractor partner through the early packages who could be engaged to continue with the subsequent packages.

### 18.5.3 Summary

Table 33 summarises the recommended packaging and contracting model for the Pukete WWTP upgrades.

**Table 33: Pukete WWTP upgrade packaging and contracting recommendations**

<b>Size and complexity</b>	<p>The Pukete WWTP is large (starting flows of 47,000 m<sup>3</sup>/day, growing to 74,000 m<sup>3</sup>/day by 2061 with 2121 flows expected at 103,000 m<sup>3</sup>/day) and the upgrades works are highly complex.</p>
<b>Integration risk</b>	<p>There are significant integration risks with existing WWTP processes and the upgrade works will need to be carefully staged and managed in co-ordination with on-going operations and maintenance.</p>
<b>Timing</b>	<p>There is time to plan and deliver the works in a staged manner. While some works can commence as soon as funding is available, the major upgrade works (i.e., MBR conversion) cannot commence until consenting of the discharge to the River is complete.</p>
<b>Packaging recommendation</b>	<p>The following packages are recommended:</p> <ul style="list-style-type: none"> <li>• Inlet works</li> <li>• New administration and maintenance buildings</li> <li>• Fourth primary sedimentation tank</li> <li>• Solids phase 1</li> <li>• New outfall</li> <li>• MBR conversion and UV</li> <li>• Stormwater</li> <li>• Solids phase 2</li> </ul> <p>These packages have been developed based on expected timing. However, should timing align (for instance between the fourth primary sedimentation tank and Solids phase 1 package) and a contractor is available with skills and experience for both packages, aggregation of relevant packages could be considered.</p> <p>Similarly, there is an opportunity to identify a contractor partner through the early packages who could be engaged to continue with the subsequent packages.</p>
<b>Contracting recommendation</b>	<p>The Pukete WWTP is a complex site and the design of the various process packages will require a good understanding of the site and its operations. There is a potential advantage to engaging a single design consultant for all major design packages, regardless of whether the same contractor is used. This suggests a traditional Construction only contract model would be more appropriate for construction packages. There is also an opportunity to identify a contractor partner through the early packages who could be engaged to continue with the subsequent packages.</p> <p>A traditional Construction only contract model is recommended for all packages except the new buildings and large reactors where a Design and Built contract could be considered. The primary reason for recommending Construction Only is the ineffectiveness of D&amp;B contracts observed in WWTP projects (where the design cost can represent 20% of the total cost rather than the 5% seen on large civil projects like roads).</p>

## 18.6 Conveyancing

### 18.6.1 Packaging

The preferred option includes several stages of conveyance works to align with growth. For the purpose of this **Commercial Case**, we are most interested in the first phase of conveyance works which include:

- New pump stations at Taupiri and Te Kowhai
- Upgraded pump stations at Ngaaruawaahia and Horotiu/Ports of Auckland
- New rising mains:
  - Taupiri to Ngaaruawaahia
  - Ngaaruawaahia to Horotiu (twin main)
  - Te Kowhai to Horotiu
  - Horotiu to Pukete (twin main)
- New emergency storage at the Taupiri, Ngaaruawaahia, Te Kowhai, and Horotiu/POAL pump stations

The next major tranche of conveyance works is not required until around post-2041. The post-2041 packages are not considered here.

Four packaging options have been considered

- Fully disaggregated, each package progressed individually
- Split into new pump stations, upgraded pump stations and pipes
- Split into pump stations and pipes
- A staged approach to reflect the option discussed in the **Economic Case** where Te Kowhai and Horotiu are diverted to Pukete early to remove some load from the Ngaaruawaahia WWTP.

**Figure 50: Conveyancing packaging options**

Disaggregated	Pump stations and pipes	Pump stations and pipes	Staged (Te Kowhai & Horotiu early)
New pump station & emergency storage: Taupiri	New pump station & emergency storage: Taupiri	New pump station & emergency storage: Taupiri	New pump station & emergency storage: Taupiri
New pump station & emergency storage: Te Kowhai	New pump station & emergency storage: Te Kowhai	New pump station & emergency storage: Te Kowhai	New pump station & emergency storage: Te Kowhai
Upgraded pump station & emergency storage: Ngaaruawaahia	Upgraded pump station & emergency storage: Ngaaruawaahia	Upgraded pump station & emergency storage: Ngaaruawaahia	Upgraded pump station & emergency storage: Ngaaruawaahia
Upgraded pump station & emergency storage: Horotiu/POAL	Upgraded pump station & emergency storage: Horotiu/POAL	Upgraded pump station & emergency storage: Horotiu/POAL	Upgraded pump station & emergency storage: Horotiu/POAL
New rising main: Taupiri to Ngaaruawaahia	New rising main: Taupiri to Ngaaruawaahia	New rising main: Taupiri to Ngaaruawaahia	New rising main: Taupiri to Ngaaruawaahia
New rising main: Ngaaruawaahia to Horotiu	New rising main: Ngaaruawaahia to Horotiu	New rising main: Ngaaruawaahia to Horotiu	New rising main: Ngaaruawaahia to Horotiu
New rising main: Te Kowhai to Horotiu	New rising main: Te Kowhai to Horotiu	New rising main: Te Kowhai to Horotiu	New rising main: Te Kowhai to Horotiu
New rising main: Horotiu to Pukete	New rising main: Horotiu to Pukete	New rising main: Horotiu to Pukete	New rising main: Horotiu to Pukete

At this stage, it is recommended to progress two packages - pump stations and pipes - to reflect the difference skill sets required.

### Contract model

The Southern Metro DBC concluded that only a Construction only contract model would be appropriate for conveyance packages. That conclusion has been adopted here, noting there is an opportunity for pump stations or pump station elements to be contracted under a D&B contact.

**Table 34: Consideration of contract models for conveyance packages**

Contract model	Comment	Consider further
Construction only	<ul style="list-style-type: none"> <li>Lower tender costs than other options</li> <li>Provides rigour of owner's engineer undertaking design work</li> </ul>	Yes
D&B	<ul style="list-style-type: none"> <li>Transfer of design risk typically not appropriate for extensive buried infrastructure with a long design life</li> <li>Appropriate for pump stations (where these can be packaged) or pump station elements (such as electrical) where design risk can be more appropriately transferred to the contractor</li> </ul>	Potentially
Managing contractor	These options are unlikely to deliver any advantage for a project that has: <ul style="list-style-type: none"> <li>Limited design risk (reasonably straightforward design)</li> <li>Low procurement complexity</li> <li>No ongoing operation requirements</li> </ul>	No
Alliance		No
DBOM		No
DBFOM		No
Private provisions		No

### 18.6.2 Summary

Table 35 summarises the recommended packaging and contracting model for the conveyance packages.

**Table 35: Conveyance packaging and contracting recommendations**

<b>Integration risk</b>	Much of the conveyance pipework can be completed offline with minimal integration risk. There will be some risk associated with upgrades to existing pump stations and around pipe tie-ins; however, this is not an unusual risk.
<b>Timing</b>	There is time to plan and deliver the works in a staged manner. While some works can commence as soon as funding is available, there would be a risk associated with constructing the major new works required to connect Ngaaruawaahia to Pukete WWTP in advance of approval of the discharge consent.
<b>Packaging recommendation</b>	Two packages: pump stations and pipes
<b>Contracting recommendation</b>	Traditional/construction only for pipes with an opportunity to further explore D&B for pump stations.  An option here would be to engage two contractors in a 'panel' arrangement and issue individual conveyance packages as design is completed.

## 18.7 Ngaaruwaahia WWTP decommissioning

### 18.7.1 Packaging

The decommissioning works are not expected to be technically complex but will require experience in remediation of contaminated soils. The decommissioning is not linked to any other project and there are no identified efficiencies in combining this project with the other projects.

Two packaging options have been considered:

- Decommissioning and redevelopment as separate packages
- Decommissioning and redevelopment as a single package

At this stage, limited consideration has been given to future use of the Ngaaruwaahia WWTP site post-decommissioning. Beyond the conveyance infrastructure that will remain on the site, the site redevelopment could range from returning to pasture, to indigenous terrestrial or wetland planting, or to something more complex.

The preferred packaging will depend on the complexity and timing of the redevelopment and should be confirmed during design development. If the site is going to be used only for pump station and emergency storage with straightforward planting-type remediation, a single package would be appropriate. If the redevelopment is more complex or will occur later, two packages would be required.

### 18.7.2 Contract model

The decommissioning and remediation works are not expected to be technically complex nor give rise to any matters that would suggest use of a more complex contract model. A Design and Construct contract model would be appropriate for decommissioning (where there is limited design input) but would limit the ability of the Project partners and mana whenua to influence design outcomes associated with the remediation.

If decommissioning and remediation are progressed as a single package, a traditional Construction only contract model is recommended.

**Table 36: Consideration of contract models for Ngaaruwaahia WWTP decommissioning**

Contract model	Comment	Consider further
Construction only	Straightforward procurement option, allows multiple stages to be tendered over time Council has more control over design and greater ability to drive co-design with iwi Appropriate for brownfields sites	Yes
D&B	Decommissioning will have limited design and design risk likely to be well understood and able to be assumed by contractor Less ability for Council to influence design and less scope for co-design meaning this approach may be less advantageous for remediation	Decommissioning only
Managing contractor	These options are unlikely to deliver any advantage for a small-scale project that has: Limited design risk (reasonably straightforward design) Low procurement complexity No ongoing operation requirements	No
Alliance		No
DBOM		No
DBFOM		No
Private provisions		No

### 18.7.3 Summary

Table 37 summarises the recommended packaging and contracting model for the Ngaaruawaahia WWTP decommissioning.

**Table 37: Ngaaruawaahia WWTP decommissioning packaging and contracting recommendations**

Size and complexity	Small and limited complexity beyond management of contaminated soils.
Integration risk	Once wastewater is diverted to Pukete WWTP there is limited integration risk beyond working around any conveyance infrastructure that remains on the site.
Timing	Diversion of flows to the Pukete WWTP is expected 2031. Decommissioning should commence in coordination with diversion of flows and construction of any new conveyance infrastructure (pump station, emergency storage) that will remain on the site.
Packaging recommendation	Single package pending scope of site redevelopment.
Contracting recommendation	Traditional / construction only.

# 19. Risk sharing

Key risks are identified in the **Management Case**. Proposed sharing of risks between the public sector and potential suppliers is consistent with the Southern Metro DBC and outlined in Table 38.

**Table 38: Risk allocation**

Project/package	Risk category	Lead council	Supplier	Shared
Ngaaruawaahia WWTP interim works	Design	✓		
	Construction		✓	
	Interface & transition			✓
	Operation	✓		
	Technology & obsolescence	✓		
	Financing	✓		
	Legislation & regulation	✓		
Ngaaruawaahia WWTP decommissioning	Design	✓		✓ (D&B aspects)
	Construction		✓	
	Interface & transition			✓
	Operation	✓		
	Technology & obsolescence	✓		
	Financing	✓		
	Legislation & regulation	✓		
Pukete WWTP upgrades	Design	✓		✓ (D&B aspects)
	Construction		✓	
	Interface & transition			✓
	Operation	✓		
	Technology & obsolescence	✓		
	Financing	✓		
	Legislation & regulation	✓		
Conveyancing	Design	✓		✓ (D&B aspects)
	Construction		✓	
	Interface & transition			✓
	Operation	✓		
	Technology & obsolescence	✓		
	Financing	✓		
	Legislation & regulation	✓		

# 20. Contracting

## 20.1 Type of contract

Construction only contracts are proposed to be contracted using the New Zealand Standard form NZS 3910:2013.

Design and build contracts are proposed to be contracted using the New Zealand standard form NZS 3916:2013.

These are both widely understood by councils in New Zealand and are well proven for projects such as these. Given the nature of wastewater assets and the importance of process commissioning at completion, these standard form contracts often undergo revisions to allow for these specific requirements.

Alternative international contracts (e.g., New Engineering Contracts (NEC) or International Federation of Consulting Engineers (FIDIC)) can sometimes be better placed for wastewater construction. However, these are less widely used and understood in New Zealand.

Specific contractual arrangements including remedies, intellectual property rights, dispute arrangements and end of the contract options will be assessed by each Lead Council.

## 20.2 Payment mechanisms

Contracts are expected to use a milestone payment methodology where payments are made on successful completion of milestones specified in the contract.

Payment mechanisms will be confirmed in the procurement plan developed by each Lead Council.

## 20.2 Contract management

The responsibility for managing delivery under the contract as well as supplier relationship management will pass to the project manager at each Lead Council on the signing of the contract. If specified in the procurement plan, this person will develop a contract and relationship management plan in consultation with the successful supplier.

## 20.3 Accountancy treatment

The Lead Council will own the wastewater assets as an asset on its balance sheet.

New assets and corresponding financial liabilities will be recognised on the balance sheet when milestone payments (or other such payment mechanisms as specified in the contract) are made and debt is drawn down to finance those payments. Off-balance sheet treatments are not typically required under Construction only or Design and Build contracting structures.

As outlined in the **Financial Case** the Lead Council is expected to own and finance the delivery of the respective projects. The Lead Council will enter into a commercial agreement for servicing of cross-boundary communities. Service agreements between councils that commit to funding obligations over time are likely to be treated as financial liabilities.

## 21. Property plan

No permanent property requirements have been identified at this stage.

It is anticipated that temporary access arrangements and permanent easements may be required within road corridors for construction and operation of conveyancing (including new pump stations). Formal discussions should comment during pre-implementation when conveyancing design and construction requirements are better understood.



# Financial Case

He Keehi taahua – puutea,  
puuranga moni



# 12. Introduction

The financial case sets out the allocation of costs, funding requirements, preferred funding and financing solutions and affordability impacts.

This section was developed by PWC as a summary of the financial case. The full version of the financial case is attached as **Appendix D**.

There are financial risks and challenges in delivering a complex, long-term programme of works. These risks include:

- Long-term programme: The accuracy of cost estimates is likely to reduce the further out they are being forecast. The timing of elements of capital expenditure could change based on population growth, further reducing levels of certainty.
- Level of design work to support costings: Detailed design work has not yet been undertaken and this constrains the accuracy of cost estimates. Costs will be refined as the design work is progressed.
- Three Waters Reform programme: The Three Waters Reform programme may change the way wastewater projects and services are delivered and could affect funding and other assumptions.

# 13. Cost allocation

The Project will service communities across boundaries and costs will be allocated between councils. Allocation will be undertaken on a ‘beneficiary pays’ basis. This means costs will be split between councils depending on the proportion of people served and the time period over which they are served. Beneficiaries of the projects are the ones who will ultimately pay for them.

Cost allocation methodologies have been developed for each component of the Project. An overview of those methodologies is provided in Table 21.

In developing the DBC, the Councils have previously agreed for Southern DBC that WWTP capital costs be allocated between the Councils based on the proportion of population equivalents serviced by the WWTP. This approach has also been adopted for the Northern Metro DBC. Conveyance capital and operating costs will be allocated to the council whose beneficiaries require such conveyance. For the Northern Metro DBC all conveyance capital and operating costs will all be allocated to WDC.

**Table 21: Cost allocation methodology**

Component	Methodology
<b>Local reticulation - capital costs</b>	Costs for upgrades or new local reticulation (where applicable) are proposed to be met by the relevant council (or developer) on the basis that only beneficiaries within the territory would benefit from the works. The relevant council is expected to recover these funds as additional properties are connected.
<b>WWTP - capital costs (upgrades and new plants)</b>	WWTP capital cost allocation follows a ‘beneficiary pays’ basis, while also considering the asset’s useful life. For example, the mechanical and electrical capital costs in a given year are allocated based on the population equivalent demand for the next 20 years.
<b>WWTP - operating costs</b>	Operating costs are allocated on a ‘beneficiary pays’ basis - the operating costs in a given year are allocated based on the council’s proportion of total population equivalent demand in that year.  As was the case for the Southern DBC, the calculation of the respective proportions will need to be updated regularly to reflect changes in the level of population equivalent demand in each district. The expectation is that the proportions will be estimated every three years (i.e., to align with LTP cycles) and then confirmed at the start of each financial year as part of the annual planning process.
<b>Conveyance - capital costs</b>	Costs for upgrades or new conveyance are proposed to be met by the council relying on the conveyance for connection. This is because the beneficiaries of the conveyance would be located within that district (e.g., the capital cost of new pipes to connect Taupiri would be expected to be funded by WDC).
<b>Conveyance - operating costs</b>	As per conveyance capital costs, conveyance operating costs are proposed to be met by the council where the conveyance originates from.
<b>Land and consenting costs (Pukete WWTP)</b>	Given the land and consenting costs will benefit all stages of the Project, land acquisition, planning, and consenting costs for the WWTP are proposed to be shared pro-rata <sup>30</sup> according to the council’s forecast population equivalent proportion in the final year of capital spend, 2062.
<b>Depreciation</b>	Depreciation expenses are allocated on the same basis as the relevant capital or conveyance capital costs for assets that are depreciating.

The analysis considers future costs only, no allowance for costs incurred to date is included. The analysis also does not consider the historical investment by HCC in the Pukete WWTP as a means for reallocating future capital costs between councils given that this is a historical cost.

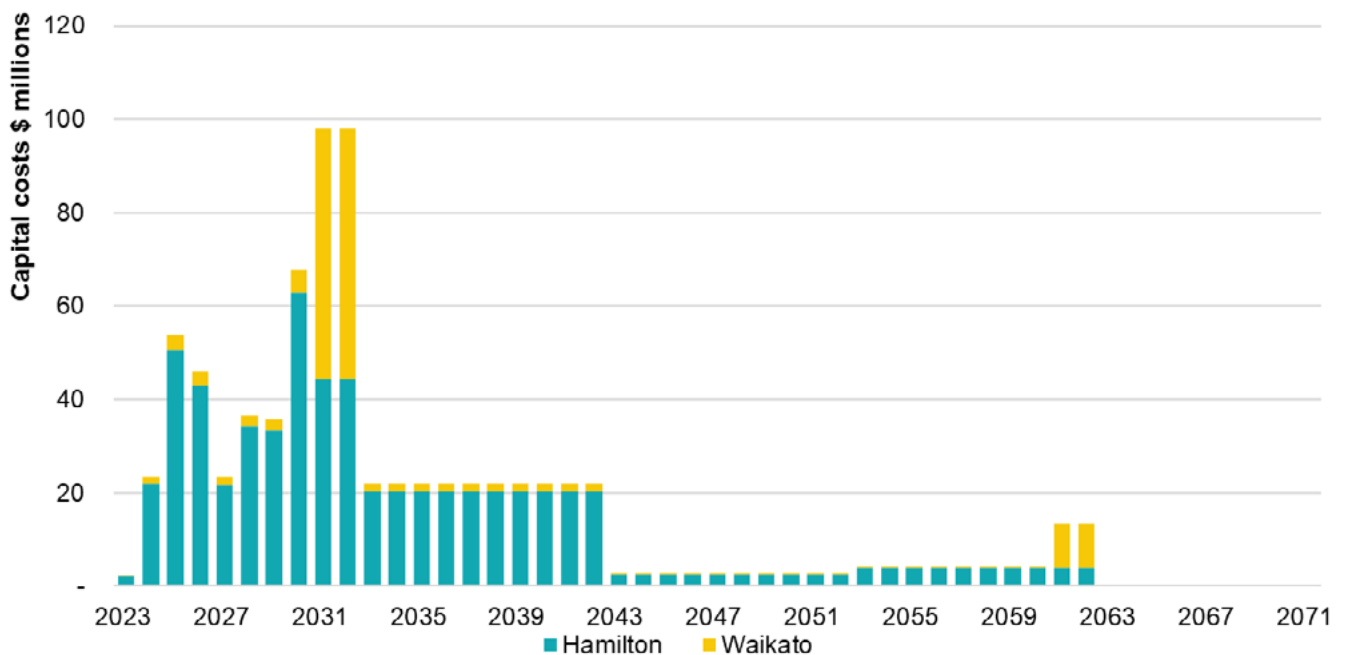
Based on the methodologies in Table 21 above, Table 22 shows a breakdown providing an indication of each Council’s share. Note that the allocations for the Pukete WWTP use the growth assumptions agreed for this DBC project and will need to be reviewed as part of project implementation. Pukete WWTP capital costs shown exclude renewals. The operating costs shown are inclusive of those attributable to industry (i.e. trade waste).

<sup>30</sup> These flows represent the final state of the preferred option.

**Table 22: Council cost allocation**

Cost allocation for each project component (\$000s)							
Capital costs	Council	2022-31	2032-41	2042-51	2052-61	2062-71	Total
Pukete WWTP	HCC	372,124	218,082	34,410	44,736	-	669,351
	WDC	27,081	18,144	2,978	4,065	-	52,268
	Total	399,205	236,225	37,388	48,801		721,619
Conveyance	WDC	99,990	-	-	18,150	-	118,140
Consenting	HCC	8,161	-	-	-	-	8,161
	WDC	739	-	-	-	-	739
<b>Total</b>		<b>508,095</b>	<b>236,225</b>	<b>37,388</b>	<b>66,951</b>	<b>508,095</b>	<b>848,659</b>
Operating costs <sup>31</sup>	Council	2022-31	2032-41	2042-51	2052-61	2062-71	Total
Pukete WWTP	HCC	95,793	167,768	191,319	212,500	200,171	867,552
	WDC	1,017	11,892	14,968	16,766	18,259	62,901
	Total	96,810	179,660	206,287	229,266	218,430	930,453
Conveyance	WDC	410	4,180	4,960	5,620	6,700	21,870
Ngaaruawaahia WWTP	WDC	6,174	-	-	-	-	6,174
<b>Total</b>		<b>103,394</b>	<b>183,840</b>	<b>211,247</b>	<b>234,886</b>	<b>225,130</b>	<b>958,497</b>

**Figure 35: Capital cost council allocation**



31 Operating costs continue will continue beyond 2071.

Figure 36: Operating cost council allocation

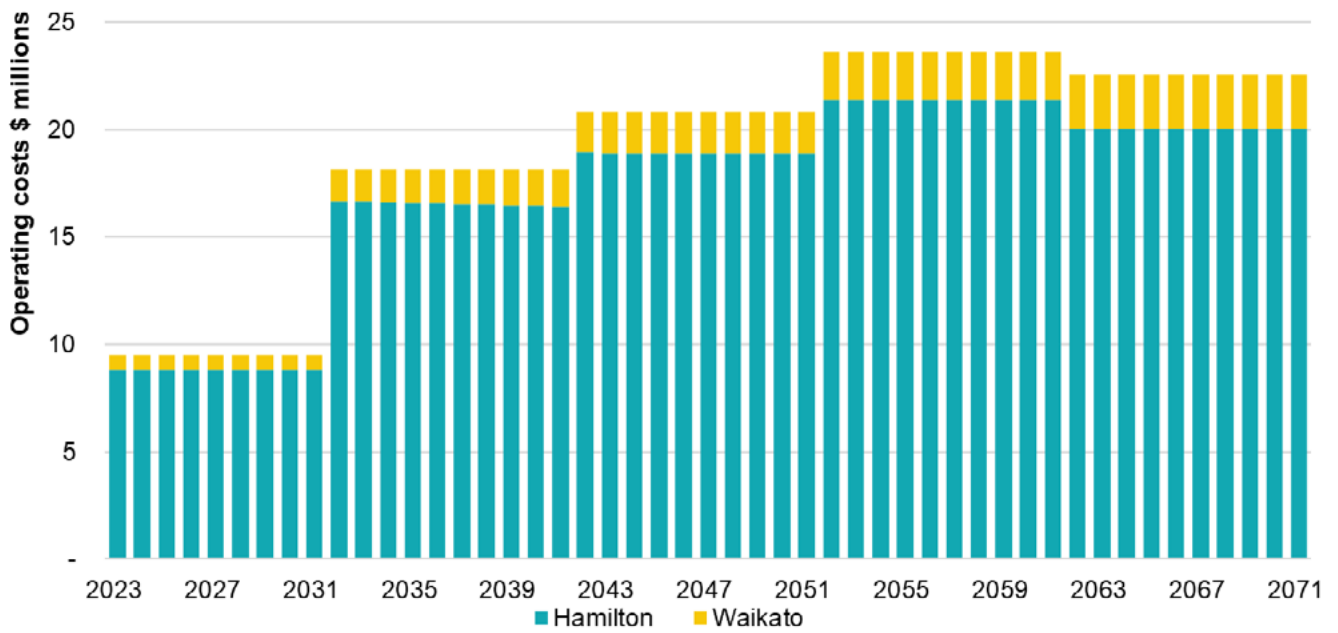
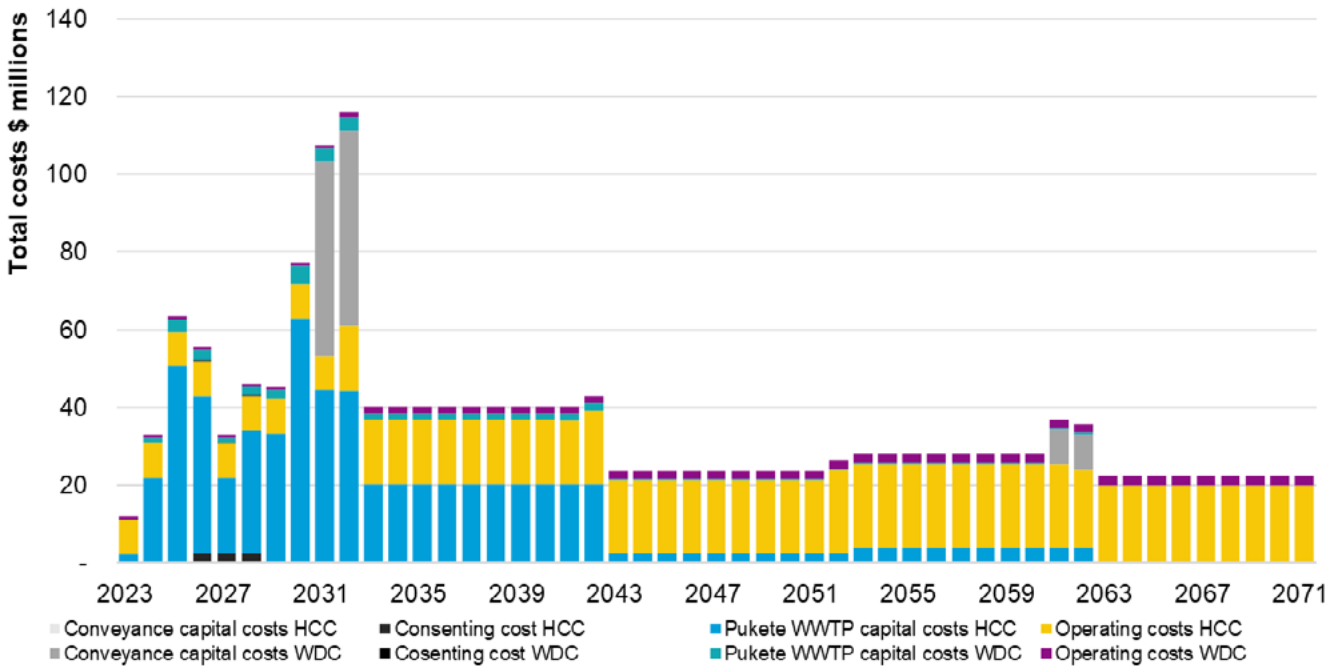


Figure 37: Overall cost allocation



The cost allocation for the Pukete WWTP in 2022-71 reflects:

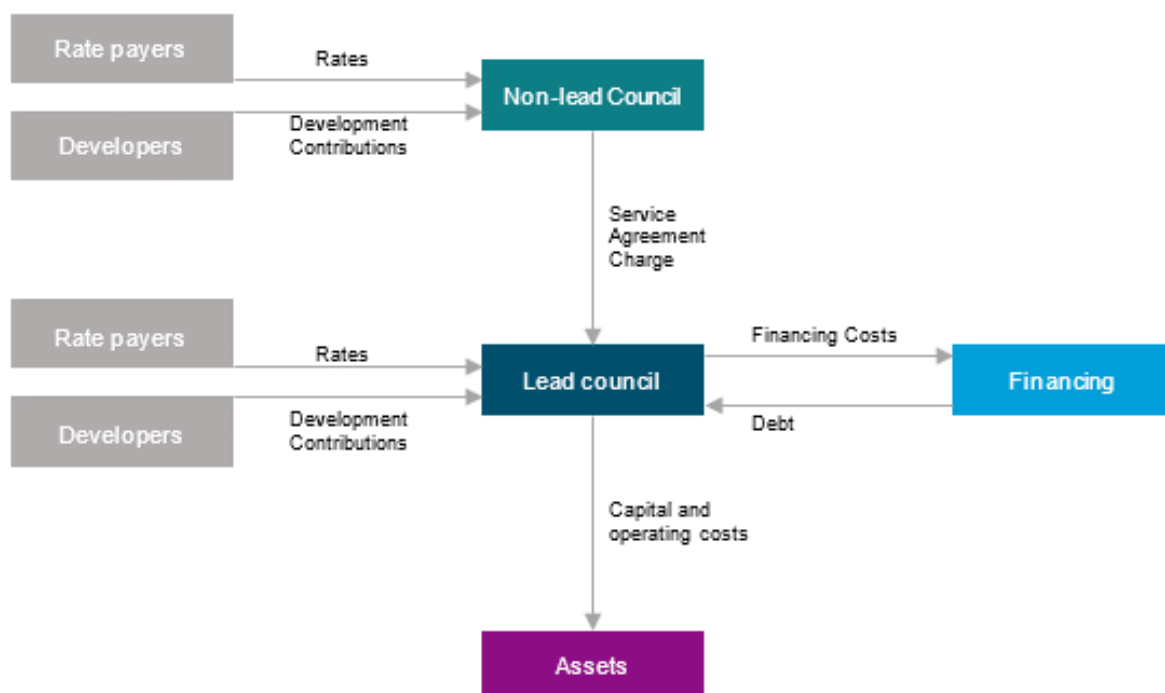
- The allocation of consenting costs allocated based on the council's population equivalent proportion in the final year of capital spend, 2062; and
- The build costs which are predominantly allocated to HCC based on the population equivalents served.

# 14. Financing

Similar to the approach adopted for the Southern DBC, the individual Programme projects will be delivered by a single council (the “Lead Council”). In the case of the Pukete WWTP, the Lead Council will deliver the project on behalf of the partners. The Lead Council will utilise its existing resources, policies and procedures for project delivery. Under the lead council model, the financing approach is broadly as follows:

- Financing of the full project cost is proposed to be undertaken by the Lead Council and where costs have been allocated to other councils (the non-lead council), costs (including financing costs) are proposed to be recouped through a service agreement.
- The non-Lead Council is expected to meet the service payment through applying its preferred funding tools to the communities that benefit from the Project within its respective territorial boundaries.

An overview of the proposed structure is provided below.



An evaluation of funding and financing options available to councils was undertaken and assessed during the development of the Southern DBC and the outcomes of that have been adopted for the Northern Metro DBC. Based on this, the preferred approach is for each Council to leverage its existing funding tools (i.e., general rates, targeted rates, development contributions etc) as per existing policies. These are outlined in Table 23 below.

**Table 23: Preferred options - Current council funding and financing approaches**

Council	Current funding approach	Current financing approach
HCC	General rates and development contributions (including trade waste or bulk supply arrangements)	Generally debt funded through the LGFA
WDC	Wastewater targeted rate and development contributions (including trade waste or bulk supply arrangements)	Generally debt funded through the LGFA

Responsibility for collecting rates and development contributions will remain with respective councils who will also determine which funding tools are utilised for each project.

# 15. Affordability

A high-level affordability assessment was undertaken based on an assessment of:

- The burden on ratepayers to fund the additional general and/or targeted rates;
- The cost to developers of development contributions; and
- The debt headroom under the current relevant LGFA covenants for each Council.

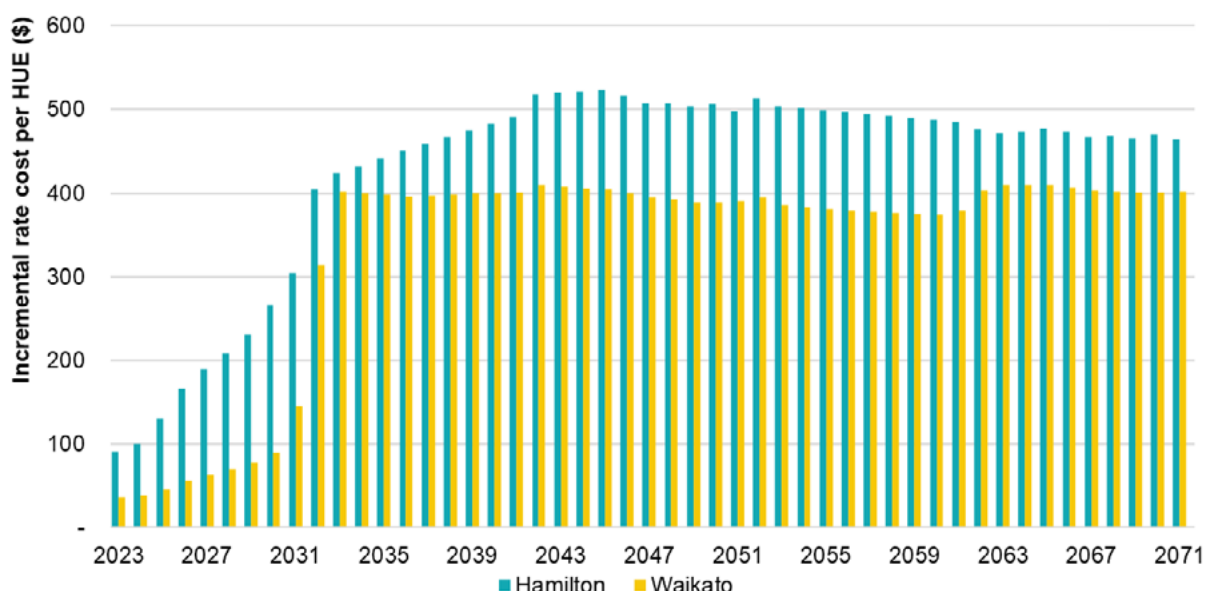
This assessment indicates the work is affordable for each Council. However, this should continue to be tested against the financial risks and complexities. An estimated rating impact as well as a high-level rates affordability assessment are outlined below.

An overview of the estimated annual impact (i.e. the incremental increase in rates per ratepayer) of the Programme on ratepayers is provided in Table 24 below.

**Table 24: Estimated average annual rating impact**

Year	2032	2042	2052	2062	2072
Hamilton City Council - General rate	\$484	\$538	\$520	\$497	\$440
Waikato District Council - Wastewater targeted rate	\$407	\$406	\$391	\$415	\$356

**Figure 38: Estimated annual rates impact per HUE**



An overview of the affordability of these rates increases is provided in Table 25 below. The assessment is based upon the five per-cent affordability threshold that was identified in the 2007 Local Government Rates Inquiry. Ratepayer affordability has been assessed based on adding the average rating impact for a ratepayer to the average household rates bill as outlined in the Ratepayer’s Report<sup>32</sup>.

The analysis shown in Table 25 starts with the median household total (gross) income in Waikato for 2021 (\$79,322)<sup>33</sup>, assumes wage inflation of 2%, in line with the Labour Cost Index between 1996 and 2022. Average annual rates per household in 2021 of \$2,540 and \$2,608 for HCC and WDC respectively were increased by the planned rate increase as stated in each of the Councils’ most recent LTP.

It should be noted that there are likely other costs that would need to be considered in more detail prior to implementing an increase in rates, such as additional water related costs, mortgage servicing costs and other cost of living increases.

Under current policies, HCC uses a general rate while WDC uses a wastewater targeted rate.

<sup>32</sup> Average annual rates are from <https://www.ratepayersreport.nz/>.

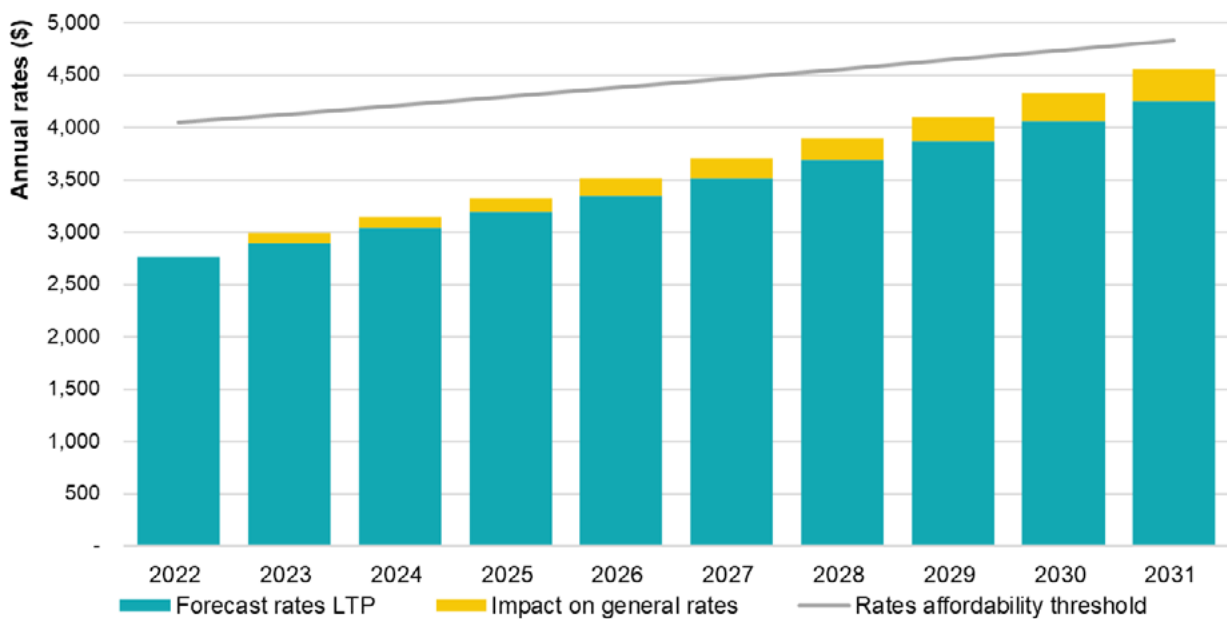
<sup>33</sup> StatsNZ.

**Table 25: High-level rates affordability assessment**

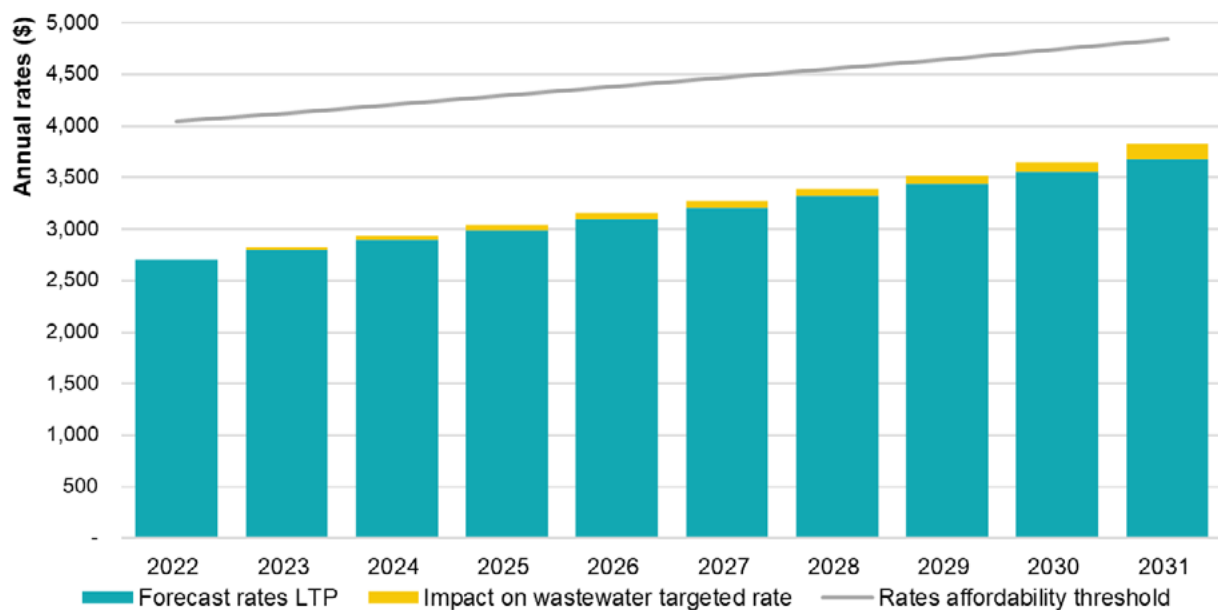
Council	Waikato median household gross income (2031)	Affordability threshold (5%)	Average rates per household	Additional project rating impact (2031)	Total rating burden	Affordability check
HCC - general rate	\$96,693	\$4,835	\$4,254	\$318	\$4,572	✓
WDC - wastewater targeted rate			\$3,679	\$150	\$3,828	✓

Table 25 demonstrates that the rating impacts all sit under the affordability threshold set out in the 2007 Local Government Rates Inquiry based on the average additional project rating impact for both HCC and WDC ratepayers.

**Figure 39: HCC ratepayer affordability**



**Figure 40: WDC ratepayer affordability**



## 15.1 Development contributions

Affordability of development contributions imposed on future development because of the Project was assessed through the following approach:

- The portion of the Project that is attributable to growth was estimated by Beca based on a high-level best judgement for each individual upgrade on the split between each factor. This split has been reviewed by HCC's asset management team and certain adjustments have been made. The analysis results in a split of 12% renewals, 55% Levels of Service and 33% Growth for Pukete WWTP and 63% Levels of Service and 37% Growth for Conveyance.
- Based on this analysis, it has been assumed that 33% (pro rata) of capital costs relate to growth. It is assumed these growth-related capital costs and associated debt financing costs are assumed to be recovered from development contributions. Councils consider that a development should make a contribution based on the anticipated demand that it will impose on infrastructure and the cost of providing that infrastructure to avoid ratepayers subsidising these.
- The DC charge was solved for on the basis that the overall DC revenues offset the growth-related costs by the end of each of the Councils' maximum cost recovery period – 30 years for HCC and 25 years for WDC<sup>34</sup>. DC revenue is calculated as the DC charge multiplied by increase in HUE demand in a year, with the DC charge being escalated annually at a rate of 2%<sup>35</sup>.
- A new DC charge is calculated every 10 years to reflect how councils will reassess and update their DC models periodically and to demonstrate the impact of the Project on DCs over time, noting some capital expenditure sits outside the 25–30-year timeframes of the Councils' maximum cost recovery period.

A more detailed assessment of the proportion of total capital costs that are attributable to growth, service improvement and renewal expenditure will need to be completed once cost estimates are refined.

The estimated development contribution per HUE of demand for each Council is provided in Table 26 below. Population is converted to HUEs based on 2.7 people per household in the region, as per Census data and HCC's DC policy<sup>36</sup>.

**Table 26: Estimated development contributions (per HUE of demand)**

Council	2022	2032	2042
Hamilton City Council	\$4,742	\$2,025	\$461
Waikato District Council	\$7,778	\$1,363	\$2,036

The development contributions set out above compare reasonably to existing levels charged by the Councils as they fall within the range of existing wastewater related development contribution charges currently outlined in HCC and WDCs respective development contribution policies, this is shown in Table 27 below.

**Table 27: Current wastewater related development contribution charges under existing council policies**

Council	Policy Reference	Average	Min	Max
Hamilton City Council	Development Contributions Policy 2022/23	\$10,061	\$7,337	\$17,940
Waikato District Council	Development Contributions Policy 28 June 2021 to June 2024	\$14,593	\$6,807	\$36,841

Note that under the current development contribution policies, each council has varying wastewater related charges across their catchment areas and for simplicity the average across the catchment areas is shown here and for HCC the charges presented here are on the basis of standard residential dwellings.

<sup>34</sup> In line with HCC and WDC development contribution policies.

<sup>35</sup> [treasury.govt.nz/information-and-services/state-sector-leadership/guidance/financial-reporting-policies-and-guidance/discount-rates](https://treasury.govt.nz/information-and-services/state-sector-leadership/guidance/financial-reporting-policies-and-guidance/discount-rates)

<sup>36</sup> [stats.govt.nz/information-releases/family-and-household-projections-2018base-2043/](https://stats.govt.nz/information-releases/family-and-household-projections-2018base-2043/)

## 15.2 Net present value

A Net Present Value (NPV) for the overall Project has been determined to understand the current value of all the future cash flows of the Project. This measure can be used to test the sensitivity of the Project to changes in the underlying assumptions (e.g. the discount rate or changes to costs).

The estimated NPV for the Project is **-\$959,083,190**, which is based on the Project's capital and ongoing costs and a five percent real, pre-tax discount rate (as per the New Zealand Treasury guidance)<sup>37</sup>.

While renewal capital costs and operating costs would continue beyond the end of the financial forecasting period, a terminal value is not included in the NPV calculation.

Sensitivity analysis was carried out to understand the potential impact on the NPV as a result of several key risks eventuating. The risks include changes to discount rate, operating costs, and capital costs.

The NPV sensitivity analysis indicates that the impact of these risks eventuating is relatively minor in the context of the overall NPV for the Project. In relative terms, capital costs have the greatest impact on NPV as compared to operating costs and discount rate, however this impact with respect to the overall Project costs remains minor. Accordingly, there is still expected to be a material impact on affordability if there are significant cost overruns.

37 [treasury.govt.nz/information-and-services/state-sector-leadership/guidance/financial-reporting-policies-and-guidance/discount-rates](https://treasury.govt.nz/information-and-services/state-sector-leadership/guidance/financial-reporting-policies-and-guidance/discount-rates)

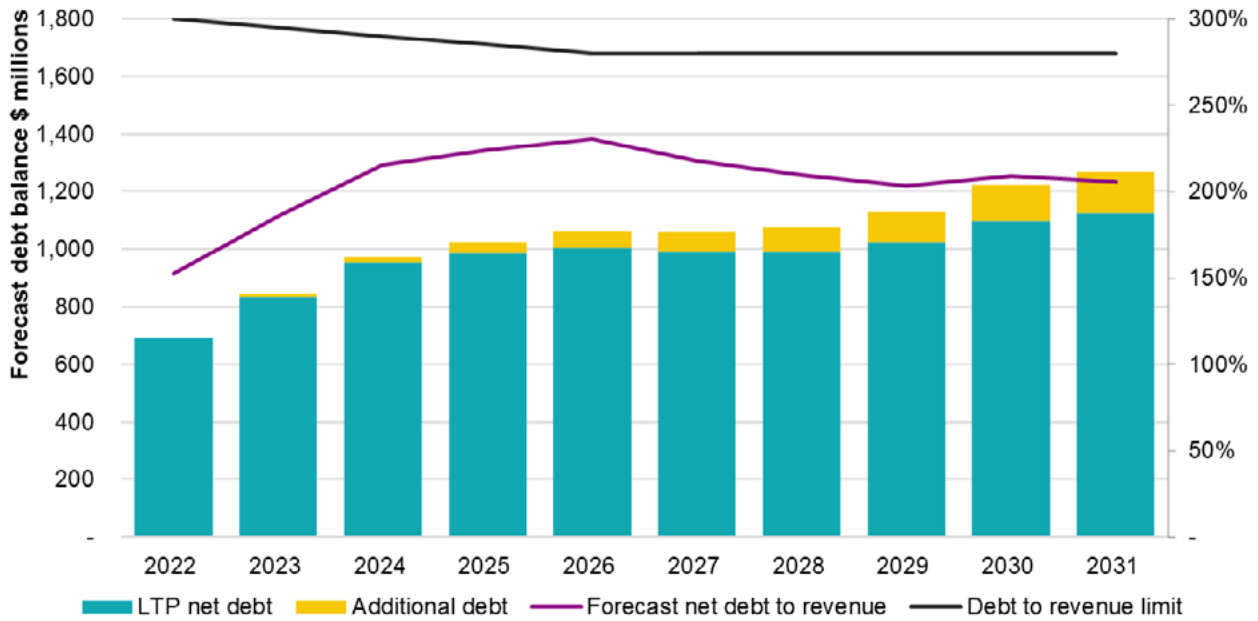
### 15.3 Affordability for councils – debt to revenue

The estimated financial impact on the debt-to-revenue ratio for each Council over the most current 10-year LTP period was assessed. Debt forecasts were not available beyond this period.

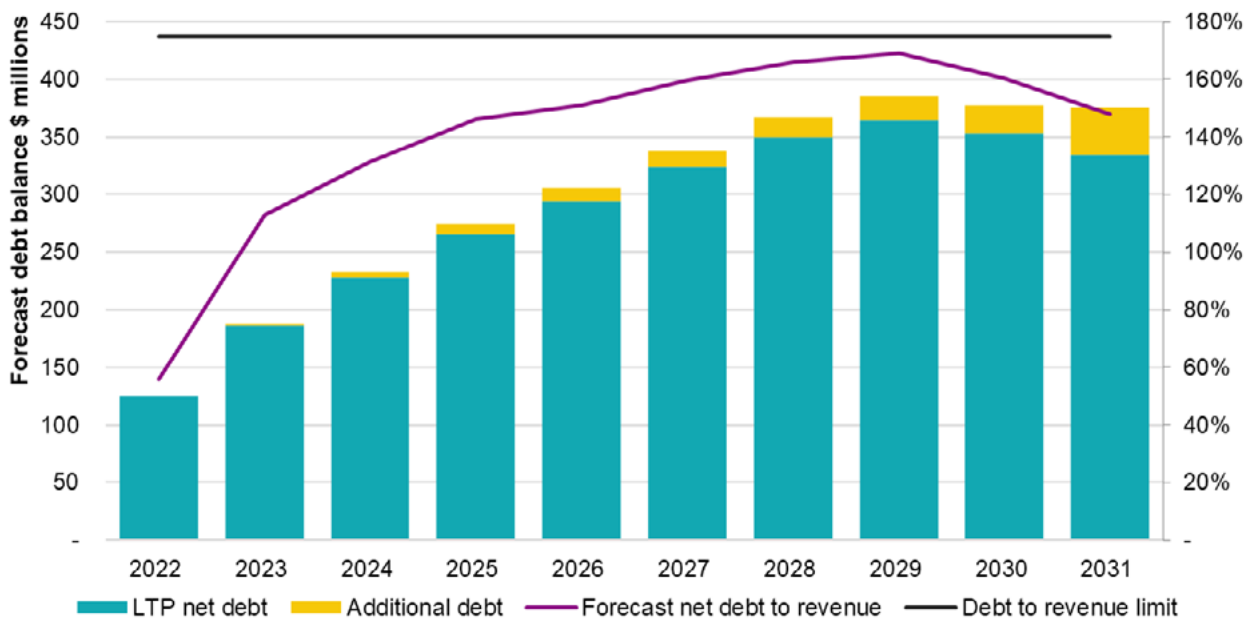
The councils are forecast to remain within the debt to revenue caps after allowing for the impact of the Project over the next 10 years, although WDC do get close to breaching their debt limit around 2029.

A sensitivity analysis on the debt to revenue ratios was completed by applying changes to capital costs (+10% and +20%). The analysis identified that HCC and WDC are not significantly impacted in the next 10 years due to the comparatively small capital expenditure.

**Figure 41: Forecast HCC debt-to-revenue**



**Figure 42: Forecast WDC debt-to-revenue**



## 15.4 Affordability considering both Northern and Southern Metro WWTPs

Using the P50 capital costs, the analysis below shows the affordability for the combined Waikato Metro Southern WWTP and Waikato Northern Metro WWTP.

### Affordability for ratepayers

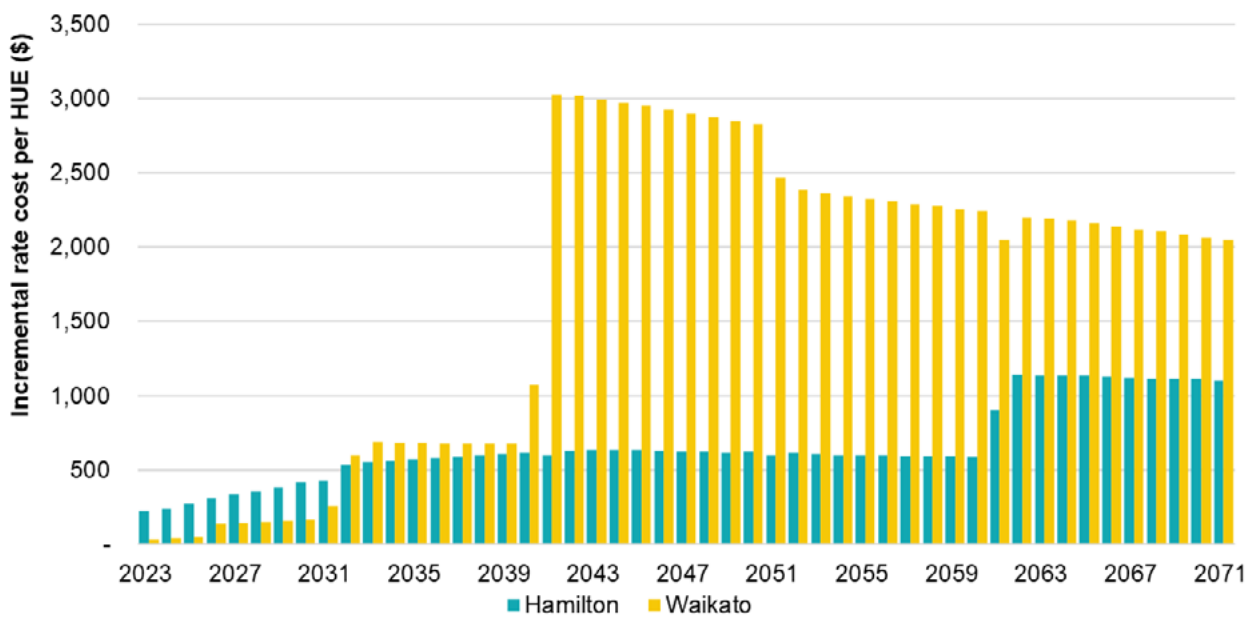
To consider the estimated impact on ratepayers from these Projects, we calculated the incremental costs to recover and divided this by the number of HUEs - using population forecasts to determine the incremental increase in rates per household.

For HCC, it is assumed that these costs will be funded through increases in general rates, while for WDC, it is assumed that these will be funded through increasing the wastewater targeted rate. WDC's targeted rate is applied consistently across the district to those communities that are connected to the WDC wastewater network.

**Table 28: Estimated average annual rating impact**

Year	2032	2042	2052	2062	2072
Hamilton City Council - General rate	\$591	\$623	\$682	\$1,118	\$789
Waikato District Council - Wastewater targeted rate	\$1,188	\$2,813	\$2,265	\$2,110	\$1,434

**Figure 43: Estimated annual rates impact per HUE**



An overview of the affordability of these rates increases is provided in Table 29 below. The assessment is based upon the five per-cent affordability threshold that was identified in the 2007 Local Government Rates Inquiry. Ratepayer affordability has been assessed based on adding the average rating impact for a ratepayer to the average household rates bill as outlined in the Ratepayer's Report<sup>38</sup>.

The analysis shown in Table 28 starts with the median household total (gross) income in Waikato for 2021 (\$79,322)<sup>39</sup>, assumes annual wage inflation of 2% to 2031, in line with the Labour Cost Index between 1996 and 2022. Average annual rates per household in 2021 of \$2,540 and \$2,608 for HCC and WDC respectively were increased by the planned rate increase as stated in each of the Councils' most recent LTP.

It should be noted that there are likely other costs that would need to be considered in more detail prior to implementing an increase in rates, such as additional water related costs, mortgage servicing costs and other cost of living increases.

<sup>38</sup> Average annual rates are from [ratepayersreport.nz/](http://ratepayersreport.nz/).

<sup>39</sup> StatsNZ

**Table 29: High-level rates affordability assessment**

Council	Waikato median household gross income (2031)	Affordability threshold (5%)	Average rates per household	Average additional project rating impact (both Projects) (2031)	Total rating burden	Affordability check
HCC - general rate	\$96,693	\$4,835	\$4,254	\$430	\$4,684	✓
WDC - wastewater targeted rate			\$3,679	\$150	\$3,828	✓

Source: Stats NZ.

Table 29 demonstrates that the rating impacts for 2031 all sit under the affordability threshold set out in the 2007 Local Government Rates Inquiry based on the average additional Projects rating impact for both HCC and WDC ratepayers, noting that that estimated total rating burden for HCC ratepayers in 2031 is close to this threshold.

Figure 44 and Figure 45 below illustrate how the incremental rating impact as a result of the Projects and the planned rate increases outlined in HCC's and WDC's Long Term Plan (LTP) compared to the affordability threshold over the current LTP forecast period (2021 to 2031).

Figure 44: HCC ratepayer affordability

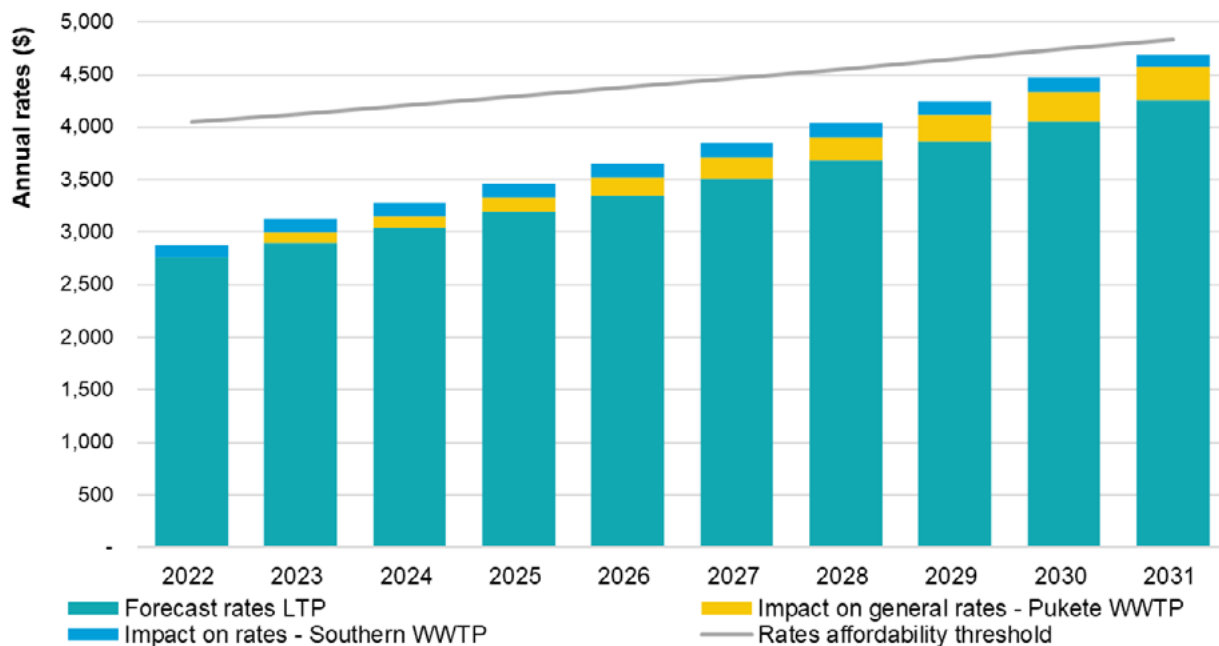
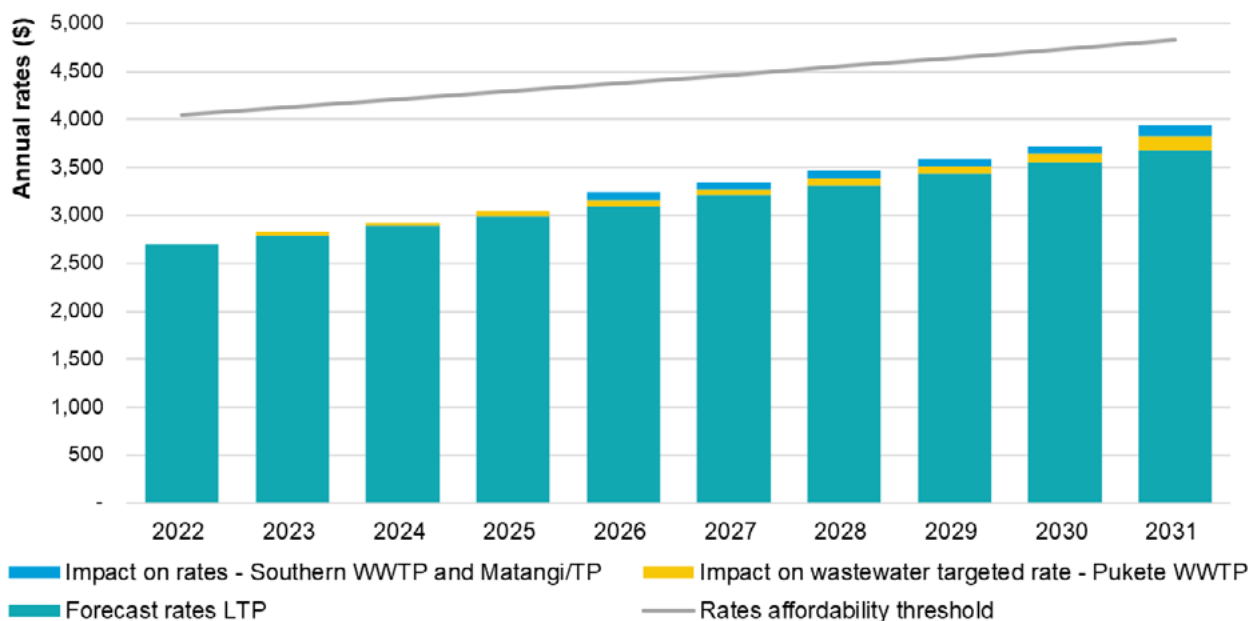


Figure 45: WDC ratepayer affordability



### Affordability for Councils

The affordability analysis for councils was based on whether (or not) the financial impacts of the Projects resulted in any of the councils breaching their LGFA debt to revenue financial covenants.

The estimated financial impact on the debt-to-revenue ratio for each Council over the most current 10-year LTP period is provided in Figure 46 and Figure 47 below. These figures consider the impact of additional debt, without considering any increase in rates revenue (despite these being forecast for other analyses), given that this would not have been included in the current LTP. This is considered a conservative approach. Debt and revenue forecasts are not available beyond this period.

Figure 46: Forecast HCC debt-to-revenue (Source: Hamilton City Council Long Term Plan 2021-31)

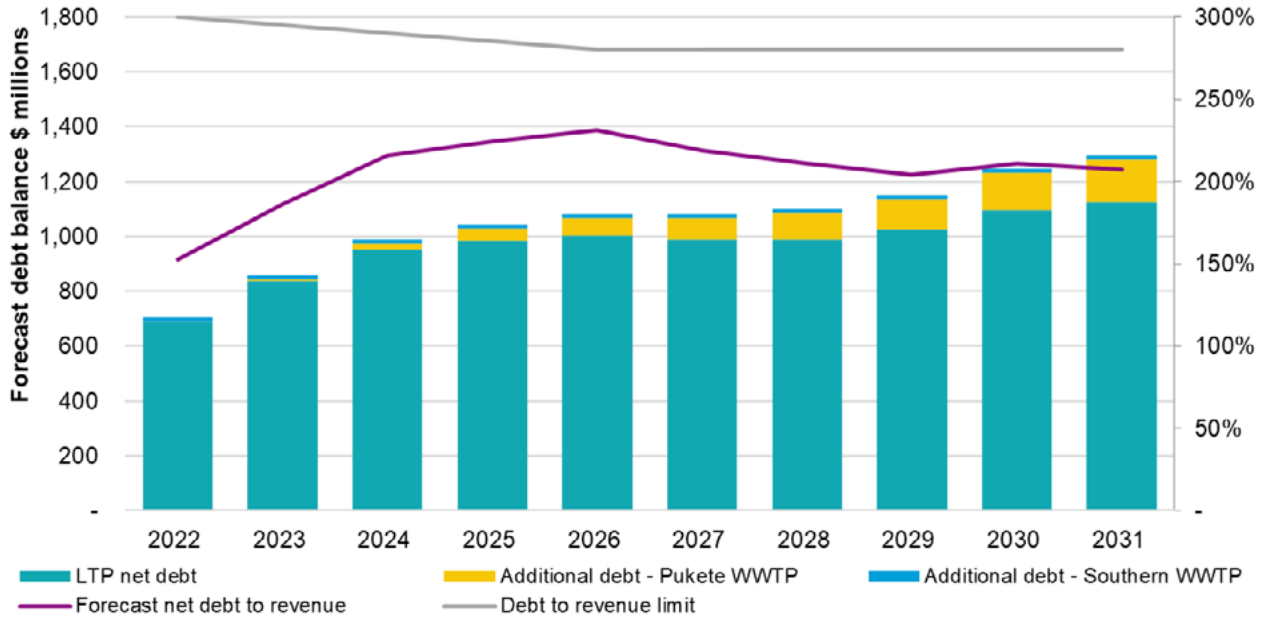
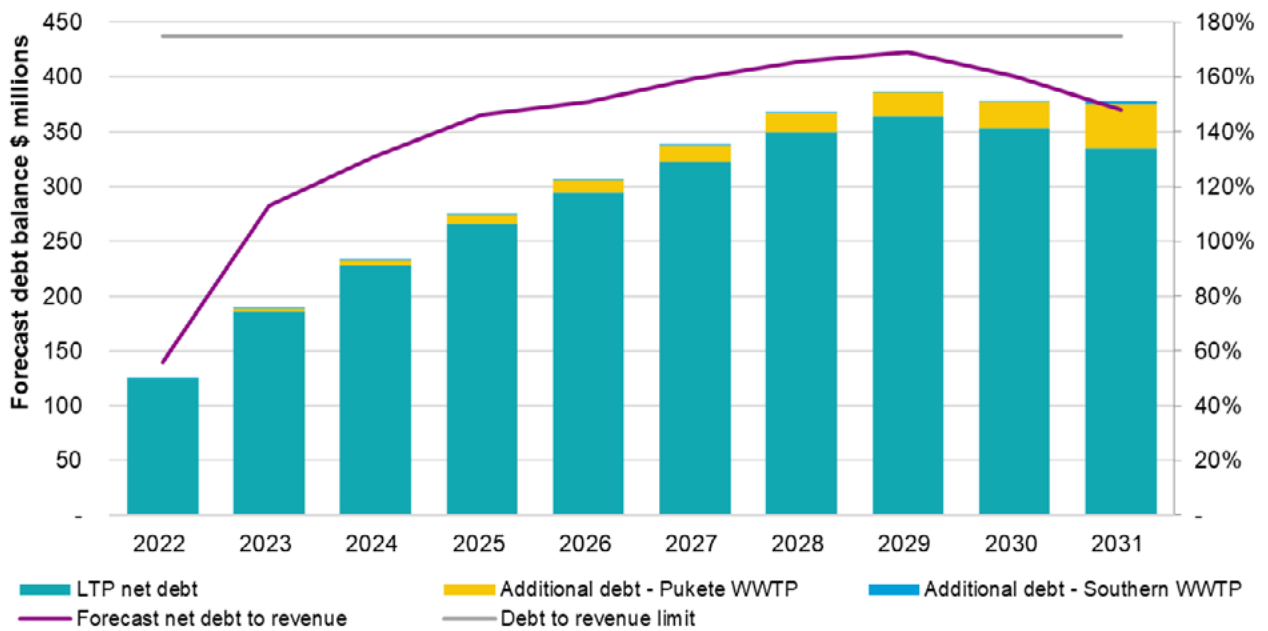


Figure 47: Forecast WDC debt-to-revenue (Source: Waikato District Council Long Term Plan 2021-31)



**Note:** Revenue received from development contributions has been excluded from the WDC’s revenue figure as they are not included in the LGFA’s metrics due to their one-off and uncertain nature.

As demonstrated in the charts, the Councils are forecast to remain within the debt to revenue caps after allowing for the impact of the Projects over the next 10 years, although WDC do get close to breaching their debt limit.



# Management Case

He Keehi Whakahaere -  
Whakatinanatanga



## 22. Management case introduction

The **Management Case** sets out the programme and project governance and management arrangements, roles and responsibilities, and change, benefits, and risk management for the preferred option for the Northern Metro DBC.

The purpose of the management case is to demonstrate that the preferred option is achievable, detail the arrangement necessary to ensure successful delivery of the preferred option, and outline identified risks and management actions.

## 23. Project governance and management

This DBC is a collaboration between HCC, Waipā District Council, Waikato District Council, Waikato-Tainui, and hapuu representatives. The membership of the Governance and Control Groups provide for equal representation for local government and iwi/mana whenua.

### 23.1 Overarching Memorandum of Understanding

The packages of work identified in this DBC will be undertaken at different times, in different council jurisdictions and may be led by different parties. Strong collaboration between the respective councils, iwi and mana whenua will be key to successful delivery of the strategic outcomes.

A Memorandum of Understanding (MoU) has been approved to capture these requirements and will be updated to include the Northern Metro DBC projects.

The MoU outlines the parties' continued commitment to cooperation, collaboration and delivery of the strategic outcomes. It is expected the proposed Entity B could become a party to the MoU in future.

The MoU is described in more detail in the Southern Metro DBC.

### 23.2 Programme and project management arrangements

The Programme Governance Structure will follow existing arrangements with representation from each of the Sub-Regional Partners (Waikato-Tainui, mana whenua, HCC, WDC and Waipā DC). The proposed governance structure is presented in Figure 51 and is consistent with that outlined in the Southern Metro DBC.

A Programme Partnership Group (PPG) has been established. This senior level governance group between the Sub-Regional Partners provides direct oversight of the Programme. It ensures the strategic objectives of the Southern and Northern Metro DBCs and MoU are being met and that opportunities for collaboration and integration are being identified.

An independent Programme Director will sit across the whole Programme and report to the PPG. The Programme Director is the key intermediary between the individual projects and the PPG.

The roles and responsibilities of the PPG and Programme Director are set out in the Southern Metro DBC.

At a project level, it is expected each package of work will be delivered by a single council (Lead Council) on behalf of the Sub-Regional Partners. The councils have existing, well-defined governance and approvals structures and the Lead Council will use existing resources, policies, and procedures to deliver the packages. The Lead Council is responsible for core project delivery functions including design, consenting, procurement, construction management and ongoing asset management and compliance.

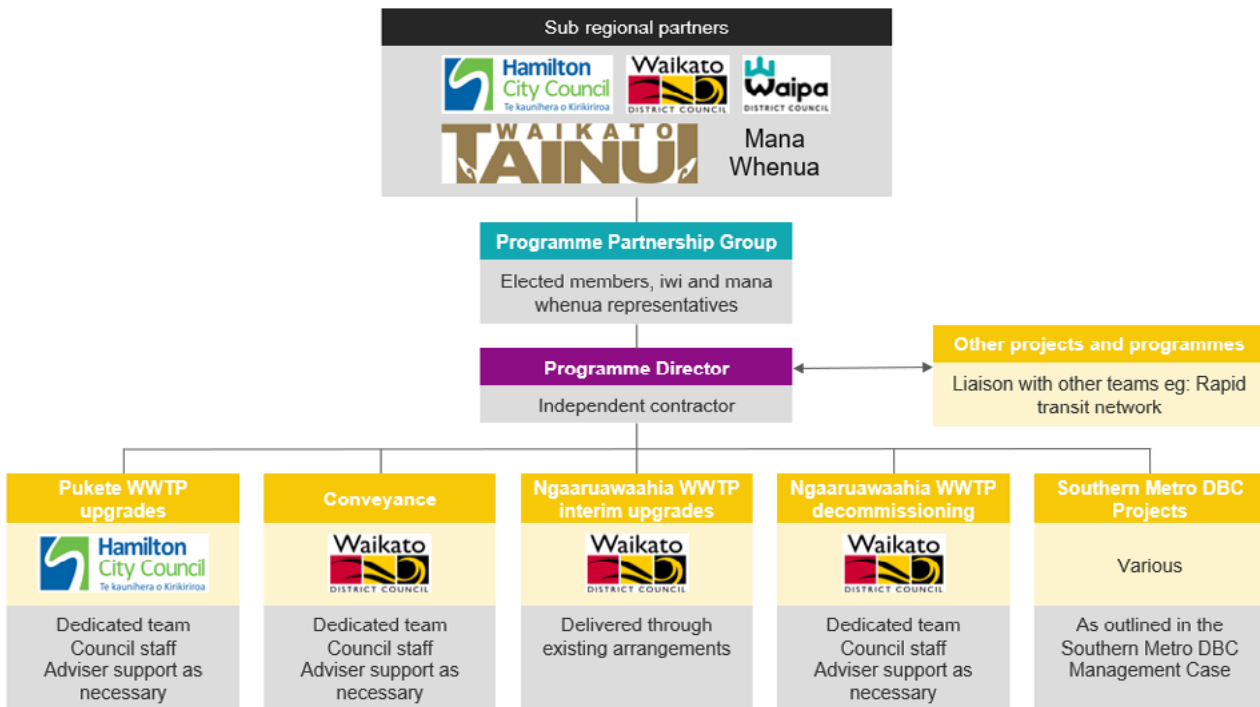
The Lead Council for each Project is generally based on the territorial authority where most beneficiaries are located.

It is expected the Ngaaruawaahia WWTP interim and decommissioning works and the conveyancing packages will be managed within existing Council resource arrangements.

The Pukete WWTP upgrades themselves represent a significant long-term programme of works. HCC will establish a Project Implementation Plan including a project organisation and management structures to manage the delivery of this package. Where capacity or capability does not exist or is not available in-house, some roles (including specialist advisors) may be filled by external contractors.

Alternative project delivery structures (including joint procurement and a new entity) were considered in the Southern Metro DBC but ultimately discounted due to the anticipated cost, timeframes, and difficulty of transitioning to Entity B associated with these other structures.

**Figure 51: Governance structure**



### 23.3 Co-management and co-design opportunities

Co-management extends beyond governance structures and project management. There are two significant co-design opportunities in the preferred option programme of works:

- Pukete WWTP outfall design
- Ngaaruawaahia WWTP site redevelopment

Mana whenua will be involved in these projects in a co-management role.

Mana whenua involvement in design of the form and function of the Pukete WWTP outfall is considered a critical component of the consentability of the outfall. Direct discharge of treated wastewater to the Waikato River is inconsistent with mana whenua values and the preference is typically to include some form of land treatment such as wetlands. Design of the discharge point to the river must find a balance between avoiding piercing of the bed or banks (if possible) while achieving required mixing. The appropriate balance should be developed through engagement and co-design with mana whenua.

### 23.3 Personnel and resourcing

The Pukete WWTP upgrade programme will require dedicated resourcing of appropriate subject matter experts. This is expected to include council staff with expertise in consenting and planning, procurement, and construction management. Where backfill requirements exist, these will be managed in line with the relevant human resource policies at the Lead Council. The brownfield nature of the upgrades means sufficient expertise will be required to manage the interfaces with the existing operations.

The Pukete WWTP is anticipated to require at least three additional Full Time Equivalent (FTE) operations staff and additional maintenance resource following the MBR transition. This reflects the higher operational and maintenance requirements of the MBR plant and will be incorporated into operational budgets and plans.

Given their relatively small scale, the Ngaaruawaahia WWTP works and conveyancing packages are expected to be largely managed through existing Lead Council resources (i.e. there will be no backfill requirements).

## 23.4 Reporting

The reporting should provide timely sharing of information and ensure risks are escalated as soon as they are identified. The objective of monthly reporting is to ensure the Lead Council, Programme Director, and PPG have relevant, accurate and complete information to accurately fulfil governance obligations.

### 23.4.1 Governance reporting

High level reporting will be prepared for the quarterly PPG meetings. The reporting will be received from each of the Lead Councils for their projects, compiled by the Programme Director. The reporting will provide updates on:

- Key project updates
- Progress against schedule and budget
- Project integration
- Design/consent/construction progress monitoring
- Benefits management.

### 23.4.2 Construction monitoring

During construction, monthly cost and progress reporting will be prepared for each of the projects by the relevant Project Manager. The monthly reports will include:

- Progress against key milestones and any change to the project schedule
- Progress against budget
- Key risks and mitigations
- Utilisation of contingency
- Variation history

### 23.4.3 Project closure and post implementation review

On completion, a project closure report will be prepared by the Project Manager. A post-implementation review will also be undertaken by the respective Lead Council to assess the success of the project, including the business case, planning and delivery phases. This will be undertaken within the first six months after asset acceptance to confirm the assets are operating as intended and delivering the services proposed in the DBC.

### 23.4.4 Operational reporting

The Local Government Act 2002 requires all councils report annually on the performance of their wastewater systems. The reporting covers key performance metrics including compliance with resource consents, number of wastewater overflows and any public health incidents.

Resource consents also include monitoring and reporting requirements with reports to be provided to the WRC and, often, iwi.

This reporting will be provided by the Lead Council for each project.

## 24. Programme plan

The Pukete WWTP process upgrades have been grouped into several stages which would be progressed simultaneously (as shown in Figure 52). Key drivers include:

- The inlet works does not meet capacity requirements and is physically deteriorated. Design of the replacement is currently underway.
- Capacity of at least one extra PST is already required
- In order to progress the conversion of the secondary process from clarifier based MLE to membrane based 4 Stage Bardenpho, at least one reactor needs to be able to be taken offline. That is currently available, with Reactor 5, but this situation will not last for many years. The sixth reactor will need to be built and commissioned before the current capacity is exhausted (approximately 175,000 PE).

The new consent application would need to be lodged 2-3 years prior to expiry of the existing consent for the consent to be granted prior to the major construction works associated with the MBR upgrade. Certainty around consent conditions is typically required before committing to major design or capital expenditure. This would certainly be so in this case due to the high cost of anticipated increases to the required level of service.

Some works could commence prior to the consent being granted. This includes the proposed new administration/maintenance building, new primary sedimentation tank, new digesters and MBR enabling works.

Following the consent decision (assuming a 2-3 year period for processing), the MBR conversion would proceed with Reactor 6 and membrane trains constructed along with the new UV system and outfall. The main solid stream development works would follow the completion of the MBR conversion post 2031. The conveyance work would be undertaken over 2-3 years prior to the Pukete WWTP MBR conversion works finishing.

Figure 52: Proposed programme

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Consent				Lodge combined consent	Consent processing	Consent granted														
Inlet works (4A)	Design/Procure	Construct	Construct																	
Site Masterplan																				
Admin/Mtce buildings (4A)		Design/Procure	Design/Procure	Construct	Construct															
Primary sed tank and solids upgrade (4B)		Design/Procure	Design/Procure	Construct	Construct	Construct	Construct													
MBR Enabling works incl new outfall (5A)				Design/Procure	Design/Procure	Construct	Construct	Construct												
MBR conversion (5B)						Design/Procure	Design/Procure	Construct	Construct	Construct										
Stormwater modifications (6)										Design/Procure	Design/Procure	Construct	Construct	Construct						
THP and TDF (7) Thermal hydrolysis and drying													Design/Procure	Design/Procure	Construct	Construct	Construct			
Conveyance							Design/Procure	Design/Procure	Construct	Construct										
Ngaaruwaahia short term improvements					Design/Procure	Construct	Construct													

## 25. Sensitivity testing

Sensitivity testing has been undertaken on the key assumptions underpinning the preferred option (including population growth). The sensitivity testing seeks to inform the following questions:

- Is there a significant tipping point for Pukete WWTP post-MBR conversion (i.e., what are the triggers for additional upgrades and expansion)?
- What happens if development occurs faster, or in different locations, to those assumed? Does this impact on proposed staging? This includes Southern Links and HT1 areas being developed earlier than anticipated and/or additional infill and intensification within existing suburbs and the Hamilton CBD
- What is the impact of diverting the Hamilton south catchment to the new Southern WWTP and, conversely, is there a trigger where it would be more effective to divert flows to the Southern WWTP rather than undertake the next phase of upgrades at Pukete?

These are considered below.

### Key triggers for future upgrades

Following the MBC conversion, the next major capacity-driven upgrades at Pukete WWTP are:

- Addition of a fifth and sixth primary sedimentation tank, currently programmed for the 10-year periods 2031-2040 and 2041-2050 when ADF reaches approximately 59MLD and 78MLD respectively
- Addition of a seventh bioreactor, currently programmed for the period 2051-2060 when ADF exceeds 78MLD<sup>44</sup>
- Following initial conveyance upgrades, the next major capacity-driven conveyance works are:
- Taupiri to Ngaaruawaahia Stage 2: Programmed when flows reach 84 L/s (i.e. 2060-61 in the base case)<sup>45</sup>
- Ngaaruawaahia to Horotiu Stage 2: Programmed when flows reach 271 L/s (i.e. 2060-61 in the base case)
- Horotiu to Pukete Stage 2: Programmed when flows reach 271 L/s (i.e. 2060-61 in the base case)
- Additional emergency storage:
- Taupiri pump station: additional 689m<sup>3</sup> programmed when flow reach 57 L/s (i.e. 2060-61 in the base case)
- Ngaaruawaahia pump station: additional 543m<sup>3</sup> programmed when flow reach 209 L/s (i.e. 2060-61 in the base case)
- Horotiu/POAL: additional 662m<sup>3</sup> programmed when flow reach 305 L/s (i.e. 2060-61 in the base case)

These flows are the trigger points that should be considered during sensitivity testing.

<sup>44</sup> Based on assumptions from the Site Buildout Report and assuming the broad make-up of wastewater remains consistent (ie relative load is the same)

<sup>45</sup> The "trigger" flows specified are those reached in the base case in 2041/2061 when additional works are programmed. They do not necessarily represent full capacity of the relevant system and should be used for comparative purposes only.

## 25.1 What happens if growth assumptions are incorrect?

**Table 39: Qualitative assessment of changes to base assumptions (all at 2061)**

Factor	Base assumption	Test	Conveyance impact	Treatment impact
Wet industry growth in Horotiu & Te Rapa	Wet industry growth at Horotiu and Te Rapa North of approximately 3,800 PE	Growth double that anticipated (total 8,000 PE)	Capacity limit on pumped main to Pukete reached sooner requiring pump or pipe upgrade	Depends on composition but could be a positive impact by adding additional readily biodegradable carbon
New north-east Hamilton suburb (e.g., Te Kowhai east)	Not specifically provided for	Additional PE outside current MSP areas	Significant impact on Northern Interceptor	Small impact: additional growth represents <3% of total PE
HT1 occurs earlier	Assumed as post-2061	Additional 20,000 PE growth between 2040-2060	Significant impact on Northern Interceptor	Small impact: additional growth ~5% of total PE
Hamilton infill	Infill consistent with MSP (16,000) by 2051	Double MSP by 2051 (additional 16,000 across CBD and Eastern & Western Interceptor catchments)	Significant impact on local conveyance network	Small impact: additional growth <5% of total PE
Southern Links occurs earlier	Not included (assumed to align with Southern WWTP)	SL1 growth between 2030-2040 but assumed this displaces growth elsewhere	Additional demand on Western Interceptor (SL1) Southern WWTP conveyance required early for SL2	NA assumes no net change in PE
Taupiri industrial	Light industry only at 30PE/ha (4,500 PE total)	More intensive industry at 45PE/ha (additional 2,250 PE)	Small increase to average flows, similar peak flows so minimal impact	Very small impact: additional growth <1% of total PE
Ngaaruawaahia residential growth	Total population of 11,676	50% more residential growth (additional 3,210)	Small increase to average flows and peak flows so minimal impact	Very small impact: additional growth <1% of total PE
Water consumption	200 l/p/day	Decreases to 150 l/p/d	Small decrease in average flows but limited impact on peak flows	While flow would decrease, load is likely to stay similar
Wastewater composition	Pukete actual data used	Higher BOD and TN	NA	Additional aeration/reactor volume required earlier
Southern WWTP early	Southern catchment of 60,000PE diverted in 2050-2060 period	Southern catchment of 60,000PE diverted in 2030-2040 or 2040-2050 period	NA	Notable reduction in Pukete WWTP flows

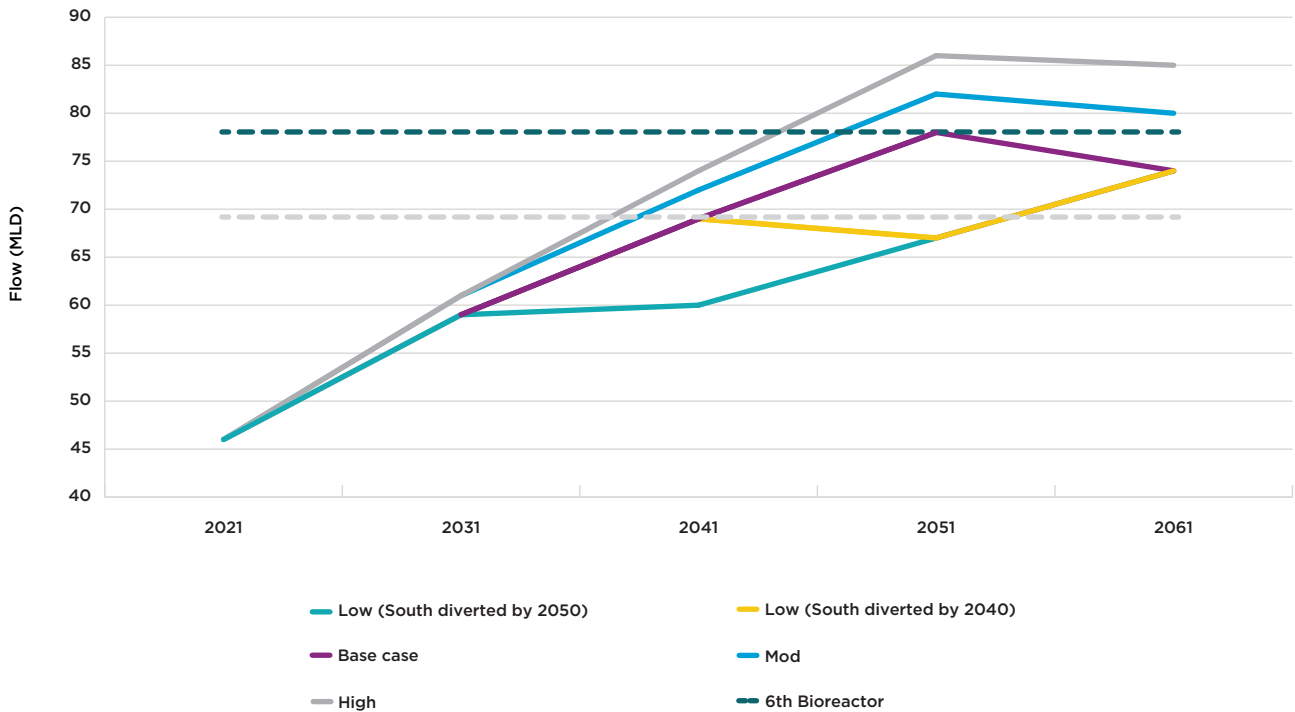
The individual factors have been combined into high, medium, and low scenarios.

Factor	High	Medium	Low
Wet industry growth in Horotiu & Te Rapa	X	X	
Taupiri industrial	X		
Hamilton infill	X	X	
New northern Hamilton suburb	X	X	
HT1 occurs earlier	X		
Ngaaruawaahia residential growth	X		
Southern WWTP early (between 2030 and 2040 or 2040 and 2050)			X
PE change by 2061	+55,000	+30,000	-60,000

These scenarios can be converted to average daily flows (in m<sup>3</sup>/d) to see the change in when the triggers may be reached.

	2021 (Actuals)	2031	2041	2051	2061
Low (South diverted by 2040)	47	59	59	67	74
Low (South diverted by 2050)	47	59	69	67	74
Base case	47	59	69	78	74
Mod	47	60	72	82	80
High	47	61	74	86	85

### Sensitivity testing



Under a high-growth scenario, the 6<sup>th</sup> primary sedimentation tank could be required in the middle of the 2031-2041 period (five years earlier than the base case) and the 7<sup>th</sup> bioreactor may be required early in the 2041-2051 period (around seven years earlier than the base case). Diverting flows to the Southern WWTP could delay the need for these works.

During preparation of the site masterplan, daily flow triggers should be set to trigger investigation and design of future works (including the 6<sup>th</sup> primary sedimentation tank and 7<sup>th</sup> bioreactor) well before the actual trigger needed for these additional processes occurs. This will allow time for design and construction.



# 26. Change management

## 26.1 Organisational change

The preferred option is not expected to result in significant change to culture or systems of the councils. Programme and project delivery will utilise existing policies and procedures in place at each Lead Council alongside implementation of the Memorandum of Understanding, which sets out how the Councils will work together. Operational change

This DBC will result in two major operational changes:

- **Pukete WWTP:** The new MBR plant will be more demanding than the existing conventional plant from an operations and maintenance perspective. Operations will require at least three additional FTEs and additional maintenance resource. Training of existing and new staff will be undertaken as part of project implementation to reflect changes to the treatment process and technology. The design team, contractor and any process equipment suppliers will be involved in this training.
- **Ngaaruwaahia WWTP:** Once decommissioned, operational staff will no longer be required at the Ngaaruwaahia WWTP. It is assumed they can be redeployed elsewhere within the WDC wastewater service.

Existing asset management, risk management and project delivery policies and procedures will be updated as required to reflect changes to the conveyance and treatment network. No material changes are anticipated.

## 27. Benefits management

This Benefits Management Plan has been prepared to outline the framework for delivery of benefits and ongoing assessment against the Project KPIs. These KPIs are largely the same as those included in the Southern Metro DBC and the monitoring and measurement should be done in an integrated process.

Benefits management will be led by the Lead Council at a project/work package level. The Lead Council will report to the Programme Director monthly.

The PPG will have oversight to ensure the agreed KPIs are being met. The PPG and Project Director can make recommendations to Lead Councils if opportunities are identified to enhance the delivery of strategic outcomes or raise objections if the strategic outcomes and 'Best for River' principles are not being met.

Any changes to the governance structure following completion of construction (for all works under the programme) must consider the appropriate body to oversee ongoing benefits management and reporting.

### 27.1 Project KPIs

KPIs are set out in the **Strategic Case**. The project KPIs were adapted from the Southern Metro DBC and are identified as the best measures to reflect the project objectives. These KPIs use the most up-to-date sources and real time data to ensure baselines and targets are accurate and quantifiable.

The Benefits Management Plan in Table 40 identifies baseline measures (collated using the most recent available data), sets timebound targets, identifies the action required to monitor progress against the KPI and identifies the party responsible for undertaking the action.

Further work is required to develop a number of the baseline measures and targets (indicated by grey highlight). Future actions for the PPG to progress include:

- Setting of targets for algae biomass (KPI 2.1)
- Assessment of mahinga kai sites, terrestrial ecology, and riparian and wetland vegetation currently affected by wastewater treatment and conveyance processes and discharges and setting of targets for improvements (KPI 2.2, 2.3 and 2.4)
- Completion of a Maatauranga Maaori cultural health index/cultural impact assessment including baselining and setting of targets for improvements (KPI 3.1)
- Identifying a process for assessing physical and cultural connection to the River and ability to use land including baselining and setting of targets for improvements (KPI 3.2)
- Setting of targets for reuse of treated wastewater and other and putting in place processes to identify and support industries that could reuse treated wastewater (KPI 4.1)
- Setting of targets for carbon footprint and energy reductions at the Pukete WWTP and for the conveyance network (KPI 4.2)
- Setting of targets for beneficial reuse of resources and putting in place processes to identify and support industries that could support beneficial reuse (KPI 4.3)

**Table 40: Baseline and target measures for KPIs**

KPI	Baseline	Target			Action	Responsibility for the identified action
		Years 1-10 <sup>46</sup>	Years 11-30	Years 30+		
KPI 1.1: Public health risks caused by the concentration of E.coli within the WWTP discharges	All WWTPs have UV disinfection, consent limits for E.coli vary	Meet resource consent conditions (typically E. coli median < 126 cfu/100mL)	Meet adopted treated wastewater standard median <14 cfu/100ml	Meet adopted treated wastewater standard median <14 cfu/100ml	Monitor and report annual E.Coli discharge	WWTP operators
KPI 1.2 Total nitrogen load impacting the River and connected waterways from WWTPs	Median <sup>47</sup> : • Pukete: <450 kg/day (summer) and <1500 kg/day (winter) • Ngaaruawaahia: 30 g/m <sup>3</sup> (non-compliant)	Meet current resource consent conditions: • Pukete: <450 kg/day (summer) and <1500 kg/day (winter) • Ngaaruawaahia: <20 g/m <sup>3</sup> (summer) and <25 g/m <sup>3</sup> (annual)	Reduction from baseline and meet or exceed adopted treated wastewater standard	Reduction from baseline and meet or exceed adopted treated wastewater standard	Monitor and report total nitrogen load from WWTP discharge	WWTP operators
KPI 1.3: Total phosphorous load impacting the River and connected waterways from WWTPs	Median <sup>48</sup> : • Pukete: <95 kg/day (summer) and 700 kg/day (winter) • Ngaaruawaahia: <8 g/m <sup>3</sup> (summer)	Meet current resource consent conditions: • Pukete: <95 kg/day (summer) and 700 kg/day (winter) • Ngaaruawaahia: <8 g/m <sup>3</sup> (summer) and 8 g/m <sup>3</sup> (annual)	Reduction from baseline and meet or exceed adopted treated wastewater standard	Reduction from baseline and meet or exceed adopted treated wastewater standard	Monitor and report annual total phosphorus load from WWTP discharge	WWTP operators
KPI 1.4: Proportion of plants which are compliant against discharge quality consent conditions	Pukete: Fully compliant (2020/21) Ngaaruawaahia: Moderate non-compliance (2022/21)	Fully compliant	Fully compliant	Fully compliant	Monitor consent compliance (refer annual site audit reports)	WWTP operators and Waikato Regional Council
KPI 2.1: Amount of algal biomass in the Waikato River as measured by chlorophyll a concentration attributable to treated wastewater discharges	6.0 mg/m <sup>3</sup> <sup>49</sup>	Reduced from baseline	Reduced from baseline	Reduced from baseline	Set targets	Project manager

46 This period is intended to reflect the period prior to completion of the Pukete WWTP conversion

47 From 2020/21 Waikato Regional Council Site Compliance Report, REG602619 (19 October 2021) & REG603968 (18 January 2022).

48 From 2020/21 Waikato Regional Council Site Compliance Report, REG602619 (19 October 2021) & REG603968 (18 January 2022).

49 Baseline chlorophyll-a concentration at Huntly/Tainui Bridge WRC monitoring site (i.e. site downstream of entire Metro Area) as determined by current state assessment included within Plan Change 1 to the Waikato Regional Plan (Table 3.11.1c) - Chlorophyll, Total Nitrogen and Total Phosphorus Attribute States (Volume-2-Proposed-Waikato-Regional-Plan-Change-1-Decisions-version.pdf (waikatoregion.govt.nz)). This is the current state of the river water quality as a whole not solely attributable to treated wastewater discharges.

KPI	Baseline	Target			Action	Responsibility for the identified action
		Years 1-10 <sup>46</sup>	Years 11-30	Years 30+		
KPI 2.2: Health and abundance of mahinga kai species	Sites affected by current discharges to be identified and assessed as part of resource consent applications.	Improvement over baseline	Improvement over baseline	Improvement over baseline	Complete baseline assessment – recommend this is progressed with urgency to align with go-fast programme	Project manager
KPI 2.3: Number and variety of terrestrial species at specific locations within the Metro Area	To be set by ecological investigations undertaken as part of resource consent applications	Improvement over baseline	Improvement over baseline	Improvement over baseline	Complete baseline assessment – recommend this is progressed with urgency to align with go-fast programme	Project manager
KPI 2.4: Area coverage of native riparian and wetland vegetation surrounding water bodies and within the catchment area	Current state assessment from GIS (GIS work to be commissioned)	Improvement over baseline	Improvement over baseline	Improvement over baseline	Complete baseline assessment – recommend this is progressed with urgency to align with go-fast programme	Project manager
KPI 3.1: Maatauranga Maaori cultural health index/cultural impact assessment	To be determined by mana whenua as part of resource consent process	Improvement over baseline	Improvement over baseline This could include management of mortuary waster	Improvement over baseline	Complete baseline assessment – recommend this is progressed with urgency to align with go-fast programme	Project manager
KPI 3.2: Ability to physically and culturally connect to the River including: number and quality of access points, quality of cultural and recreational access and opportunities, and ability to use land (including Maaori-owned land) for commercial and residential purposes	To be determined by mana whenua as part of resource consent process	Improvement over baseline	Improvement over baseline	Improvement over baseline	Complete baseline assessment – recommend this is progressed with urgency to align with go-fast programme	Project manager

KPI	Baseline	Target			Action	Responsibility for the identified action
		Years 1-10 <sup>46</sup>	Years 11-30	Years 30+		
KPI 4.1: Volume of wastewater reuse as a percentage of discharge volume	0% (no plants capable of water reuse)	0% (no plants capable of water reuse)	Increase in reuse of treated wastewater - target TBC	Further increase in reuse of treated wastewater - target TBC	Monitor and report annual total percentage of wastewater re-used	WWTP operators
					Identify potential industries that could support reuse of treated wastewater and work proactively to support reuse	Councils / PPG
KPI 4.2: Decreasing greenhouse gas footprint (capital and operational) energy requirements of plant and plant systems (i.e., pumps) as a proportion of wastewater treated	Greenhouse gas accounting baselines of current plants to be established by councils as part of complying with climate change reporting legislation  Limited Energy recovery at Pukete WWTP	Use of energy efficient equipment, controls and processes to existing and new WWTPs.  Energy recovery improved at Pukete WWTP - target TBC	Reduced operational carbon footprint per PE - target TBC  Increased energy recovery - target TBC	Reduced operational carbon footprint per PE - target TBC  Further increase energy recovery - target TBC	Calculate operational carbon footprint per PE annually/5 yearly	Asset management team (Pukete and conveyancing)
					Calculate total energy recovery annually	
KPI 4.3: Proportion of resources that are able to be recovered for beneficial reuse	Pukete WWTP biosolids go to worm composting	Pukete WWTP biosolids go to worm composting	Increase quantity of resource captured for beneficial reuse- target TBC	Further increase quantity of resource captured for beneficial reuse- target TBC	Monitor and report total quantify of resource captured for beneficial re-use per PE	WWTP operators
					Identify potential industries that could support beneficial reuse and work proactively to support reuse	Councils / PPG

KPI	Baseline	Target			Action	Responsibility for the identified action
		Years 1-10 <sup>46</sup>	Years 11-30	Years 30+		
KPI 5.1: Flexibility and adaptability of solution to be staged/ developed over time to meet the needs of the community	Communities not currently serviced have no alternatives  Limited capacity to accommodate future growth in serviced communities	All communities identified in DBC serviced (i.e., connect Te Kowhai)	Flexibility to continue progressive upgrades at Pukete WWTP OR divert Hamilton South catchment to Southern WWTP. HCC has flexibility to choose which parts of Hamilton South are diverted to Southern WWTP based on conveyance capacity and growth.	Both Pukete WWTP and Southern WWTP operational. HCC has flexibility to choose which parts of Hamilton South are diverted to Southern WWTP.	Monitor residential growth, land zoning, and new growth cells to allow early identification of potential changes to conveyance staging (including local networks)  Progress Southern WWTP design, consenting, construction.	Councils / PPG
KPI 5.2: Proportion of Industrial areas which are serviced by municipal plants sustainably	<100%	100% industrial growth cells in Northern Metro Area serviced	100% industrial growth cells in Northern Metro Area serviced	100% industrial growth cells in Northern Metro Area serviced	Monitor industrial growth cells and land zoning to allow early identification of potential changes to treatment or conveyance staging (including local networks)	Councils / PPG
KPI: 5.3 Proportion of residents in the metro area serviced by municipal treatment plants sustainably	<100% (eg Te Kowahi)	100% residential growth in Northern Metro Area serviced	100% residential growth in Northern Metro Area serviced	100% residential growth in Northern Metro Area serviced	Monitor residential growth, land zoning, and new growth cells to allow early identification of potential changes to treatment or conveyance staging (including local networks)	Councils / PPG

## 28. Risk and opportunity management

Risk recording and reporting is an integral part of the Project governance framework. It will enhance the quality of dialogue among stakeholders and support the Lead Council, Programme Director and PPG in meeting their responsibilities.

The Project Manager for each project will be responsible for managing project risk and will maintain the project risk register. Project risks will be reported to the Programme Director monthly. The Programme Director will compile significant project risks and risks that are relevant to the wider programme.

HCC's risk management system has been used to capture risks identified during development of this DBC.

Risks will be allocated in accordance with the selected procurement model. Risks will be transferred in accordance with relevant standard conditions of contract and the Lead Council's risk management policy after identifying the most appropriate person/entity to manage each risk.

Risks associated with safety in design will be developed using a formal process to inform design outcomes.

The Southern Metro DBC includes a number of over-arching risks that apply equally to this DBC. Those risks including funding, cost escalation, resource availability, governance arrangements and changes to the legislative environment.

There are additional risks specific to the Northern Metro DBC, including:

- Breakdown of relationship with iwi partners impacting particularly on re-consenting of Pukete discharge, design and consenting of the new Pukete outfall, and decommissioning and remediation of the Ngaaruawaahia WWTP
- Population growth exceeds assumptions, requiring future Pukete upgrades earlier than anticipated (if Southern WWTP is not available or flows cannot be diverted) or, in the shorter term, wastewater flows to Ngaaruawaahia WWTP exceed treatment capacity prior to flows being diverted to Pukete WWTP
- Challenges associated with maintaining a compliant operation during the Pukete MBR conversion and other upgrades and renewals at the Pukete WWTP
- Conveyancing: Through both the maatauranga evaluation and the technical MCA process, a number of participants highlighted the conveyance risks associated with the longer conveyance required for the preferred option including:
  - Greater residence time resulting in a higher risk of septicity and odour
  - Greater impact in the event of equipment breakdown/malfunction or pipe failure (third party damage or earthquake events)
- There are mitigation activities that can be undertaken to reduce the conveyance risks:
  - Use of twin mains to reduce septicity risk and increase resilience
  - Provision of backup generators/pumps
  - Isolation valves
  - Calamity storage
  - Material selection
- These mitigations were factored into the short-listed options development and costings

The Southern Metro DBC and Northern Metro DBC Risk Registers are included as **Appendix G** and risks with a residual rating of very high are included in Table 41.

No specific dependencies have been noted beyond the Site Masterplan, consenting, and design as outlined in this DBC.

**Table 41: Top risks**

Risk description	Controls	Inherent risk	Action plan	Residual risk
Lack of forward planning could lead to <b>insufficient funding availability within councils</b> (or future Entity B) which could result in the projects being delayed, not proceeding, or lower standards being adopted (and ultimately the Best for River outcomes not being met)	<ul style="list-style-type: none"> <li>HCC 2021-2031 LTP includes funding for initial stages of Pukete WWTP upgrades.</li> <li>WDC 2021-2031 LTP includes funding for Ngaaruawaahia WWTP upgrades that could potentially be re-directed to decommissioning and remediation</li> <li>DBC includes consideration of rating impacts</li> </ul>	Extreme	<ul style="list-style-type: none"> <li>Include funding in future LTPs as required</li> <li>Consider appropriate development contributions policy</li> </ul>	Very high
The preferred option includes significant works at the Pukete WWTP, implementation of the DBC could result in <b>operational and/or compliance failures at the WWTP.</b>		Very high	<ul style="list-style-type: none"> <li>High priority consideration in procurement plan</li> <li>Early contractor engagement</li> </ul>	Very high
Increasing consultant and contractor costs, high contractor demand, limited providers, increasing costs of key materials, and supply chain disruption lead <b>to design and/or construction cost increases.</b> This could impact the ability to secure funding or financing, resulting in the projects being delayed, not proceeding, or lower standards being adopted	<ul style="list-style-type: none"> <li>DBC costing and affordability analysis includes risk allowance</li> <li>DBC cost sensitivity analysis considers effects of changing inflation rates and OPEX/CAPEX</li> <li>'Go fast' programme includes early design and consenting</li> </ul>	Very high	<ul style="list-style-type: none"> <li>Progress some work packages ahead of Pukete consenting where possible</li> <li>Implement 'go fast' programme as recommended</li> <li>Early contractor engagement</li> </ul>	Very high
<b>Commercial arrangements</b> between HCC and WDC <b>cannot be agreed</b> (or agreements are delayed), adversely impacting project delivery and diversion of WDC wastewater flows to Pukete.	<ul style="list-style-type: none"> <li>MoU signed by Project partners to confirm principles agreed in the DBC including approach to ownership, funding and financing.</li> <li>Governance and delivery structure established in accordance with Southern Metro DBC.</li> </ul>	Very high	<ul style="list-style-type: none"> <li>Ensure appropriate joint engagement between Councils/Partners occurring throughout project</li> <li>HCC and WDC to enter into service agreement to contribute toward funding of Pukete WWTP.</li> </ul>	Very high

Risk description	Controls	Inherent risk	Action plan	Residual risk
<p>Inconsistency with Te Ture Whaimana, national policy statements, regional plan and/or new legislation means new long-term Pukete and/or short-term <b>Ngaaruawaahia discharge consent cannot be secured or consent is appealed</b></p>	<ul style="list-style-type: none"> <li>• Key project objectives were designed to drive alignment with Te Ture Whaimana</li> <li>• DBC includes high-level assessment of alternatives to avoid or reduce discharges to the river</li> <li>• Mana whenua involvement to assess consistency with Te Ture Whaimana</li> <li>• DBC based on best achievable discharge standards</li> </ul>	<p>Very high</p>	<ul style="list-style-type: none"> <li>• DBC recommends re-consenting of Pukete is advanced early</li> <li>• Option for Ngaaruawaahia short-term re-consenting to be linked to Pukete consenting (and or reductions associated with Huntly re-consenting)</li> <li>• Early engagement with WRC on consent strategy</li> <li>• On-going engagement with mana whenua partners to drive alignment with Te Ture Whaimana</li> <li>• Consider progressing Te Kowhai and Horotiu conveyance sections earlier to allow those catchments to be diverted to Pukete in advance of the more northern communities. This would reduce the interim load at Ngaaruawaahia.</li> </ul>	<p>Very high</p>
<p>At the time the DBC was drafted, transition processes for the Government's Three Waters Reform Programme were underway. Some aspects of this DBC will commence prior to <b>the proposed transition to Entity B in 2024</b>. Many aspects of the future state under the proposed 'Entity B remain unknown and changes could result in impacts to project timeframes, relationships, and costs.</p>	<ul style="list-style-type: none"> <li>• DBC prepared based on current council arrangements while maintaining flexibility to transition to a new structure as required.</li> <li>• The arrangements outlined in the DBC should be revisited if and when the transition is complete.</li> </ul>	<p>Very high</p>	<ul style="list-style-type: none"> <li>• Early briefings to incoming Entity B management in concert with Future Proof</li> <li>• Invitation to Entity B to nominate representatives on the governance group moving forward</li> </ul>	<p>Very high</p>

## 28.1 Alignment with other projects and programmes

Some or all of the required conveyance network construction is likely to occur along the alignment of the proposed rapid transit network. Delivery of these projects should be aligned (i.e., construct new wastewater mains when the rapid transit network is being constructed): both for cost effectiveness and to minimise disruption to local communities.

## 28.2 Sustainability and carbon reduction

The *Preferred Option Technical Report* in **Appendix C** identifies options for reducing capital and operational carbon that should be considered during detailed design.

**Table 42: Opportunities for carbon reduction**

Conveyance	Pukete WWTP
<ul style="list-style-type: none"> <li>Design new pump stations to accommodate stage 2 upgrade and stage 2 pump fitout with minimal changes. Build larger wet well in stage 1<sup>50</sup> but operate using less of volume for efficiency to minimise future rework and construction effort.</li> <li>Fewer concrete manholes – use GRP or remove need for manholes through design. GRP has less embodied carbon than reinforced concrete.</li> <li>Undertaken a more detailed assessment of peak flows and impact of upstream pump stations to reduce storage requirements at pump stations</li> <li>Optimise storage to reduce pipe sizes and pressure class (i.e., wall thickness).</li> </ul>	<ul style="list-style-type: none"> <li>Reduce material use where possible (particularly concrete and steel reinforcement). Impact is largely associated with materials (as opposed to transport and construction activity)</li> <li>Investigate feasibility of using lower carbon concrete (i.e., fly ash to replace cement or Golden Bay Cement instead of Holcim)</li> <li>Reuse existing assets at Ngaaruawaahia WWTP and Pukete WWTP</li> <li>Optimise energy recovery</li> <li>Select energy efficient equipment (e.g., aeration)</li> <li>Advanced process monitoring and control</li> </ul>

Options to improve energy efficiency include:

- Specifying machinery with high electro-mechanical efficiency such as turbo blowers (Te Maunga WWTP)
- Specifying low power alternatives such as screw presses instead of centrifuges (New Plymouth and Te Maunga WWTPs)
- Using instrument driven, precise aeration control (Luggage Point – Brisbane)
- Design diffused rather than surface aeration (Pukete WWTP)
- Specifying high-efficiency panel diffusers with efficiency c0.7%/m of bubble rise cf 0.5 – 0.6 for conventional or tube diffusers
- Importation of raw, high calorific value substrate to augment digester feed and biogas production. This is very common in British Columbia (e.g., Anasis Island WWTP) and is being considered for several sites in New Zealand (e.g., Palmerston North)
- Side stream ‘shortcut’ nitrogen removal processes on the digester returns stream (e.g., Anammox)
- Membrane Aerated Bio-Reactor (MABR) could be considered in the first anoxic stages of the future 4 stage Bardenpho reactors

50 As opposed to ultimately building two wet wells at a given pump station

## 29. Consent strategy

The Southern Metro DBC includes a detailed consent strategy identifying relevant planning legislation and regulation. The same requirements, as summarised below and outlined in more detail in Section 10 of the *Preferred Option Technical Report* in **Appendix C**, will apply to the projects under this DBC.

A detailed consent programme is being prepared by HCC outside the scope of this DBC.

### 29.1 Consent requirements

The Ngaaruawaahia and Pukete WWTPs discharge consents expire in 2029 and 2027 respectively. Regardless of the staging of the preferred option, new consents are required. Consent applications must be lodged at least six months before expiry of the current consents to allow continued operation of the WWTPs while new consents are being sought.

For the purpose of this DBC, it is assumed future discharges will be to the Waikato River. A high-level assessment of potential discharge options is provided in Section 4.6 of the *Short-list Technical Report* in **Appendix A** and includes discharge to water, discharge to land and a variety of re-use options as described in Section 7.3. These options should be revisited as part of a detailed assessment of alternative discharge methods during the consent development process.

The discharge to water consent for Pukete WWTP is the first to expire. A new consent application must be lodged prior to March 2027 to allow discharges to continue while the consent application is considered. However, it is recommended that an earlier date is targeted (e.g., early 2026) to reduce the potential impact of unanticipated delays.

A holistic approach is recommended for the main Pukete WWTP reconsenting (where possible). This would see the majority of the existing Pukete WWTP consents for discharge to air, land, and water renewed as a single package with a single schedule of conditions.

It is recommended the consents sought allow for continuation of the current discharge regime at the Pukete WWTP for a fixed period of time (5-10 years) to allow design, construction and commissioning of the MBR conversion and new outfall before the new treatment standards apply. This is consistent with how WRC has treated the recent Fonterra Hautapu discharge consents (existing treatment standards apply until a new WWTP is operational).

The Ngaaruawaahia WWTP discharge consent expires in 2029. However, because the interim operation of the Ngaaruawaahia WWTP will be intrinsically tied to upgrades at the Pukete WWTP, it is recommended reconsenting of the Ngaaruawaahia WWTP discharge (for the interim period) is sought concurrently with the Pukete WWTP consents.

The existing Ngaaruawaahia WWTP discharge consent is linked to the Huntly WWTP discharge consent through common mass load conditions. Further consideration is required on the separation of these consents to allow the proposed consent strategy whereby Ngaaruawaahia would be linked to Pukete rather than Ngaaruawaahia. This could be facilitated through a shorter consent term (10 years) with conditions requiring the wastewater to be diverted to Pukete WWTP as soon as the required conveyance infrastructure is in place.

The current consent for the Te Kowhai WWTP expires in 2033. Based on the recommended staging, this wastewater would be diverted to Pukete WWTP prior to consent expiry and no re-consenting would be required.

## 29.2 Specific consents required

### Pukete WWTP re-consenting

Based on current available information it is expected consent requirements associated with the primary Pukete re-consenting package (including interim use of the Ngaaruawaahia WWTP) could include:

- **Discharge of treated wastewater** from Pukete WWTP (long-term) and Ngaaruawaahia WWTP (short-medium term (this is assumed as discharge to water but would equally apply for a full or partial discharge to land))
- **Discharges to air** associated with Pukete WWTP (long-term) and Ngaaruawaahia WWTP (short-medium term)
- **Discharge of stormwater** from the Pukete WWTP to an unnamed tributary of the Waikato River. (While the existing consent doesn't expire until 2039, it is recommended this be incorporated into the main package). If realignment of the tributary is needed, additional consent may be required for diversion of surface water.
- **Structure(s) in/on/over the riverbed** for use and maintenance of the Pukete WWTP diffuser (long-term) and Ngaaruawaahia WWTP diffuser (short-medium term) as well as the new Pukete outfall depending in the form (along with associated construction consents that could include earthworks and vegetation clearance with a high-risk erosion area and damming/diversion of surface water)
- **Outline plan** for works to be constructed within the Pukete WWTP designation (including the height, shape, and bulk of new structures and buildings)
- **Land use consent under the NES for contaminated land** for earthworks within the Pukete WWTP site (which is classified as a HAIL site)
- **Land use consent and/or designation for discharge to land** if a discharge to land option is progressed
- The Pukete WWTP also holds a resource consent for retaining biosolids on land at the WWTP site. This consent expired in 2039. If changes to biosolids handling are required as part of the MBR transition, replacement of this consent should be included in the main package outlined above. Alternatively, renewal of this consent could be delayed until the solids phase 2 work package when future biosolids processes are better understood.

### Ngaaruawaahia decommissioning and remediation

Decommissioning of the Ngaaruawaahia WWTP is unlikely to give rise to any notable consent requirements beyond:

- **Outline plan** for works within the Ngaaruawaahia WWTP designation (where these are within the scope of the designation)
- **Land use consent under the NES for contaminated land** for earthworks within the Ngaaruawaahia WWTP site, which is classified as a HAIL site, (e.g., to remediate the oxidation pond)

The Ngaaruawaahia WWTP site is expected to be retained at least in part for wastewater infrastructure (including a pump station and emergency storage). However, the full footprint of the designation may no longer be necessary. In that event, a **partial uplift of the Ngaaruawaahia WWTP designation** would reduce the footprint to the area required for on-going operations.

At this stage, limited consideration has been given to future use of the Ngaaruawaahia WWTP site post-decommissioning. Beyond the conveyance infrastructure that will remain on the site, the site redevelopment could range from returning to pasture, to indigenous terrestrial or wetland planting, or to something more complex.

### Conveyancing

Wastewater conveyance infrastructure is typically permitted by District Plans where it is constructed within road corridor. Once conveyance routes and pump station locations are confirmed, a consent strategy should be prepared to identify any consent requirements.

## 29.3 Specific legislative considerations

The legislative and regulatory framework that requires consideration as part of any new consent application is constantly changing. At the time this DBC was prepared it included:

- **Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010 and Te Ture Whaimana o Te Awa o Waikato:** Te Ture Whaimana is the primary direction setting document for activities occurring within the Waikato River catchment and was given significant weighting during options development and selection of the preferred option. In a consenting framework, when seeking to re-consent an existing point source discharge, the applicant must demonstrate either a reduction in discharge load (proportionate with the size of the discharge) or provide for betterment through offsetting.  
The Waikato River Authority has recently announced a review of Te Ture Whaimana, expected to be complete in 2025. This review is likely to coincide with the consenting required to implement the preferred option.
- **Other settlement legislation and joint management agreements (JMAs):** Consideration must be given to legislation and JMAs when undertaking activities such as those relating to discharges to the Waikato River. These will require further consideration during the consenting process in particular with regard to consultation and engagement as part of the resource consent applications.
- **Resource Management Act (RMA) 1991:** The RMA sets out consenting processes and the matters that must be considered by a consenting authority. These include preservation of the natural character of rivers and their margins, protection of significant indigenous vegetation and habitats, relationship of Maaori and their culture and traditions with their ancestral lands and water, and the effects of climate change (including effects of discharge into air of greenhouse gases on climate change).  
The Government is replacing the RMA with the new Natural and Built Environments (NBA) Bill and the Spatial Planning Bill (now at submission stage) and the Climate Adaptation Bill (expected to be introduced in 2023). Enactment of this new legislation is expected to coincide with consenting of the WWTP discharges.
- **National direction under the RMA:** National direction under the RMA includes National Policy Statements (NPS) and National Environmental Standards (NES). At this stage it is understood that all existing national direction will be adopted under the new NBA. Those of particular relevance include:
  - *National Policy Statement for Freshwater Management (2020):* Sets out objectives and policies to protect and restore freshwater bodies and give effect to the fundamental concept of Te Mana o te Wai. Discussions with mana whenua during preparation of this DBC confirm that providing for Te Mana o te Wai is a lower standard than giving effect to Te Ture Whaimana.
  - *National Policy Statement on Urban Development (2020):* While this NPS does not directly impact consenting of discharges, it imposes requirements on the councils in the Metro Area to provide adequate infrastructure to support development. This is one of the drivers for this DBC.
  - *National Environmental Standards for Freshwater (2020)*
  - *National Environmental Standard for Sources of Drinking Water 2007*
  - *National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health 2011*
  - *National Environmental Standards for Air Quality 2004*
  - *National Policy Statement for Highly Productive Land 2022:* This seeks to maintain the availability of productive land for primary production which could affect the viability of wastewater discharges to land.
  - *Proposed National Policy Statement for Indigenous Biodiversity:* This would sets out objectives and policies to identify, protect, manage and restore indigenous biodiversity under the RMA.
- **Waikato Regional Policy Statement, Waikato Regional Plan, and Proposed Waikato Regional Plan Change 1:** The documents set the specific objective, policies, methods, and rules for activities being undertaken in the Waikato Region. Te Ture Whaimana is included within the Regional Policy Statement and the Waikato Regional Plan cannot be inconsistent with Te Ture Whaimana. Plan Change 1 seeks to give partial effect to the NPS for Freshwater Management and Te Ture Whaimana.
- **Tai Timu Tai Pari Taiao (Waikato-Tainui Environmental Plan) and other Iwi Management Plans:** Iwi management plans are an 'other matter' that must be considered under RMA s104

## 30. Next steps

The immediate next steps are

- Progress with the proposed project plans.
- Confirm funding requirements for next steps and submit to LTP process
- Confirm Southern WWTP diversion timing. The timing of the Southern WWTP diversion impacts the maximum mass load discharge from Pukete WWTP that needs to be considered as part of re-consenting, impacts the treatment capacity at Pukete (and therefore the timing of upgrades at Pukete), and the related ability of Pukete to absorb any increase in peak flows that may result from works to reduce network overflows.
- Discharge alternatives:
  - Undertake further investigations on options for a discharge to land or other beneficial re-use for some of the discharge to reduce the volume of discharge to the Waikato River (immediately or in the longer term)
  - Commence engagement with iwi partners for the co-design of a new discharge structure at the Pukete WWTP combined with a possible habitat wetland solution. As noted in section 7.3.1, the aim is to reduce or remove structures in the bed or banks of the Waikato River and to improve the cultural and spiritual purification of the discharge. The discharge structure could remain via a discharge structure or take a form of indirect discharge via a rock passage or wetland
- Pukete WWTP:
  - Continue existing programme of physical works (including inlet screen replacement)
  - Complete site masterplan and concept design for the MBR transition
  - Progress pre-MBR transition works (i.e., those works not impacted by the discharge consent renewal including the fourth primary sedimentation tank and new buildings)
  - Progress environmental assessments to support consenting. This includes assessment of the baseline environment (the water quality/environment as it would exist in the absence of the discharge, typically using the upstream water quality as a proxy) and assessment of the effects of the proposed discharge (both immediately following commissioning of the new WWTP and at the maximum discharge volume/contaminant loading near the end of the term of the consent)
  - Progress an assessment against Te Ture Whaimana including demonstrating whether the proposed discharge meets the “betterment” required to support the restoration and protection of the Waikato River and, if necessary, identifying any offsetting activities that might be required to support the proposal.
  - Progress a more specific assessment the relevant provisions of Plan Change 1 including demonstrating whether the proposed discharge will meet the proportionate reduction in nitrogen, phosphorus, suspended sediment, and e. coli required to meet the short and long-term water quality targets.
  - Update consent strategy to reflect work above
  - Complete consent applications
- Ngaaruawaahia WWTP:
  - Investigate works to bring WWTP back into compliance with current resource consent
  - Commence discussions regarding future use of site
  - Progress design and consenting for conveyancing
  - Complete design and consenting for interim works
- Continue to develop risk register including responsibilities and management plans for high-risk items
- Develop a Waikato Metro Wastewater Benefits Management Plan combining both Southern and Northern Metro DBC requirements.

# Definitions

AACE	Association for the Advancement of Cost Engineering
ADF	Average Daily Flow
cBOD	Biochemical oxygen demand
DBC	Detailed Business Case
DCs	Development Contributions
FTE	Full Time Equivalent
HAIL	Hazardous Activities and Industries List, a list developed by the Ministry of the Environment for the purposes of identifying potentially contaminated land
HAIL site	Land where a HAIL activity is or has historically been undertaken
HCC	Hamilton City Council
HT1	A future growth area: an area of land to the northwest of the existing Hamilton city boundary - roughly triangular in shape between the Waikato River, the existing City boundary along Kay Road/Horsham Downs Road, and the Waikato Expressway
KPI	Key Performance Indicator
LGFA	Local Government Funding Authority
LTP	Long-Term Plan
MBR	Membrane Bioreactor (a wastewater treatment process)
MCA	Multi-Criteria Assessment
Metro Area	The Hamilton-Waikato Metropolitan Area: centred around Hamilton City as the core but extending from Taupiri in the north to Te Awamutu and Cambridge in the south
MoU	Memorandum of Understanding
MLE	Modified Ludzack Ettinger (a wastewater treatment process)
MSP	Hamilton Waikato Metropolitan Spatial Plan
NES	National Environmental Standards
NPSFM	National Policy Statement for Freshwater Management
NPSUD	National Policy Statement on Urban Development 2020
NPV	Net Present Value
PE	Population Equivalent (a parameter used to estimate wastewater generation across a range of residential and non-residential activities)
Plan Change 1	Waikato Regional Plan Change 1
PPG	Programme Partnership Group
PST	Primary Sedimentation Tank
RPS	Waikato Regional Policy Statement: Te Tauākī Kaupapahere Te-Rohe O Waikato
Southern Metro DBC	Waikato Metro Wastewater Treatment Detailed Business Case
Te Ture Whaimana	Te Ture Whaimana o te Awa o Waikato - The Vision and Strategy for the Waikato River
TN	Total nitrogen
TP	Total phosphorus
UV	Ultra-violet light
WDC	Waikato District Council
Waipā DC	Waipā District Council
WRC	Waikato Regional Council
WWTP	Wastewater Treatment Plant