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Hamilton - Waikato - Waipa Metropolitan Area Wastewater Detailed Business case - Long List Options Report

Metro Wastewater Project Partners

April 2022

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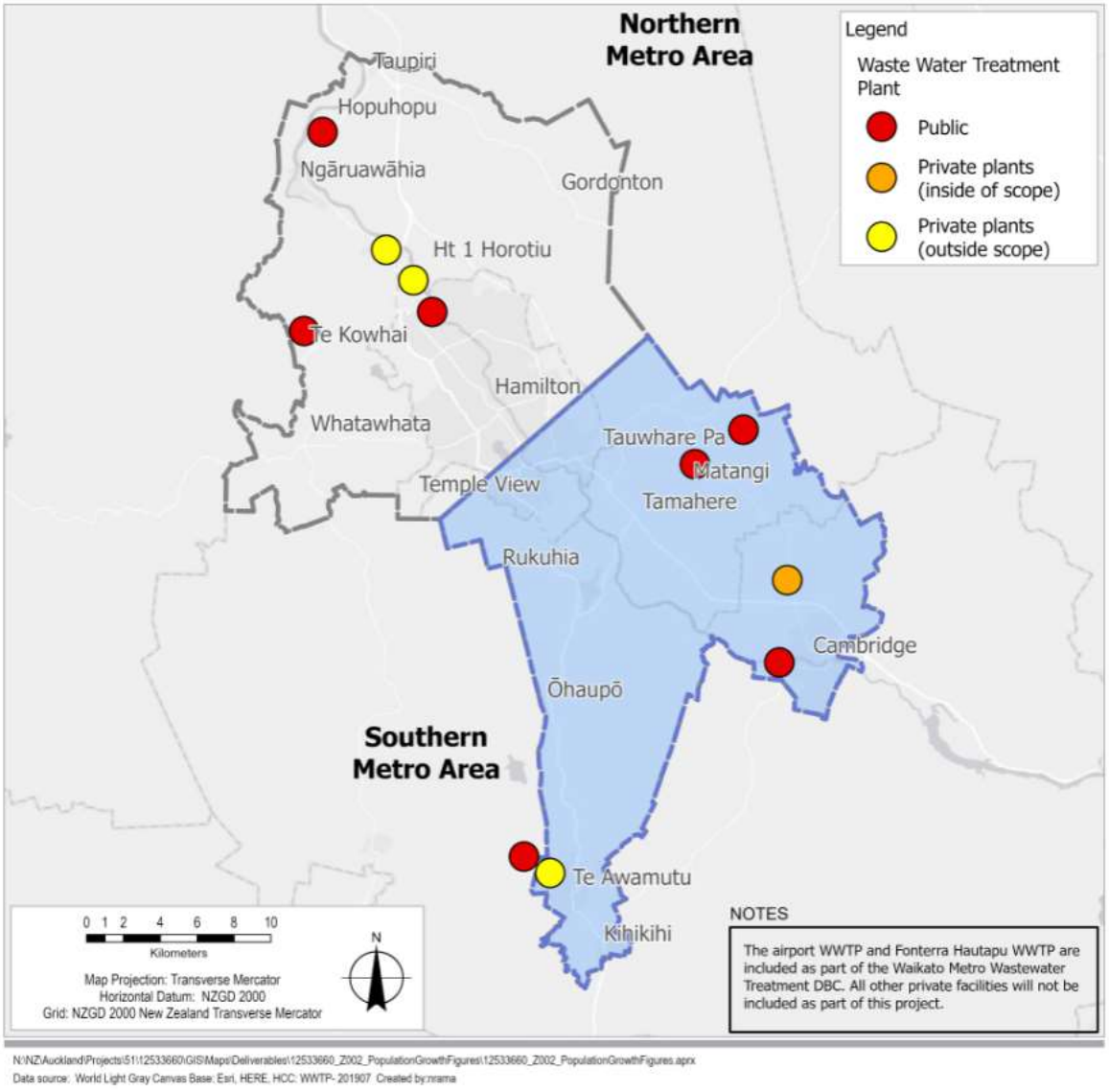
Introduction

The purpose of the Longlist Options Report is to provide detailed documentation of the options development and assessment process of the longlist wastewater servicing options for the Hamilton, Waipa, Waikato Metro Area (metro area, refer to Figure 1). This report is part of the Economic Case within the Waikato Metro Wastewater Detailed Business Case (DBC) and recommends a shortlist for further investigation, assessment, and consideration.

This longlist options assessment is a comparative assessment to determine whether centralised wastewater servicing solution for the southern metro area should be considered further and in more detail at the shortlist stage.

Figure 1 Wastewater treatment plants within the metro area (study area)



Longlist Options Development

In total, eight longlist options were developed for the Waikato Metro Wastewater Detailed Business Case using previous feasibility study material[1]. The longlist options are described in Table 1 below.

Table 1 High level option description

Option	Description
Option 1A	Do Minimum – All the existing plants will be upgraded to produce high quality flows (as outlined within the Water Quality Assumptions Memorandum). A new facility will be built to service the industrial growth around the airport and another new facility will be built to service growth in Ohaupo. The existing Cambridge plant will also be upgraded. Fonterra will operate as per BAU.
Option 1B	Option 1B includes all interventions outlined in Option 1A. However, Fonterra flows will instead be serviced by the proposed new Cambridge facility which will be more than double the current flows being serviced by Cambridge.
Option 2A	All northern communities will be serviced by a northern plant located at Pukete and southern communities will be serviced by a new southern centralised facility to be built on a new location (location to be determined). The new southern facility will service the industrial growth around the airport, Cambridge, Matangi, Ohaupo and a portion of south Hamilton. The extent of south Hamilton flows being diverted south is still under investigation. Te Awamutu and Tauwhare Pa will continue to operate as standalone plants but will undergo upgrades. Pukete will service flows from Te Kowhai and Ngaruawahia. Fonterra to operate as per BAU.
Option 2B	Option 2B includes all interventions outlined in Option 2A. The Fonterra flows will instead be serviced by the proposed new southern centralised facility. Flows from Fonterra equate to almost double the domestic flows currently being serviced by the Cambridge WWTP.
Option 3A	All northern communities will be serviced by a northern plant located at Pukete and southern communities will be serviced by a new southern centralised facility to be built at the Cambridge site. The new southern facility will service the industrial growth around the airport, Cambridge, Matangi, Ohaupo and a portion of south Hamilton. The extent of south Hamilton flows being diverted south is still under investigation. Te Awamutu and Tauwhare Pa will continue to operate as standalone plants but will undergo upgrades. Pukete will service flows from Te Kowhai and Ngaruawahia. Fonterra to operate as per BAU.
Option 3B	Option 3B includes all interventions outlined in Option 3A. The Fonterra flows will instead be serviced by the proposed new southern centralised facility at the Cambridge site. Flows from Fonterra equate to almost double the domestic flows currently being serviced by the Cambridge WWTP.
Option 4A	A new southern facility will be built near the airport which will service flows from the airport industrial area, Matangi, and Ohaupo. Pukete will service flows from Te Kowhai. This option will also include upgrades to the existing plants at Ngaruawahia, Te Awamutu, and

[1] Future Proof Partners, 2020. Hamilton Metro Wastewater Treatment Feasibility Study. Retrieved 25 Feb 2021, from https://www.futureproof.org.nz/assets/FutureProof/H2A/Waters/Final-Metro-Area-Wastewater-Treatment-Feasibility-Study_with-Appendices.pdf

Option	Description
	Tauwhare Pa and a new plant at Cambridge to ensure water quality standards are met. Fonterra to operate as per BAU.
Option 4B	Option 4B includes all interventions outlined in Option 4A. The Fonterra flows will instead be serviced by the proposed new Cambridge facility. This will more than double the current flows being serviced by Cambridge.

Each of these longlist options were then assessed using a project specific multi-criteria analysis assessment framework. This framework measured longlist option performance against the key project investment objectives, critical success factors and cost criteria confirmed in the previous strategic case phase of this project (refer Section 4.1).

Longlist Options MCA Assessment Summary

A summary of the longlist option MCA results is shown in Table 2 which shows the 'score' of each option against each MCA criteria. The longlist MCA assessment results show both Option 2A and Option 3A as the highest overall scoring options.

Table 2 Longlist Option MCA summary

OBJECTIVE CRITERIA	Do Nothing	Option 1A (Do Minimum)	Option 1B	Option 2A	Option 2B	Option 3A	Option 3B	Option 4A	Option 4B
Water Quality - TN and TP	-3	3	2	3	2	3	2	3	2
Water Quality - E. coli	-2	2	2	2	2	2	2	2	2
Water Quality - Public health	-1	1	1	1	1	1	1	1	1
Aquatic Ecology	-2	1	1	1	1	1	1	1	1
Terrestrial Ecology	0	1	1	1	1	1	1	1	1
Discharge location	Not scored at this time								
River vs land discharge	Not scored at this time								
Cultural Connectivity	Not scored at this time								
Access to river	0	1	1	2	2	2	2	1	1
Water reuse potential	0	1	0	3	2	2	1	1	0
Carbon neutral potential	0	-1	0	1	2	1	2	-1	0
Flexible and adaptable	-3	1	0	3	2	2	1	1	0
Meeting growth	-3	2	2	3	3	3	3	2	2
CRITICAL SUCCESS FACTORS									
Constructability (treatment)	0	-2	-3	-1	-2	-2	-3	-2	-3
Constructability (reticulation)	0	0	-1	-2	-3	-2	-3	-1	-2

OBJECTIVE CRITERIA	Do Nothing	Option 1A (Do Minimum)	Option 1B	Option 2A	Option 2B	Option 3A	Option 3B	Option 4A	Option 4B
Operability (treatment)	0	0	-2	1	0	1	0	0	-2
Operability (reticulation)	0	0	0	-2	-2	-3	-3	-1	-1
Land impacts	Not scored at this time								
Community acceptability	Not scored at this time								
Consentability opportunities and risks	-4	-3	-3	-1	-2	0	-1	-2	-3
Resilience	-2	1	0	0	-1	0	-1	1	0
Funding Potential	0	-2	-1	1	2	1	2	0	1
	3	2	2	-2	-2	-2	-2	0	0
COSTS									
Capital costs ($m)		$481	> $481	$588	>$588	$612	>$612	$494	>$494
Operational costs ($m)		$30.2	TBD	$30.8	TBD	$30.7	TBD	$30.6	TBD

Option 2A is the highest performing option and shortlisted under the MCA scoring process at the longlist to shortlist stage. It is considered that the benefits associated with building a new plant on a new site outweigh the risks involved in consenting and approving a new site. A new site offers the opportunity to masterplan a treatment facility to achieve the greatest long term operational efficiency and flexibility to adapt to load, technology and resource recovery opportunities and is able to adapt more quickly and easily to changes. A central location also reduces the length of large diameter rising main pipework and allows for greater development opportunities when compared against Option 3A. Additionally a new location south of Hamilton is closer to the airport industrial area. This area has significant industrial growth potential which provides greater opportunities for industrial water reuse.

Option 3A (building a sub-regional plant on the Cambridge site) is the second highest scoring option. However, this option has not been identified for the shortlist because of the following issues:

- Requires long conveyancing/pumping lengths from Peacocke and south Hamilton
- Constructing on an existing site that includes expansive, low intensity process units, whilst trying to keep the existing plant operational is logistically difficult and will require additional time and strict planning during construction
- Limited space on the existing site will make it very difficult to masterplan to the greatest efficiency and to respond to changes and growth
- Poor community perceptions and poor community acceptance already exist for the Cambridge site which may be difficult to overcome and put additional challenges on the consenting process
- There are geotechnical risks on the existing site, particularly the potential for lateral spread during construction and consequential impact on the river
- If geotechnical, master planning and other space constraints around operational logistics dictate a move to partial siting on adjacent land (e.g. the quarry site) then designation work and its inherent risks will be required to provide for the expanded site
- There is limited ability to reuse any of the existing assets at the Cambridge site.

This option utilises the site of the existing Cambridge WWTP, which is already consented for this type of land use and as an existing discharge location. The length and cost of conveyance for the airport and areas to the south of Hamilton make this option comparatively expensive to construct and operate may make it difficult to obtain consents to extend the site to accommodate a sub-regional WWTP.

A modified Option 4A is proposed as the Enhanced BAU option. For comparative purposes, an Enhanced BAU option is required to be carried through to the shortlisting stage. Option 4A is considered to be a more appropriate than Option 1A because of the following reasons:

- For the northern metro area (spanning from North Hamilton region to Taupiri), the servicing of Te Kowhai through the Pukete WWTP is considered more practicable than building a new plant at Te Kowhai for whole of life cost and efficiency reasons. A new plant for Te Kowhai would very likely require a new site. It would also place a high rate burden on a small community to invest in a high quality plant (to meet water quality assumptions). It is therefore recommended that the northern metro area pursue Option 4A over Option 1A as an Enhanced BAU approach. Conveying Te Kowhai to Horotiu and then onto Ngaruawahia is a considerably longer distance
- For the southern metro area (spanning from south Hamilton to Te Awamutu), it is proposed that a new plant (south of Hamilton) is master planned to allow for the inclusion of Matangi, Tauwhare, and Ohaupo. However, conveyance from these communities should *only* be considered when flows are large enough to avoid excessive retention times. Within the short to medium term, both Matangi and Ohaupo will continue to operate as per BAU with Matangi investing in short to medium term improvements in its standalone plant if required to obtain resource consent. The connection of Ohaupo is not expected to be needed until at least 2050. Developer interest within these areas may trigger the inclusion of the communities to a more centralised plant sooner. At this stage it has been assumed that these would occur in 2050
- This approach also allows for the potential to stage centralisation in the future, and therefore is flexible enough to adapt to changes and development opportunities as they occur.

Fonterra Options: The MCA shows that the benefits of servicing Fonterra through a municipal system *do not* (at this stage) outweigh the risks. The key risk of including Fonterra options into a sub-regional WWTP service network were the risks of liability and additional consequences of an operational failure. It was also noted that it is likely to increase the footprint of a new plant. These risks are most significant when considering the inclusion of Fonterra with a standalone Cambridge plant. Option 1B and 4B (which both

involve retaining Cambridge as a standalone facility at the existing Cambridge site) are therefore not recommended for shortlisting. Servicing Fonterra through a sub-regional facility is likely to have lower operational risk that if serviced through a Cambridge standalone facility. This is because the proportion of the total flow and load derived from the Fonterra would be significantly lower.

A key unknown, at this stage is how the inclusion of Fonterra flows will improve the ability to use advanced biosolids recovery technology. This has the potential to partially offset the operational costs for the plant (and support moves toward achieving energy neutrality). This benefit has not been fully investigated and could mean operational cost savings (for both council and Fonterra). However, it is considered unlikely that these benefits will offset the costs and risks associated with the options including Fonterra.

The recommendation for the shortlist is:

- Option 1 as the do nothing (for comparative purposes)
- Option 2A as our centralised option (involving a new southern facility on a new site)
- Option 4A (refined with staging limitations) as the Enhanced BAU Option.

Option 2A is recommended for the shortlist as the highest scoring option from the raw MCA assessment and the MCA sensitivity assessments. Option 4A is recommended for shortlisting over 1A, as servicing the smaller communities collectively (e.g. Matangi, Airport) or via existing municipal facilities (e.g. Te Kowhai) is considered more pragmatic and efficient than having many smaller plants. This option also has the potential to deliver more cost-effective and resilient solutions and could enable a transition to Option 2A in the future.

Preferred Shortlisted Metro Options

The longlist option assessment process identified the following options for shortlisting:

- Option 1 – Do Nothing (carried forward for comparative purposes only)
- Option 2A - Centralised northern plant and centralised southern plant (new site)
- Option 4A - Enhanced BAU option (refined with staging limitations)

The preferred shortlisted options for the Metro Wastewater DBC were identified following the longlist options assessments and are summarised below.

Option 1: Do Nothing – Option 1 Do Nothing has been brought forward for comparative purposes.

Option 2A: Centralised northern plant and centralised southern plant (new site)

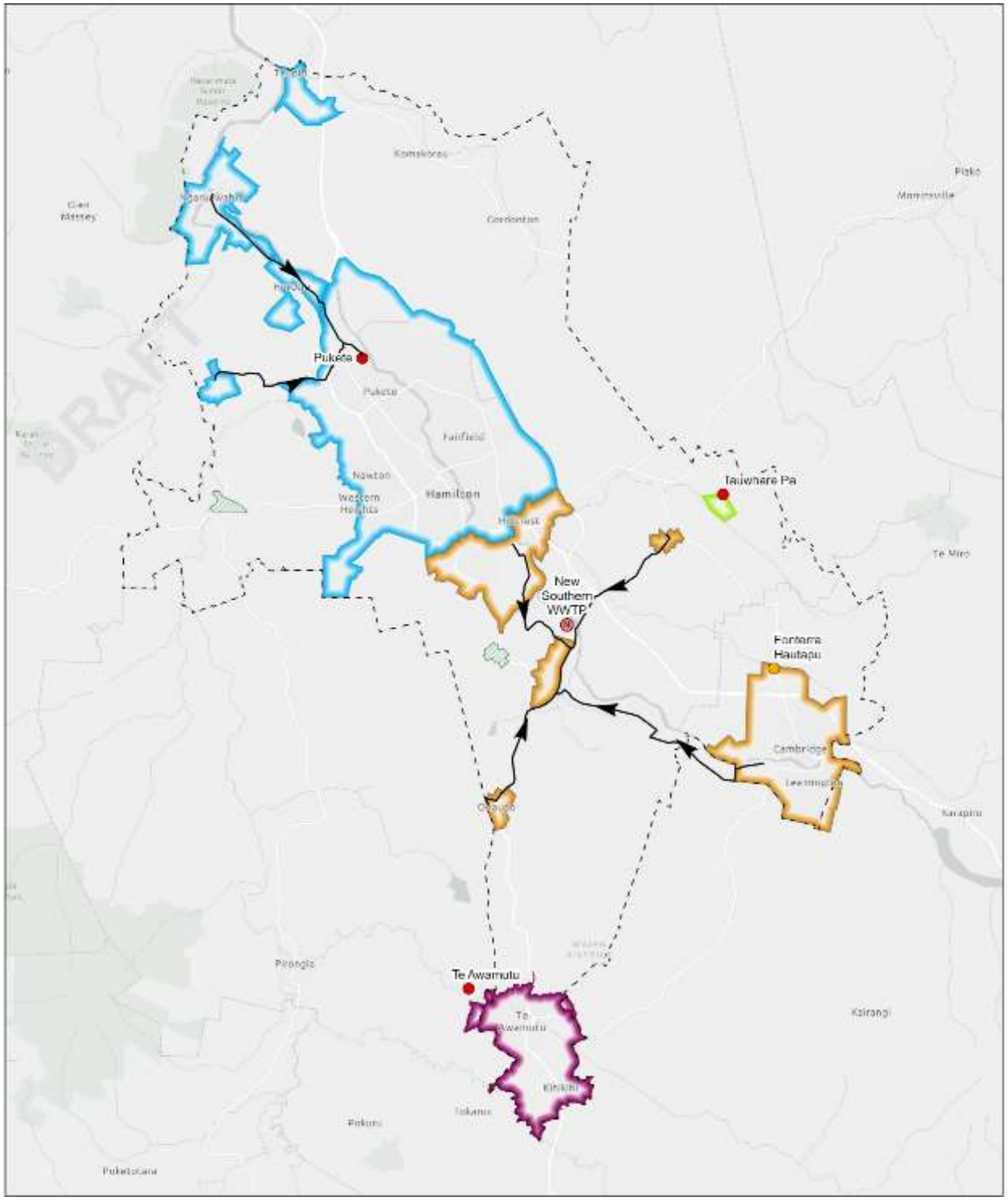
Option 2A consists of the following plants:

- One centralised southern plant to service southern communities (plant located on a new site near Hamilton airport
  - Hamilton (North)
  - Hopuhopu
  - Horotiu
  - Taupiri
  - Te Kowhai.
- One centralised southern plant to service southern communities (plant located south of Hamilton)
  - Cambridge

  - Hamilton Airport Business Zone
  - Hamilton (South)
  - Matangi
  - Ohaupo.
- Tauwhare Pa (standalone plant) to be upgraded
- Te Awamutu/Kihikihi (standalone plant) to be upgraded
- Fonterra Hautapu remains as a standalone private plant

This option consists of five facilities to service the wider metro area (refer to Figure 2). The longlist assessment identified Option 2A as the most preferred technical solution under all various weightings and sensitivities (excluding a detailed cost assessment). This option provides the flexibility to masterplan an efficient facility on a new site which minimises impacts. A site selection process is underway to determine potential locations for the new plant. Some benefits of this option are related to a centralised location between south Hamilton and Cambridge. The reticulation alignment and cost may change depending on the location of the site. For the purposes of this assessment, it has been assumed that the site is as shown in Figure 2.

Figure 2 Option 2A – Centralised northern plant and centralised southern plant (new site)



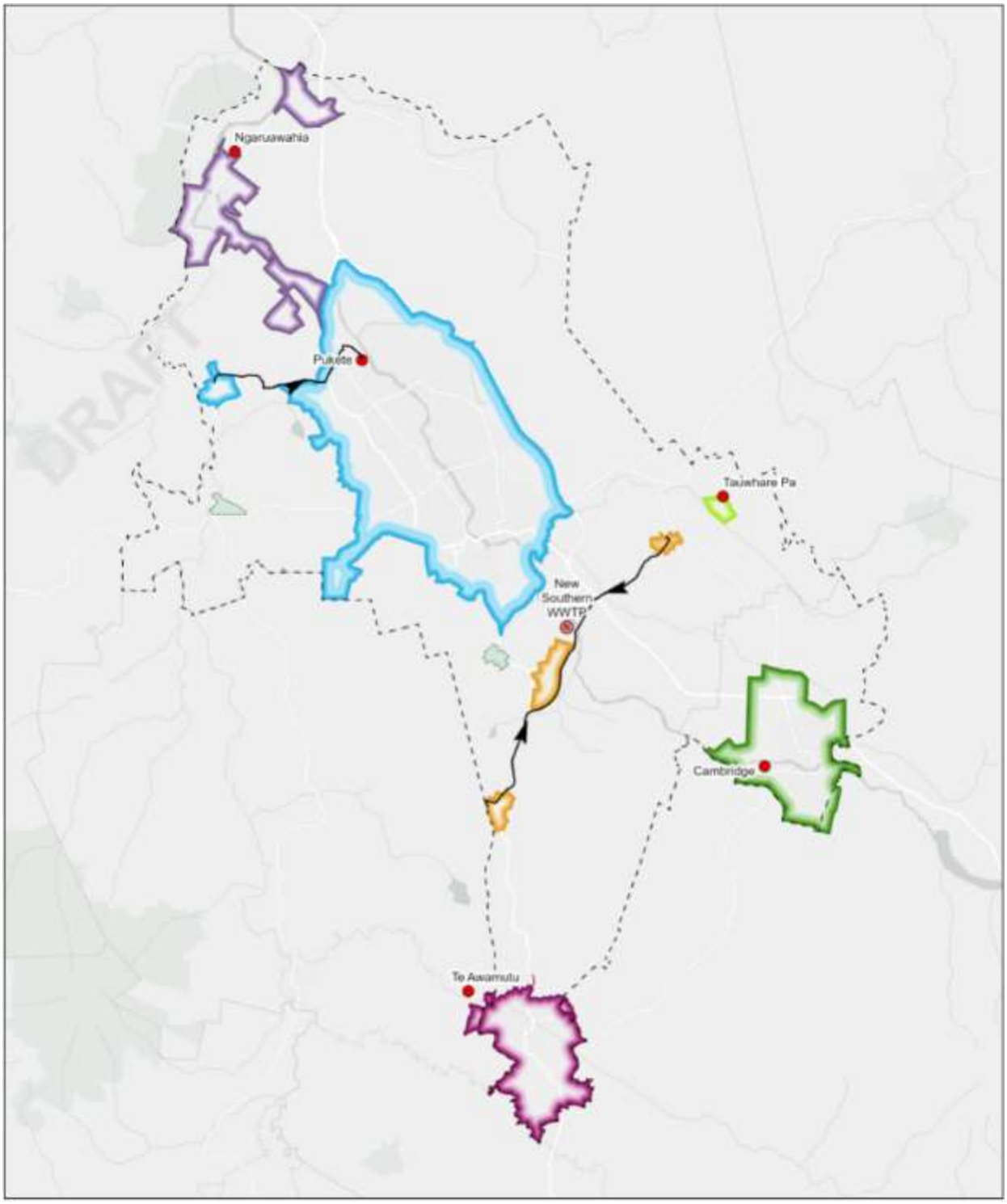
OPTION 4A: Enhanced BAU

Option 4A has been progressed as the new Enhanced BAU option. This option consists of the following plants:

- Ngaruawahia standalone plant to service:
  - Hopuhopu
  - Horotiu
  - Ngaruawahia
  - Taupiri.
- Hamilton (Pukete Plant) to service:
  - Hamilton (north)
  - Hamilton (south)
  - Te Kowhai
- Southern plant to service small southern communities (plant located south of Hamilton):
  - Hamilton Airport Business Zone
  - Matangi
  - Ohaupo.
- Tauwhare Pa (standalone plant) to be upgraded
- New plant at Cambridge (standalone plant)
- Te Awamutu/Kihikihi (standalone plant) to be upgraded
- Fonterra Hautapu remains as a standalone private plant

This option consists of seven plants to service the wider metro area (refer to Figure 3). It is proposed that this option is refined to allow for growth considerations. A new southern plant to service the airport will be master planned to cater for Matangi, Tauwhare and Ohaupo. However, both communities will only be connected once flows are large enough to minimise retention risks and the servicing option is needed. In the interim, the Matangi plant is likely to require short to medium term upgrades. It is also expected that the connection of Te Kowhai to Pukete is more economical than building a new plant in Te Kowhai. This connection is likely to be required in the next 10 years. This option also maintains existing council boundaries.

Figure 3 Option 4A Enhanced BAU



Next Steps

The longlist options development and assessment phase is the second stage of the Detailed Business Case process and forms part of the economic case. The next step of the Waikato Metro Wastewater DBC project is to refine and assess the shortlist options for the southern area only and identify a preferred technical solution.

This involves undertaking the following steps:

- Develop the shortlist of options
  - Determine the extent of Hamilton City to be conveyed to a Southern WWTP
  - Develop shortlist options in more detail (including staging of servicing the communities in the study area)
  - Determine a shortlist of potential treatment plant sites
  - Further refine the discharge options
  - Further refine conveyance options
  - Further refine staging of upgrades and construction
- Develop more refined cost estimates for shortlisted options
- Undertake MCA of shortlisted options
- Determine preferred option for the southern metro area.

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The Cost Estimate has been prepared for the purpose of making a relative assessment of options and must not be used for any other purpose.

The Cost Estimate is a preliminary estimate only. Actual prices, costs and other variables may be different to those used to prepare the Cost Estimate and may change. Unless as otherwise specified in this report, no detailed quotation has been obtained for actions identified in this report. GHD/Beca does not represent, warrant or guarantee that the project can or will be undertaken at a cost which is the same or less than the Cost Estimate.

1 Introduction

1.1 Purpose of the Report

The purpose of the Longlist Options Report is to provide detailed documentation of the options development and assessment process of the longlist wastewater treatment options for the Hamilton Waipa Waikato Metro Area (metro area). This report feeds directly into Economic Case of the Waikato Metro Wastewater Treatment DBC.

The purpose of the DBC is to explore potential wastewater strategic options for the wider metro area and determine a preferred wastewater treatment solution for the southern metro area (refer to Figure 4). This project aims 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.

The longlist options assessment is a high-level comparative assessment to determine whether centralised wastewater servicing solutions for the metro area should be considered further and in more detail.

This report follows on from the Hamilton Metro Wastewater Treatment Feasibility Study[2] which identified a number of potential servicing options for the metro area. Options recommended as part of this study have been carried through to this assessment for further development.

1.2 Geographical Context

The metro area starts from Taupiri through to Te Awamutu (North - South) and Te Kowhai/ Whatawhata to Tauwhare (East - West) and forms part of the Sub-Regional Three Waters Study Area (See Figure 4)

These communities within the metro area have been separated into northern and southern areas:

Northern communities:

- Area east of Hamilton
- Gordonton
- Hamilton (North – Extent to be confirmed)
- Hopuhopu
- Horotiu
- Ngaruawahia
- Taupiri
- Te Kowhai
- Whatawhata

Southern communities:

- Cambridge
- Hamilton (South – Extent to be confirmed)
- Hamilton Airport Business Zone
- Matangi
- Ohaupo
- Tamahere
- Tauwhare Village and Tauwhare Pa
- Te Awamutu /Kihihkihi

[2] Future Proof Partners, 2020. Hamilton Metro Wastewater Treatment Feasibility Study. Retrieved 25 Feb 2021, from https://www.futureproof.org.nz/assets/FutureProof/H2A/Waters/Final-Metro-Area-Wastewater-Treatment-Feasibility-Study_with-Appendices.pdf

Figure 5 below provides a detailed map of the areas and existing treatment plants currently servicing the metro area.

Figure 4 Waikato Three Waters Sub-Regional study area and project study area

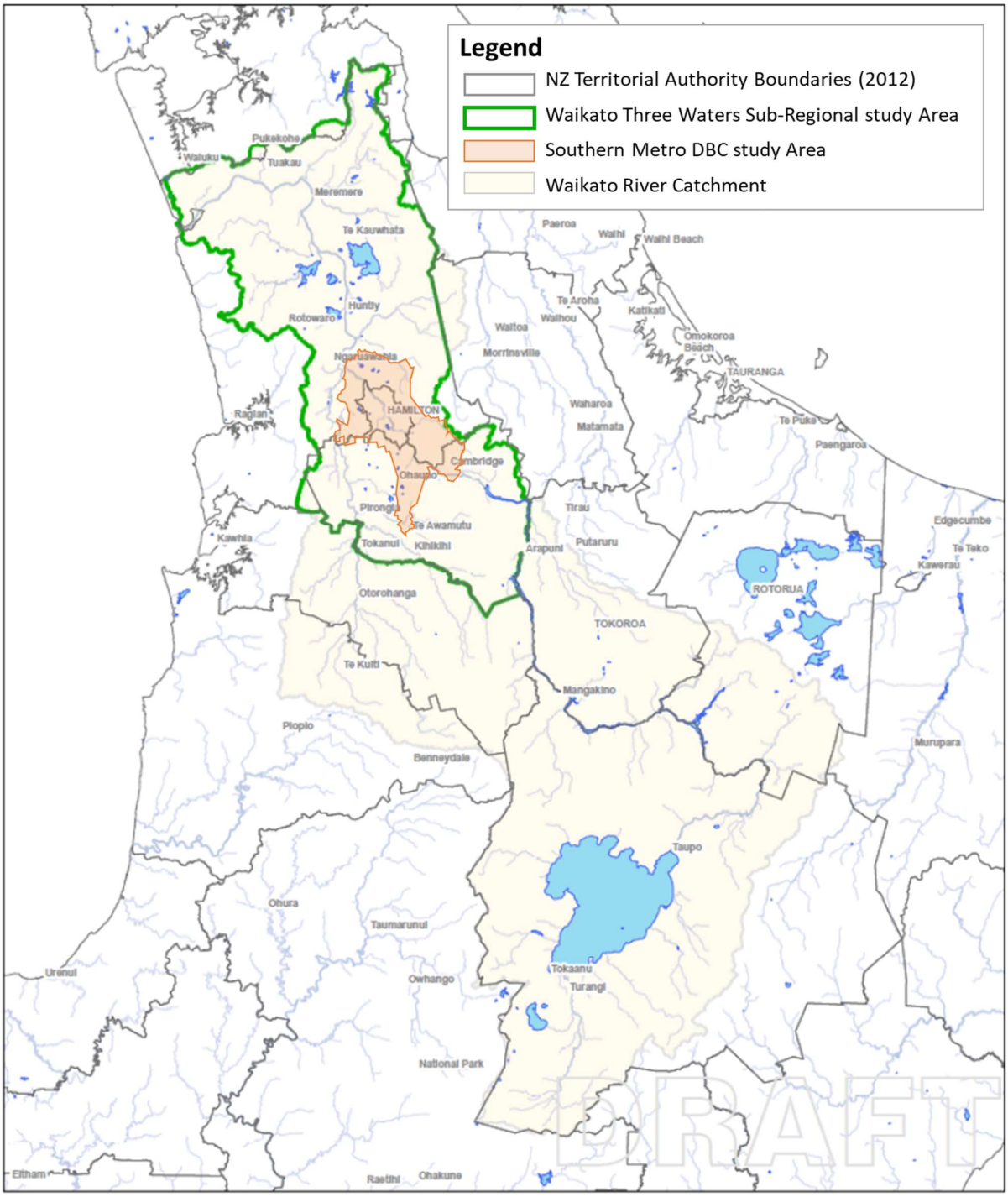
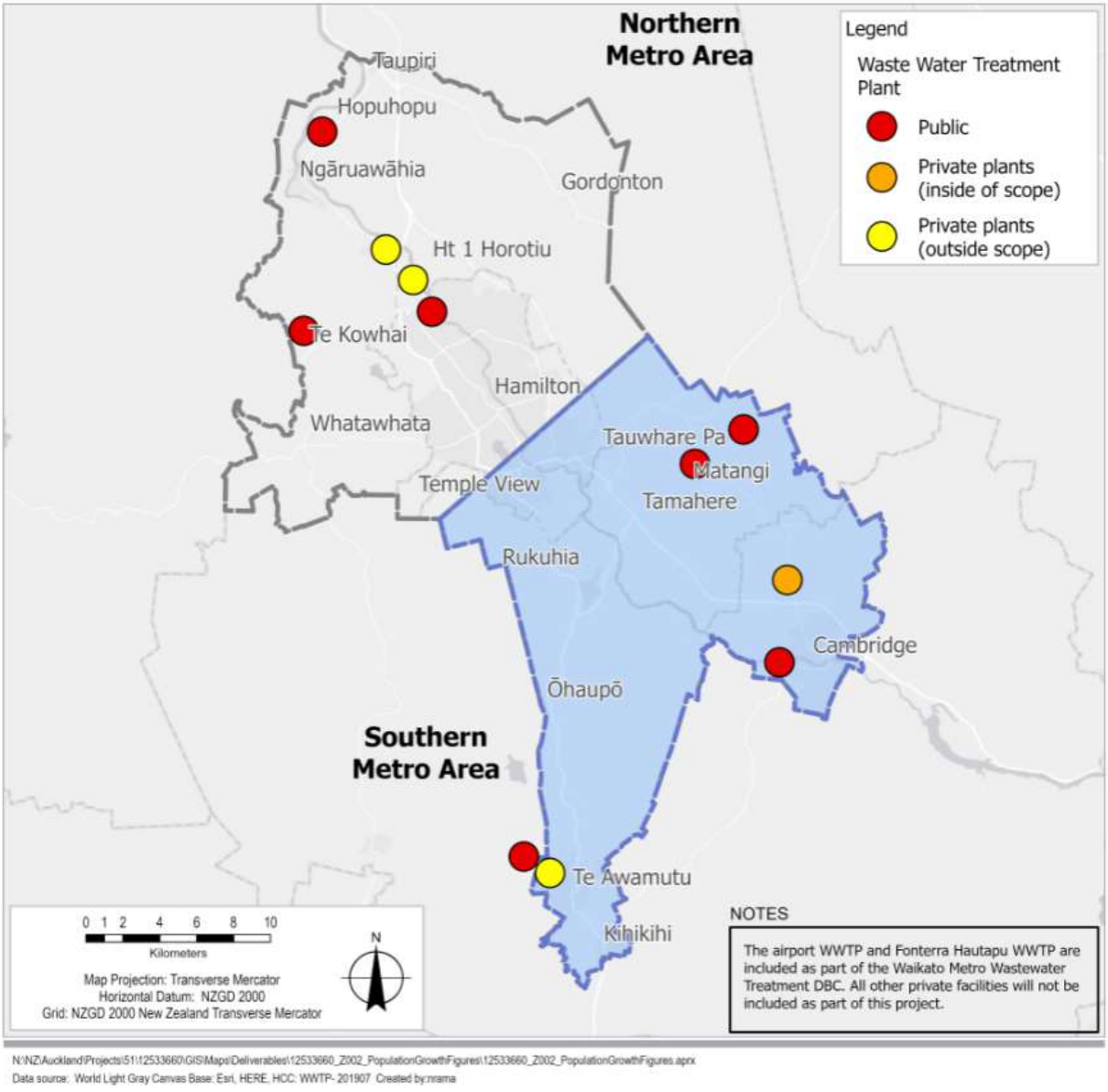


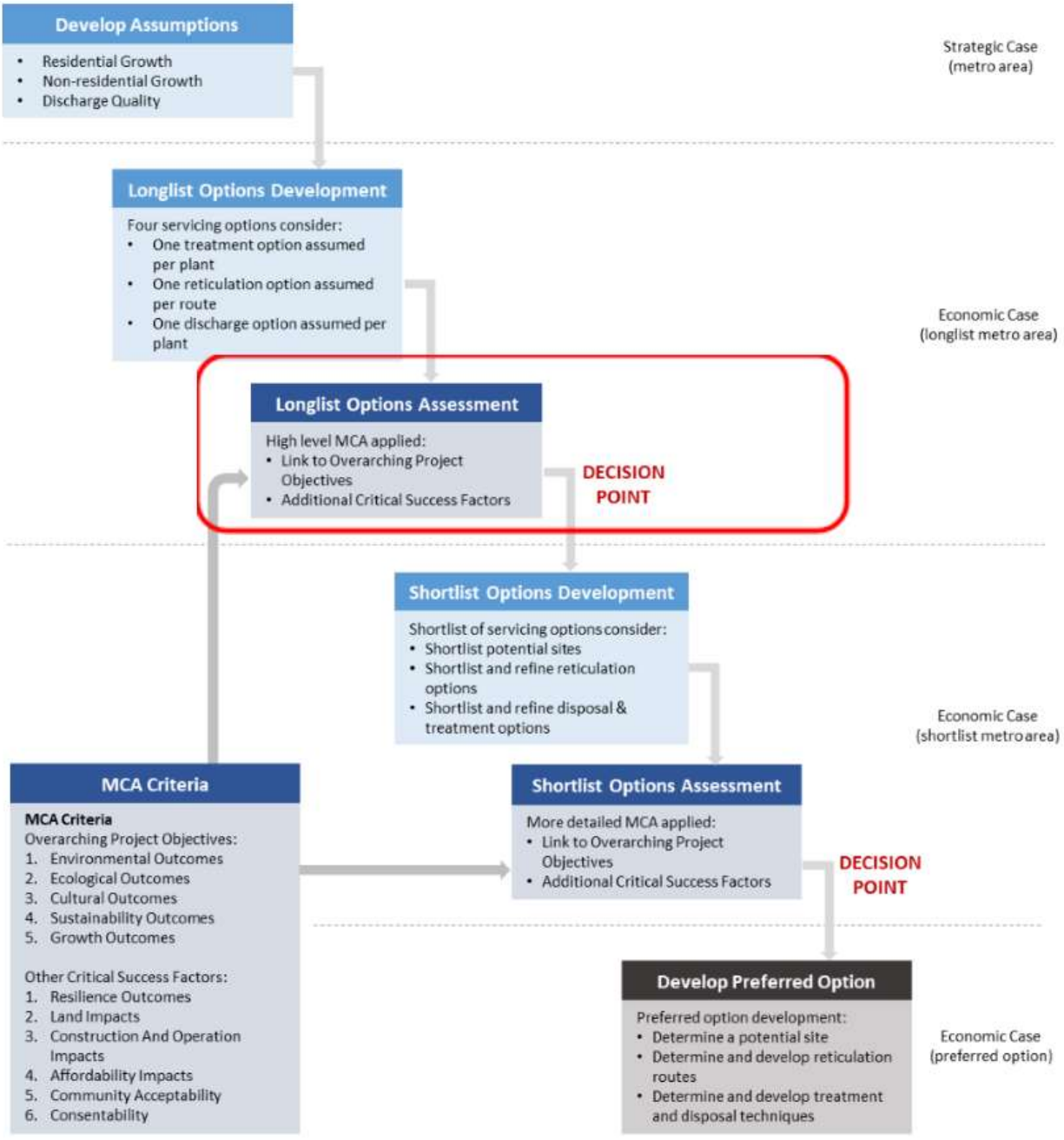
Figure 5 Hamilton Waikato Waipā Metro Area



1.3 Methodology

The following steps outline the overarching methodology (refer to Figure 6) used to develop and assess the longlist options for this Waikato Metro Hamilton Wastewater Detailed Business Case (DBC).

Figure 6 Options development and assessment process[3]



Stakeholder, Control Group and Governance Group engagement has been a key feature of this project since its inception. Project Control and Governance Group support of the key longlist option development and

[3] HCC, 28th Oct 2020. Waikato Metro Area Wastewater Detailed Business Case Project Governance Group – Meeting Agenda: Thursday 28th October 2020.

assessment activities, including assumptions were achieved on 14 October 2020 and 28 October 2020 respectively.

Step 1: Develop Assumptions

The first step was to determine and confirm key assumptions. Both potential residential and non-residential growth assumptions were developed for the metro area. Population and growth assumptions were determined based on existing sources (Futureproof and other individual council plans). Ten-year incremental projections were developed for each of the main areas within the metro spatial area from a 2021 scenario to 2061 with an additional ultimate scenario developed which considers a 100-year timeframe (refer to Section 2.1 and Appendix A).

Options were also developed based on a high discharge quality assumption which was based on achieving the project vision, the requirements of Te Ture Whaimana, National Policy Statement on Freshwater (NPS-FW), objectives of the Three Waters Reform, and the overall environmental performance of wastewater systems. Other key assumptions such as those identified below were also included to fully develop and further evaluate servicing options:

- Reticulation routes (one route selected per option)
- Treatment solutions (one treatment option assumed per plant in order to meet water quality assumptions set as part of Step 1)
- Disposal options (one disposal method selected per option)
- Staging of new build and upgrades.

A full list of the options development assumptions can be found in Section 2.

Step 2: Longlist Options Development

The longlist of options was subsequently developed to meet the above assumptions and to meet the investment objectives and KPIs. The longlist was based on options that were previously developed and recommended as part of the Hamilton Metro Wastewater Treatment Feasibility Study[4].

Step 3: Longlist Options Assessment

This step assessed the longlist of metro options against the **Multi-Criteria Analysis (MCA)**. The MCA identified a number of specific criteria and assigned a score to each of these criteria. Each of these longlist options were measured against criteria which reflected different priorities outlined below:

Overarching Project Objectives:

- Environmental Outcomes
- Ecological Outcomes
- Cultural Outcomes
- Sustainability Outcomes
- Growth Outcomes

Other Critical Success Factors:

- Resilience Outcomes
- Land Impacts
- Construction and Operation Impacts

[4] Future Proof Partners, 2020. Hamilton Metro Wastewater Treatment Feasibility Study. Retrieved 25 Feb 2021, from https://www.futureproof.org.nz/assets/FutureProof/H2A/Waters/Final-Metro-Area-Wastewater-Treatment-Feasibility-Study_with-Appendices.pdf

- Affordability Impacts
- Community Acceptability
- Consentability

After the longlist options assessment, the shortlist options will then be determined for further investigation.

Step 4: Shortlist Options Development

This step will involve development of the shortlisted metro options, but for the southern area only (note that the northern area solutions are to be undertaken at a later stage). The shortlist options will be developed by taking these factors into consideration: sites for new plants, reticulations routes (if applicable), treatment and disposal, and cost estimates. The shortlist options will also be developed with stakeholders to determine preferences and gain some insights for further options assessment.

Step 5: Shortlist Options Assessment

Shortlist options will be assessed against the same **MCA criteria** (refer to **Step 3** for Overarching Project Objectives and Critical Success Factors) with greater levels of details. In this stage, the detailed MCA criteria will be included for site selection and reticulation selection. The shortlist options will be assessed against technical and implementation risks. Other key interdependencies which affect the success of the preferred southern metro option will be determined and further developed in the next stage.

Step 6: Develop Preferred Option

In the final stage of the Economic Case, the most preferred and feasible southern metro option will be determined based on the outcomes of the shortlist options assessment described above. Further option development will be considered at this stage:

- Concept design for treatment techniques and reticulation section
- Site selection for preferred option
- Discharge type and location
- Cost development
- High level assessment of environmental effects
- Consenting strategy.

2 Assumptions

The assumptions that underpinned the development and assessment of the longlist options related to population and land use, design and flow, treatment plant performance, cost, and conveyance (refer to Section 2.1 to 2.5 below). The wastewater treatment plants (WWTP) included as part of these assumptions were:

- Municipal WWTPs:
  - Cambridge WWTP
  - Matangi WWTP
  - Ngaruawahia WWTP
  - Pukete WWTP
  - Te Awamutu WWTP
  - Te Kowhai WWTP
- Private WWTPs:
  - Fonterra Hautapu WWTP

Other private facilities were not part of the longlist options.

2.1 Population and Land Use Assumptions

Population and land use assumptions used for the long list assessment can be categorised as residential growth, non-residential growth and Hamilton City breakdown growth assumptions. The sources and process for developing the future growth assumptions are further detailed in the Growth Assumptions for Waikato Metro Wastewater DBC Memorandum[5] (see Appendix F for more detail). These assumptions were approved for use in the longlist assessment by the Project Control and Governance on 14 October 2020 and 28 October 2020 respectively.

Residential Growth

Table 3 provides a summary of the residential growth expected for each of the communities in the metro area and the proposed future servicing approach. Figure 7 Metro area residential growth highlights the areas of residential growth expected within the region and the corresponding population within each area. The figure also highlights the WA, HT1 and R2 areas as potential longer-term areas for residential growth. These are outside the Hamilton City boundary but an agreement is in place between Hamilton City and Waikato District for later transfer if criteria are met. The Southern Links area shown in Figure 7 is a "Possible Area" that may be identified for future development.

Work completed to support the 2020 Hamilton-Waikato Metro Spatial Plan[6] has been used to inform additional infill expected and ultimate forecasts for Hamilton, Waikato and Waipa. For the purpose of this assessment, the ultimate infill development projections from the MSP have been used to inform wastewater

[5] GHD, Beca, 2020. Growth Assumptions for Waikato Metro Wastewater DBC. Hamilton City Council.

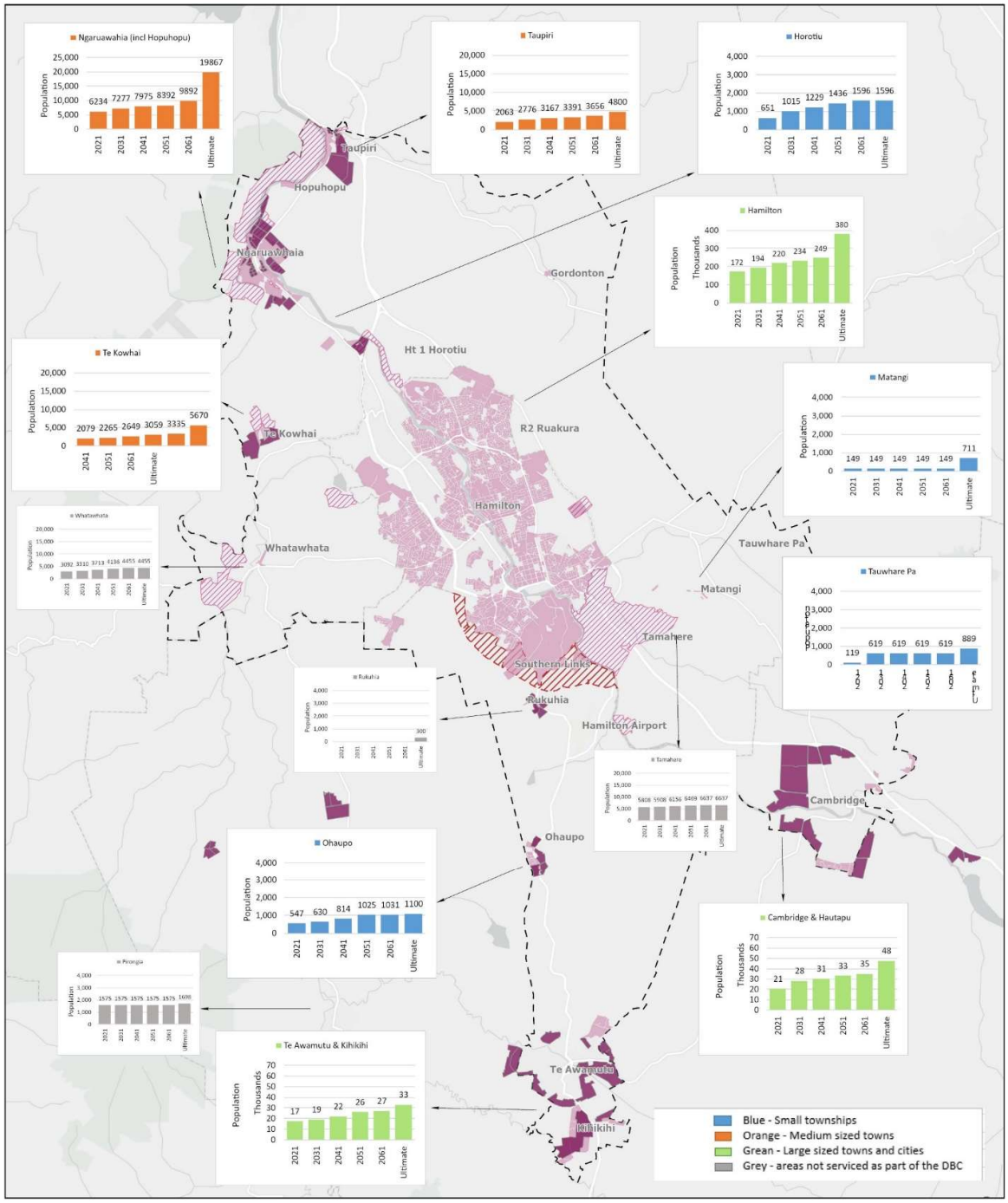
[6] Future Proof Partners, 2020. Hamilton Waikato Metropolitan Spatial Plan. Retrieved 25 Feb 2021, from https://www.futureproof.org.nz/assets/FutureProof/H2A/Metro-Spatial-Plan/Hamilton-Waikato-Metropolitan-Spatial-Plan-Final-Low-Res.pdf

treatment plant footprint that may be needed for footprint requirements for new infrastructure only as part of the DBC.

All forecast urban growth areas are expected to be serviced by large, public municipal WWTP's. Rural residential lots adjacent to towns are currently not serviced for wastewater and this is proposed to continue. Te Kowhai currently has a mixture of on-site (privately serviced) and publicly serviced properties, however, the proposed District Plan signals that Te Kowhai growth areas have the potential for more dense development which would require servicing. Ohaupo township; Matangi Village and business hub; and Tamahere Village Hub and commercial zones are included in the wastewater servicing area due to the sensitive environment associated with the peat lakes at Ohaupo and difficult soil conditions in Matangi/Tamahere areas. Tauwhare Pa and Village are also included in the study area and the servicing will be confirmed in the preferred option refinement stage of the DBC

Little growth is expected in Gordonton, Pirongia and Whatawhata so there would be little benefit in servicing these areas. Servicing of Rukuhia by a public municipal WWTP may be reconsidered when the Southern Links area is developed. The flows from Gordonton, Whatawhata and Pirongia communities are likely to be relatively small and so, like Rukuhia could be considered in the future but have not been factored into the current work.

Figure 7 Metro area residential growth



LEGEND

- Existing residential district plan zones
- Existing country living zone (Waikato district plan)
- Residential growth zones
- Potential future growth area
- Ultimate overall growth area
- Metro spatial area

NOTES

Whatawhata, Pirongia and Tamahere Country Living Zone will not be considered as part of the Waikato Metro Wastewater DBC. These will remain as self-serviced areas

Table 3 Residential population assumptions

	Area	Current servicing	Future Servicing	2021	2031	2041	2051	2061	Ultimate
Waikato District Council	Taupiri	Currently serviced	Yes	2,060	2,780	3,170	3,390	3,660	4,800
	Ngaruawahia (incl Hopuhopu)	Currently serviced	Yes	6230	7280	7980	8390	9890	19870
	Horotiu	Currently serviced	Yes	650	1,020	1,230	1,440	1,600	1,600
	Te Kowhai	Small part of township serviced	Yes all new development and existing township from 2030	2,080	2,270	2,650	3,060	3,330	5,670
	Matangi	Township only serviced	Yes, continue existing township only and include existing commercial area	150	150	150	150	150	150
	Tauwhare Pa[7]	Township only serviced	Yes, continue existing township only	120	620	620	620	620	890
	Whatawhata	Not currently serviced	No	3,090	3,310	3,710	4,140	4,460	4,460
	Tamahere[8]	Not currently serviced other than Tauwhare Pa	Potential servicing of Tamahere commercial area, school and rest home/ retirement village post 2030	5,810	5,910	6,160	6,470	6,640	6,640
Hamilton City Council	Hamilton	Currently serviced	Yes	171,610	194,190	219,740	234,190	248,650	320,000
	Out of boundary areas	Southern Links	Yes post 2061	N/A	N/A	N/A	N/A	N/A	60,000
Waipa District Council	Ohaupo	Not currently serviced	Yes post 2051	550	630	810	1,030	1,030	1,100
	Rukuhia	Not currently serviced	No – but could be serviced as part of developing a	N/A	N/A	N/A	N/A	N/A	300

[7] Allowance for extra Papakainga housing – 50 houses at 10 person per house occupancy.

[8] Large lot or houses in Tamahere "Country living zone" which are currently serviced by onsite wastewater treatment facilities.

	Area	Current servicing	Future Servicing	2021	2031	2041	2051	2061	Ultimate
			new facility near the airport						
	Cambridge (incl Hautapu and Karapiro)	Currently serviced	Yes	20,520	28,310	30,540	33,010	35,140	47,760
	Te Awamutu & Kihikihi	Currently serviced	Yes	17,490	19,160	22,070	26,150	27,170	33,180
	Pirongia	Not currently serviced	No	1,580	1,580	1,580	1,580	1,580	1,700

Non-Residential Growth

The assumptions for new non-residential areas used in this assessment are outlined below:

- For Waikato and Waipa Districts, non-residential growth has been based on the areas in Table 4 spread over expected development timeframes and the population equivalent (PE) factor outlined below
- For Hamilton City, non-residential growth information has been incorporated into the PE forecasts for the Wastewater Master Plan V3 as outlined in the following section
- Existing and known future trade waste/wet industry discharges have been included in the wastewater flow and load projections
- 45 population equivalent per hectare was used per additional hectare of industrial activity as per the RITS unless a different population equivalent was outlined in the table below. Gross areas were corrected for non-usable areas such as transport corridors based on structure plans where available.

Table 4 Non-Residential population assumptions

Location	Type of development	Current zoned (incl deferred) ha	Potential additional areas ha	Recommended PE/ha	Comments/Expected Timing
Taupiri	Light Commercial		150	30	West 3-10 yrs, East 10-30 yrs
Te Kowhai Airpark	Mixed use	45		30	3-10 yrs
Hopuhopu Business Park	Commercial/light industrial		35	45	10-30 yrs
Waikato Tainui - Hopuhopu	Mixed use		24	Varies (PE estimate provided[9])	1-30 years
Horotiu	Light Industrial/ logistics	194	50	30	3-10 years
Te Rapa North	Industrial	As per WWMP			As per WWMP
Rotokauri	Light Industrial				
Ruakura	Light Industrial/ logistics				
Tamahere[10]	Business zone	8.5		30	1-10 years.
Matangi	Commerical/light industrial	5		30	1-10 years.
Airport	Light Industrial	153	100	45	Titanium Park, Meridian 37 by 2035, Montgomery block to 2050, Northern extension post 2050

[9] Email Jackie Colliar on 12/8/20.

[10] Waikato District Council, 2018. S92 Report Tamahere Business Zone.

Location	Type of development	Current zoned (incl deferred) ha	Potential additional areas ha	Recommended PE/ha	Comments/Expected Timing
Cambridge - Hautapu	Industrial	197		45	Small area currently under development, remainder by 2050
Te Awamutu	Light industrial and commercial	37		45	Bond Rd and Paterangi Rd developed by 2030

At present, the metro area local authorities do not collectively plan for or design infrastructure to include capacity for new wet industrial (or high-water use) activities. This project, alongside relevant land use planning projects provides an opportunity to implement more integrated and considered infrastructure planning approaches.

While the portion of non-residential land capacity which will be allocated to wet industries is uncertain on an area basis it is expected to be small. The servicing of new wet industry will be partly limited by water allocation and water supply infrastructure. As a starting point for factoring wet industrial land use into infrastructure planning, the following areas were identified as reasonable locations to assume (and provide for) new wet industrial activity may be concentrated at:

- Horotiu / Te Rapa North
- Ruakura
- The Airport Business Zone
- Near the existing Cambridge WWTP.

Many different approaches can be taken to estimate potential flows (and loads) from wet industrial activity. For the purpose of this assessment, high water use activities were assumed for 2% of total land area allocated for industrial activities as part of the base growth projection assessments as outlined below.

Table 5 Wet industry assumptions

Location	Type of development	Indicative area (incl deferred and non-zoned) ha	Base Industrial Flow allowance m^3/d	Base Industrial Flow PE/ha	Additional Wet Industry Allowance m^3/d	Additional Wet Industry PE	Total Industrial flow allowance **m^3/d**
Horotiu	Light Industrial/ logistics	194	931	30	1341	6,705	2,272
Te Rapa North	Industrial	60	432	45	415	2,074	847
Ruakura	General Industrial	225	1,620	45	1,555	7,776	3,175
Airport	Light industrial	253	1,822	45	1749	8,744	3,570
Cambridge (near WWTP)	Industrial	23	165	45	159	795	325

Hamilton City Breakdown

A more detailed breakdown of population equivalent projections was developed for the Hamilton wastewater network model V3 and has been used for the DBC.

Population equivalent growth breakdown includes both residential, commercial and industrial inputs and are available for the main growth cells and infill locations within Hamilton. Table 6 shows where the growth cells are located and the growth expected over time. This information is being used to determine which areas could potentially be diverted to a southern sub-regional WWTP and what flows would continue to be treated at Pukete WWTP. The areas marked * are currently outside the Hamilton City boundary but are subject to an agreement with Waikato District Council regarding future transfer to the city.

Table 6 Hamilton City population equivalent growth breakdown

Growth Cell	2021	2031	2041	2051	2061	City Full
Te Rapa North	1,167	9,073	9,677	10,280	10,884	15,898
Ruakura	6,816	10,127	13,965	17,014	25,697	28,769
Peacockes	1,346	6,532	14,161	18,648	25,489	25,607
Templeview	2,031	2,681	3,550	4,419	5,289	15,860
Rotokauri	2,897	9,129	9,567	19,913	21,570	31,624
Te Rapa	13,892	15,003	15,993	17,290	19,168	39,698
Rototuna	10,433	15,165	15,068	14,972	14,875	15,284
WA*	0	0	0	0	0	1,000
HT1*	0	0	0	8,398	16,796	33,591
R2*	179	179	179	4,725	9,450	9,450
East of Ruakura						30,000
MSP Additional Infill		2,311	6,934	11,557	16,180	72,278
Brownfield	217,377	231,480	239,636	253,447	254,244	339,475

2.2 Design/Flow Assumptions

The Regional Infrastructure Technical Specification (RITS) is a document that sets design specifications for constructing transportation, water supply, wastewater, stormwater and landscaping infrastructure in the Waikato Local Authority Shared Services (WLASS) participating council areas[11].

The RITS guidance for wastewater infrastructure has been used together with average daily flow (ADF) data to inform the design/flow assumptions of the Metro Wastewater DBC longlist options.

Average Flow

The Regional Infrastructure Technical Specification (RITS) provides the following data assumptions and calculations:

- Domestic Average Daily Flow (ADF) is 200 litres per person per day
- Non-domestic ADF is development area catchment * population equivalent factor * 200 litres per day.

Peak Flow

The RITS details how peak flows can be calculated. The Peak Daily Flow (PDF) and Peak Wet Weather Flow (PWWF) were initially calculated for each catchment using the method provided in RITS. The RITS method included infiltration and surface water ingress allowances on a catchment area basis, which resulted in PDF and PWWF values that were approximately 5-10xADF and 10-20xADF respectively.

For comparison, peak flows were calculated using recent catchment ADF data provided by the Councils. The peak flows calculated using RITS were found to be significantly higher than those calculated using actual flow data. This was particularly true for the larger population centres such as Cambridge and Hamilton.

To prevent oversizing the infrastructure, the RITS methodology was modified to more accurately correlate with actual flow data. While there was a peaking factor applied to the population component of the ADF to determine the PDF, the majority of the additional flow came from the infiltration and surface water components for the PWWF, which were both based on the reticulated area. This led to peaking factors that were significantly smaller than those calculated under RITS, averaging 5xADF for PDF and 10xADF for PWWF.

For all towns with a Population less than 10,000, the RITS calculations were used verbatim to calculate the PDF and PWWF.

[11] WLASS, 2021. Regional Infrastructure Technical Specifications (RITS). Retrieved 11 Feb 2021, from https://waikatolass.co.nz/shared-services/regional-infrastructure-technical-specifications/

2.3 Treatment Plant Performance Assumptions

During the development of the longlist options, the following liquid stream, solid stream, atmospheric emissions, and general WWTP performance assumptions were made and approved by the Governance Group.

Further information regarding the treatment plant performance assumptions can be found in the Wastewater Treatment Assumptions Memorandum on 14 August 2020:

Liquid Stream:

A consistent standard of treated wastewater quality was adopted for all WWTP discharges to water. It was proposed that the level of treatment within that option would provide:

- A high level of nutrient removal <4mg/L TN and <1mg/L TP (as annual means) and
- A very high pathogen removal (E.coli <14 cfu/100ml as a 95th percentile).

The treated wastewater quality standards will be introduced by 2031 or when the existing resource consent for the discharge expires. For WWTPs including digestion facilities, primary treatment will also be included.

Note that the treated wastewater qualities initially adopted for the preferred Southern Area solution will be confirmed at a later stage of the DBC based on the nutrient loading assessment and scale of facilities initially included as part of the preferred solution.

Solid Stream:

A graduated scale of solids management was proposed with complexity and extent of solids destruction and energy potential realisation increasing in steps with population equivalent served. Solids management and in particular energy recovery could be subject to staging considerations at the preferred option down-select stage:

- For very small plants (in some options) such as Te Kowhai, the solids stream treatment might be thickening waste activated sludge, followed by tankering to a larger facility for further treatment
- For WWTPs up to the digester threshold (currently proposed as 40,000 PE), the extent of treatment would increase to dewatering to a minimum of 19% dry solids, being a ‘last resort’ standard for landfilling if that had to be adopted temporarily or permanently
- WWTPs above 40,000PE would adopt anaerobic digestion with one or more forms of energy recovery e.g. a co-generation engine producing both heat and electrical energy
- And above 150,000PE a more advanced form of solids destruction would be adopted
- For WWTPs with digesters, side stream digestate treatment will be provided for.

Atmospheric emissions:

Proposed provisions for atmospheric emissions were reasonably general but all would require best practice to be implemented. The costs of such initiatives were not able to be differentiated at the Class 5 estimating level, apart from large items such as co-generation plant. These initiatives included the following:

- Noise mitigation to levels that were safe for operators and which complied with local ordinances at the boundary
- No objectionable odour beyond the boundary but was assumed that the owners would do all in their power to create and maintain odour buffers around the WWTPs
- Process units and equipment were specified and configured to minimise the release of fugitive greenhouse gas emissions such as use of biogas in boilers, furnaces or co-generation engines, and providing for very stable nitrogen removal processes that released a minimum of nitrous oxide
- In all process plant development, life cycle emissions would be considered and anticipated that the councils would adopt the zero carbon bill aspirations and optimization of life cycle emissions in general. These will be drivers for initiatives, particularly in the larger plants, for processes that drive the plants towards energy neutrality (Scope 2 reductions) and emissions minimisation, whether on site (Scope 1) or off site for residuals management (Scope 3).

General:

- The treatment plants were configured such that the limit of capability was not fixed at the initial target performance but could be upgraded by augmentation of processes at appropriate times
- The treatment standards will be reviewed for the preferred southern option once further information is available on effects, staging and costs
- Detailed assessment of quality assumptions has been provided in Wastewater Treatment Assumptions for Waikato Metro Wastewater DBC Memorandum[12].

2.4 Cost Assumptions

High level capital costs have been estimated using rates from Hamilton Metro Wastewater Treatment Feasibility Study[13], work at Pukete WWTP for HCC, and Parallel Road for pipelines.

All capital costs included allowances for investigation, design, procurement, and construction supervision. Contingency for unknown scope and risks was allowed for at 30%.

Conveyance capital costs were based on the assessed size of pump station needed with the pipeline cost for the length needed. Conveyance operational costs for maintenance and operations were a fixed percentage of pump station capital cost with variable components for energy and septicity control chemicals based on average annual flow.

WWTP capital costs were based on actual costs for comparable sized WWTPs in New Zealand with allowances for additional costs related to increased levels of treatment and energy recovery facilities. An allowance has been made for land designation and discharge consenting costs which was not site specific. Most of the WWTPs were located at existing sites where there was sufficient space for additional process units. An estimated cost has been included where there was additional land required. Where geotechnical risks were known, an allowance has been made for these risks.

WWTP operational costs were based on representative costs per megalitre (ML) of flow processed for small, medium, and large plants. Costs considered included labour, maintenance costs, energy, chemicals, consumables (e.g. UV lamps), and sludge/biosolids disposal but excluded overheads and depreciation.

[12] GHD, Beca, 2020. Growth Assumptions for Waikato Metro Wastewater DBC. Hamilton City Council.

[13] Future Proof Partners, 2020. Hamilton Metro Wastewater Treatment Feasibility Study. Retrieved 25 Feb 2021, from https://www.futureproof.org.nz/assets/FutureProof/H2A/Waters/Final-Metro-Area-Wastewater-Treatment-Feasibility-Study_with-Appendices.pdf

The above approach was not applicable to the Fonterra WWTP options due to different waste strengths and the cost curves assumed standard municipal waste. As a result, the “B” Option Variations had indicative costs for options comparison.

2.5 Conveyance Assumptions

In order to develop a longlist of options, the following assumptions have been made in regard to the conveyance routes.

General assumptions were:

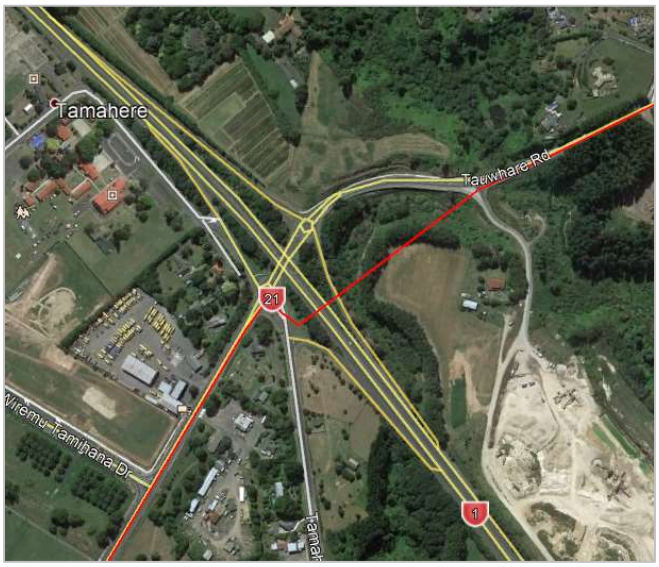
- Conveyance routes follow public road corridors wherever practical and only included deviations where they offered significant benefit, e.g. significant reduction in pipe length (specific examples are noted below)
- The most direct route practical has been used
- Was not possible to utilise the State Highway 1 (SH1) expressway corridor, due to the disruption that this would cause.
- All pipelines would pump directly into the wastewater treatment plant (i.e. no discharge into existing interceptor sewers, as capacity was unknown) which was conservative and could be refined during design development
- Daisy-chaining of pump stations has been avoided for the longlist assessment which its approach could be refined during design development
- It was expected that significant optimisations of the pipeline alignment could be made by crossing through private properties but considered higher risk than road corridors and as such was not explored for the longlist report.

Route specific assumptions:

Matangi to Southern WWTP:

Where the route crosses SH1 at Tamahere, it was assumed that the pipeline would be installed under the stream, as well as the highway in a single trenchless construction, likely drilling. The highway was elevated in this location so there was not expected to be any issues with clearances.

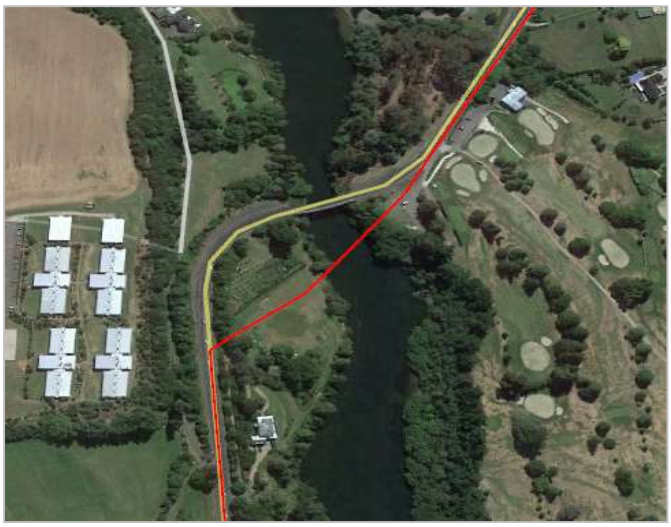
Figure 8 Route alignment assumption at SH1



Where the route crosses the Waikato River near Narrows Bridge, given the size of the pipe, the pipeline was expected to be drilled under the Waikato River if ground conditions allowed. It was GHD's experience that Waka Kotahi was becoming less receptive to pipelines being attached to bridges, and therefore this was

taken as the less risky option. The location of the launch and receival pits was assumed to be as close as practical to the banks of the river.

Figure 9 Route alignment assumption at River (South of Hamilton)



Fonterra to Southern WWTP:

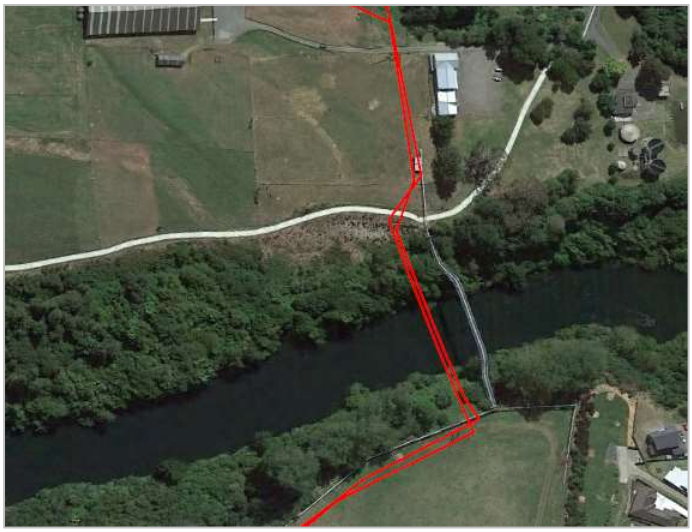
The Fonterra to Southern WWTP pipeline was the only pipe that was assumed to traverse private property. This was because deviating all the way up to The Narrows bridge crossing would require a significant additional length of pipe, and therefore it was assumed that the extra risk of landholder negotiations would be worth consideration in this case. The pipeline route followed a private access track through the properties before the assumed drilling launch site near the end of the access road. It was possible that this would be a pipe bridge crossing of the river, however that level of detail was not explored in the longlist options.

Figure 10 Route alignment assumptions at Waikato River (near The Narrows)

Matangi to Cambridge and Fonterra to Cambridge:

Both pipelines were assumed to cross at the same location as the recently constructed existing pipe bridge across the Waikato river near the treatment plant. While the exact drivers behind using a pipe bridge were not understood, it was assumed that the same criteria made it economical for a single pipe as well as a second pipe. There was adequate space on both sides of the river to drill, as an alternative.

Figure 11 Route alignment assumption at River (Cambridge)



Calculation assumptions:

- Pump head was limited to 100 m. which was considered high, but allowed for the pumps to initially be submersible pumps that were then boosted with surface mounted pumps in future upgrades
- Pump kW was calculated assuming 60% efficiency
- Pipes were sized for velocities between 1-2.5 m/s
- The desired retention times were less than 8 hours where possible and assumed to be higher when require dosing to limit septicity.

3 Longlist Option Development

The previous feasibility study[14] identified six metro wastewater treatment solutions. The outcome of this study recommended the following options for further development:

- Option C: Convey all communities to a northern and southern centralised facility (new site)
- Option D: Convey all communities to a northern and southern centralised facility (Cambridge site)
- Option E: Five wastewater facilities to cater for the whole metro spatial area including a new southern facility
- Option F: Upgrades of BAU including new facilities at Whatawhata, the airport and Ohaupo.

These options have been developed and relabelled with additional options provided for the inclusion of Fonterra Hautapu flows. As outlined in Section 2 above, Fonterra Hautapu is currently operating as a private plant. This assessment will provide high level insights as to whether the Fonterra flows can feasibly be catered for by a municipal plant. A high level description of each option is outlined in Table 7 below.

Table 7 High level option description

Option	Description	Alignment to previous study names
Option 1A	Do Minimum – All the existing plants, including Pukete, Ngaruawahia and Te Kowhai in the northern metro area will be upgraded to produce high quality flows (as outlined within the Water Quality Assumptions Memorandum). A new facility will be built to service the industrial growth around the airport and another new facility will be built to service growth in Ohaupo. The existing Cambridge plant will also be upgraded. Fonterra will operate as per BAU.	Previously Option F
Option 1B	Option 1B includes all interventions outlined in Option 1A. However Fonterra flows will instead be serviced by the proposed new Cambridge facility. This will more than double the current flows being serviced by Cambridge.	Previously Option F (inclusion of Fonterra flows)
Option 2A	All northern communities will be serviced by a northern plant located at Pukete and southern communities will be serviced by a new southern centralised facility to be built on a new location (location to be determined). The new southern facility will service the industrial growth around the airport, Cambridge, Matangi, Ohaupo and a portion of south Hamilton. The extent of south Hamilton flows being diverted south is still under investigation. Te Awamutu and Tauwhare Pa will continue to operate as standalone plants but will undergo upgrades. Pukete will service flows from Te Kowhai and Ngaruawahia. Fonterra to operate as per BAU.	Previously Option C

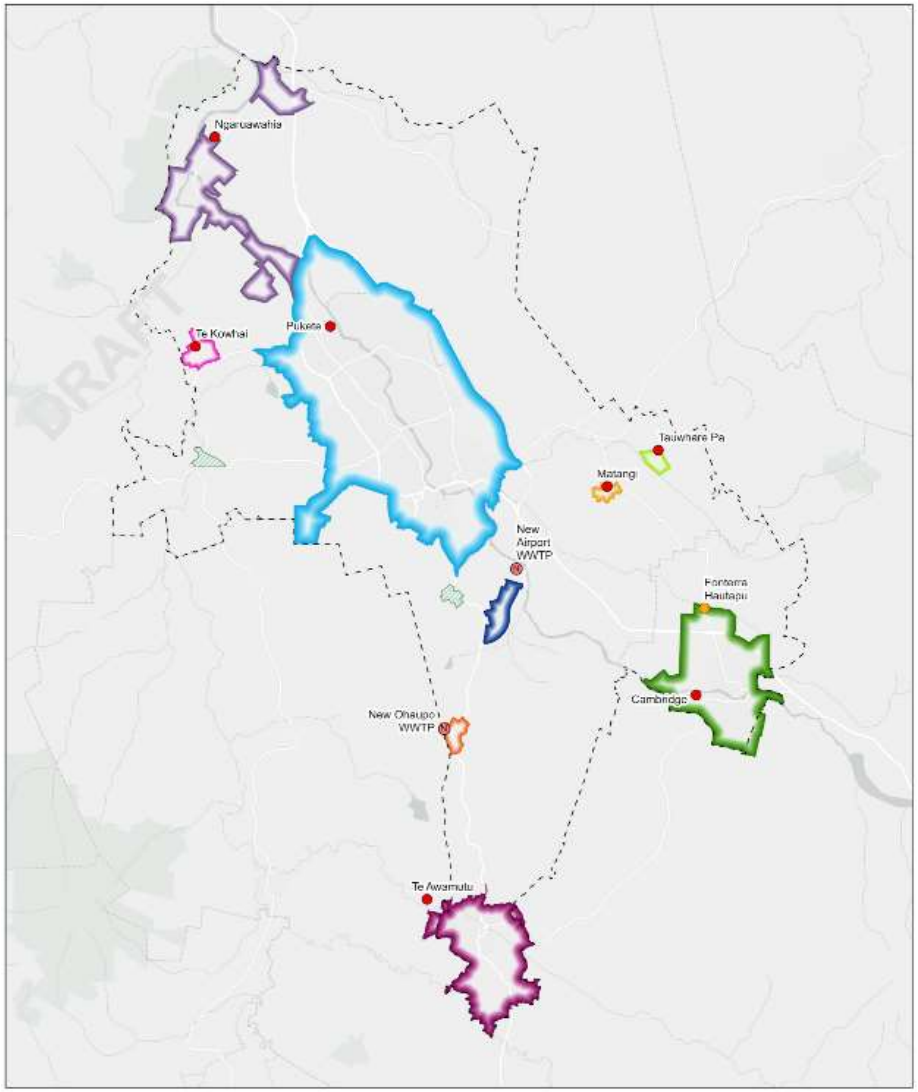
[14] Future Proof Partners, 2020. Hamilton Metro Wastewater Treatment Feasibility Study. Retrieved 25 Feb 2021, from https://www.futureproof.org.nz/assets/FutureProof/H2A/Waters/Final-Metro-Area-Wastewater-Treatment-Feasibility-Study_with-Appendices.pdf

Option	Description	Alignment to previous study names
Option 2B	Option 2B includes all interventions outlined in Option 2A. The Fonterra flows will instead be serviced by the proposed new southern centralised facility. Flows from Fonterra equate to almost double the domestic flows currently being serviced by the Cambridge WWTP.	Previously Option C (inclusion of Fonterra flows)
Option 3A	All northern communities will be serviced by a northern plant located at Pukete and southern communities will be serviced by a new southern centralised facility to be built at the Cambridge site The new southern facility will service the industrial growth around the airport, Cambridge, Matangi, Ohaupo and a portion of south Hamilton. The extent of south Hamilton flows being diverted south is still under investigation. Te Awamutu and Tauwhare Pa will continue to operate as standalone plants but will undergo upgrades. Pukete will service flows from Te Kowhai and Ngaruawahia. Fonterra to operate as per BAU.	Previously Option D
Option 3B	Option 3B includes all interventions outlined in Option 3A. The Fonterra flows will instead be serviced by the proposed new southern centralised facility at the Cambridge site. Flows from Fonterra equate to almost double the domestic flows currently being serviced by the Cambridge WWTP.	Previously Option D (inclusion of Fonterra flows)
Option 4A	A new southern facility will be built near the airport which will service flows from the airport industrial area, Matangi, and Ohaupo. Pukete will service flows from Te Kowhai. This option will also include upgrades to the existing plants at Ngaruawahia, Te Awamutu, and Tauwhare Pa and a new plant at Cambridge to ensure water quality standards are met. Fonterra to operate as per BAU.	Previously Option E
Option 4B	Option 4B includes all interventions outlined in Option 4A. The Fonterra flows will instead be serviced by the proposed new Cambridge facility. This will more than double the current flows being serviced by Cambridge.	Previously Option E (inclusion of Fonterra flows)

3.1 Servicing Areas

The basis of the above eight longlisted options (Option 1A to 4B) was largely driven by existing and potential growth, coverage and distribution of service areas and their associated treatment plants within the metro area. The current and indicative location of new facilities including servicing areas are shown and outlined in the maps below.

Note that for the purposes of this study Whatawhata and Rukuhia areas were not considered as part of the Waikato Metro Wastewater DBC. It was assumed that these would remain as self-serviced areas. The site locations for new plants would be indicative only.



Approximate service areas for Option 1A and 1B

- Ngaruawahia (standalone plant)

  Horotiu

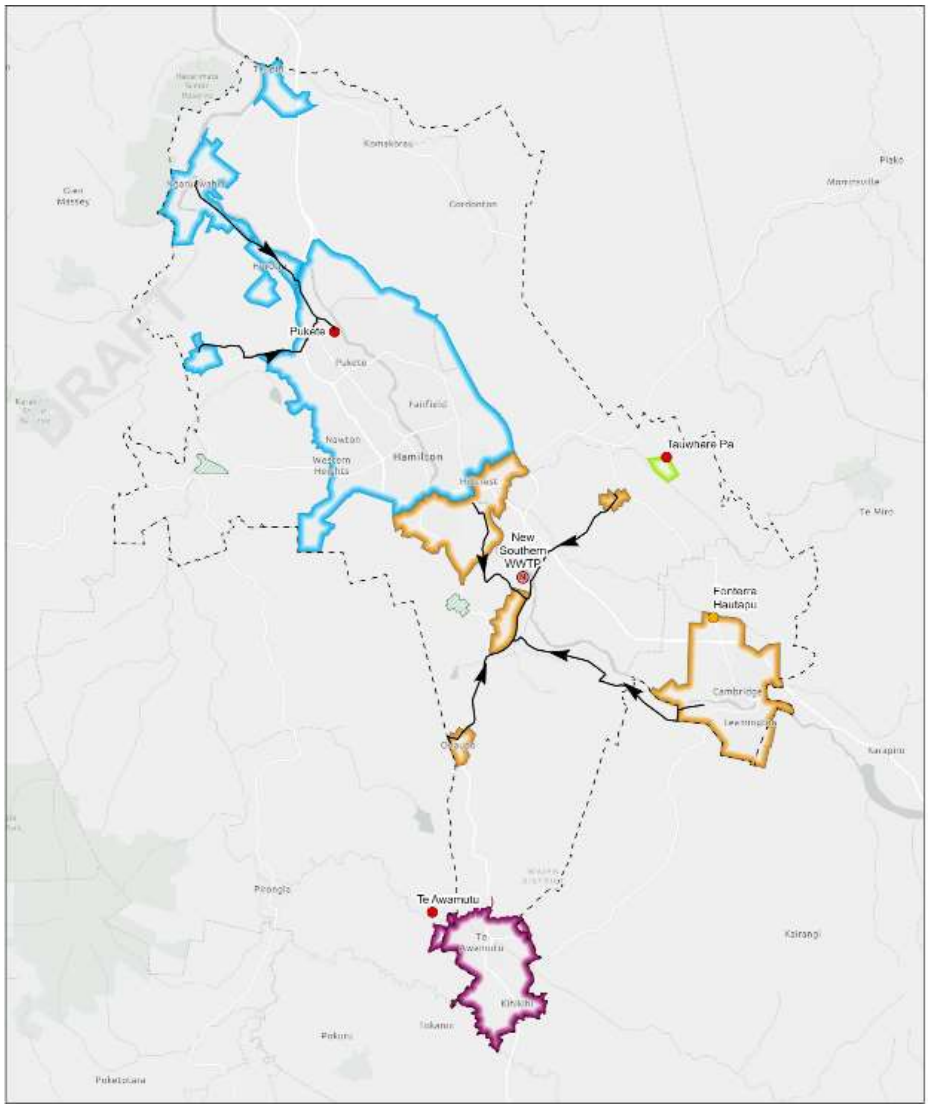
  Taupiri
- Te Kowhai (standalone plant)
- Hamilton (Pukete Plant)

  Hamilton (north)

  Hamilton (south)
- Hamilton Airport (standalone plant)
- Matangi (standalone plant)
- Tauwhare Pa (standalone plant)
- Ohaupo (standalone plant)
- Cambridge and Hautapu (standalone plant)
- Te Awamutu and Kihikihi (standalone plant)

Option 1A: 9 municipal plants and 1 private facility at Fonterra

Option 1B: 9 municipal plants with Fonterra Hautapu flows conveyed to the new southern plant at Cambridge



Approximate service areas for Option 2A and 2B

- Northern Communities (plant located at Pukete)

  Ngaruawahia

  Taupiri

  Horotiu

  Hamilton (North)

  Hopuhopu

  Te Kowhai
- Southern Communities (plant located south of Hamilton)

  Hamilton (South)

  Matangi

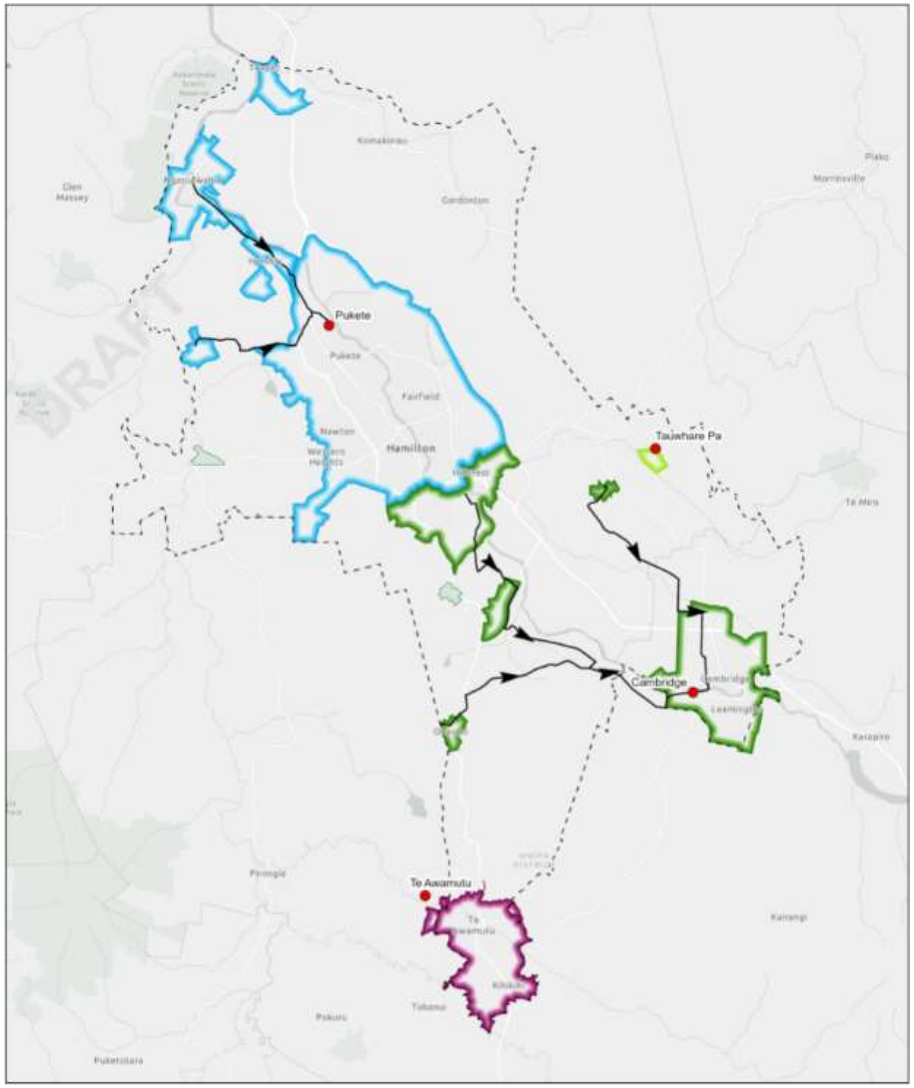
  Hamilton Airport

  Ohaupo

  Cambridge
- Tauwhare Pa (standalone plant)
- Te Awamutu/Kihikihi (standalone plant)

Option 2A: 4 municipal plants and 1 private facility at Fonterra

Option 2B: 4 municipal plants with Fonterra Hautapu flows conveyed to the new southern plant at Peacocke



Approximate service areas for Option 3A and 3B

- Northern Communities (plant located at Pukete)

  Ngaruawahia

  Taupiri

  Horotiu

  Hamilton (North)

  Hopuhopu

  Te Kowhai
- Southern Communities (plant located at Cambridge)

  Hamilton (South)

  Matangi

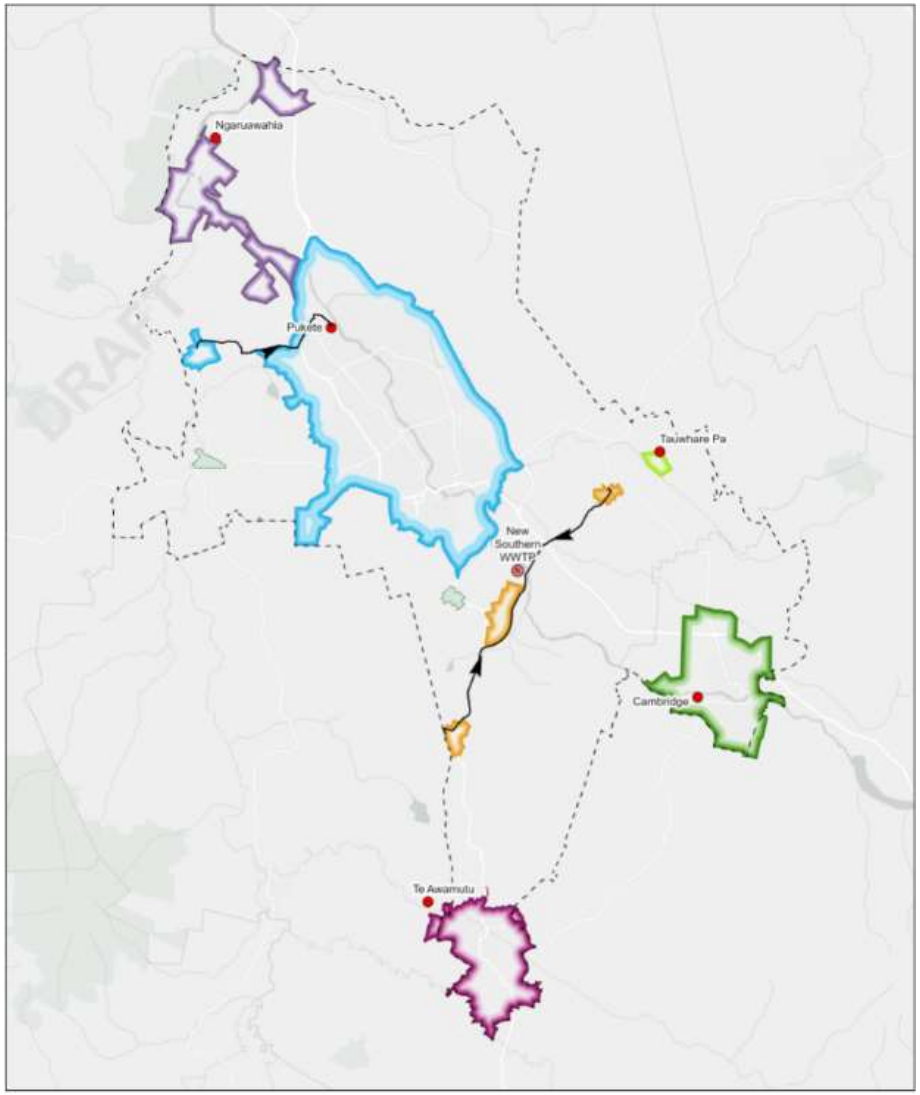
  Hamilton Airport

  Ohaupo

  Cambridge
- Tauwhare Pa (standalone plant)
- Te Awamutu/Kihikihi (standalone plant)

Option 3A: 4 municipal plants and 1 private facility at Fonterra

Option 3B: 4 municipal plants with Fonterra Hautapu flows conveyed to the new southern plant at Cambridge



Approximate service areas for Option 4A and 4B

- Ngaruawahia (standalone plant)

  Taupiri

  Horotiu

  Hopuhopu
- Hamilton (Pukete Plant)

  Hamilton (north)

  Hamilton (south)

  Te Kowhai
- Southern Communities (plant located south of Hamilton)

  Matangi

  Hamilton Airport

  Ohaupo
- Tauwhare Pa (standalone plant)
- Cambridge and Hautapu (standalone plant)
- Te Awamutu/Kihikihi (standalone plant)

Option 4A: 6 municipal plants and 1 private facility at Fonterra

Option 4B: 6 municipal plants with Fonterra Hautapu flows conveyed to the new southern plant at Cambridge

3.2 Conveyance

The proposed wastewater conveyance network for each of the longlist options (Option 1A to 4B) is outlined below. These conveyance routes assume the route specific assumptions shown in Section 2.5 where applicable. In this circumstance, there will be no additional reticulation required for Option 1A.

The solution for pumps and pipes has been designed 20 years at a time; the 2041 solution; the 2061 solution and the 2120 solution. As a result, the 2021 solution was fundamentally sized and based on the 2041 solution.

As the pipes have been sized 20 years at a time, there was an opportunity to refine pipe sizes and staging during design development. It is common to install multiple rising mains as opposed to replacing a rising main with a marginally larger rising main. For the purposes of this analysis, the required rising main size at each design horizon has been listed. However, there is an opportunity to augment the pipeline with an additional rising main which would be considered further once the WWTP sites are finalised. In reality, it is likely that the smallest main would be installed first, followed by a larger main once the smaller main is at capacity. The smaller main might then be disused until the flow required both pipelines to be used at once. For the purposes of this analysis, it has been shown that the larger pipe has been installed first as this is more conservative for costing purposes.

The proposed wastewater conveyance network for each of the longlist options (Option 1A to 4B) is outlined below.

Option 1B

Reticulation shown in Table 8 is required for the conveyance from Fonterra WWTP to the new Cambridge WWTP only.

Table 8 Option 1B reticulation specifics

Pipeline name	Length (km)	Pipe Diameter 2021	Pipe Diameter 2061
Fonterra to Cambridge	5.3	DN315	DN315

Option 2A and 2B

Table 9 and Table 10 below outline the conveyance details for Option 2A and 2B. Option 2A requires a total additional trunk reticulation of 39 km to the new Southern plant (south of Peacocke location) while Option 2B requires the total of 51.3 km. Both options include the longest single pipeline of 14.5 km from Cambridge. The key difference between Option 2A and 2B is the additional Fonterra flows which will be conveyed to the new Southern plant.

Table 9 Option 2A and 2B reticulation specifics

Pipeline name	Length (km)	Pipe Diameter 2021	Pipe Diameter 2061
Cambridge to Southern	14.5	DN630	DN710
Peacocke to Southern	7.3	DN800	DN900
Matangi to Southern	7.7	DN160	DN200

Ohaupo to Southern	9.5	DN225	DN250
Ngaruawahia to Pukete	11.0	DN630	DN710
Horotiu to Pukete	5.8	DN355	DN400
Te Kowhai to Pukete	6.1	DN225	DN315
Fonterra to Southern (Option 2B only)	12.3	DN355	DN355

Table 10 Option 2A and 2B total length of conveyance

Total length of pipeline (km)	Option 2A	Option 2B
To Southern WWTP	39.0	51.3
To Northern WWTP	24.5	22.9

Option 3A and 3B

Table 11 and Table 12 below outline the reticulation details for Option 3A and 3B. Option 3A requires a total additional trunk reticulation of 53.48 km to the new Southern plant at Cambridge site while Option 3B requires the total of 58.78 km. Both options include the longest single pipeline of 21.8 km from Peacocke to Cambridge. The key difference between Option 3A and 3B is the additional Fonterra flows which will be conveyed to the new Southern plant.

Table 11 Option 3A and 3B reticulation specifics

Pipeline name	Length (km)	Pipe Diameter 2021	Pipe Diameter 2061
Peacocke to Cambridge	21.8	DN800	DN900
Matangi to Cambridge	7.7	DN160	DN200
Ohaupo to Cambridge	9.5	DN225	DN250
Ngaruawahia to Pukete	14.5	DN450	DN560
Airport to Cambridge	11.0	DN630	DN710
Horotiu to Pukete	5.8	DN355	DN400
Te Kowhai to Pukete	6.1	DN225	DN315
Fonterra to Cambridge (Option 3B only)	5.3	DN315	DN315

Table 12 Option 3A and 3B total length of conveyance

Total length of pipeline (km)	Option 3A	Option 3B
To Southern WWTP	53.48	58.78

To Northern WWTP	22.9	22.9

Option 4A and 4B

Table 13 and Table 14 below outline the reticulation details for Option 4A and 4B. Both options require a total additional trunk reticulation of 17.2 km to the new Southern plant near Airport and 6.1 km to the Northern plant at Pukete site from Te Kowhai. Both options also include the longest single pipeline of 9.5 km from Ohaupo. The only difference between Option 4A and 4B is the additional Fonterra flows which will be conveyed to the new Southern plant.

Table 13 Option 4A and 4B reticulation specifics

Pipeline name	Length (km)	Pipe Diameter 2021	Pipe Diameter 2061
Te Kowhai to Pukete	6.1	DN225	DN315
Matangi to Southern	7.7	DN160	DN200
Ohaupo to Southern	9.5	DN225	DN250
Fonterra to Cambridge (Option 4B only)	5.3	DN315	DN315

Table 14 Option 4A and 4B total length of conveyance

Total length of pipeline (km)	Option 4A	Option 4B
To Southern WWTP	17.2	17.2
To Northern WWTP	6.1	6.1

Most pipelines required dosing due to retention times being longer than 8 hours. The only pipelines that did not require dosing were:

- Peacocke to Southern
- Horotiu to Pukete
- Fonterra to Cambridge
- Fonterra to Southern.

3.3 Wastewater Treatment

Projected average daily flows (ADF) in cubic meters per day (m3) were developed for each longlist option WWTP. A description of the type of treatment processes assumed to be used at each WWTP to meet the target treated wastewater quality is provided in Table 15 below. Note that all WWTPs would have screening and grit removal and ultra-violet disinfection and only the larger WWTPs would have primary sedimentation and digestion.

Table 15 Treatment Plant Details

Option	Site	Estimated ADF @ 2061 (m3)		Primary Sedimentation	MBR	Digestion	Dewatering
		A	B				
Option 1A and 1B	Taupiri	6796	6796	N	Y	N	Screw Press
	Horotiu						
	Ngaruawahia						
	Te Kowhai	420	420	N	Y	N	N
	Hamilton North	90191	90191	Y	Y	Y	Centrifuge
	Hamilton South						
	Matangi	83	83	N	Y	N	N
	Airport	3570	3570	N	Y	N	Screw Press
	Ohaupo	206	206	N	Y	N	N
	Cambridge	9006	16206	Y	Y	Y	Centrifuge
	Fonterra	7200					
	Tauwhare Pa	55	55	N	Y	N	N
	Te Awamutu	7200	7200	N	Y	N	Screw Press

Option	Site	Estimated ADF @ 2061 (m3)		Primary Sedimentation	MBR	Digestion	Dewatering
		A	B				
Option 2A and 2B	Taupiri	85482	85482	Y	Y	Y	Centrifuge
	Horotiu						
	Ngaruawahia						
	Te Kowhai						
	Hamilton North						
	Hamilton South	24791	31991	Y	Y	Y	Centrifuge
	Matangi						

	Airport						
	Ohaupo						
	Cambridge						
	Fonterra	7200					
	Tauwhare Pa	55	55	N	Y	N	N
	Te Awamutu	7200	7200	N	Y	N	Screw Press
Option	**Site**	**Estimated ADF @ 2061 (m3)**		**Primary Sedimentation**	**MBR**	**Digestion**	**Dewatering**
		A	**B**	**B**	**B**	**B**	**B**
Option 3A and 3B	Taupiri	85482	85482	Y	Y	Y	Centrifuge
	Horotiu						
	Ngaruawahia						
	Te Kowhai						
	Hamilton North						
	Hamilton South	24791	31991	Y	Y	Y	Centrifuge
	Matangi						
	Airport						
	Ohaupo						
	Cambridge						
	Fonterra	7200					
	Tauwhare Pa	55	55	N	Y	N	N
	Te Awamutu	7200	7200	N	Y	N	Screw Press
Option	**Site**	**Estimated ADF @ 2061 (m3)**		**Primary Sedimentation**	**MBR**	**Digestion**	**Dewatering**
		A	**B**				
Option 4A and 4B	Taupiri	6796	6796	N	Y	N	Screw Press
	Horotiu						
	Ngaruawahia						
	Te Kowhai	90611	90611	Y	Y	Y	Centrifuge
	Hamilton North						
	Hamilton South						
	Matangi	3859	3859	N	Y	N	Screw Press
	Airport						

	Ohaupo						
	Cambridge	9006	16206	Y	Y	Y	Centrifuge
	Fonterra	7200					
	Tauwhare Pa	55	55	N	Y	N	N
	Te Awamutu	7200	7200	N	Y	N	Screw Press

3.4 Wastewater Discharge

A range of discharge options for individual wastewater treatment plants were identified and assumed for the longlist options of the study area to facilitate fair comparisons between options at this assessment stage. These discharge options assumed for each wastewater plant included the following:

1. Land discharges:
    - Slow rate irrigation
    - Rapid Infiltration Beds.
2. Direct to water discharges:
    - Direct pipe to river
    - Diffuser to river.
3. Indirect to water discharges:
    - Discharge to wetlands (including restoration of natural wetland and constructed wetlands)
    - Discharge to artificial rock passage
    - Rapid Infiltration Beds.
4. Reclamation and reuse:
    - Indirect reuse (for potable purposes)
    - Direct reuse (for industrial purposes)
    - Seasonal irrigation use.

The longlist assessment assumed a discharge option based on the volume of flows predicted at each plant, land availability, nearby waterways and wetlands, and known soil information. The longlist options considered the potential for reuse based on the location of the plant compared with potential wet industry locations. The assumed discharge option is outlined in Table 16 for each site and option (see Appendix D for more detail).

Once the general location is identified for new WWTPs, discharge options will be reviewed and investigated further to see what options could be feasible at each site. This will likely happen at the shortlist stage and will consider:

- Land disposal area required (including buffer area) calculated
- Terrain and available ground condition information reviewed
- Restoration opportunities
- Potential for reuse identified
- Potential water discharge

Table 16 Assumed discharge options by wastewater plant[15]

Option	Discharge route	WWTP
Option 1	River	Pukete (Hamilton north and south) Cambridge Ngaruawahia Te Awamutu Fonterra Hautapu (for all option Bs)
	Land	Matangi Tauwhare Pa Te Kowhai
	River and Land	Fonterra Hautapu (for all option As)
	Potential for Reuse	Pukete (Hamilton north and south) may have capacity for reuse but this could be limited by build out capacity
Option 2	River	Northern (Pukete) Southern Te Awamutu Fonterra Hautapu (for all option Bs)
	Land	Tauwhare Pa
	River and Land	Fonterra Hautapu (for all option As)
	Potential for Reuse	Northern (Pukete) Southern
Option 3	River	Northern (Pukete) Southern Te Awamutu Fonterra Hautapu (for all option Bs)
	Land	Tauwhare Pa
	River and Land	Fonterra Hautapu (for all option As)
	Potential for Reuse	Northern (Pukete) Southern
Option 4	River	Northern (Pukete) Southern Ngaruawahia Te Awamutu Cambridge Fonterra Hautapu (for all option Bs)

[15] Note: All longlist options assume wastewater discharges for the new southern plant are to the river or reuse. No options for combined land/ water discharge were considered for like for like comparative purposes between options.

Option	Discharge route	WWTP
	Land	Tauwhare Pa
	River and Land	Fonterra Hautapu (for all option As)
	Potential for Reuse	Pukete (Hamilton north and south) may have capacity for reuse but this could be limited by build out capacity

3.5 Staging

Different longlist options are proposed to be staged slightly differently, with pipelines and plants being constructed, upgraded or decommissioned at various times over the next 40 year timeframe. Note the timeframes are indicative only at this stage and will be reassessed during the shortlist option development and assessment.

Option 1 – Decentralised options

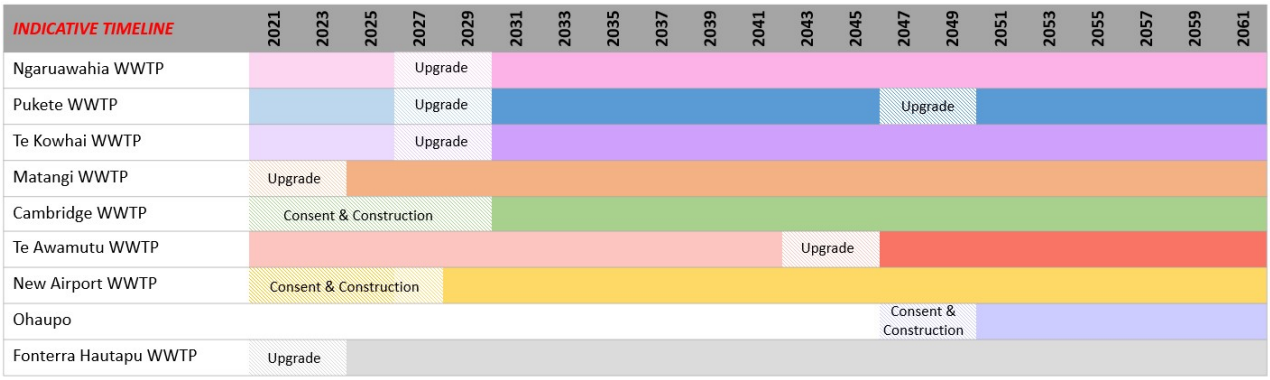
Option 1 involves the construction or upgrade of 10 plants (in Option 1A) and 9 plants (in Option 1B). However, it is expected that a new plant at Ohaupo will not be needed until 2050 when population and the equivalent flows become significant enough to justify a new plant. Additionally, Te Awamutu is expected to undergo upgrades around 2030 to cater for growth and 2045 to reduce nutrients at consent renewal. All other plants will be either built (new) or upgraded within the next 10 year period. Table 17 below provides a summary of the staging timeframes and Figure 12 shows this graphically for Option 1A.

Table 17 Option 1 staging timeframes

WWTPs	Timeframe/Staging
Ngaruawahia	New plant to be built by 2030
Te Kowhai	Upgrade existing plant by 2030
Pukete	Upgrade existing plant every 10-15 years
Matangi	Upgrade existing plant with next 5 years
Tauwhare Pa	Upgrade existing plant when Papakainga development occurs[16]
Airport	New plant to be built by 2027
Cambridge	New plant to be built by 2027
Ohaupo	New plant to be built by 2050
Te Awamutu	Upgrade existing plant by 2030 and around 2045
Fonterra Hautapu (Option A)	An upgraded plant will be constructed by 2025
Fonterra Hautapu (Option B)	Short term wastewater treatment process to be decommissioned by 2030 Fonterra flows will be serviced by the proposed new Cambridge facility

[16] Note: Assumed to be 2030 for the purposes of this assessment.

Figure 12 Option 1A indicative staging timelines



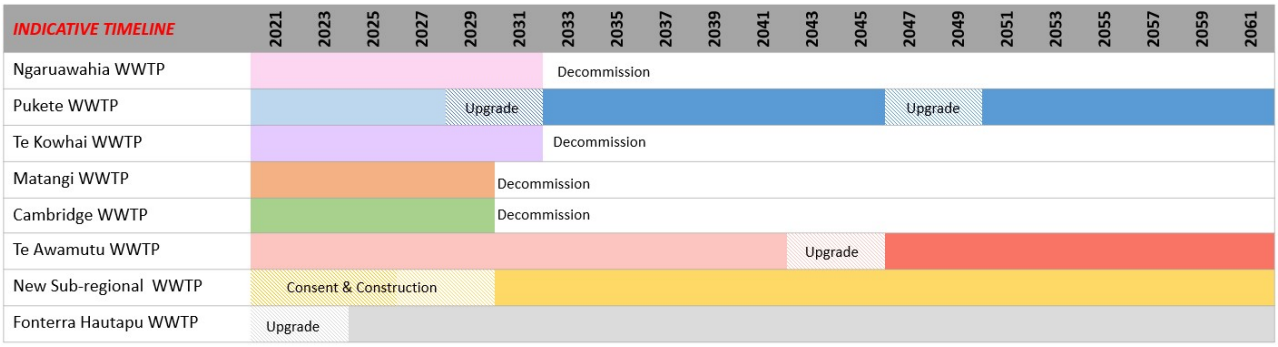
Option 2 – Centralised northern plant and a centralised southern plant (New site)

Option 2 involves the construction or upgrade of 5 plants (in Option 2A) and 4 plants (in Option 2B). The existing Northern plant located at Pukete will require an upgrade every 10-15 years. The new Southern centralised facility is to be built by 2030 on a new location (exact location to be determined) which will service the industrial growth around the airport, Cambridge, Matangi, Ohaupo and a portion of south Hamilton. Te Awamutu and Tauwhare Pa will continue to operate as standalone plants but will undergo upgrades. Table 18 below provides a summary of the staging timeframes and Figure 13 shows this graphically for Option 2A.

Table 18 Option 2 staging timeframes

WWTPs	Timeframe/Staging
Northern	Expansion required every 10-15 years
Southern	New plant to be built by 2030
Tauwhare Pa	Upgrade existing plant when Papakainga development occurs[17]
Te Awamutu	Upgrade existing plant by 2030 and around 2045
Fonterra Hautapu (Option A)	An upgraded plant will be constructed by 2025
Fonterra Hautapu (Option B)	Short term wastewater treatment process to be decommissioned by 2030 Fonterra flows will be serviced by the proposed new south of Peacocke facility

Figure 13 Option 2A indicative staging timelines[18]



[17] Note: Assumed to be 2030 for the purposes of this assessment.

[18] Note: Matangi and Cambridge wastewater flows will be conveyed to the New Southern Sub-regional WWTP when decommissioned

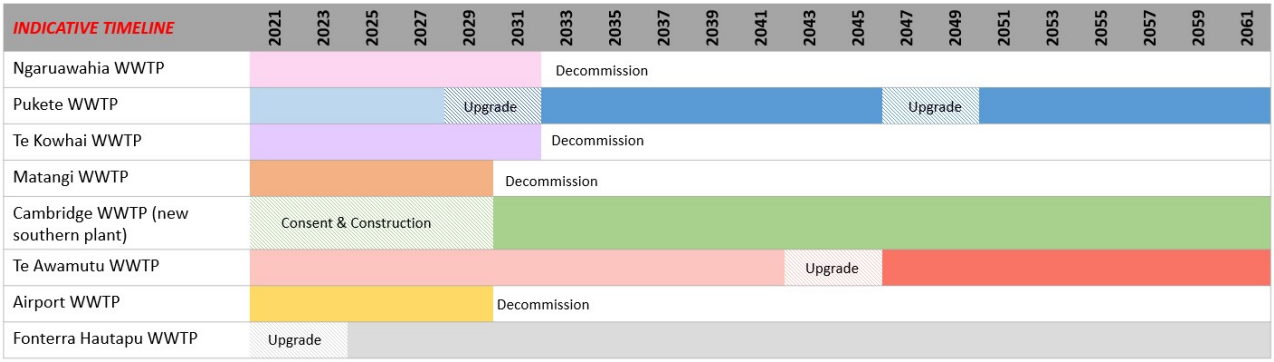
Option 3 – Centralised northern plant and a centralised southern plant (Cambridge site)

Option 3 is very similar to Option 2 which involves the construction or upgrade of 5 plants (in Option 3A) and 4 plants (in Option 3B) and the staging timeframes are the same. The major differences are location of the new Southern plant which will be located at the Cambridge site and the longer distances conveyance between Peacocke, Matangi and Cambridge. The construction of new Cambridge plant is to be built by 2030 while operating an existing plant on the same site. Te Awamutu and Tauwhare Pa will continue to operate as standalone plants but will undergo upgrades. Table 19 below provides a summary of the staging timeframes and Figure 14 shows this graphically for Option 3A.

Table 19 Option 3 staging timeframes

WWTPs	Timeframe/Staging
Northern	Expansion required every 10-15 years
Southern	New plant to be built by 2030
Tauwhare Pa	Upgrade existing plant when Papakainga development occurs[19]
Te Awamutu	Upgrade existing plant by 2030 and again at 2045
Fonterra Hautapu (Option A)	An upgraded plant will be constructed by 2025
Fonterra Hautapu (Option B)	Short term wastewater treatment process to be decommissioned by 2030 Fonterra flows will be serviced by the proposed new Cambridge facility

Figure 14 Option 3A indicative staging timelines



[19] Note: Assumed to be 2030 for the purposes of this assessment.

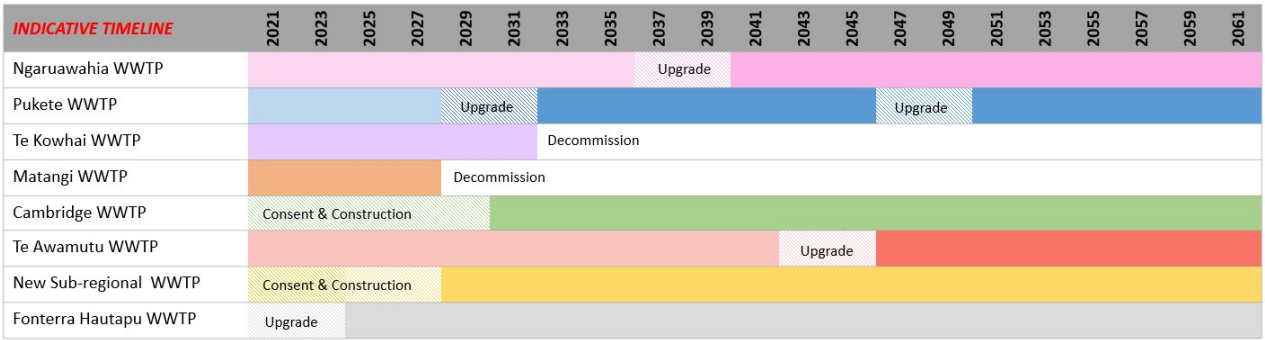
Option 4 – Partial centralisation in the north and south

Option 4 is very similar to Option 1 but with some centralisation in the north and south. This option involves the construction or upgrade of 7 plants (in Option 4A) and 6 plants (in Option 4B). The new Southern centralised facility is to be built by 2027 near the Airport. Ngaruawahia, Te Awamutu, and Tauwhare Pa will continue to operate as standalone plants but will undergo upgrades. Concurrently, the existing standalone plant at Cambridge will be replaced with new plant by 2030. Table 20 below provides a summary of the staging timeframes and Figure 15 shows this graphically for Option 4A.

Table 20 Option 4 staging timeframes

WWTPs	Timeframe/Staging
Ngaruawahia	Replace existing plant by 2030
Northern	Expansion required every 10-15 years
Southern (Airport)	New plant to be built by 2027
Cambridge	New plant to be built by 2027
Tauwhare Pa	Upgrade existing plant when Papakainga development occurs[20]
Te Awamutu	Upgrade existing plant by 2030 and again at 2045
Fonterra Hautapu (Option A)	An upgraded plant will be constructed by 2025
Fonterra Hautapu (Option B)	Short term wastewater treatment process to be decommissioned by 2030 Fonterra flows will be serviced by the proposed new Cambridge facility

Figure 15 Option 4A indicative staging timelines



[20] Note: Assumed to be 2030 for the purposes of this assessment.

3.6 High Level Costs

Capital Costs

High level capital costs were determined for each of the longlisted options (see Appendix E for detail on rates used). Option A's have assumed that a Fonterra standalone plant will cost approximately $60 million. This has been applied to all Option A's. Due to the different configuration requirements for Option B's (i.e. plants involving Fonterra flows), the same cost curve flows could not be used for the cost assessment. An indicative approximation has been made which assumes the Fonterra contribution to a joined plant would be between $50 and $60 million. Fonterra would also incur costs associated with a short-term intervention and an additional $10 to $20 million in conveyancing costs. It is therefore assumed that Option B's are more costly than Option A's.

Overall, the capital plant costs between options are relatively similar (i.e. the cost a building multiple small and medium plants equates to the same as building a smaller number of larger plants). However, the centralised options will incur significantly greater conveyancing costs. The centralised options (Option 2 and 3) are more costly than Options 1 and 4.

Table 21 Option 1A and 1B Capital Costs

OPTION 1A				
WWTP Name	**Size of Plant**	**Area**	**WWTP Capital Cost ($M)**	**PS & Conveyance Capital Cost ($M)**
Ngaruawahia	Medium	Taupiri & Hopuhopu	$35	
		Ngaruawahia		
		Horotiu		$11
Te Kowhai	Small	Te Kowhai	$8	
Pukete	Large	Hamilton North	$225	
		Hamilton South		
Matangi	Small	Matangi	$3	
Airport	Medium	Airport	$28	
Ohaupo	Small	Ohaupo	$6	
Cambridge	Large	Cambridge & Hautapu	$78	
Te Awamutu	Medium	Te Awamutu & Kihikhi	$25	
Fonterra Hautapu		Fonterra	$60	
Sub-Total			**$469**	**$11**
TOTAL			**$480**	
OPTION 1B				
Fonterra to Cambridge	Cambridge		~$50-60 million + short term solution	$10
Sub-Total			**>$469**	**$21**
TOTAL			**>$490**	

Table 22 Option 2A and 2B Capital Costs

OPTION 2A				
WWTP Name	**Size of Plant**	**Area**	**WWTP Capital Cost ($M)**	**PS & Conveyance Capital Cost ($M)**
N. Sub-regional	Large	Taupiri & Hopuhopu	$220	
		Ngaruawahia		$35
		Horotiu		$11
		Te Kowhai		$5
		Hamilton North		
S. Sub-regional	Large	Hamilton South	$136	$35
		Matangi		$5
		Airport		
		Ohaupo		$6
		Cambridge & Hautapu		$50
Te Awamutu	Medium	Te Awamutu & Kihikhi	$25	
Fonterra Hautapu		Fonterra	$60	
Sub-Total			**$442**	**$146**
TOTAL			**$588**	
OPTION 2B				
Fonterra to Sub-regional	S. Sub-regional		~$50-60 million + short term solution	$20
Sub-Total			**>$442**	**$166**
TOTAL			**$608**	

Table 23 Option 3A and 3B Capital Costs

OPTION 3A				
WWTP Name	**Size of Plant**	**Area**	**WWTP Capital Cost ($M)**	**PS & Conveyance Capital Cost ($M)**
N. Sub-regional	Large	Taupiri & Hopuhopu	$220	
		Ngaruawahia		$35
		Horotiu		$11
		Te Kowhai		$5
		Hamilton North		
		Hamilton South		$80
		Matangi		$5

OPTION 3A				
		Airport		$20
		Ohaupo		$6
S. Sub-regional	Large	Cambridge & Hautapu	$149	
Te Awamutu	Medium	Te Awamutu & Kihikhi	$25	
Fonterra Hautapu		Fonterra	$60	
Sub-Total			**$455**	**$161**
TOTAL			**$617**	
OPTION 3B				
Fonterra to Sub-regional	S. Sub-regional		~$50-60 million + short term solution	$10
Sub-Total			**$455**	**$166**
TOTAL			**>$627**	

Table 24 Option 4A and 4B Capital Costs

OPTION 4A				
WWTP Name	**Size of Plant**	**Area**	**WWTP Capital Cost ($M)**	**Pumping station & Conveyance Capital Cost ($M)**
Ngaruawahia	Medium	Taupiri & Hopuhopu	$35	
		Ngaruawahia		
		Horotiu		$11
Pukete	Large	Te Kowhai	$225	$5
		Hamilton North		
		Hamilton South		
		Matangi		$5
Southern	Small	Airport	$29	
		Ohaupo		$6
Cambridge	Large	Cambridge & Hautapu	$78	
Te Awamutu	Medium	Te Awamutu & Kihikhi	$25	
Fonterra Hautapu		Fonterra	$60	
Sub-Total			**$452**	**$27**
TOTAL			**$479**	
OPTION 4B				
Fonterra to Cambridge	Cambridge		~$50-60 million + short term solution	$10

OPTION 4A				
Sub-Total			**$452**	**$37**
TOTAL			**>$489**	

Annual Operation Costs

Annual operation costs are based on the typical labour, energy, chemical, maintenance and solids disposal costs for different sized plants. The costs are converted into $ per ML (1000 m^3) as operational costs will increase in proportion to flow. The initial cost estimated for operational costs shows that the cost of operating a smaller number of larger wastewater treatment plants and the associated conveyance is similar to the cost of operating a larger number of smaller plants with little to no conveyancing operational costs. Operational costs were not available for Fonterra options.

Table 25 to Table 28 outline the details of the operational costs for each of the options at 2061. Over time operational costs will increase as flows increase.

Table 25 Annual operating costs for Option 1A and 1B

OPTION 1A				
WWTP Name	**Size of Plant**	**Area**	**WWTP Operational Cost ($M)**	**PS Operational Cost ($M)**
Ngaruawhia	Medium	Taupiri & Hopuhopu	$3.60	
		Ngaruawahia		
		Horotiu		$0.40
Te Kowhai	Small	Te Kowhai	$0.30	-
Pukete	Large	Hamilton North	$18	
		East of Hamilton		
		Hamilton South		
Matangi	Small	Matangi		-
Airport	Medium	Airport	$1.90	-
Ohaupo	Small	Ohaupo	$0.10	-
Cambridge	Large	Cambridge & Hautapu	$1.80	-
Te Awamutu	Medium	Te Awamutu & Kihikhi	$3.90	-
Fonterra Hautapu		Fonterra	TBD	TBD
Sub-Total			**$30**	**$1**
TOTAL			**$31**	
OPTION 1B				
Fonterra to Cambridge	Cambridge		TBD	TBD

Table 26 Annual operating costs at 2061 for Option 2A and 2B

OPTION 2A				
WWTP Name	**Size of Plant**	**Area**	**WWTP Operational Cost ($M)**	**PS Operational Cost ($M)**

N. Sub-regional	Large	Taupiri & Hopuhopu	$17.10	
		Ngaruawahia		$0.90
		Horotiu		$0.50
		Te Kowhai		$0.10
		Hamilton North		
		East of Hamilton		
S. Sub-regional	Large	Hamilton South	$5.00	$1.60
		Matangi		$0.10
		Airport		
		Ohaupo		$0.10
		Cambridge & Hautapu		$1.50
Te Awamutu	Medium	Te Awamutu & Kihikhi	$3.90	-
Fonterra Hautapu		Fonterra	TBD	TBD
Sub-Total			**$26**	**$5**
TOTAL			**$31**	
OPTION 2B				
Fonterra to Sub-regional	S. Sub-regional		TBD	TBD

Table 27 Annual operating costs for Option 3A and 3B

OPTION 3A				
WWTP Name	**Size of Plant**	**Area**	**WWTP Operational Cost ($M)**	**PS Operational Cost ($M)**
N. Sub-regional	Large	Taupiri & Hopuhopu	$17.10	
		Ngaruawahia		$0.90
		Horotiu		$0.50
		Te Kowhai		$0.10
		Hamilton North		-
		East of Hamilton		
		Hamilton South	$5.00	$2.30
		Matangi		$0.10
		Airport		$0.60
		Ohaupo		$0.10
S. Sub-regional	Large	Cambridge & Hautapu		-
Te Awamutu	Medium	Te Awamutu & Kihikhi	$3.90	-
Fonterra Hautapu		Fonterra	TBD	TBD
Sub-Total			**$26**	**$5**
TOTAL			**$31**	
OPTION 3B				

OPTION 3A				
Fonterra to Sub-regional	S. Sub-regional		TBD	TBD

Table 28 Annual operating costs for Option 4A and 4B

OPTION 4A				
WWTP Name	**Size of Plant**	**Area**	**WWTP Operational Cost ($)**	**PS Operational Cost ($)**
Ngaruawahia	Medium	Taupiri & Hopuhopu	3.6	
		Ngaruawahia		
		Horotiu		$0.40
Pukete	Large	Te Kowhai	18.1	$0.10
		Hamilton North		-
		East of Hamilton		
		Hamilton South		
		Matangi		$0.10
Southern	Small	Airport	2.4	
		Ohaupo		$0.10
Cambridge	Large	Cambridge & Hautapu	$1.80	-
Te Awamutu	Medium	Te Awamutu & Kihikhi	$3.90	-
Fonterra Hautapu		Fonterra	TDB	TDB
Sub-Total			**$30**	**$1**
TOTAL			**$31**	
OPTION 4B				
Fonterra to Cambridge	Cambridge		TBD	TBD

4 Longlist Option Assessment

Options were assessed using an MCA framework which used a defined set of criteria to distinguish between options. The assessment criteria used for the longlist was based on the project objectives and KPIs developed as part of the Strategic Case and the 2020 Hamilton Metro Wastewater Treatment Feasibility Study[21]. These objectives were developed with the purpose of giving effect to the Te Ture Whaimana (Vision and Strategy of the Waikato River) and are based around the following five themes:

[21] Future Proof Partners, 2020. Hamilton Metro Wastewater Treatment Feasibility Study. Retrieved 25 Feb 2021, from https://www.futureproof.org.nz/assets/FutureProof/H2A/Waters/Final-Metro-Area-Wastewater-Treatment-Feasibility-Study_with-Appendices.pdf

- Water Quality
- Ecology
- Cultural outcomes
- Sustainable technology
- Sustainable growth.

Additional critical success factors were developed to assess all other distinguishing features of the options:

- Constructability
- Operability
- Land impacts
- Consentability
- Community acceptability
- Resilience
- Funding potential.

Costs were also developed; however they were not part of the MCA scores.

4.1 MCA Assessment Criteria

Criteria

Table 29 Assessment criteria definitions

MCA	Criteria measure
OBJECTIVE CRITERIA	
Water Quality 1. By 2050 municipal wastewater treatment plant discharges, as part of cumulative discharges to the river, are no longer impacting the ability of people to swim and collect Kai from the river	To what extent does the option reduce the level of Nitrogen, Phosphorous, Nitrates and Ammonia in the quality of the discharge?
	To what extent does the option reduce the E.coli levels of the discharge to the river?
	To what extent does the option reduce the risk to public health?
Ecology 2. The quality and extent of aquatic and/or terrestrial habitat and biodiversity in and around water bodies affected by municipal wastewater treatment plant discharges is significantly enhanced from the baseline by 2050	To what extent does the option impact or improve river ecosystems and hydrology?
	To what extent does the option provide the ability to improve vegetation coverage around riverbed and terrestrial ecosystems? - this will only be applicable if we are including potential riparian areas as part of the options? This may have to remain very high level for now
Cultural Outcomes 3. Wastewater treatment solutions restore and enhance cultural connectivity with the river so that by 2050 Marae and iwi access to the	To what extent does this option improve the quality of the water in relation to the number and location of discharge points
	What potential is there for land discharge vs water discharge (How much does the option reduce the discharge to the river?)
	Cultural assessment to be determined

MCA	Criteria measure
river and other sites of significance within the metro spatial area is no longer impeded by wastewater treatment solutions	To what extent does the option increase the number of access points to the river and/or other waterways, lakes and wetlands? - measure by considering the potential to rehabilitate existing sites/riparian activities of options/location of site
Sustainable technology 4. Achieve net zero greenhouse gas related emissions from wastewater treatment systems by 2050 and maximise efficient use of resources and resource recovery	To what extent does the option allow for water reuse?
	To what extent does the option consider energy and carbon neutral technologies? To what extent do options reduce relative operational carbon associated with conveyance system?
Sustainable growth 5. The wastewater solution applies best practice to provide sufficient capacity and flexibility to ensure sustainable growth in the Hamilton Waipa Waikato Metro Area in accordance with growth projections for the next fifty years.	To what extent does the option provide flexibility to adapt to growth and land use changes?
	To what extent does this option provide additional growth opportunities which align with the sustainable and planned future growth of the Waikato Metro area?
CRITICAL SUCCESS FACTORS	
Constructability	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)
Maintenance and operations	What is the relative ease or difficulty of operation and maintenance (includes access, odour treatment, resource availability, monitoring, etc).
Land impacts	Land requirements, impacts to properties during construction, Potential site impacts to environment and potential for impacts to sites of cultural significance
Community acceptability	Level of support or resistance that can be expected from affected stakeholders (including residents, businesses and community groups) during construction and operation. Less resistance is rated higher.
Consentability opportunities and risks	What are the relative risks of delays during the consenting process for the option? And are there any consenting fatal flaws?
Resilience	To what extent will the option provide resilience against potential failures, climate change impacts and natural hazards
Funding Potential	What is the funding potential of the option? / What is the extent of the financial and funding risk associated with this option?
COSTS	
Capital costs	High level estimates only
Whole of life costs	High level estimates only

A seven point scoring system ranging from -3 to +3 (refer Table 30) was used to score each shortlist options performance against the MCA assessment criteria described in Table 29. It also included a fatally flawed score. Table 30 below briefly summarises the scoring definitions. Note that all options were scored based on the long term impacts of that option and the Do Nothing option did not always score “0” (i.e. no impact). In several instances the Do Nothing option was deemed not sustainable in the short or long term. In these cases the Do Nothing option was considered fatally flawed or as having severely negative impacts.

Scoring

Table 30 MCA Scoring system and definitions

3	Significant positive impact compared with other options
2	Moderate positive impact compared with other options
1	Minor positive impact compared with other options
0	Very limited to no positive or negative impact (neutral)
-1	Minor negative impact compared with other options
-2	Moderate negative impact compared with other options
-3	Significant negative impact compared with other options
FF	Fatally flawed

Weighting Sensitivity Tests

A series of weightings scenarios were developed with stakeholders at the outset of the MCA process to be used to test the validity of the longlist options MCA results. These involved stakeholders identifying their most important MCA criteria to be weighted higher than the others. Stakeholders identified the top five criteria as:

1. Water quality
2. Cultural connectivity
3. Sustainable technology
4. Sustainable growth
5. Ecology and Resilience

Other criteria which were identified as important included:

6. Funding potential
7. Land impacts
8. Operational impacts

Water quality was highlighted as the top priority for the majority of stakeholders. Additionally, the five key objective criteria were generally considered more important than the critical success factors, with the exception of resilience (which ranked 5th).

Stakeholder weightings were developed based on the above assessment. Additional weightings were developed based on a number of sensitivities. This was to test the robustness of the decision making process and to test the how sensitive the results are to varying weightings.

The following sensitivity weightings were agreed to be used to test the longlist option results:

- Equal weightings across all criteria
- Objective criteria weighted higher than critical success factors
- Stakeholder sensitivity (reflects the outcomes shown below)
- Environmental sensitivity
- Cultural sensitivity
- Operability sensitivity
- Constructability sensitivity
- Funding potential sensitivity.

Table 31 below outlines the priorities identified by key stakeholders which were used to develop the 'stakeholder weightings' for the criteria.

Table 31 Key stakeholder priorities

CRITERIA	STAKEHOLDER PRIORITIES												RANK
Water Quality	1	1	1	1	1	1	6	1	1	1	6	1	1
Ecology	6	6	6	6	2	1	6	6	3	1	6	5	5
Cultural connectivity	2	6	2	2	3	2	6	5	5	4	6	2	2
Sustainable Technology	6	2	6	6	4	3	6	2	2	3	6	6	3
Sustainable Growth	6	6	4	3	5	4	6	4	4	2	6	3	4
Constructability	4	6	6	6	6	6	6	6	6	6	6	6	11
Maintenance and operations	6	3	6	6	6	6	6	6	6	6	4	6	9
Land impacts	5	6	6	6	6	6	2	6	6	6	3	6	8
Community acceptability	6	6	6	6	6	6	6	6	6	6	6	6	12
Consentability risks	3	6	6	6	6	6	6	6	6	6	6	6	10
Resilience	6	4	3	6	6	6	3	3	6	6	1	4	5
Funding Potential	6	5	5	6	6	6	1	6	6	3	2	5	7

4.2 Options Assessment

The following section provides a summary of the outcomes of the MCA.

MCA Summary

Table 32 below provides a summary of the MCA assessment for each of the options. The detailed MCA results can be found in Appendix F. The detailed MCA provides rational justification for each score. These scores were tested and altered based on key stakeholder feedback. Appendix B (Longlist MCA stakeholder workshop minutes) outlines the pre-workshop and post- workshop outcomes of the MCA and changes which resulted from the stakeholder feedback.

Table 32 MCA summary

OBJECTIVE CRITERIA		Do Nothing	Option 1A	Option 1B	Option 2A	Option 2B	Option 3A	Option 3B	Option 4A	Option 4B
Water Quality	To what extent does the option reduce the level of Nitrogen, Phosphorous, Nitrates and Ammonia in the quality of the discharge?	-3	3	2	3	2	3	2	3	2
	To what extent does the option reduce the E.coli levels of the discharge to the river?	-2	2	2	2	2	2	2	2	2
	To what extent does the option reduce the risk to public health? Measure by assessing risks associated with contamination of groundwater and the location of the discharges. E.coli has been captured above	-1	1	1	1	1	1	1	1	1
Ecology	To what extent does the option impact or improve river ecosystems and hydrology	-2	1	1	1	1	1	1	1	1
	To what extent does the option provide the ability to improve vegetation coverage around riverbed and terrestrial ecosystems? - This will only be applicable if we are including potential riparian areas as part of the options? This may have to remain very high level for now	0	1	1	1	1	1	1	1	1
Cultural Connectivity	To what extent does this option improve the quality of the water in relation to the number and location of discharge points	Not scored at this time- will be scored in future utilising feedback from stakeholders as appropriate								
	What potential is there for land discharge vs water discharge (How much does the option reduce the discharge to the river?)	Not scored at this time- will be scored in future utilising feedback from stakeholders as appropriate								
	To what extent does this option enhance and restore cultural connectivity with the river?	Not scored at this time- will be scored in future utilising feedback from stakeholders as appropriate								
	To what extent does the option increase the opportunity to improve the number of access points to the river and/or other waterways, lakes and wetlands? - measure by considering the potential to rehabilitate existing sites/riparian activities of options/location of site	0	1	1	2	2	2	2	1	1
Sustainable Technology	To what extent does the option allow for water reuse?	0	1	0	3	2	2	1	1	0
	To what extent does the option consider energy and carbon neutral technologies? To what extent do options reduce relative operational carbon associated with conveyance system?	0	-1	0	1	2	1	2	-1	0
Sustainable Growth	To what extent does the option provide flexibility to adapt to growth and land use changes?	-3	1	0	3	2	2	1	1	0
	To what extent does this option provide additional growth opportunities which align with the sustainable and planned future growth of the Waikato Metro area?	-3	2	2	3	3	3	3	2	2
CRITICAL SUCCESS FACTORS										

Constructability (treatment)	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)	0	-2	-3	-1	-2	-2	-3	-2	-3
Constructability (reticulation)		0	0	-1	-2	-3	-2	-3	-1	-2
Operability (treatment)	What is the relative ease or difficulty of operation and maintenance (includes access, odour treatment, resource availability, monitoring, etc.).	0	0	-2	1	0	1	0	0	-2
Operability (reticulation)		0	0	0	-2	-2	-3	-3	-1	-1
Land impacts	Land requirements, impacts to properties during construction.	Not scored at this time- will be scored in future utilising feedback from stakeholders as appropriate								
Community acceptability	Level of support or resistance that can be expected from affected stakeholders	Not scored at this time- will be scored in future utilising feedback from stakeholders as appropriate								
Consentability opportunities and risks	To what extent will the option require consents for a new site (that require land use consent)? To what extent will the option have discharges that are likely to meet discharge parameters acceptable to the consent authority?	-4	-3	-3	-1	-2	0	-1	-2	-3
Resilience	To what extent will the option provide resilience against potential failures, climate change impacts, natural hazards and labour skill.	-2	1	0	0	-1	0	-1	1	0
Funding Potential	What is the funding potential of the option?	0	-2	-1	1	2	1	2	0	1
	What is the distribution of costs across the population base?	3	2	2	-2	-2	-2	-2	0	0
COSTS										
Capital costs	$ Million		$481	> $491	$588	>$608	$612	>$622	$479	>$489
Operational costs	$ Million (annual)		$30.2	TBD	$30.8	TBD	$30.7	TBD	$30.6	TBD

Assessment Against Objectives

The design of the longlist of options assumed the same very high quality of treated wastewater discharge for all options (this assumes a standard of < 4 mg/L Total Nitrogen (TN) and < 0.5 mg/L Total Phosphorus (TP) as annual means). An initial assessment showed the adoption of this standard, even when taking into account the forecast growth, would lead to a measurable reduction in TN and TP contaminant loads discharged to the Waikato River when compared to the existing situation. As a result, all options achieved a high score when compared against the water quality, public health, and ecology investment objective criteria.

The addition of Fonterra flows and loads to a municipal plant would have a small impact on water quality of the river, when compared to the options not including Fonterra. It was assumed that flows would all be discharged to the river, if Fonterra flows were combined with municipal plants. A Fonterra standalone option would continue to discharge to both a combination of land (via an irrigation system) and the Waikato River (and therefore reducing discharges to Waikato River).

Cultural criteria (including the number and location of the discharges and the river vs. land discharges) was not assessed at this stage of the process. Early iwi and mana whenua feedback indicated that overall water quality was their highest priority (i.e. more important than the number and location of discharges). It was also noted that the number and location of discharges to the river were irrelevant from a 'Best for River' perspective while reduction of total flows and contaminant loads to the river were more important. At this stage of the process, each wastewater treatment plant included in each longlist option assumed a single discharge method. No combined land/water discharge methods were assumed.

However, the ability of each plant to discharge to a combination of land and water will need to be assessed at the shortlist assessment phase. At the same time, cultural connectivity will be assessed and investigated during the development and assessment of discharge options.

The criteria outlined in Table 33 below has key distinguishing features and therefore different scores for each option.

Table 33 Assessment against objective criteria

OBJECTIVE CRITERIA		DN	1A	1B	2A	2B	3A	3B	4A	4B
Cultural connectivity	To what extent does the option increase the opportunity to improve the number of access points to the river and/or other waterways, lakes and wetlands?	0	1	1	2	2	2	2	1	1
Sustainable Technology	To what extent does the option allow for water reuse?	0	1	0	3	2	2	1	1	0
	To what extent does the option consider energy and carbon neutral technologies?	0	-1	0	1	2	1	2	-1	0
Sustainable Growth	To what extent does the option provide flexibility to adapt to growth and land use changes?	-3	1	0	3	2	2	1	1	0
	To what extent does this option provide additional growth opportunities which align with the sustainable and planned future growth of the Waikato Metro area?	-3	2	2	3	3	3	3	2	2

The above scores were chosen for the following reasons:

- **Cultural connectivity**: Option 2 and 3 scored higher than Options 1 and 4. This was because these options would provide additional opportunities to improve access at the Cambridge WWTP site and the

Ngaruawahia WWTP site. Decommissioning plants at these sites would allow for greater rehabilitation and access opportunities.

- **Sustainable technology (water reuse):** Option 2 scored the highest. This was because a new plant at a new location, likely to be near larger industrial growth areas would have greater opportunities to reuse water for industrial purposes. A new subregional plant at the Cambridge site would have some opportunity for industrial reuse, however the industrial growth potential around Cambridge was less than other locations. Options 1 and 4 would not achieve the economies of scale for water reuse to be economical. The Fonterra standalone options (Option A's) would continue to use water for irrigation purposes and therefore scored slightly better than Option B's.
- **Sustainable technology (Energy neutral):** Both Option 2 and 3 scored higher than Option 1 and 4. This is because subregional plants achieve greater economies of scale making energy reducing or energy neutral technologies increasingly feasible to install and to operate efficiently in the long term. The additional conveyancing energy requirements for Options 2 and 3 meant that scores were only marginally better than the Do Nothing and Enhanced BAU options. Options 1 and 4 scored slightly lower than the Do Nothing Option. This is because the energy requirements for a small high rate plant to achieve a high water quality are significant and more than what is currently being used.

  Fonterra options (i.e. Option B's) scored slightly higher as they would significantly increase plant size. Hence there would be an opportunity for more energy recovery which provides additional capacity for biosolids reuse. Once these facilities are in place, there would be an opportunity to then import other high strength (low volume) wastes for anaerobic digestion and power generation out of proportion to the small volumes involved, and thereby optimise the capacity of the installed capital.
- **Sustainable growth (flexibility):** Option 2 scored the highest. It scored the highest because this option included a new facility in a new location which could be master planned and designed from a pure 'Greenfield' perspective to enable the greatest flexibility and optimise the potential for future introduction of new technologies as growth allows. All other options would require a new build on the existing Cambridge site which limits the ability to master plan appropriately and significantly increases the build cost due to the need to build around the existing works and implement temporary process solutions and multiple utilities moves. The inclusion of Fonterra flows and loads to the municipal facilities would also limit the ability for a staged upgrade due to the technology requirements necessary immediately for managing the Fonterra loads i.e. Plant sizing jumps immediately to the 'Large' category. Large upfront costs would be required in the short term. However, Fonterra would be there to mitigate those at least to a certain extent.
- **Sustainable growth (meeting growth expectations):** All options have been designed to meet growth expectations out to 2061. However, Option 2 and 3 would free up additional space at Pukete WWTP, meaning the potential new growth areas (southern links and R3), or land use changes (e.g. wet industry) would be more easily serviced in the future.

Assessment Against Constructability

Treatment

The Fonterra Options (Option B's) all scored lower than their Option A counterparts (i.e. Option B's would have greater constructability risks). There are two main reasons for this as follows:

- More conveyance infrastructure to build than the Option A counterpart
- Having to fit more infrastructure into the already compromised Cambridge site, exacerbating the layout problems further and requiring additional ground improvements at that site (for Option 1B, 3B and 4B only).

The main treatment reactors, both activated sludge and the anaerobic digesters were sized proportional to the additional Chemical Oxygen Demand (COD) load entering the plant from Fonterra flows. The ultimate population of Cambridge and Hamilton South (80,000 PE) was also compared to the population equivalence of the COD produced by Fonterra (approximately 100,000 PE). Consequently, the additional Fonterra flows for the Option B's would more than double the size of the subregional plant and triple the size of a standalone Cambridge plant.

Not only is the land area requirement greater, but the anaerobic digesters required for Fonterra flows would be significantly taller than activated sludge reactors, thereby increasing the ground loading and the attention that needs to be paid to foundation improvement. Options 1, 3 and 4 all have Cambridge as the key southern site. It would also be the most difficult site (into which) to build a large, heavy, and complex plant.

Option 2B, using a central and entirely 'Greenfield' site was regarded as slightly better option as it provided for the required infrastructure on a site whose area would be determined as a result of the process sizing.

Geotechnical considerations:

A review of the recent geotechnical information provided for the Cambridge site (dated September 2019) was undertaken to determine the geotechnical risks of the site. No additional analysis or intrusive works was undertaken and have focused on the proposed development of the site, not the existing layout.

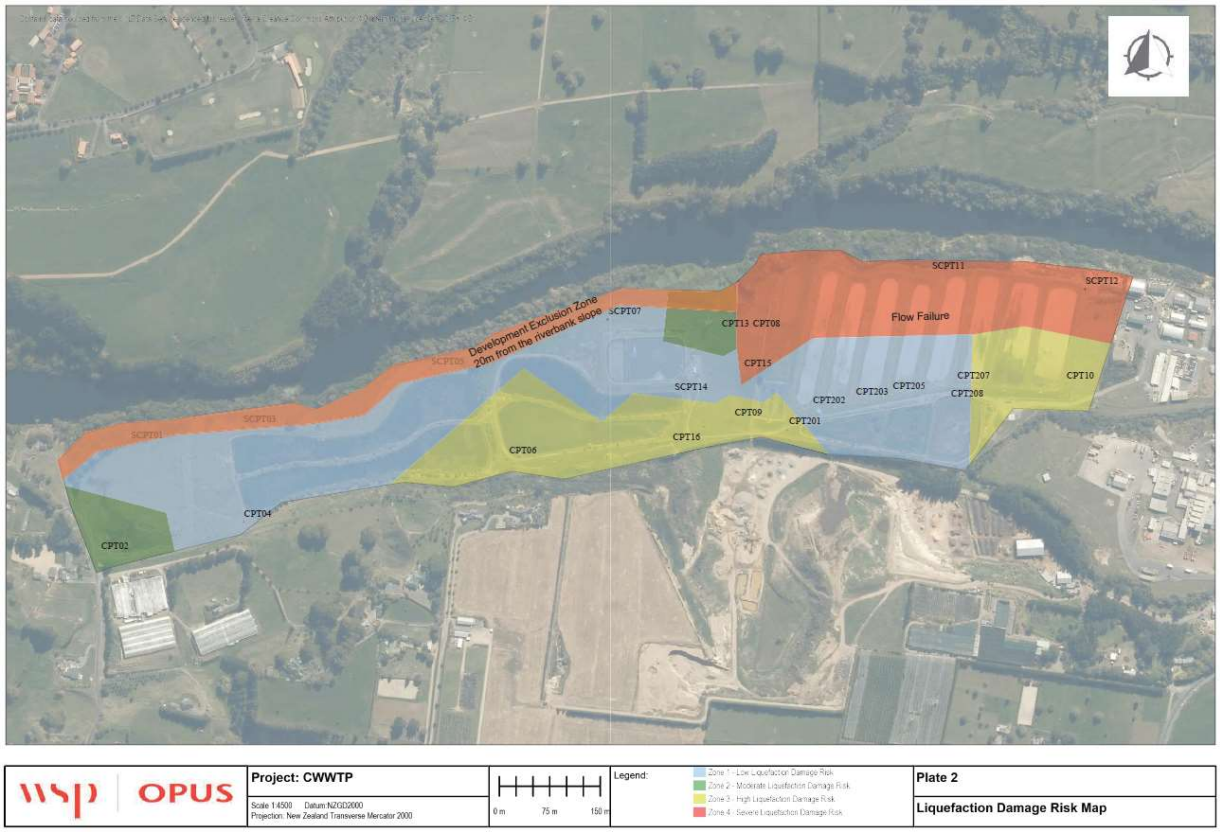
It has been identified that during an earthquake, liquification and in turn lateral spread could occur which could damage buildings beyond repair. The liquification risk s something likely shared by other sites (and all options) but the lateral spread risk would be significantly higher at the Cambridge site and any other site within approximately 200 m of the Waikato River.

To assist in quantifying the risk at the Cambridge site, a previous consultant has created liquification induced risk 'zones' which showed approximately half the site to be a high risk or as an area unsuitable to build. The testing has however been limited by the presence of the existing ponds leaving large areas being unable to be tested. Additional risk should be attached to these areas as they are yet to be quantified. This quantification could only be completed on decommissioning of the ponds. This would not be realised on a site free from obstructions to testing (e.g. a site that a large SUV sized vehicle could mostly get around).

At this stage, it was assumed that a new site (south of Hamilton) could be tailored to minimise as many risks as possible including geotechnical risks. Choosing a site which is further from the river bank and on stable and permeable soils would reduce the constructability risks.

Figure 16 below shows the areas which have severe and high liquification risk in red and yellow and moderate to low risk in blue and green, with area under the ponds being a large unknown.

Figure 16 Liquification risks areas at Cambridge site



Conveyance

Construction of conveyance pipework was expected to be reasonably straight forward, generally installed in road berms or carriageways by open cut trench or HDD methods. The primary risks associated with the conveyance construction were considered to be the river and road crossings. Crossings of the Waikato River and State Highway 1 were limited to the minimum number possible, and alignments were chosen that would provide flexibility for construction (drilling under SH1, and either drilling under the Waikato River or bridging across it). In general, smaller diameters were considered to be less risky, as they could more likely be efficiently drilled under roads or rivers, while large diameters might necessitate bridges or tunnelling as the bending radius' become too large to effectively drill with the working areas available. In general, the alignments followed road corridors favouring lower traffic volume roads where possible, while maintaining the straightest line between the source and destination. For the Peacocke to Southern and Peacocke to Cambridge, major road corridors of the Peacocke development were used to reduce the overall risk. However, sufficient planning the pipeline could be placed in reserves which would enhance future access.

All options that required conveyance were considered riskier than the options that did not require conveyance which was reflected in the scoring. Options 2B and 3B would require multiple river crossings (for the Fonterra flows and Matangi flows) and SH1 crossings and therefore were scored lower (i.e. greater risk). Options with longer lengths of conveyance also scored poorly (Option 2A, 2B, 3A and 3B), as the extent of constructability issues were expected to be roughly proportional to pipe length.

Table 34 Assessment against constructability

CRITICAL SUCCUSS FACTORS		DN	1A	1B	2A	2B	3A	3B	4A	4B
Constructability (treatment)	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)	0	-2	-3	-1	-2	-2	-3	-2	-3
Constructability (reticulation)		0	0	-1	-2	-3	-2	-3	-1	-2

Assessment Against Operability

Treatment

The operability assessment for the treatment facilities assumed the following:

- Small plants scored lower because they require (in total) more full-time operators to cover the requisite number of sites
- Small plants are likely to have a poorer Quality Assurance regime than large plants. The consents are more likely to be based on monthly or fortnightly compliance sampling and so it is more likely that regular process monitoring sampling will be done on the same time scale.
- Small plants are expected to be poorly resourced in terms of on site maintenance and repair capability, when compared to larger plants. Therefore, failures, calibration, and breakdowns are more likely to go unattended for longer in a smaller plant.

Therefore, options with more, smaller plants (Option 1A, 1B, 4A and 4B) scored lower than those options that reduce the number of plants having to be managed (Options 2A, 2B, 3A and 3B).

Introducing Fonterra dairy waste loads to any particular plant increases the associated operational risk. Dairy sites have to manage high fat loadings (cream associated with raw milk). This needs to be kept out of the waste stream. However, unintended discharges can happen. The milk is processed to exacting standards and 'out of spec' process parameters at any time can lead to a sudden cessation of a process run and the need to dump large amounts of product and clean (CIP) the process vessels. As with cream, this can lead to very high loading spikes that it is very difficult for the bacteria in the treatment plant to rapidly adjust for. The regular process system CIPs use alternating hot caustic followed by cold acidic washes which drain to waste. These can be at extremes of pH and temperature and so, if not adequately buffered, can lead to significant process upsets in an otherwise well operating biological treatment plant.

Thus, compared to a comparatively stable domestic treatment plant whose largest fluctuations are morning ablutions and significant rain events, adding a very large and sometimes harsh and rapidly changing industrial load can be very challenging to stable, compliant plant operation.

Hence, the 'B' options scored lower than the 'A' options.

Reticulation

The majority of the pipelines resulted in average retention times that were in excess of 8 hours (up to 24 hours for some), meaning that chemical dosing to reduce septicity would be required for most pipelines. This would be more prevalent with the Cambridge regional plant (Option 3A and 3B) than the Southern regional plant (Option 2A and 2B), as the transmission distances are further on average. Apart from septicity, the only major difference in operability was any leakage or pipe breakage and the resulting environmental impacts, as all the options featured pump stations and there was not considered to be a significant difference in the requirements for operating pump stations. Options that crossed the Waikato River were considered to be a higher risk than options that did not.

Table 35 Assessment against operability

CRITICAL SUCCUSS FACTORS		DN	1A	1B	2A	2B	3A	3B	4A	4B
Operability (treatment)	What is the relative ease or difficulty of operation and maintenance (includes access, odour treatment, resource availability, monitoring, etc.).	0	0	-2	1	0	1	0	0	-2
Operability (reticulation)		0	0	0	-2	-2	-3	-3	-1	-1

Assessment Against Consentability

Consenting risks were assessed based on:

- The need for designating land through Notice of Requirement process and/or additional land use consents
- The number and potential complexity of discharge consents required.

The Do Nothing option was fatally flawed (scored a '-4') as the existing plants do not meet current consenting conditions and will not be able to meet increasing environmental standards.

Option 3 scored the highest (or the consenting risks are lowest for this option). This is because the option would utilise the existing designated Cambridge WWTP site and existing discharge. No new site or discharge location would be needed. It should be noted that the additional size needed for a sub-regional plant, may mean that additional land would be needed, however this is still being investigated. If additional land is identified as a requirement for this option, then a Notice of Alteration to the Designation to extend the existing designation would be needed. The higher flows will also need new discharge consents hence there may still be some consenting challenges.

All other options will require new sites to be designated with new discharge consents sought which presents additional consenting risks. Option 1 has the highest risk as a minimum of three new sites will be needed and two new discharge locations (one to the river and the other a land discharge). This option will also require the renewal and management of 10 wastewater treatment facilities and associated consents. Option 4 has similar risks, however only one new site and one new discharge is required, along with the renewal and management of seven wastewater treatment facilities and associated consents. Option 2 will require a new site and new discharge location as well (similar to Option 4), however, this option removes the current discharge at Cambridge WWTP and only requires the renewal and management of five wastewater treatment facilities and associated consents.

Including Fonterra flows to a municipal plant adds additional consenting risks. Fonterra might need to lodge a short-term consent in the interim period between choosing and implementing a long term option. If this was

necessary, it would increase costs for Fonterra and would mean Fonterra may need to implement short term wastewater treatment interventions.

Final scores for each option are shown in Table 36.

Table 36 Assessment against consentability

CRITICAL SUCCESS FACTORS		DN	1A	1B	2A	2B	3A	3B	4A	4B
Consentability risks	To what extent will the option require consents for a new site (that require land use consent)? To what extent will the option have discharges that are likely to meet discharge parameters acceptable to the consent authority?	-4	-3	-3	-1	-2	0	-1	-2	-3

Assessment Against Resilience

Resilience assesses the ability for each option to prevent or minimise the risk of potential failures. Failures could occur as a result of climate change impacts, natural disasters, operational issues and labour skill shortages.

The options were assessed as to how well the facilities are likely to serve the community under various resilience testing scenarios.

These included:

- **Potential major equipment / process failures:** The larger plant options (2 & 3) scored better because they are almost certain to be better resourced in terms of standby systems and redundant plant. This makes both planned preventative maintenance programmes easy to implement and recovery from an unexpected major failure to recover from.
- **Climate change:** In this regard, options 2 and 3 scored down because they both employ long lengths of internodal conveyance pipeline to get all wastewater into the centralised processing facilities. Pipeline sizing has to balance both pumping cost (friction head) and the maintenance of flushing velocities. Each pressure pipe is therefore designed to perform optimally under a relatively narrow band of flow rates.

  The implication of future wet weather flows in excess of those that can be designed for now is that the pumping costs will increase, or that more buffering storage will be required back in the collection system.
- **Significant seismic event:** Again, the long lengths of conveyance pipeline scored down because they introduce many more points of vulnerability to significant damage, which could lead to increased loss of service for larger populations
- **Skilled operator shortages:** While rewarding, the wastewater industry is not one for which it is easy to attract an ample workforce. Modern treatment systems can be quite complex to understand, and to operate skilfully. The larger plants require a lesser overall number of skilled operators and also tend to foster an environment where there is more support and on the job training available which will likely make them more resilient to future skilled labour shortages.

The Do Nothing option scored the lowest, as resilience is currently not built into the wastewater treatment network. Option 1A and Option 4A scored the highest as they would construct multiple plants in the metro area. The plant sizes would also be smaller, meaning it would be more difficult to build in redundancies.

Therefore, the likelihood of failure would increase, but the consequence would be significantly smaller (as each plant services a smaller population).

Option 2A and 3A scored slightly lower than 1A and 4A. Whilst larger plants have built in redundancies, meaning they would have a lower chance of failure (but much higher consequence of failure). Option 2A and 3A would also require long lengths of conveyance, including crossing rivers and highways which has a high consequence of failure. The increase in plant resilience's would be offset by the risk of failure for conveyancing. Therefore, these options scored a '0'.

Fonterra options (Option B's) always scored slightly lower than the option counterpart. This was because the risk of failure increased once Fonterra flows were included into the plant.

Table 37 Assessment against Resilience

CRITICAL SUCCUSS FACTORS		DN	1A	1B	2A	2B	3A	3B	4A	4B
Resilience	To what extent will the option provide resilience against potential failures, climate change impacts, natural hazards and labour skill.	-2	1	0	0	-1	0	-1	1	0

Assessment Against Funding Potential

The funding potential assessment considered:

- The potential for options to attract alternative funding sources
- The distribution of costs over the population base for different options.

Under this criteria, the Do Nothing option scored the highest. It scored the highest for the funding potential criteria because it would not require any increases to rate payers or any additional funding to implement.

Option 1A has the lowest potential to attract additional funding sources as it would continue to provide small facilities managed by individual councils. This option is unlikely to attract any further developer contributions or any further central government funding as these providers favour amalgamation of facilities to service larger sub-regional areas more efficiently.

Option 4A has some potential for further funding opportunities with the Councils combining some facilities which may create additional developer land. Option 2A and 3A have greater potential to access alternative funding streams, as they align with the new central government water reform objectives. Option 2A and 3A also provide greatest opportunities for future development. The inclusion of Fonterra opens up potential private industry funding streams, which will create additional economies of scale for centralised options.

A higher number of standalone treatment plants (Option 1A and 4A) is likely to have better ratepayer affordability compared to a smaller number of centralised plants (Option 2A and 3A). Options 1A and 4A have lower whole of life costs. This is based on the assumption that the economies of scale benefits delivered by the centralised plants are outweighed by the added reticulation costs.

The final score for each option is summarised in Table 38.

Table 38 Assessment against funding potential

CRITICAL SUCCUSS FACTORS		DN	1A	1B	2A	2B	3A	3B	4A	4B
Funding Potential	What is the funding potential of the option?	0	-2	-1	1	2	1	2	0	1
	What is the distribution of costs across the population base?	3	2	2	-2	-2	-2	-2	0	0

Costs

High level costs for the capital investment and annual operating costs were developed for the longlist of options . These longlist option costs are detailed by individual WWTP in Section 3.6 and summarised for each option in Table 39 below.

Table 39 Capital and Operational costs

Option	CAPEX ($ million)	CAPEX ($ million) Fonterra	OPEX (Annual $ million)
Option 1A	$481	$60	$30.2
Option 1B	>$491 (additional costs required for high strength flows)	Between $50 -$60 for contribution to municipal plants + $10 Conveyance costs + Short term intervention costs	>$30.2
Option 2A	$588	$60	$30.8
Option 2B	>$608 (additional costs required for high strength flows)	Between $50 -$60 for contribution to municipal plants + $20 Conveyance costs + Short term intervention costs	>$30.8
Option 3A	$617	$60	$30.7
Option 3B	>$627 (additional costs required for high strength flows)	Between $50 -$60 for contribution to municipal plants + $10 Conveyance costs + Short term intervention costs	>$30.7
Option 4A	$479	$60	$30.6
Option 4B	>$489 (additional costs required for high strength flows)	Between $50 -$60 for contribution to municipal plants + $10 Conveyance costs + Short term intervention costs	>$30.6

4.3 MCA Results Summary and Sensitivities

The MCA results and the scores for the multiple weighting scenarios agreed with stakeholders (outlined in Section 4.1) are summarised below. The weighting scenarios used to test the sensitivities of the longlist option MCA results were:

- Equal Weighting - Equal weightings across all criteria
- Objectives - Objective criteria weighted higher than critical success factors
- Stakeholder sensitivity – reflects stakeholder priorities
- Environmental sensitivity – prioritises water quality, ecology and sustainability
- Cultural sensitivity – prioritises cultural connectivity, water quality and ecology
- Operability sensitivity – prioritises Operability and resilience
- Constructability sensitivity – prioritises constructability, operability and consenting
- Affordability sensitivity – prioritises funding potential

Table 40 MCA summary of results

MCA score sensitivities	**Do Nothing**	**Option 1A (Do Min)**	**Option 1B**	**Option 2A**	**Option 2B**	**Option 3A**	**Option 3B**	**Option 4A**	**Option 4B**
Equal Weighting	-1.05	0.25	-0.08	0.65	0.27	0.55	0.17	0.25	-0.18
Objectives	-1.11	0.59	0.32	1.19	0.89	1.05	0.75	0.59	0.26
Environmental	-1.03	0.62	0.38	1.08	0.81	0.95	0.68	0.59	0.29
Cultural	-0.99	0.66	0.44	1.22	0.98	1.10	0.86	0.66	0.39
Stakeholder	-1.15	0.70	0.41	1.25	0.93	1.12	0.80	0.70	0.36
Operability	-0.97	0.16	-0.26	0.41	-0.02	0.29	-0.14	0.12	-0.40
Constructability	-1.12	-0.06	-0.47	0.30	-0.20	0.22	-0.28	-0.06	-0.61
Funding potential	-0.93	0.00	-0.26	0.37	0.02	0.33	-0.02	0.04	-0.36
MCA rank sensitivities	**Do Nothing**	**Option 1A (Do Min)**	**Option 1B**	**Option 2A**	**Option 2B**	**Option 3A**	**Option 3B**	**Option 4A**	**Option 4B**
Equal Weighting	9	4	7	1	3	2	6	4	8
Objectives	9	5	7	1	3	2	4	6	8
Environmental	9	5	7	1	3	2	4	6	8

MCA score sensitivities	Do Nothing	Option 1A (Do Min)	Option 1B	Option 2A	Option 2B	Option 3A	Option 3B	Option 4A	Option 4B
Cultural	9	6	7	1	3	2	4	5	8
Stakeholder	9	6	7	1	3	2	4	5	8
Operability	9	3	7	1	5	2	6	4	8
Constructability	9	3	7	1	5	2	6	3	8
Funding potential	9	5	7	1	4	2	6	3	8
Costs (reflective of costs only)	N/A	2	4	5	6	7	8	1	3

Option 2A is consistently the most preferred option, under all weighting scenarios. Option 2A is therefore recommended for the shortlist of options. Option 3A consistently scores the second highest of the options regardless of weightings which suggests that the centralised options realise greater benefit and minimal risks when compared to Option 1A and 4A (the standalone options). Note that the overall MCA scores were very similar among the standalone options.

Option 1A and Option 4A scored similar against weighting scenarios which prioritised environmental, cultural, stakeholder and sustainability objectives. . Option 1A scored slightly higher than Option 4A for of operability. This is largely due to the challenges associated with conveyance of the smaller flows from Matangi and Ohaupo. However, Option 4A scored better than Option 1A for affordability. This is because Option 1A would have very limited potential for any additional funding sources and also would require large upfront costs for the new build of smaller plants. This risk is considered slightly less for Option 4A.

Fonterra sub-options (Option Bs) scored lower than Option A sub- options under all weighting sensitivity scenarios. The sensitivities applied show that Fonterra options scored higher when prioritising objectives and scored lower when prioritising critical success factors. This is because the inclusion of Fonterra flows adds additional constructability and operability risks to the options as discussed in Section 0 and 0.

5 Key Recommendations

Option 2A is the highest performing option and shortlisted under the MCA scoring process at longlist to shortlist stage. The benefits associated with building a new plant on a new site outweigh the risks involved in consenting and approving a new site. A new site offers the opportunity to masterplan a treatment facility to achieve the greatest long-term operational efficiency and flexibility to adapt to load, technology and resource recovery opportunities and be able to adapt more quickly and easily to changes. The central location also reduces the single pumping lengths and allows for greater development opportunities when compared against Option 3A. Additionally a new location south of Hamilton is closer to the airport industrial area. This area has significant industrial growth potential which provides greater opportunities for industrial water reuse.

Option 3A (building a sub-regional plant on the Cambridge site) was the second highest scoring option in the longlist assessment. However, this option has not been identified for the shortlist because of the following issues:

- Requires long conveyancing/pumping lengths from Peacocke and south Hamilton
- Constructing on an existing site that includes expansive, low intensity process units, whilst trying to keep the existing plant operational is logistically difficult and will require additional time and strict planning during construction
- Limited space on the existing site will make it very difficult to masterplan to the greatest efficiency and to respond to changes and growth
- Poor community perceptions and poor community acceptance already exist for the Cambridge site which may be difficult to overcome and put additional challenges on the consenting process
- There are geotechnical risks on the existing site, particularly the potential for lateral spread during construction and consequential impact on the river
- If geotechnical, master planning and other space constraints around operational logistics dictate a move to partial siting on adjacent land (e.g. the quarry site) then designation work and its inherent risks will be required to provide for the expanded site
- There is limited ability to reuse any of the existing assets at the Cambridge site.

This option utilises the site of the existing Cambridge WWTP, which is already consented for this type of land use and as an existing discharge location. The length and cost of conveyance for the airport and areas to the south of Hamilton make this option comparatively expensive to construct and operate and may make it difficult to obtain consents to extend the site to accommodate a sub-regional WWTP.

A modified Option 4A is proposed as the modified Enhanced BAU Option. For comparative purposes, an Enhanced BAU option is required to be carried through to the shortlisting stage. Option 4A is considered to be a more appropriate than Option 1A because of the following reasons:

- For the northern metro area (spanning from North Hamilton region to Taupiri), the inclusion of Te Kowhai to Pukete is more practicable than building a new plant at Te Kowhai. A new plant for Te Kowhai would very likely require a new site. It would also place a high rate burden on a small community to invest in a high quality plant (to meet water quality assumptions). It is therefore recommended that the northern metro area pursue Option 4A over Option 1A as an Enhanced BAU approach
- For the southern metro area (spanning from south Hamilton to Te Awamutu), it is proposed that a new plant (south of Hamilton) is master planned to allow for the inclusion of Matangi and Ohaupo. However, conveyance from these communities should *only* be considered when flows reach a more sustainable level. Within the short to medium term, both Matangi and Ohaupo will continue to operate as per BAU with Matangi investing in short to medium term improvements in its standalone plant. The connection of Ohaupo is not expected to be needed until 2050. Developer interest within these areas may trigger the inclusion of the communities to a more centralised plant sooner
- This approach also allows for the potential to stage centralisation in the future, and therefore is more flexible to adapt to changes.

Fonterra Options: The MCA shows that the benefits of including Fonterra *do not* (at this stage) outweigh the risks. The key risks identified in the MCA for the inclusion of Fonterra are the challenges associated with

allocating risks and the additional consequences of an operational failure which are likely to increase the footprint of a new plant. These risks are most significant when considering the inclusion of Fonterra with a standalone Cambridge plant. Option 1B and 4B are therefore not recommended for shortlisting. Including Fonterra flows becomes increasingly feasible when connected to a sub-regional plant, as its size reduces the operational risks and may have benefits due to the potential for biosolids reuse.

A key unknown, at this stage is how the inclusion of Fonterra flows could improve the ability to use advanced biosolids recovery technology. This has the potential to offset the operational costs for the plant (and also allows for energy neutrality). This benefit has not been fully investigated and could mean operational cost savings (for all Councils and Fonterra). However due to the peak flows required to service Fonterra the plant would need to be built in accordance with the peak flow requirements. This has a material impact on the capital and operational costs of the facility.

Our recommendations for the emerging shortlist are therefore:

- Option 1 – Do Nothing (carried forward for comparative purposes only)
- Option 2A as our Centralised Option
- Option 4A (refined with staging limitations) as the Enhanced BAU Option.

5.1 Next Steps

The longlist options development and assessment phase is the second phase of the DBC process and forms part of the Economic Case. The next step of the Waikato Metro Wastewater DBC project is to refine and assess the shortlist options for the southern area only and identify a preferred technical solution.

This involves undertaking the following steps:

- Develop the shortlist of options
    - Determine the extent of Hamilton City to be conveyed to a Southern WWTP
    - Develop shortlist options in more detail (including staging of servicing the communities in the study area)
    - Determine a shortlist of potential treatment plant sites
    - Further refine the discharge options
    - Further refine conveyance options
    - Further refine staging of upgrades and construction
- Develop more refined cost estimates for shortlisted options
- Undertake MCA of shortlisted options
- Determine preferred option for the southern metro area.

Appendix A – Population and growth assumptions

Memorandum

10 December 2020

To	Waikato Metro Wastewater DBC Control Group Hamilton City Council		
Copy to	Jackie Colliar		
Author	Claire Scrimgeour and Kate Jackson		
Reviewer	Rob Brodnax	Approver	Sioban Hartwell
Subject	**Growth Assumptions for Waikato Metro Wastewater DBC**	Job no.	12533660/3257177

1 Introduction

The purpose of this technical note is to outline the residential and non-residential growth assumptions proposed to be used for the metro long list and southern short list options stages of the Waikato Metro Wastewater Detailed Business Case (DBC). The DBC will explore potential wastewater strategic options for the wider Hamilton Waikato Waipa Metro Area (the metro area) (see Figure 1-1) and determine a preferred wastewater treatment solution within the southern metro area.

The residential and non-residential growth assumptions as defined within this technical note will inform the development of high level strategic wastewater treatment options. Growth assumptions will provide indications of the size and timing of potential new conveyance systems and wastewater treatment plants and when upgrades are required for existing treatment plants.

The growth forecasts have been updated to incorporate feedback from the Project Control Group.

This technical note has been structured as follows:

1. Introduction
2. Background: Project history and previous investigations
3. Assumptions: List of wider overarching assumptions which have been taken for this project
4. Approach: Detailed description of the population sources, approach and limitations for each council area
    4.1. Residential growth assumptions
    4.2. Non-residential assumptions
5. Metro Area Residential growth: Summary of available projection and capacity information
6. Hamilton City Growth: Summary of Hamilton City population equivalent information and growth areas outside current city boundary
7. Limitations: Discussion of the key limitations and issues with existing sources and approach
8. Recommendations

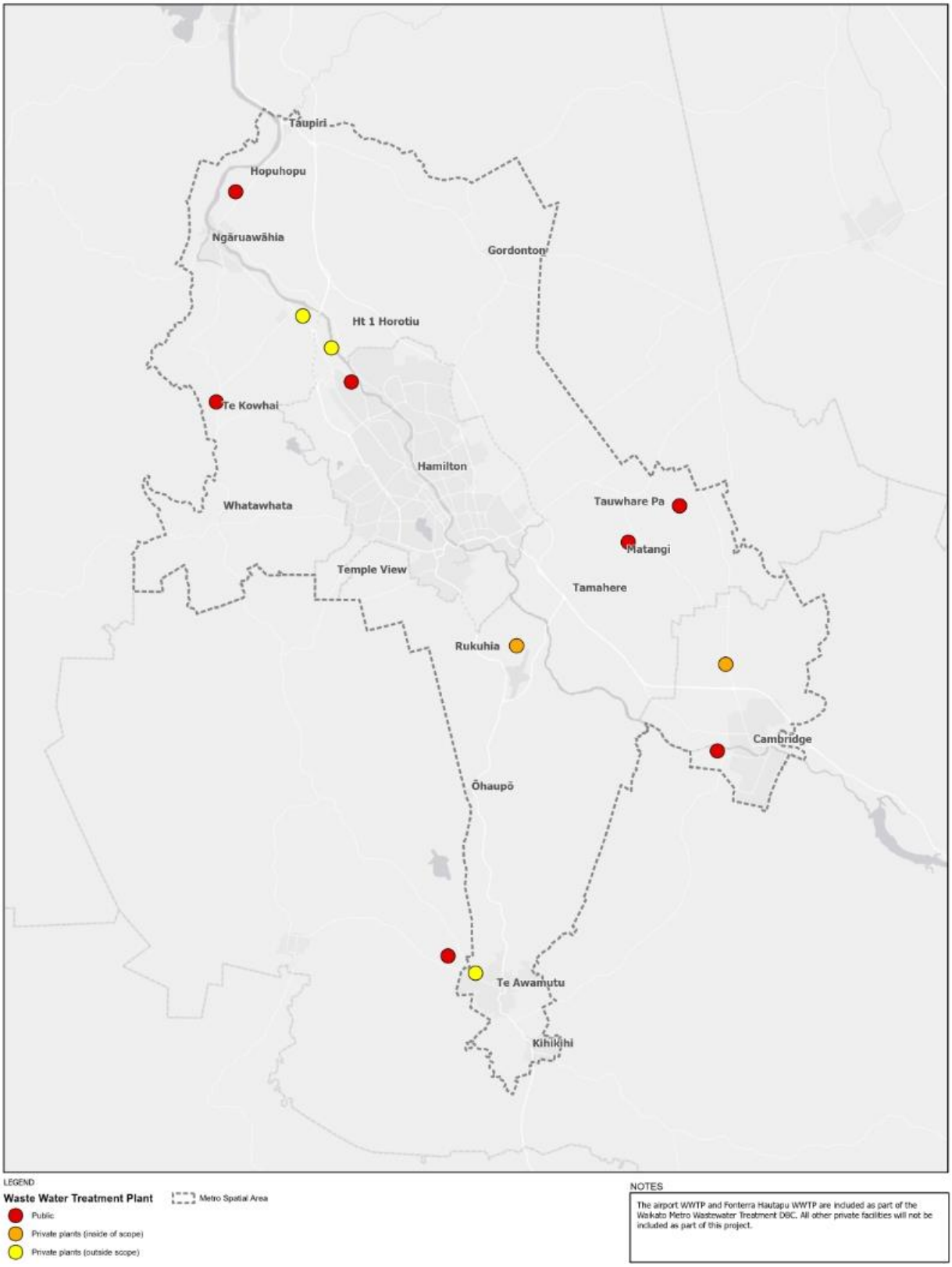


Figure 1-1 Waikato-Hamilton-Waipa Metro Area (Scope Area)

2 Background

High level population assumptions were collated earlier this year as part of the Hamilton Metro Wastewater Treatment Feasibility Study. Population projections were determined for two growth scenarios; the 2045 growth scenario and a 100 year plus growth scenario using a variety of sources.

This assessment provides more recent population projection and capacity information, provides greater granularity for residential and non-residential growth within the metro area and also defines potential longer term growth areas.

3 Assumptions

The following high level assumptions have been taken into account for the purpose of this technical note:

- Growth assumptions have been collated based on information available as of 12th August 2020.
- An 'ultimate' growth capacity scenario has been identified which reflects the largest household projection for an area based on known development areas and expected density and is generally indicative of a 60-100 year growth period.
- Population projections for 10 year incremental periods have been collated starting in 2021 and finishing in 2061 (i.e. 2021, 2031, 2041, 2051 and 2061).
- The residential projections collated for this project focus on the "connected" population to be serviced by wastewater infrastructure.
- Maximum growth capacity is informed by zones in District Plans and additional areas indicated in growth strategies, private plan changes and submissions to Proposed District Plans as at August 2020.
- Significant industrial facilities with private wastewater treatment systems and discharge consents (such as Fonterra Te Rapa, Hautapu and Te Awamutu Plants and Affco Horotiu) within the Metro Area are not included in the population equivalent or trade waste flows described in this memo.

3.1 Available data sources

The growth strategies and growth projection information available for the metro area are summarised in Table 3-1.

Table 3-1 Data sources

Available information	Description
Future Proof Strategy – Planning for Growth (November 2017)	Provides direction of the preferred development pattern for the metro area
Metro Spatial Plan (MSP)	The Metro Spatial Plan, currently under development, seeks to determine a shared 100+ year vision and spatial framework. The MSP is supported by several growth scenarios that spatially distribute a future 500,000 PE residential population across the Metro Area. The figures considered for this memo are based on the 70/30 scenario, i.e. 70% of the additional residential population growth occurring within or immediately adjacent to the future Hamilton City Boundary and 30% distributed across the other communities in the Metro Area.

Available information	Description
Waikato 2070 (May 2020)	Provides future residential and industrial development areas planned in the Waikato District Council for the 3,10 and 30 year time frames
Waipa 2050 Growth Strategy (November 2017)	Provides future residential and industrial development areas planned for the Waipa District to 2050
Hamilton Urban Growth Strategy 2010	Outlines growth cells for Hamilton City.
2013 Census data	The 2013 census data along with land use and economic information was used by NIDEA to develop growth projections at the Census area unit (CAU) level from 2021 to 2061.
2018 Census data	The 2018 Census data is not yet available in sufficient detail to update the NIDEA projections, however, it has been used by Waikato District Council and Hamilton City Council to re-baseline the 2016 NIDEA projections.
Land use, demographic and economic projections for the Waikato region, 2013 to 2063 (NIDEA 2016)	Provides household and population projections for the 2021 to 2061 time period for Waikato District Council, Hamilton City Council and Waipa District Council
Waipa Three Waters Master Plan – Growth Gateway 2019.	Provides baseline projections for Waipa District Council for 2025, 2035 and 2050 timeframes
Waikato Growth GIS model 2020	Provides breakdown of household and population growth projections and capacity for Waikato towns for period between 2021 and 2063.
HCC Growth GIS model 2020	Provides breakdown of household and population growth projections for Hamilton City Council area for period between 2021 and 2063.
Regional Infrastructure Technical Specifications (RITS)	Outlines design requirements for new infrastructure. Of particular relevance to this memo are the population equivalence assumptions included in the RITS for different land use activities.
HCC Wastewater Model and Master Plan V3 (WWMP) 2020	Provides population equivalent (PE) and flow forecasts for catchments in the HCC network for 2021-2081 and city full horizons.
Strategic agreement on future urban boundaries Between Hamilton City Council and Waikato District Council March 2005	Waikato District and Hamilton City Council have agreed to future boundary changes that will shift areas from Waikato District into Hamilton City jurisdiction. The strategic agreement sets out the specific areas, conditions and indicative dates for the boundary changes to occur.
Waikato Tainui Iwi Resilience Plan 2020	Includes development plan for Hopuhopu area including additional residential, commercial and recreational activities.
Future Proof Industrial Land study (GMD March 2020)	A study of industrial land demand vs capacity for the metro area.
Business Development Capacity Assessment 2017 (ME Consulting)	This study focuses on the non-residential development capacity within the urban environments of each of the partnership councils, as required by the NPS-UDC.

Available information	Description
HCC Non-Residential Water and Wastewater Design Flows Report (GHD 2017)	A review of flows and typical design allowances for non-residential demand.

4 Approach

The metro area compromises of communities located within Waipa District Council, Waikato District Council and Hamilton City Council (see Figure 1-1). Each council is responsible for developing future growth and capacity projections. However, the methodology for determining growth projections for each council varies and therefore it is important to document the assumptions taken for each council.

Available information sources were identified by each Council and growth projection and capacity information was provided to the project team. The information was reviewed and collated into a form suitable for use in the project and the proposed approach and assumptions were checked with Council staff.

4.1 Residential Growth Assumptions

The following table provides a more detailed description of the assumptions, sources and approach used by the Councils to supply the baseline and 10 year breakdown of residential growth between 2021 and 2061 and also how an 'ultimate' residential growth number was developed. Refer to section 7 for further details on limitations of residential growth projections.

Table 4-1 Sources and methodology – residential growth area assumptions

	Forecasts	Source	Approach	Limitations
Waikato District Council	Base Population	2018 Stats NZ Estimate (supported by actual dwelling counts)	Census Area Unit data resolved to property parcel level was used to calculate the community base population.	
	Forecasts for 2021 through to 2061	Rebased NIDEA (2016) using 2013 Base Stats NZ	NIDEA Midpoint household projection data provided was converted into population using a factor of 2.7 people per household. This data was provided by Waikato District Council - Mark Davey[1].	Information yet to be adopted by Waikato District Council
	Ultimate Forecasts	GIS capacity model, Waikato 2070	Total available household capacity from the GIS based household capacity model (2020) was used for the ultimate growth horizon with a factor of 2.7 people per household. Additional infill has been added to Ngaruawahia from the MSP projections provided by GMD Consultants – Susan Henderson[2].	Information yet to be adopted by Waikato District Council
Hamilton City Council	Base Population	2018 Stats NZ Estimate	Census Area Unit data resolved to property parcel level was used to calculate the community base population.	

[1] Email dated 12/08/2020

[2] Email dated 1/09/2020

	Forecasts	Source	Approach	Limitations
	Forecasts for 2021 through to 2061	Wastewater Master Plan V3 population equivalent projections for 2021-City Full	Detailed population equivalent projections for each wastewater catchment were prepared for the wastewater model V3. PE data was based on the Hamilton City NIDEA 2016 Population projections, with further modelling completed to spatially allocate the residential and non-residential demands across the city, given planning provisions and infrastructure programmes available at the time. Information provided by Hamilton City Council - Manjit Devgun[3]. This is the primary source of information to be used for the DBC infrastructure sizing. Additional infill has been added to the PE projections 2031-2061 from the MSP projections provided by GMD Consultants – Susan Henderson[4] (see Section 6). This covers the key nodes of Hamilton CBD, Te Rapa (The Base), Frankton, Chartwell, Fairfield and the University. NIDEA 2020 Information provided by Hamilton City Council - Nathan Dalgety[5] has been provided in Table 5-1 for comparison with similar data from Waipa and Waikato Districts but will not be used for technical work as the population equivalent information is considered more suitable for infrastructure sizing.	For the 2021/31 LTP, a new set of population projections has been completed, which are referred to as NIDEA 2020. These projections overall are still very similar to the NIDEA 2016 projections; however some adjustments have been made to net migration in the short term due to the Covid related border closures. Additionally, the NIDEA 2020 projections have been rebased to 2019 Population Estimates for Hamilton City. With the additional MSP infill data included the HCC population trend is more consistent with the medium NIDEA projection.

[3] Email dated 11/8/2020

[4] Email dated 1/09/2020

[5] Email dated 21/7/2020

	Forecasts	Source	Approach	Limitations
	Ultimate Forecasts	Metro Spatial Plan	Indicative ultimate population has been sourced from the Metro Spatial Plan work stream population projections July 2020, and City Full Projections from WWMP V3 (2020). Additional infill has been added to Hamilton ultimate forecast from the MSP projections provided by GMD Consultants – Susan Henderson[6] (see Section 6).	Southern Links and area east of Ruakura are not specifically included in the Metro Spatial Plan estimates.
Waipa District Council	Base population	Waipa Three Waters Master Plan Growth Gateway 2019. Statistics New Zealand 2013 Census Data	The population forecasting predictions for Waipa have been based on an analysis carried out for the Waipa Three Waters Master Plan in 2019.Statistics New Zealand 2013 Census Data was adopted as the starting population estimation for each growth area.	
	Forecasts for 2021 through to 2061	NIDEA 2016 Growth Cell Timing Spreadsheet (provided by WDC, 2019)	NIDEA Population mid-point projections were used to predict population growth to 2021. GIS Information was used to determine the proportion of dwellings that are connected to the network. Growth Cell Timing Spreadsheet (provided by Waipa District Council, 2019) was used to assign growth cell population projections to the 2025, 2035 and 2050 horizons.	Limited infill allowed for reflecting historical trends. Infill allowances consistent with projections in MSP.
	Ultimate Forecasts	Waipa Three Waters Master Plan Growth Gateway 2019	Maximum probable growth for each community was calculated using a sensitivity analysis considering infill, density of new growth cells and potential additional growth cells.	

[6] Email dated 1/09/2020

4.2 Non-residential growth assumptions

Demand projections and available capacity for industrial land are outlined in the Future Proof Industrial Land study (GMD Consultants March 2020). Demand projections for the 2020-30 and 2020-50 periods are based on projections developed in the Business Development Capacity Assessment 2017 (ME Consultants). A summary of the available industrial demand and capacity information from the study is provided in Table 4-2.

Table 4-2 Industrial demand and capacity in the metro area

Location	Industrial demand 2020-2030 ha	Industrial demand 2020-2050 ha	Capacity in current zones (incl deferred) ha
Ngaruawahia/ Hopuhopu	4.1	10.1	39
Taupiri/Horotiu/ Te Kowhai	44.3	102	194
Hamilton	318	524	659
Airport	6.4	16.7	104
Cambridge	26.5	71.9	205
Te Awamutu	12	27.5	49
Total	411.3	752.2	1250

For the metro area as a whole there is expected demand for 411 hectares of industrial land over the next 10 years, increasing to 752 hectares over the next 30 years. There is current capacity of 1,250 hectares indicating that there is enough land capacity to facilitate the demand for industrial growth in the metro area. There are also additional non-residential growth areas identified in Waikato 2070 and Waipa 2050 in Taupiri, Hopuhopu, Horotiu and at the Airport. More detailed capacity and timing information for non-residential areas is required to inform the long and short list options development. Available information for individual non-residential growth cells and additional areas in Waipa and Waikato Districts has been collated in **Table 4-3**. The locations of non-residential growth areas are shown in Figure 4-1 with more detail for small townships in Appendix 1.

The current zone and potential additional areas in Table 4-3 will be used to estimate new non-residential flows (using the population equivalent factor) assuming all non-residential growth cells and additional areas will be serviced and developed. This may result in an over-provision of infrastructure capacity for some areas.

Table 4-3 Non-residential growth area assumptions

Location	Type of development	Current zoned (incl deferred) ha	Potential additional areas ha	Recommended PE/ha	Comments/Expected Timing
Taupiri	Light Commercial		150	30	West 3-10 yrs, East 10-30 yrs
Te Kowhai Airpark	Mixed use	45		30	3-10 yrs
Hopuhopu Business Park	Commercial/light industrial		35	45	10-30 yrs
Waikato Tainui - Hopuhopu	Mixed use		24	Varies (PE estimate provided[7])	1-30 years
Horotiu	Light Industrial/ logistics	194	50	30	3-10 years
Te Rapa North	Industrial		As per WWMP		As per WWMP
Rotokauri	Light Industrial				
Ruakura	Light Industrial/ logistics				
Tamahere[8]	Business zone	8.5		30	1-10 years.
Matangi	Commerical/light industrial	5		30	1-10 years.
Airport	Light Industrial	153	100	45	Titanium Park, Meridian 37 by 2035, Montgomery block to 2050, Northern extension post 2050
Cambridge - Hautapu	Industrial	197		45	Small area currently under development, remainder by 2050
Te Awamutu	Light industrial and commercial	37		45	Bond Rd and Paterangi Rd developed by 2030

[7] Email Jackie Colliar 12/8/20

[8] Waikato District Council S92 Report Tamahere Business Zone 2018

At present, the Metro Area local authorities do not specifically plan for or design infrastructure to include capacity for new wet industrial (or high water use) activities. This project, alongside relevant landuse planning projects provides an opportunity to implement more integrated and considered infrastructure planning approaches.

While the portion of non-residential land capacity which will be allocated to wet industries is uncertain, on an area basis it is expected to be small. The servicing of new high water users (wet industry) will be partly limited by water allocation and water treatment plant/network capacity, rather than land capacity unless there are changes to the allocation regime under the Waikato Regional Plan. There are a number of known future trade waste discharges that have been approved and are included as part of the based PE flow estimates as outlined in Table 4-4.

Table 4-4 New trade waste discharge assumptions

Location	Type of development	Additional Wet Industry/trade waste Allowance m^3/d
Dairy industry new site Hamilton	Industrial	2,160
Innovation park	Science and technology	400
Waikeria/Tokanui	Corrections facility/ residential discharge	700

As part of developing these recommendations, relevant staff from HCC, Waikato DC, Waipa DC and Waikato Tainui discussed and reached consensus on reasonable locations to assume (and provide for) new wet industrial activity may be concentrated:

- Te Rapa North
- Ruakura
- Airport
- Near the existing Cambridge WWTP

Table 4-5 outlines the current industrial flow allowance for these areas through to 2061 using the RITS standard allowances. The HCC Non-Residential Water and Wastewater Design Flows Report (GHD 2017) shows that there is a wide variety of flows and population equivalents (PE) from non-residential sources. The key type of activity that would impact the wastewater system is food processing industries which have a typical flow rate of 4L/s/ha (in a 24hr operation this is 346 m^3/day).

Many different approaches can be taken to estimate potential flows from wet industrial activity. For the purpose of this DBC it is recommended that high water use activities are assumed for 2% of total land area allocated for industrial activities as part of the base growth projection assessments. A sensitivity assessment assuming no specific wet industry provision will also be completed to quantify the impact on infrastructure sizing (and timing) associated with the proposed wet industry allowances. The additional wet industry PE and flow allowances are shown in Table 4-5.

Table 4-5 New Wet Industry growth area assumptions

Location	Type of development	Indicative area (incl deferred and non-zoned) ha	Base Industrial Flow allowance* m^3/d	Base Industrial Flow PE/ha	Additional Wet Industry Allowance m^3/d	Additional Wet Industry PE	Total Industrial flow allowance **m^3/d**
Horotiu	Light Industrial/ logistics	194	931	30	1341	6,705	2,272
Te Rapa North	Industrial	60	432	45	415	2,074	847
Ruakura	General Industrial	225	1,620	45	1,555	7,776	3,175
Airport	Light industrial	253	1,822	45	1749	8,744	3,570
Cambridge (near WWTP)	Industrial	23	165	45	159	795	325

The following assumptions for new non-residential areas are recommended:

- For Waikato and Waipa Districts, non-residential growth will be based on the areas in Table 4-3 spread over expected development timeframes and the population equivalent (PE) factor outlined above.
- For Hamilton City, non-residential growth information has been incorporated into the PE forecasts for the Wastewater Master Plan V3 as outlined in Section 6.
- Existing and known future trade waste/wet industry discharges will be included in the wastewater flow and load projections.
- 45 population equivalent per hectare is used per additional hectare of industrial activity as per the RITS unless a different population equivalent is outlined in the table above. Gross areas will be corrected for non-usable areas such as transport corridors based on structure plans where available.
- For areas where wet industry is preferred to occur, an additional flow/load allowance based on 2% of the area used for food processing type wet industry will be assumed. This results in approximately double the flow compared to the standard industrial flow allowances.

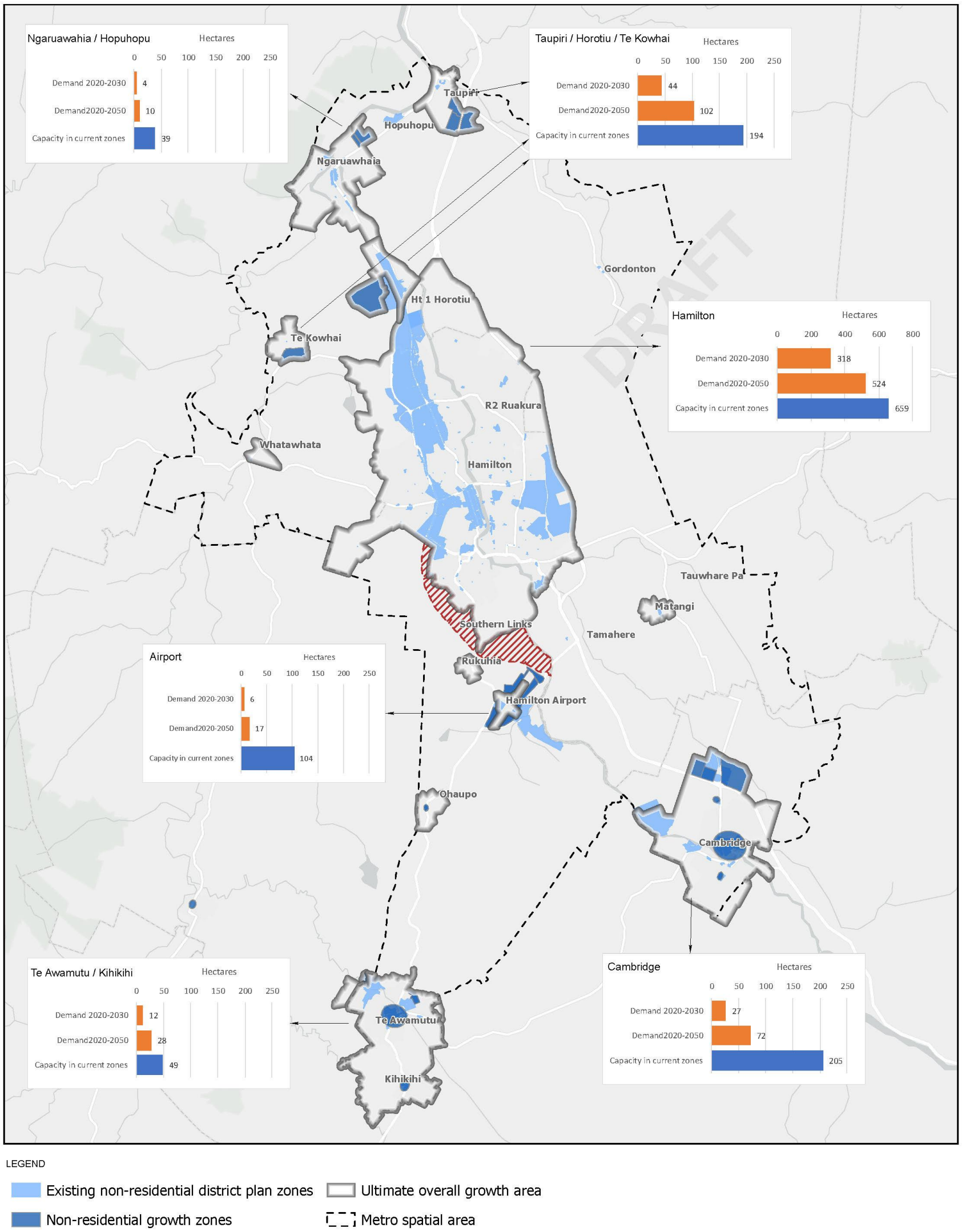


Figure 4-1 Metro Area non-residential growth areas

5 Metro Area Growth

Table 5-1 provides a summary of the residential growth expected for each of the communities in the metro area and the proposed future servicing approach.

Figure 5-1 highlights the areas of residential growth expected within the region and the corresponding population within each area. The figure also highlights the WA, HT1 and R2 areas as preferred longer term areas for residential growth. These are currently outside the current Hamilton City boundary but an agreement is in place with Waikato District for future boundary changes to bring these areas into HCC jurisdiction when specific criteria are met (see Table 3-1).

The Southern Links area and area east of Ruakura are other "Possible Areas" that may be identified for future development. Some discussions have occurred between HCC and Waipa DC around the Southern Links Area.

Residential growth information from the Metro Spatial Plan workstream is provided in Table 5-1 as a comparison with the ultimate forecasts based on capacity information for Waikato and Waipa Districts. The ultimate forecasts for Hamilton City are based on the Metro Spatial Plan information. It is proposed to use the ultimate capacity to inform footprint requirements for new infrastructure only as part of the DBC.

All urban areas will be serviced. Rural residential lots adjacent to towns are currently not serviced for wastewater and this is proposed to continue. Te Kowhai currently has a mixture of on-site (privately serviced) and publicly serviced properties, however, the proposed District Plan signals that Te Kowhai growth areas have the potential for more dense development which would require servicing. It is recommended that Ohaupo, Matangi township and Tamahere commercial flows are included in the wastewater servicing area due to the sensitive environment associated with the peat lakes at Ohaupo and difficult soil conditions in Matangi/Tamahere areas. Little growth is expected in Gordonton, Pirongia and Whatawhata so there would be little benefit in servicing these areas. Rukuhia is a very small community but servicing could be considered in future. Servicing of Tauwhare Pa will continue.

Table 5-1 Metro area residential growth summary

				Residential population projection						
	Area	Current servicing	Future Servicing	2021	2031	2041	2051	2061	Ultimate	MSP (for comparison only)
Waikato District Council	Taupiri	Currently serviced	Yes	2,062	2,776	3,167	3,391	3,656	4,800	
	Ngaruawahia (incl Hopuhopu)	Currently serviced	Yes	6,234	7,277	7,975	8,392	9,892	19,867	28,893 (covers larger area)
	Horotiu	Currently serviced	Yes	650	1,015	1,229	1,436	1,596	1,596	5,468
	Te Kowhai	Small part of township serviced	Yes all new development and existing township post 2030	2,079	2,265	2,649	3,059	3,335	5,670	1,173
	Matangi	Township only serviced	Yes, continue existing township only and include existing commercial area	149	149	149	149	149	711	711
	Whatawhata[9]	Not currently serviced	No	3,092	3,310	3,713	4,136	4,455	4,455	

[9] Large lot or houses in "Country living zone" which are currently serviced by onsite wastewater treatment facilities.

	Area	Current servicing	Future Servicing	Residential population projection						MSP (for comparison only)
				2021	2031	2041	2051	2061	Ultimate	
	Gordonton	Not currently serviced	No	103	103	103	103	103	103	
	Tauwhare Pa	Yes, Pa only	Yes, Pa only (allowance for 100 extra houses in ultimate)	119	619[10]	619	619	619	889	
	Tamahere Country Living Zone[11]	Not currently serviced	No, note servicing of Tamahere commercial area see Table 4-3	5,808	5,908	6,156	6,469	6,637	6,637	
Hamilton City Council	Hamilton	Currently serviced	Yes (includes R2, HT1 and Southern Links)	171,606	194,186	219,737	234,194	248,650	380,000	MSP used for ultimate
	Additional area - East of expressway	Not currently serviced	Yes post 2061						30,000	

[10] Allowance for extra Papakainga housing – 50 houses at 10 person per house occupancy

[11] Large lot or houses in "Country living zone" which are currently serviced by onsite wastewater treatment facilities.

	Area	Current servicing	Future Servicing	Residential population projection						
				2021	2031	2041	2051	2061	Ultimate	MSP (for comparison only)
Waipa District Council	Ohaupo	Not currently serviced	Yes post 2051	547	630	814	1,025	1,031	1,100	720
	Rukuhia	Not currently serviced	No						300	
	Cambridge (incl Hautapu and Karapiro)	Currently serviced	Yes (excluding large lot residential)	20,520	28,311	30,543	33,005	35,144	47,762	39,151
	Te Awamutu & Kihikihi	Currently serviced	Yes (excluding large lot residential)	17,488	19,157	22,073	26,150	27,169	33,179	33,848
	Pirongia	Not currently serviced	No	1,575	1,575	1,575	1,575	1,575	1,698	

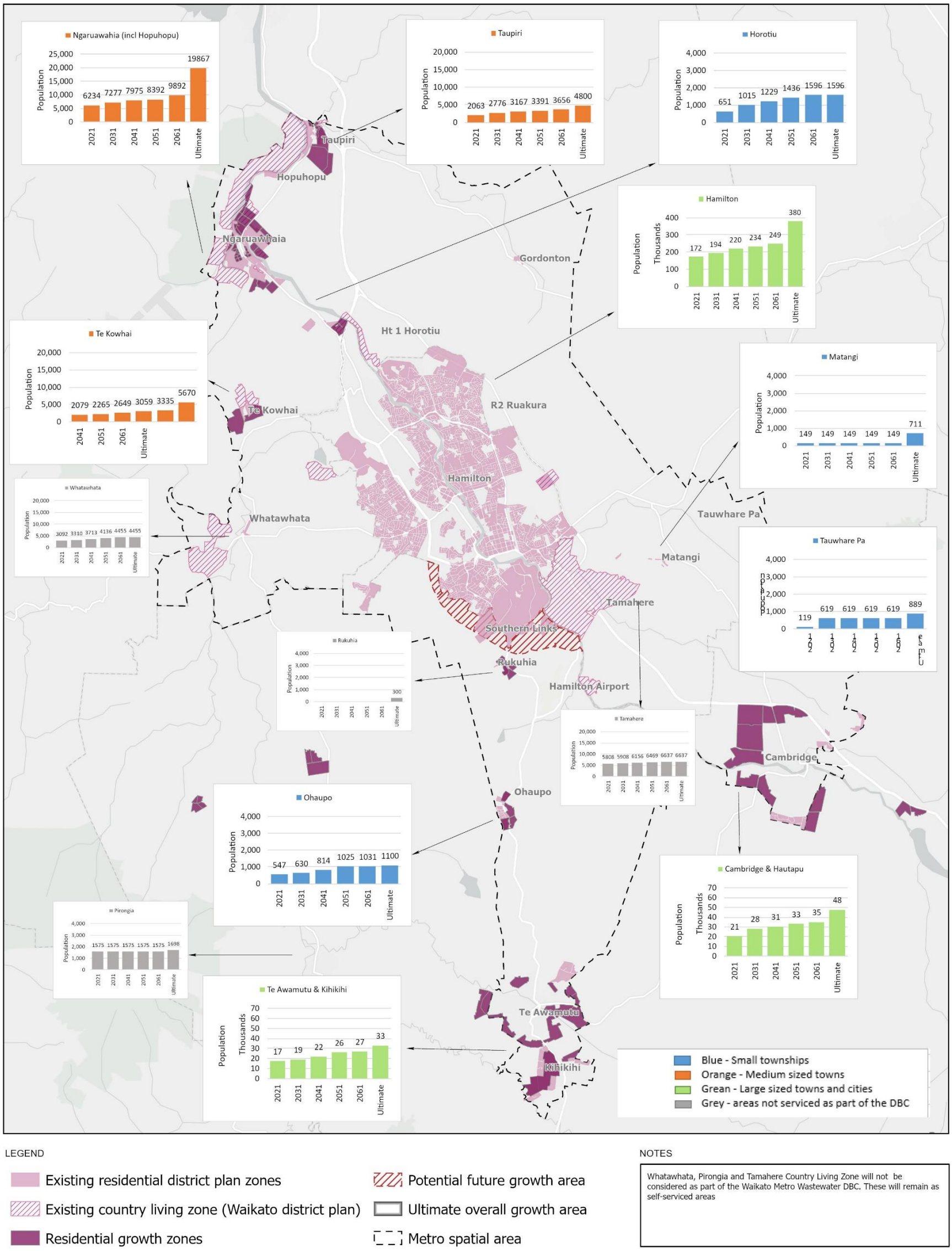


Figure 5-1 Metro Area residential growth

6 Hamilton City Growth

A more detailed breakdown of population equivalent projections was developed for the Hamilton wastewater network model V3 and are recommended for the DBC. Population equivalent includes both residential, commercial and industrial inputs and is available for the main growth cells and infill locations within Hamilton (see Table 6-1).

Figure 6-1 shows where the growth cells are located and the growth expected over time. This information will be used to determine which areas could potentially be diverted to a southern sub-regional WWTP and what flows would continue to be treated at Pukete WWTP. The areas marked * are currently outside the Hamilton City boundary but are subject to an agreement with Waikato District Council regarding future transfer to the city. A detailed breakdown is provided in Appendix 2.

Table 6-1 Hamilton City population equivalent growth breakdown

Growth Cell	2021	2031	2041	2051	2061	City Full
Te Rapa North	1,167	9,073	9,677	10,280	10,884	15,898
Ruakura	6,816	10,127	13,965	17,014	25,697	28,769
Peacockes	1,346	6,532	14,161	18,648	25,489	25,607
Templeview	2,031	2,681	3,550	4,419	5,289	15,860
Rotokauri	2,897	9,129	9,567	19,913	21,570	31,624
Te Rapa	13,892	15,003	15,993	17,290	19,168	39,698
Rototuna	10,433	15,165	15,068	14,972	14,875	15,284
WA*	0	0	0	0	0	1,000
HT1*	0	0	0	8,398	16,796	33,591
R2*	179	179	179	4,725	9,450	9,450
East of Ruakura						30,000
MSP Additional Infill		2,311	6,934	11,557	16,180	72,278
Brownfield	217,377	231,480	239,636	253,447	254,244	339,475

The PE figures for Hamilton City, detailed in Table 6-1 do not include population equivalents for the existing trade waste discharges. The population equivalent figures for Hamilton City do include allowances for schools, hospitals, additional flow within the Ruakura Growth Cell and other existing and planned commercial and industrial activities (not specifically listed in the trade waste discharge list) within the city. The infill nodes in the MSP are outlined in Figure 6-2. The current Hamilton trade waste dischargers are shown in Figure 6-3.

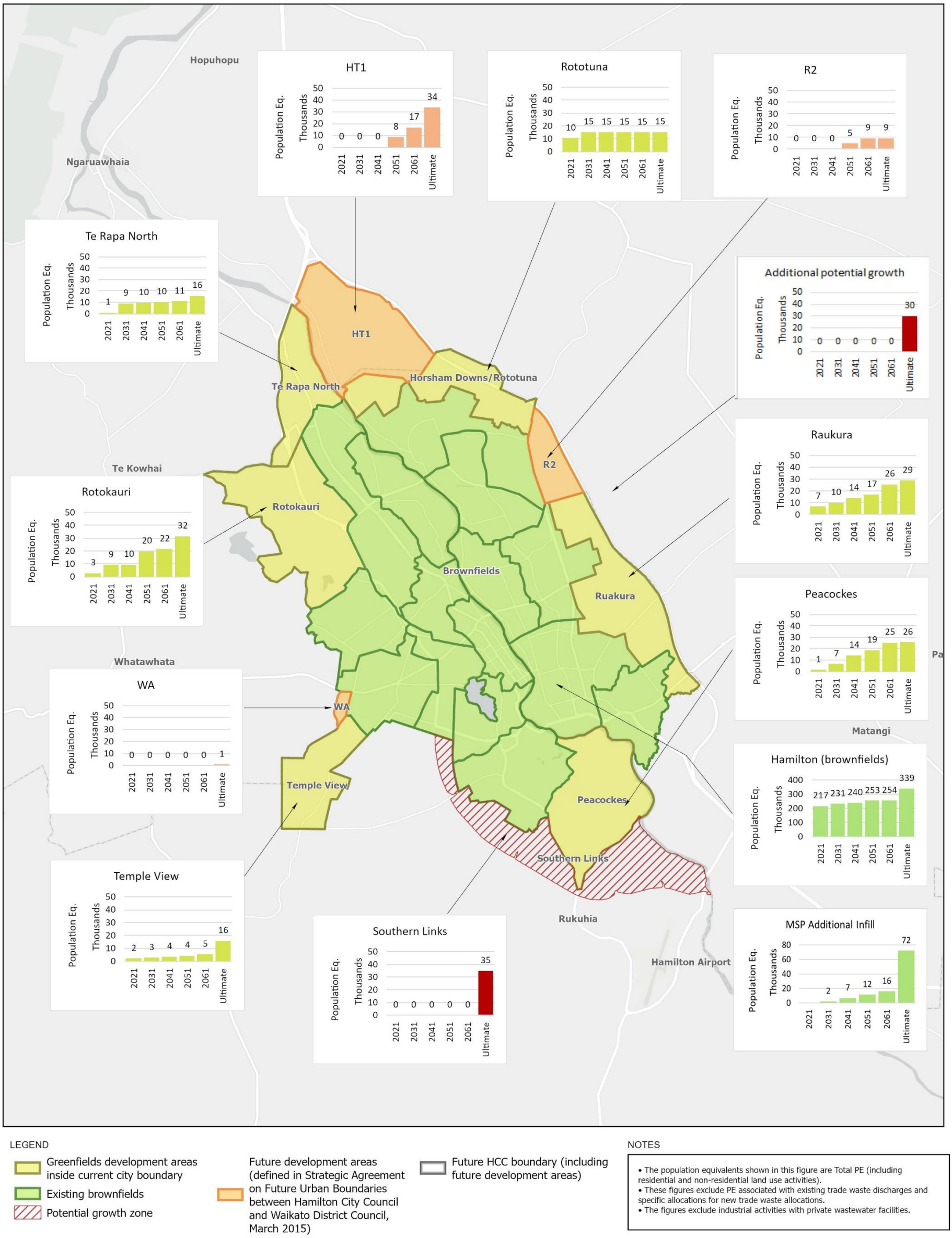


Figure 6-1 Hamilton City growth breakdown

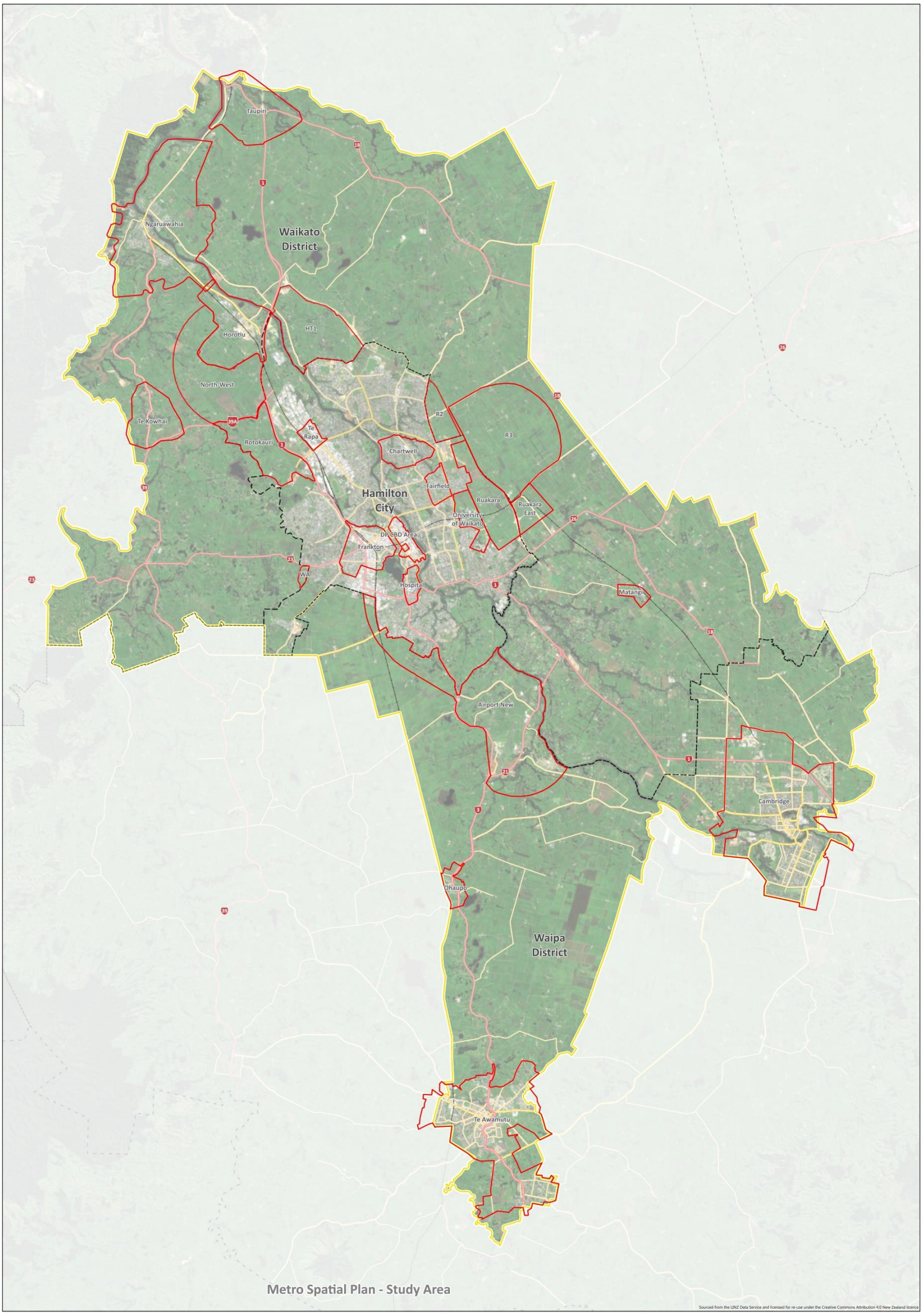


Figure 6-2 MSP Nodes

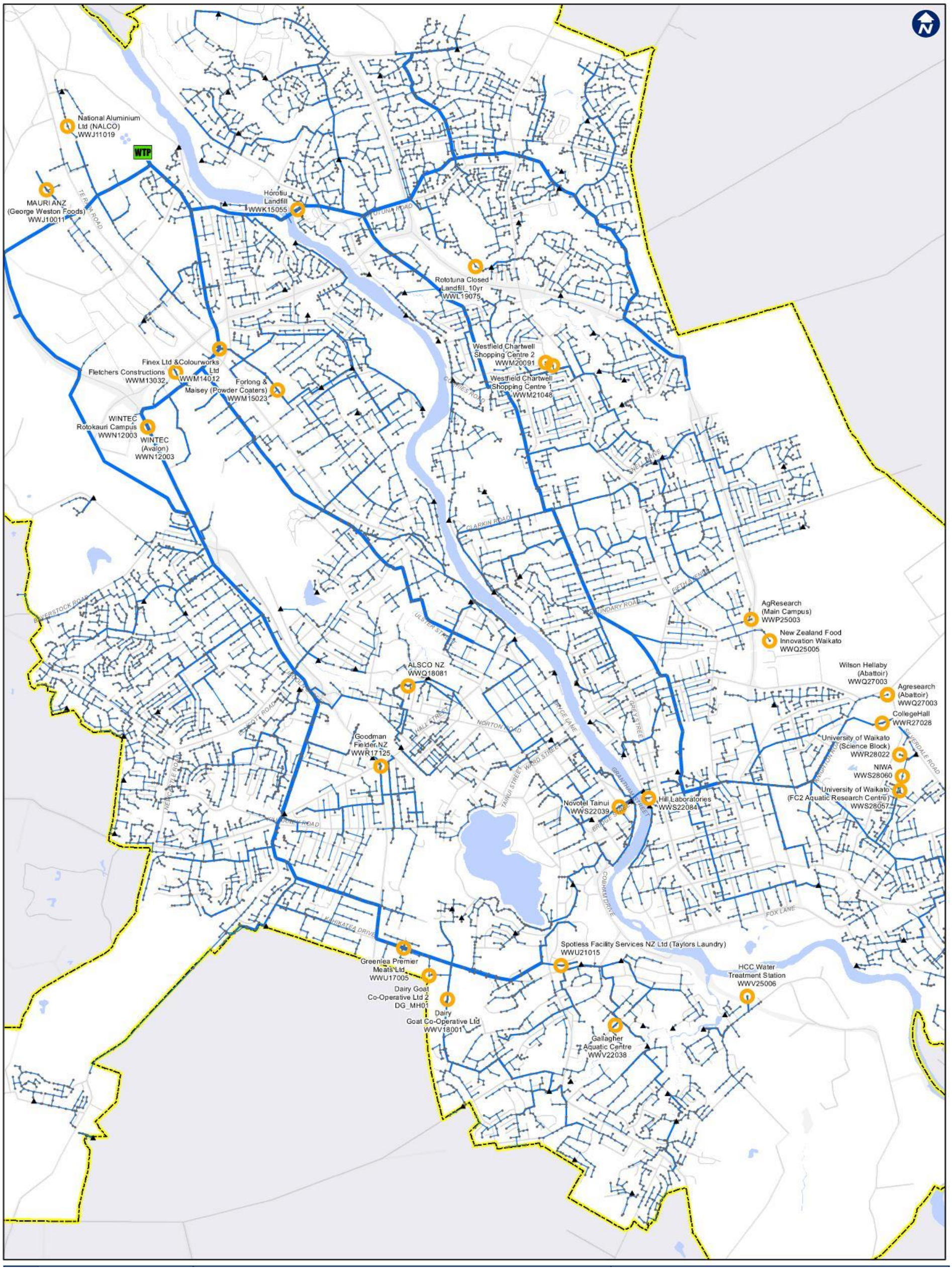


Figure 6-3 Hamilton City Trade Waste Discharges (Aecom 2016)

7 Limitations

Waipa and Waikato District residential growth projections are based on the mid-point NIDEA projections while Hamilton City growth projections are based on the low projection with additional allowance for infill under the Hamilton Waikato Metro Spatial Plan.[12]

The assumptions are consistent with those being used to inform Master Plans and Activity Management Plans (AMPs) feeding into the 2021-2031 Long Term Plans. If residential growth occurs faster than expected, infrastructure upgrades would need to be bought forward. Sensitivity analysis for growth projections will therefore be undertaken for the preferred southern option.

Development of non-residential zones is highly dependent on economic and transport factors. New wet industries in the area are likely to be relatively small scale given the limited water allocation available under current water take consents. Different industries have varying flow profiles and population equivalents. Using the RITS design basis for new non-residential growth cells is consistent with wastewater network modelling methodology. However it is acknowledged that the RITS approach does not adequately capture flows that may be associated with medium or high water use activities and therefore some specific additional provisions are included in the recommended growth figures to be adopted for the DBC. The total non-residential capacity, including the additional areas identified in Waikato 2070, appears to be in excess of expected demand, however, infrastructure will need to be capable of servicing these areas if they could be developed. Additional sensitivity analysis will be carried out at the preferred option stage to confirm the capacity allowance for non-residential areas.

NIDEA household/population projections will be reviewed once full 2018 Census data is available and updated forecasts are expected to be available mid-2021. A staged approach to providing wastewater infrastructure capacity will provide flexibility to adapt if population growth rates change.

COVID-19 – effects on growth projections for the Waikato are expected to be short-term.

Calibrated network models are available for all main serviced areas. These models provide peak flow information and population equivalent data for different catchments. The network models allow for the impact of climate change on peak flows which will be considered during conveyance design. Wastewater treatment plant design for the metro long list stage will be based on average daily flow which is less influenced by climate change.

At the preferred southern option stage, sensitivity analysis is proposed to further investigate how changes in growth affect infrastructure sizing and staging. This will involve estimating expected upper and lower ranges for:

- Infill growth,
- greenfield residential growth,
- industrial/commercial growth and
- wet industry activity (quantity and composition).

[12] **"For Hamilton City, the low NIDEA forecast in 2060 is 226,000, and the medium forecast is 259,000, a difference of 33,000. The DBC has adopted the low NIDEA population forecast of 226,000, with additional allowance for infill of 18,000 in 2060 (and 72,000 for the city full scenario), giving a total of 244,000. The difference between this adopted forecast and the medium NIDEA forecast is relatively minor."**

Once the likely lower and upper flows and loads are calculated, impacts on infrastructure sizing and operations can be assessed.

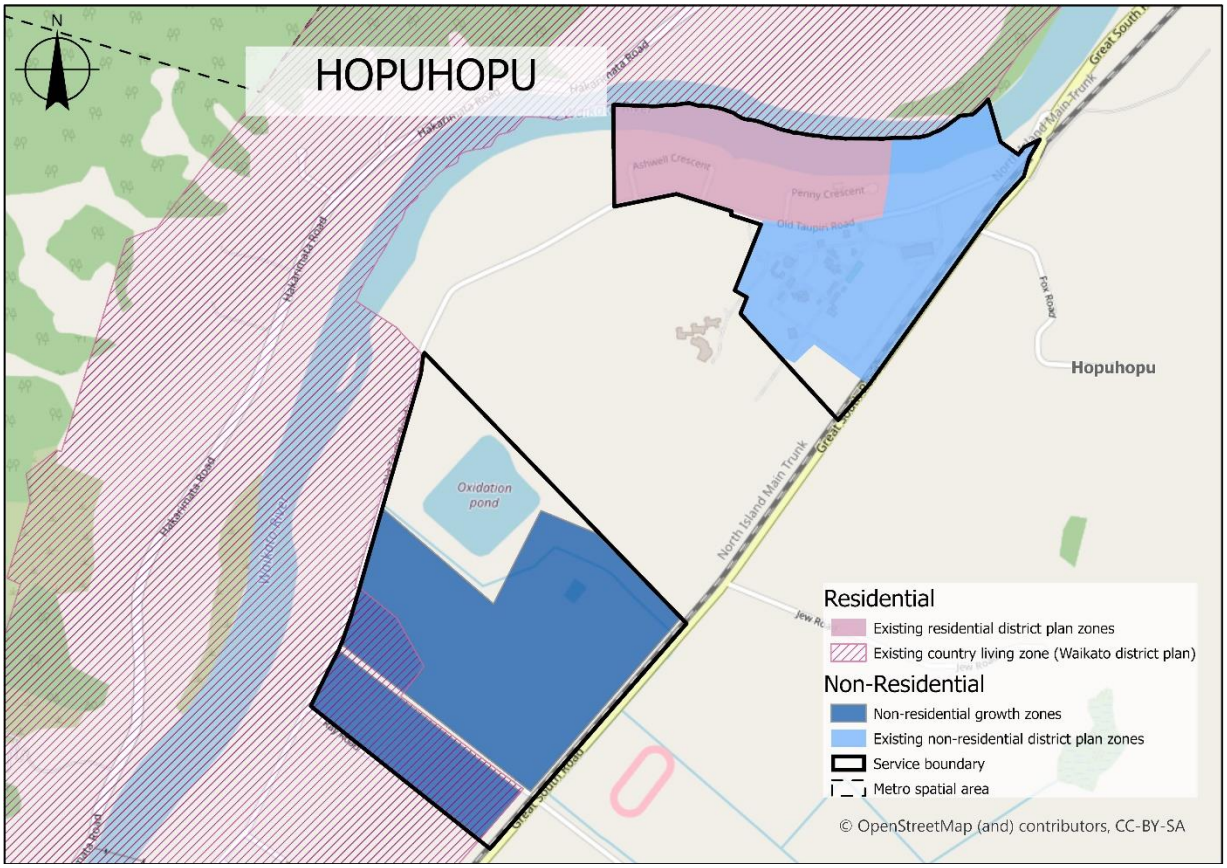
8 Recommendation

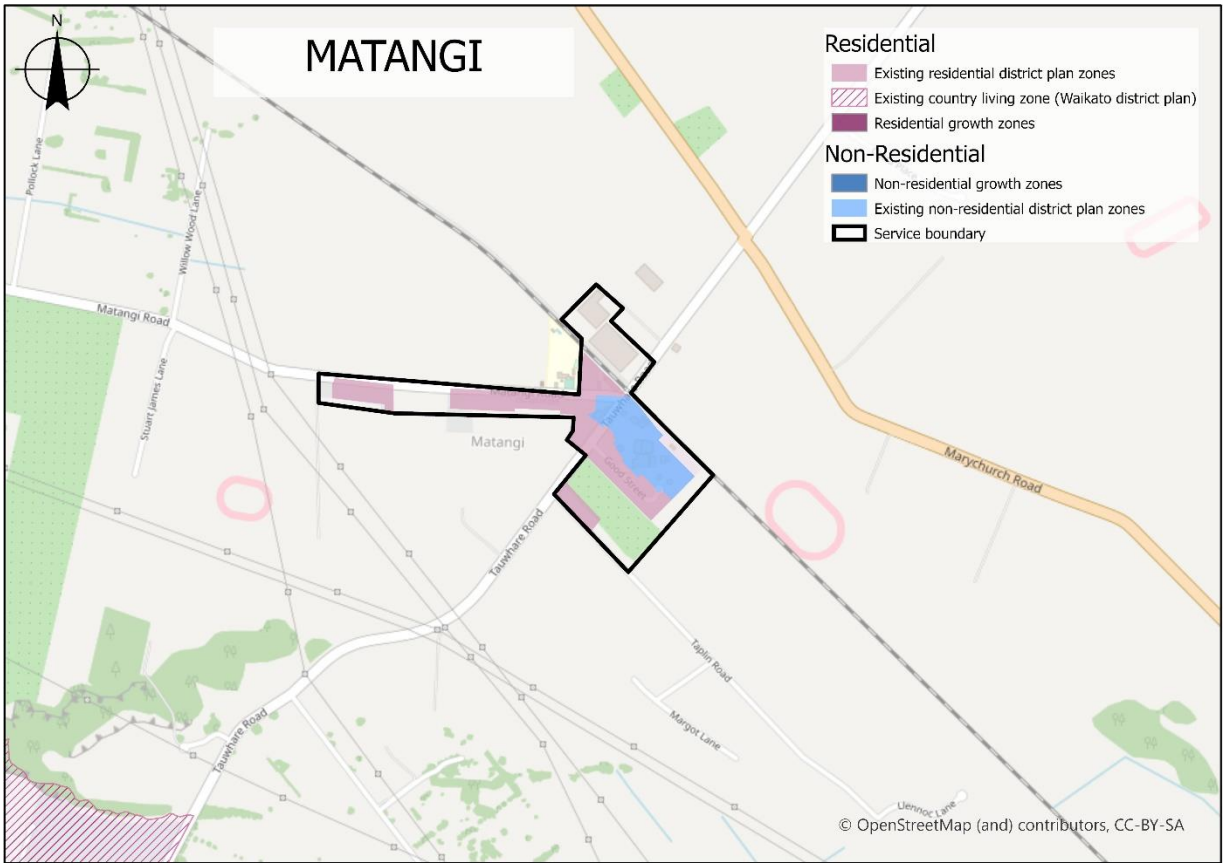
It is recommended that the residential and non-residential servicing and growth assumptions outlined in Tables 4-3, 4-4, 4-5, 5-1, and 6-1 of this technical note are used for the metro wastewater DBC long list and southern short list stages.

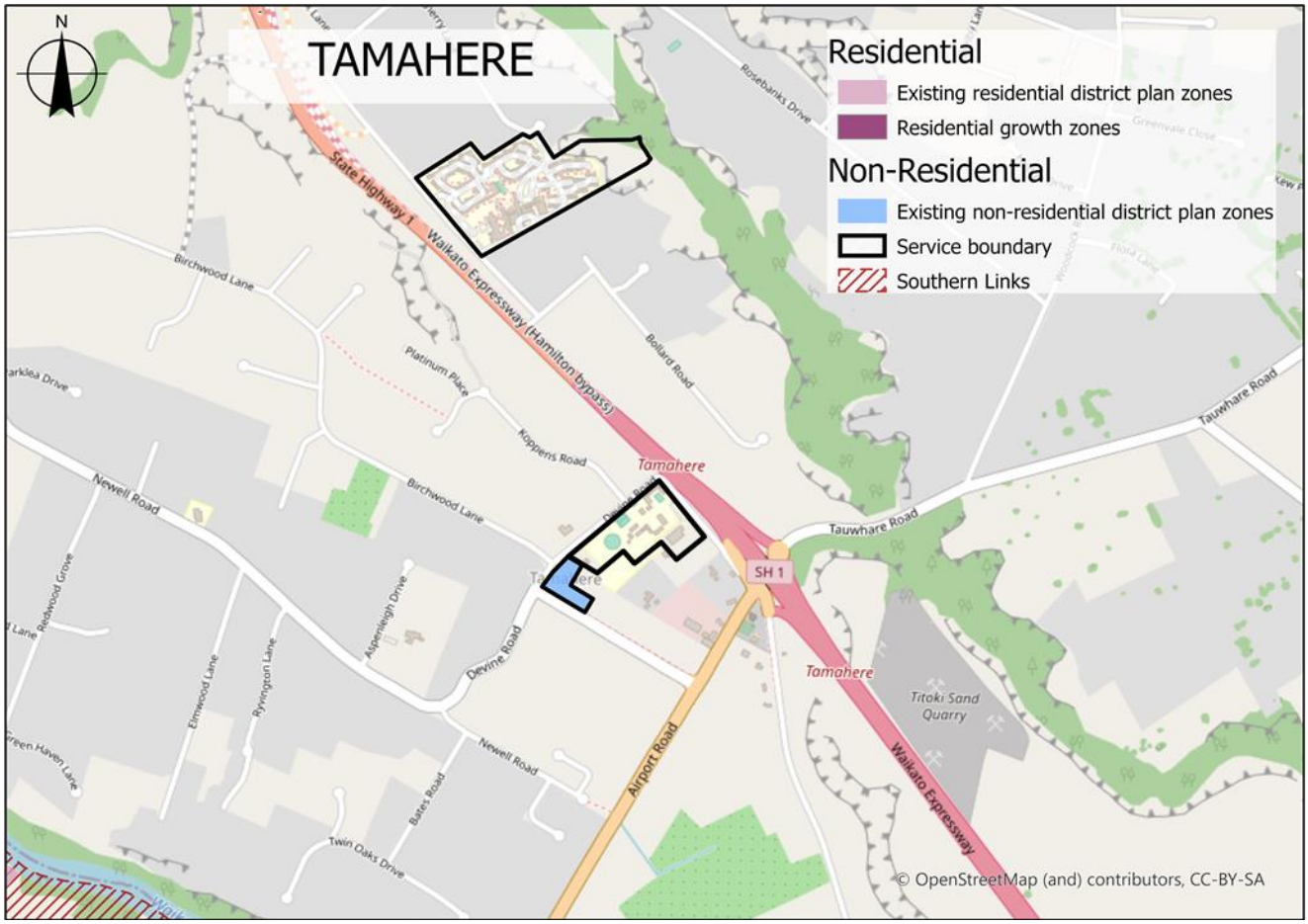
Version Control

Version	Author		Reviewer	Approver
Draft v2	Claire Scrimgeour/ Kate Jackson	13/8/2020	Rob Brodnax	Sioban Hartwell
Draft v3	Claire Scrimgeour/ Kate Jackson	14/8/2020	Rob Brodnax	Sioban Hartwell
Final	Claire Scrimgeour/ Kate Jackson	28/9/2020	Rob Brodnax	Sioban Hartwell
Updated Final	Claire Scrimgeour/ Kate Jackson	5/10/2020	Rob Brodnax	Sioban Hartwell
Final V3	Claire Scrimgeour	10/12/2020	Rob Brodnax	Sioban Hartwell

Appendix 1 – Small towns growth areas



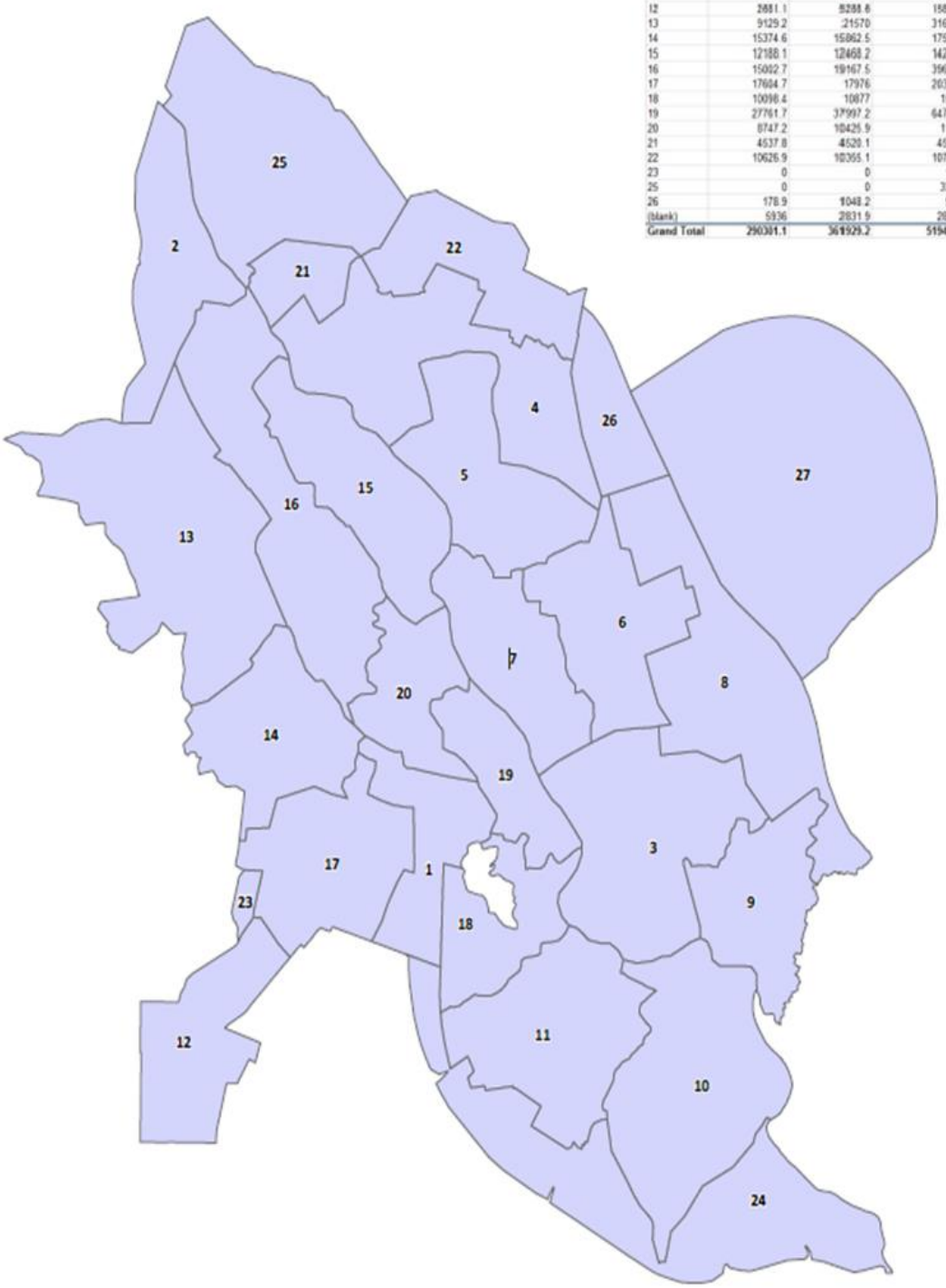



TAMAHERE
N
Residential
Existing residential district plan zones
Residential growth zones
Non-Residential
Existing non-residential district plan zones
Service boundary
Southern Links
State Highway 1
Waikato Expressway (Hamilton bypass)
Birchwood Lane
Platinum Place
Bollard Road
Koppens Road
Tamahere
Newell Road
Tauwhare Road
SH 1
Redwood Grove
Aspenleigh Drive
Devine Road
Elmwood Lane
Ryrington Lane
Airport Road
Titoki Sand Quarry
Waikato Expressway
Twin Oaks Drive
Batet Road
© OpenStreetMap (and) contributors, CC-BY-SA

Appendix 2 – Hamilton Population Equivalent Forecast by Area

Area	PE_2021	PE_2031	*PE_2041*	*PE_2051*	PE_2061	City Full
1	7,567	8,118	*8,690*	*9,283*	9,958	20,222
2	1,167	9,073	*9,677*	*10,280*	10,884	15,898
3	24,730	25,020	*24,786*	*25,373*	24,658	28,584
4	21,763	21,928	*20,622*	*21,720*	21,002	23,301
5	11,996	11,943	*11,843*	*12,087*	11,824	14,107
6	15,637	16,318	*16,606*	*16,894*	17,182	18,814
7	10,958	11,589	*12,091*	*12,715*	12,488	14,506
8	6,816	10,127	*13,965*	*17,014*	25,697	28,769
9	11,371	11,967	*13,178*	*15,084*	13,276	15,562
10	1,346	6,532	*14,161*	*18,648*	25,489	25,607
11	16,913	17,820	*18,409*	*19,720*	19,081	20,732
12	2,031	2,681	*3,550*	*4,419*	5,289	15,860
13	2,897	9,129	*9,567*	*19,913*	21,570	31,624
14	15,181	15,375	*15,537*	*15,700*	15,863	17,546
15	11,940	12,188	*12,406*	*12,413*	12,468	14,283
16	13,892	15,003	*15,993*	*17,290*	19,168	39,698
17	16,181	17,605	*17,728*	*17,852*	17,976	20,349
18	9,238	10,098	*10,358*	*10,617*	10,877	15,022
19	21,625	27,762	*32,271*	*36,655*	37,997	64,800
20	8,386	8,747	*9,118*	*10,042*	10,426	11,951
21	3,464	4,538	*4,532*	*4,526*	4,520	4,547
22	6,969	10,627	*10,536*	*10,446*	10,355	10,737
23	0	0	*0*	*0*	0	1,000
25	0	0	*0*	*8,398*	16,796	33,591
26	179	179	179	*4,725*	9,450	9,450

Identifier	Sum of PE_2031	Sum of PE_2061	Sum of PE_CityFul
1	8118.4	9958	20222
2	9072.9	10884.2	15898
3	25019.8	24657.9	28584.3
4	21927.7	21002.2	23300.6
5	11942.5	11824.4	14107
6	16317.9	17182.2	18813.7
7	11589.2	12488.2	14506.1
8	10126.7	25697.3	28769
9	11967	13276	15661.5
10	6631.8	25489.4	25606.6
11	17819.9	19081.2	20731.5
12	2881.1	5288.8	15880.1
13	9129.2	21570	31624.4
14	15374.6	15862.5	17546.2
15	12188.1	12468.2	14283.2
16	15002.7	19167.5	39697.6
17	17604.7	17976	20348.9
18	10098.4	10877	15022
19	27761.7	37997.2	64799.8
20	8747.2	10425.9	11951
21	4537.8	4520.1	4546.7
22	10626.9	10355.1	10737.1
23	0	0	1000
25	0	0	33591
26	178.9	1048.2	9450
(blank)	5936	2831.9	2848.8
Grand Total	290301.1	361929.2	519487.1



Appendix B – Longlist MCA stakeholder workshop minutes

WAIKATO METRO WASTEWATER DETAILED BUSINESS CASE WORKSHOP / MEETING RECORD		
Time & Date	9am - 1pm, 24th September 2020	
Venue	Bill Gallagher Room 1, WINTEC City Campus	
Attendees	Rae Simpson	Hamilton City Council (HCC)
	Manjit Devgun	HCC
	Evan Vaughters	HCC
	Parvati Patel	HCC
	Sven Erikson	HCC
	Thom Bamford	Fonterra (via Zoom)
	Poto Davies	Ngati Koroki Kahukura
	Sonny Matenga	Te Haa o te Whenua o Kirikiriroa (THAWK) – Ngati Tamainupo
	Piripi Matika	THAWK – Ngati Wairere
	Harry Wilson	THAWK – Ngati Koroki Kahukura
	Sonny Karena	THAWK (Chair) – Ngati Haua
	Te Raumako Karena	THAWK – Ngati Haua
	Atutahi Riki	THAWK – Ngati Mahanga
	Sonny Matenga	THAWK – Ngati Tamainupo
	Raiha Gray	THAWK – Ngati Mahanga
	Rangitionga Kaukau	THAWK – Ngati Haua
	Milton Ngaruhe	THAWK – Ngati Mahanga
	Rawiri Bidois	THAWK - Manager
	Hone Thompson	Te Hauora o Ngati Haua
	Vishal Ramduny	Waikato District Council =
	Julian Williams	Waikato River Authority
	Mark Tamura	Waikato Regional Council
	Maanaki Nepia	Waikato Tainui
	Wikitoria Tane	Waikato Tainui
	Marie McIntyre	Waipa District Council
	Martin Mould	Waipa DC
Project Team Advisors, consultants	Peter Winder	Project Director
	Jackie Colliar	Project Manager
	Tipene Wilson	Facilitator - Maximize
	Kate Jackson	Technical Advisor - GHD
	Claire Scrimgeour	Technical Advisor - Beca
	John Crawford	Technical Advisor - Beca

Apologies	Ryan Park	Fonterra
	Andrew Parsons	HCC
	Maire Porter	HCC
	Lisa Gardiner	Ngati Haua Iwi Trust
	Karaitiana Tamatea	Ngati Koroki Kahukura
	Liaise Harris	Raukawa Trust Board
	Hinerangi Raumati	Turangawaewae Marae
	Ian Cathcart	Waikato District Council
	Hugh Keane	Waikato Regional Council
	Dawn Inglis	Waipa District Council
	Sharon Danks	Watercare (Waikato)
Pre-circulated Material	Agenda and Briefing Material (Attached)	

Mihimihi / Whakatau – Chris Riki

Whakawhanaungatanga / Introductions – All

Part 1 Overview & Recap

An overview of the project was provided, and the purpose of the workshop outlined: *"To identify the short-list of WW servicing solutions for the full metro area" and specifically to seek input and feedback on:*

- *Criteria used for the MCA*
- *The Long list of options*
- *The Emerging short-list of options*

It was noted that the content in Part 1 of the presentation had been provided and feedback sought at hui at the beginning of September and so was recapped for the benefit of those who may not have attended the earlier hui.

Previous investigations

A recap on the work completed as part of the high-level wastewater assessment between January and April 2020 was provided. Noting that identified the options involving Pukete WWTP in the north, a new WWTP in the south and Te Awamatu WWTP being retained as the preferred concept for the wastewater servicing in the Metro Area.

Project Vision, objectives and Metro WW DBC SMART Objectives

A recap on the project vision and objectives was provided and the approach to developing SMART objectives for the DBC outlined.

Options Long List

The long list of options was described:

- Option 1 - Retain and upgrade existing 7 treatment plants (Ngaruawahia, Te Kowhai, Pukete, Matangi, Tauwhare Pa, Cambridge, Te Awamutu). Construct 2 new plants at Ohaupo & Airport locations. Total of 9 municipal treatment systems
- Option 2 - Northern and southern (new site) sub-regional plants + TA. Total of 3 municipal treatment systems.
- Option 3 - Northern and southern (Cambridge) sub-regional plants + TA. Total of 3 municipal treatment systems.
- Option 4 - Retain and upgrade Ngaruawahia, Pukete, Cambridge, Te Awamutu. Construct new

plant south of Hamilton. Total of 6 municipal treatment systems.

- OPTION A variations of Options 1 – 4 assume Fonterra Hautapu continues to be serviced via stand-along private system.
- OPTION B variations on Options 1 – 4 include servicing Fonterra Hautapu at the nearest municipal
- facility

The approach to be taken to discharge routes was also outlined.

Key Assumptions

The growth and population assumptions and treatment performance standards adopted for the long list options development were described in some detail.

PART 2: ASSESSMENT CRITERIA - FEEDBACK

The options assessment methodology was outlined highlighting that the MCA criteria would be used to short-list the long-list of options, and to identify the preferred solution.

The proposed MCA criteria along with critical success factor criteria were outlined to build on and provide further information and context to that detailed in the briefing material.

Feedback on specific criteria was sought. The group broke into several smaller groups to discuss the following questions:

1. The existing MCA process assumes land discharges are preferable to river discharges (from a cultural perspective). Is this assumption correct? If not, how should we assess this distinction?
2. Does the number and location of discharges make a significant difference to the water quality?
3. Cultural connectivity is currently not assessed as part of the longlist MCA. How would this be assessed? Is it appropriate to assess this as part of the longlist or shortlist assessment?

Feedback from this first exercise is summarised below.

Land Vs River discharges

Q: The existing MCA process assumes land discharges are preferable to river discharges (from a cultural perspective). Is this assumption correct? If not how should we assess this distinction?

- Stakeholder feedback is summarised below:
- Water quality is more important than the discharge to river or land
- The prioritisation of land over river discharges may vary between iwi
- Generally land discharges are preferred but this should not lower the treatment standards
- Beneficial reuse is preferable to straight disposal
- The initial drivers for land discharges is to improve river water quality and enhance Mauri
- Specifics about how land or river discharges are designed are more important from a cultural perspective (beneficial reuse, wetlands, and natural processes before entering river).
- Currently soils are not conducive to 12-month application and therefore land discharges will not be practicable for continuous application.

The following changes will be made to criteria and/or the MCA assessment based on the above feedback include:

- Ensuring water quality is weighted more highly than river vs land criteria
- Removing land vs water discharge assessment at the longlist stage and revisiting this criteria when shortlisting discharge options.
- Ensuring that water reuse is weighted more highly than discharging to land

Number and location of discharges

Q: Does the number and location of discharges make a significant difference to the water quality?

Stakeholder feedback of is summarised below:

- Reducing the number of discharges is preferable, however its acknowledged that the flows entering the river may increase (even if discharges decrease)
- Location of discharges will not make a significant difference. Improvements in one area (from a removal of a discharge) will dis-benefit another location of the river (moving discharge to new location). This is not necessarily 'best for river'.
- Moving discharges upstream will put greater pressure to improve quality of discharge more.
- Location and number of discharges may have more impacts on hydrology. However flows are still relatively small compared to flows of river

The following changes will be made to criteria and/or the MCA assessment based on the above feedback include:

- Removing number and location of discharge assessment at the longlist stage.
- Assessing the total discharge flows entering the river (regardless of discharge number and location) may be more applicable at the shortlist stage

Cultural connectivity

Q: Cultural connectivity is currently not assessed as part of the longlist MCA. How would this be assessed? Is it appropriate to assess this as part of the longlist or shortlist assessment?

Stakeholder feedback is summarised below:

- Cultural connectivity may be more about the process of engagement. This applies at the options assessment stage, discharge assessment stage, design stage, land assessment etc. This approach means that cultural values and priorities are embedded into all elements of the process rather than being an add on in isolation from everything else.
- Cultural connectivity may be a criteria which can be better defined and captured as part of the discharge option assessment
- Key aspects to consider for the cultural assessment is:
    - Water quality
    - Access opportunities
    - Odors during summer
    - Visual impacts

The following changes will be made to criteria and/or the MCA assessment based on the above feedback include:

- Cultural assessment will not be undertaken at a longlist assessment stage
- Cultural connectivity may be something which is considered through the design of discharge routes or through the discharge option assessment
- The process of developing and assessing options will continue to engage iwi.

PART 2 ASSESSMENT CRITERIA: PRIORITISATION

Participants were also asked to rank their top 5 criteria out of the "objective" criteria and "critical success" criteria. The results are summarised in the table below.

CRITERIA	STAKEHOLDER PRIORITIES												RANK
Water Quality	1	1	1	1	1	1	6	1	1	1	6	1	1
Ecology	6	6	6	6	2	1	6	6	3	1	6	5	5
Cultural connectivity	2	6	2	2	3	2	6	5	5	4	6	2	2
Sustainable Technology	6	2	6	6	4	3	6	2	2	3	6	6	3
Sustainable Growth	6	6	4	3	5	4	6	4	4	2	6	3	4
Constructability	4	6	6	6	6	6	6	6	6	6	6	6	11
Maintenance and operations	6	3	6	6	6	6	6	6	6	6	4	6	9
Land impacts	5	6	6	6	6	6	2	6	6	6	3	6	8
Community acceptability	6	6	6	6	6	6	6	6	6	6	6	6	12
Consentability risks	3	6	6	6	6	6	6	6	6	6	6	6	10
Resilience	6	4	3	6	6	6	3	3	6	6	1	4	5
Funding Potential	6	5	5	6	6	6	1	6	6	3	2	5	7

This exercise identified the top 5 criteria as:

1. Water quality
2. Cultural connectivity
3. Sustainable technology
4. Sustainable growth
5. Ecology and Resilience

Other criteria which were identified as important included:

6. Funding potential
7. Land impacts
8. Operational impacts

This exercise showed water quality as being the top priority for most participants. It also showed that the 5 key objective criteria were generally considered more important than the critical success factors, with the exception of resilience (which ranked 5th).

It was noted that weightings would be developed to test the impact of a range of sensitivities based on the feedback on priorities. was also noted that costs were still being developed and a value for money component will be assessed once costs are finalised.

PART 3 MCA ASSSESSMENT FEEDBACK

An outline of the MCA assessment distributed in the pre-workshop briefing material was provided. The emerging preferred shortlist of options based on the initial technical MCA include:

- Option 2 as preferred
- Option 3 as second most preferred
- Option 1 is emerging as preferred over Option 4

Options without Fonterra are emerging as slightly more preferred than with Fonterra.

The above options (Option 2 and 3) are emerging as preferred due to the potential for centralised options to reduce the total number of plants required, greater potential for reuse (water and bio solids) and greater potential to use sustainable technologies and to become carbon neutral in the future.

Options without Fonterra are emerging as slightly more preferred due to the additional conveyancing requirements, the increase in river discharges (and reduction in land discharges) and the significant risk of the short-term consenting process for Fonterra. The cost associated with the short term approach may become a fatal flaw.

The MCA assessment used to identify the emerging shortlist of options applied equal weightings across all criteria.

Participants asked to review and provide feedback on the assessment of the options long list. The feedback for each option is outlined below.

Option	Summary of Stakeholder feedback
Option 1	**Discharge to land or river:** - Change from 2 to 3 (best of all options) and 1 to 2 for B **Constructability:** - Reticulation conveyance construction score to be changed from 0 to 2 (similar for Fonterra options) - Need to consider quality assurance and frequency and intensity as part of the construction criteria - Airport industry is a higher risk? **Consentability:** - More admin requirements - Would be expected that in this time frame the river can be consented by reach – A suite if discharges based on load
Option 2	**Ecology:** - High volumes of discharge entering the river than BAU? Increasing impact to ecology? - Distribution of flow could be better ecologically verse concentration of discharges **Discharge number and location:** - Location doesn't matter, has localised benefits only **Reuse of water:** - Option for direct reuse at Waiora - Centralised so increased potential for reuse **Constructability:** - Reticulation constructability is better than option 3 as its working with gravity, but worse than option 1 **Operation:** - More attention? Resource

	- Addition of Fonterra (B) to change from 1 to -1 – Risks associated with seasonality can compromise discharge water quality **Consentability:** - The process of engagement and Dev. Is important - Marginal benefit with existing designation however this is offset by constructability issues (assuming this talks to the difference between Option 2 and 3) **Funding Potential:** - What are the longer-term cost risks? Fonterra inclusion may increase risk?
Option 3	**Reuse of water:** - Change from 2 to 0 – flows are conveyed away from potential wet areas for industrial use. Limited ability at Cambridge site **Water Quality:** - Assurance of quality? **Operations:** - Treatment to be changed to -1 for Fonterra (B) due to risks associated with treatment of Fonterra flows **Land Requirements:** - Should be positive (no land impacts) for both A and B **Community Acceptability:** - Should be positive results as no land requirements **Funding Potential:** - Change Fonterra to negative score due to risk with private investors
Option 4	**Discharge number and location:** - Option 4 increases discharges to river therefore should be scored negatively (-2 for A and -1 for B) **Operation (reticulation):** - Reticulation risk for all options which include conveyance from Matangi to be considered further – Change -1 to -2 - Consideration of small flows in dry conditions **Resilience:** - Consider ability to store on site (for emergency storage during a operational failure) for longer periods (smaller plants are able to do this better than larger plants **General Comments:** - Difficult to fund this option (high cost per population base) - Centralisation only feasible at a larger scale - Northern option more feasible than southern - Similar challenges to option 1 with additional conveyancing risks - Adding conveyance to Matangi will stimulate growth here – is this good or bad?
Fonterra (Option B)	**All option B:** - **Sustainable technology:** Change ability to be carbon neutral from -1 to 0. Fonterra flows as part of Cambridge site will give enough scale to consider carbon neutral technologies in the future and therefore Fonterra options should score higher for this criteria (in all options) - **Constructability:** Fonterra seasonal buffering requirements - **Consentability:** Change all consentability criteria to -2 (Fonterra did not object to Cambridge). Fonterra as a potential objector to consents? - **Funding potential** Change to negative score for all options (Private industries are less likely to contribute when there are cost overruns, greater risk in the long term) - **Operations (treatment)** of Fonterra flows will be more challenging therefore score lower than option A's - **Constructability:** Note land availability near existing Cambridge site (quarry could be used/rehabilitated for Option B's) - **Resilience:** All Fonterra options will have greater consequences if there is a failure. Therefore, all Fonterra options (Option B's) to be scored lower than Option A's

Wrap up & Next Steps

The feedback was summarized and resulting next steps outlined:

- The feedback from the workshop will be used to update the MCA criteria and assessment however it was agreed that the emerging short list of options will likely remain unchanged.
- The project team will meet to update the MCA criteria and assessment based on the workshop and issue a memo detailing the post workshop assessment.
- Future assessments should include narratives around the points of difference between options and the assessments relative to each other to assist with stakeholder understanding.
- The team noted that costs are still being developed and so hasn't been included in the assessment at this stage. A value for money component will be assessed once costs are finalised. It is possible that inclusion of value for money/affordability parameters may change the short-list of options to take forward.
- Sensitivity assessment will be undertaken to test and confirm the proposed short-list of options and to determined the preferred options.

The post-workshop MCA and value for money assessments will be used to confirm the proposed short-list of options for endorsement by the Control Group and approval by the Governance Group from mid to late October.

Participants were reminded of the Southern Wastewater Treatment Plant Site Selection workshop being held on 24 September via zoom.

The stakeholder workshop to work through the assessment of the short-listed options to identify the preferred servicing solution to take forward in the DBC will take place in mid-November. The date is still be to confirmed.

The meeting was declared closed at 13.00pm

ATTACHMENTS:

1. **AGENDA**
2. **PRESENTATION**
3. **POST WORKSHOP MEMO**

Waikato Metro Wastewater Detailed Business Case Project
Wastewater Servicing Long-List, MCA and Short-listing
Workshop Agenda

Date & Time: 22 September 2020, 9am – 1pm

Location: Bill Gallagher Event Room 1, WINTEC Hamilton

Workshop attendees: Representatives from Mana Whenua, Hamilton City Council, Waipa and Waikato District Councils, Waikato Regional Council, Watercare, Fonterra

Workshop facilitators: Tipene Wilson (Maximise), Jackie Colliar

Technical Team: Kate Jackson (GHD), John Crawford (BECA); Claire Scrimgeour (BECA)

Workshop Objective: To identify the short-list of wastewater servicing options for the full Metro Area. Note that this work is for the whole Metro Area from Taupiri in the North to the Cambridge/Te Awamutu-Kihikihi in the south.

Input and feedback will be sought on:
-Criteria used for the MCA
-Long list of option
-Emerging short-list of options

Agenda Topic /Description		Approx. Times	
		Start	**Finish**
Mihimihi / Whakatau		9.00am	
Whakawhanaungatanga / Introductions			
Purpose of Day			
Part 1 Overview & Recap			
• Overarching objectives of the project • Overview of Longlist of Options • Key assumptions			
Part 2: Assessment Criteria			
• Outline of assessment criteria • White board session regarding any feedback of the criteria			
Part 3: Group Sessions			
• Participants to split into four or five groups • Each group will spend between 15 – 20 minutes reviewing and commenting on each option assessment • Groups to reassemble and summarise feedback • Confirmation of conclusions			
Wrap Up / Closing Remarks			

WAIKATO METRO WASTEWATER

Metro Wastewater Detailed Business Case

LONGLIST MCA Workshop

22nd September 2020

PURPOSE

To identify the short-list of wastewater servicing options for the full Metro Area. Note that this work is for the whole Metro Area from Taupiri in the North to the Cambridge/Te Awamutu-Kihikihi in the south.

To seek input and feedback on:
-Criteria used for the MCA
-Long list of option
-Emerging short-list of options

AGENDA

Part 1: Overview & Recap

- Background/ Recap
- Outline purpose of the project and key objectives
- Overview of Longlist of Options
- Key assumptions

Part 2: Assessment Criteria

- Outline of assessment criteria
- White board session regarding any changes to criteria

Part 2: Group Sessions

- Participants to split into four groups
- Each group will spend between 15 – 20 minutes reviewing and commenting on each option assessment
- Groups to reassemble and summarise feedback
- Confirmation of conclusions

Part 3: Project Updates & Next Steps

- Next Steps for Metro Wastewater DBC
- Wrap up / Closing remarks

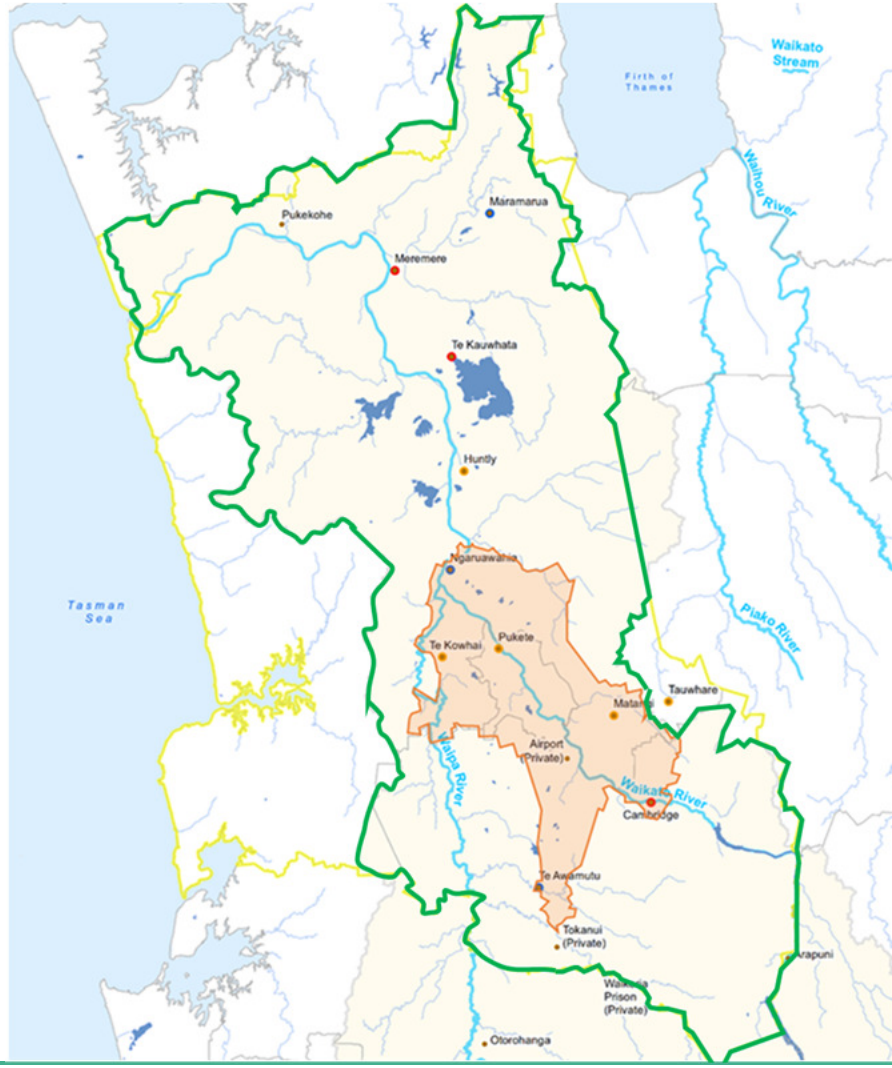
Part 1: Recap

CONTEXT

- Current compliance challenges
- Growth
- Te Ture Whaimana & other regs
- Infrastructure deficit

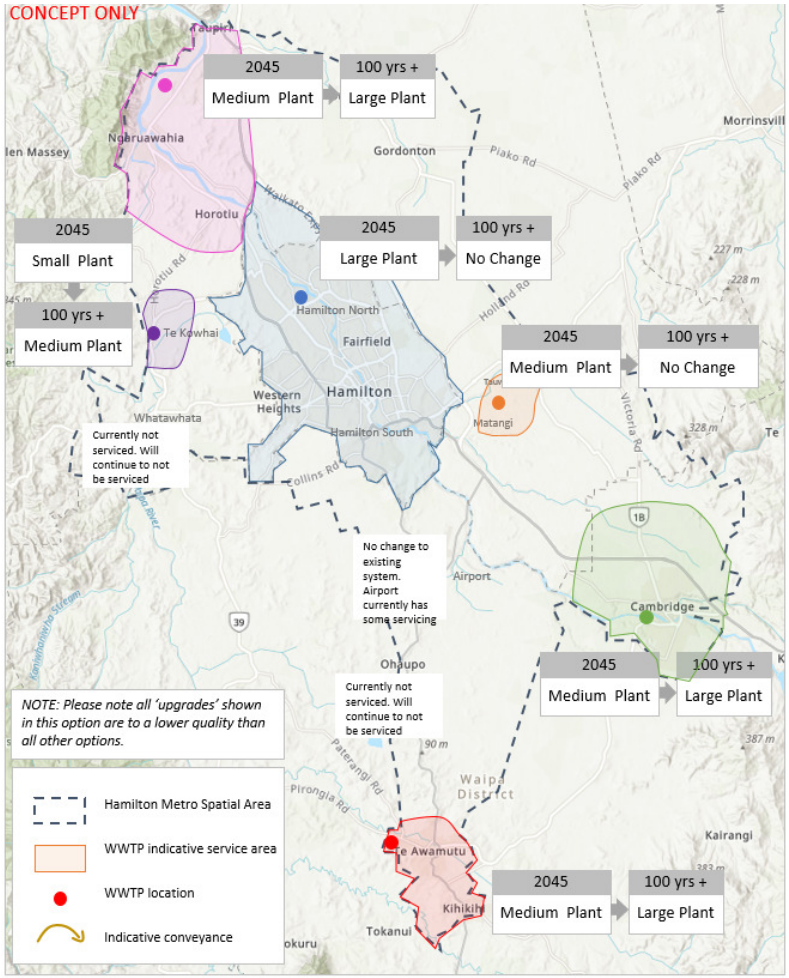
RECENT INVESTIGATIONS

- Sub-Regional 3 Waters Project
- Cambridge WW IBC
- High Level Metro WW Feasibility Assessment

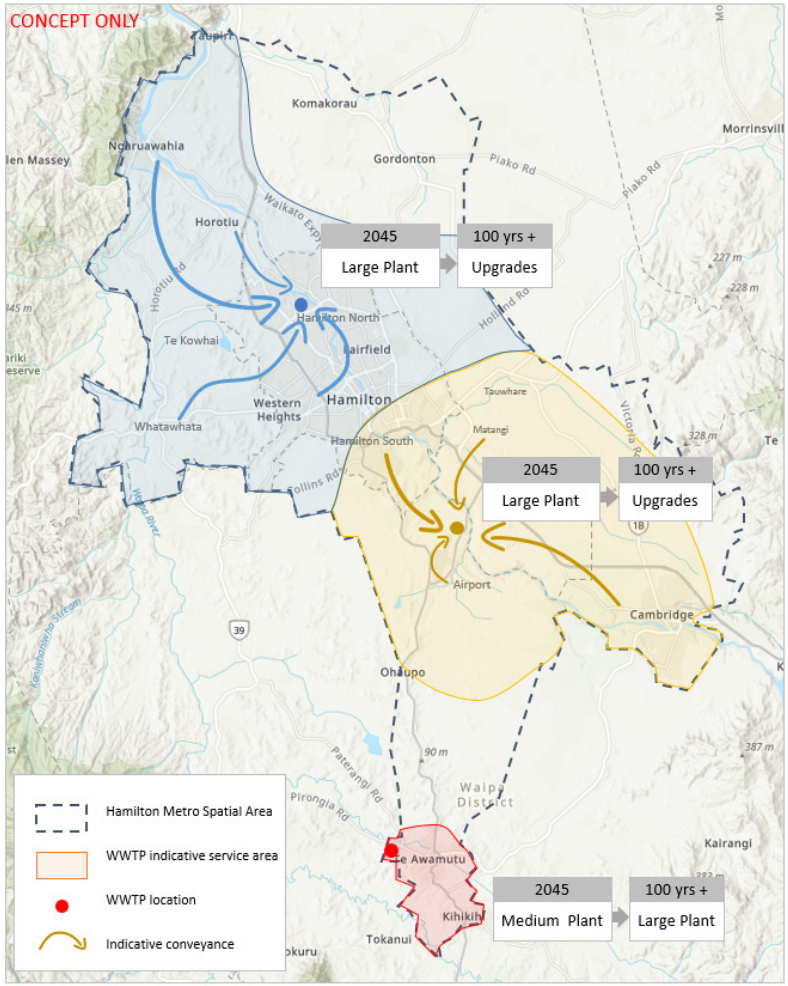


Metro Area Wastewater Assessment Summary

BAU



Preferred Concept



Notes

Three key steps:

1. Option and Criteria Development
2. Technical Inputs
3. Options Assessment

Steps 1 & 3 done collaboratively

MCA categories:

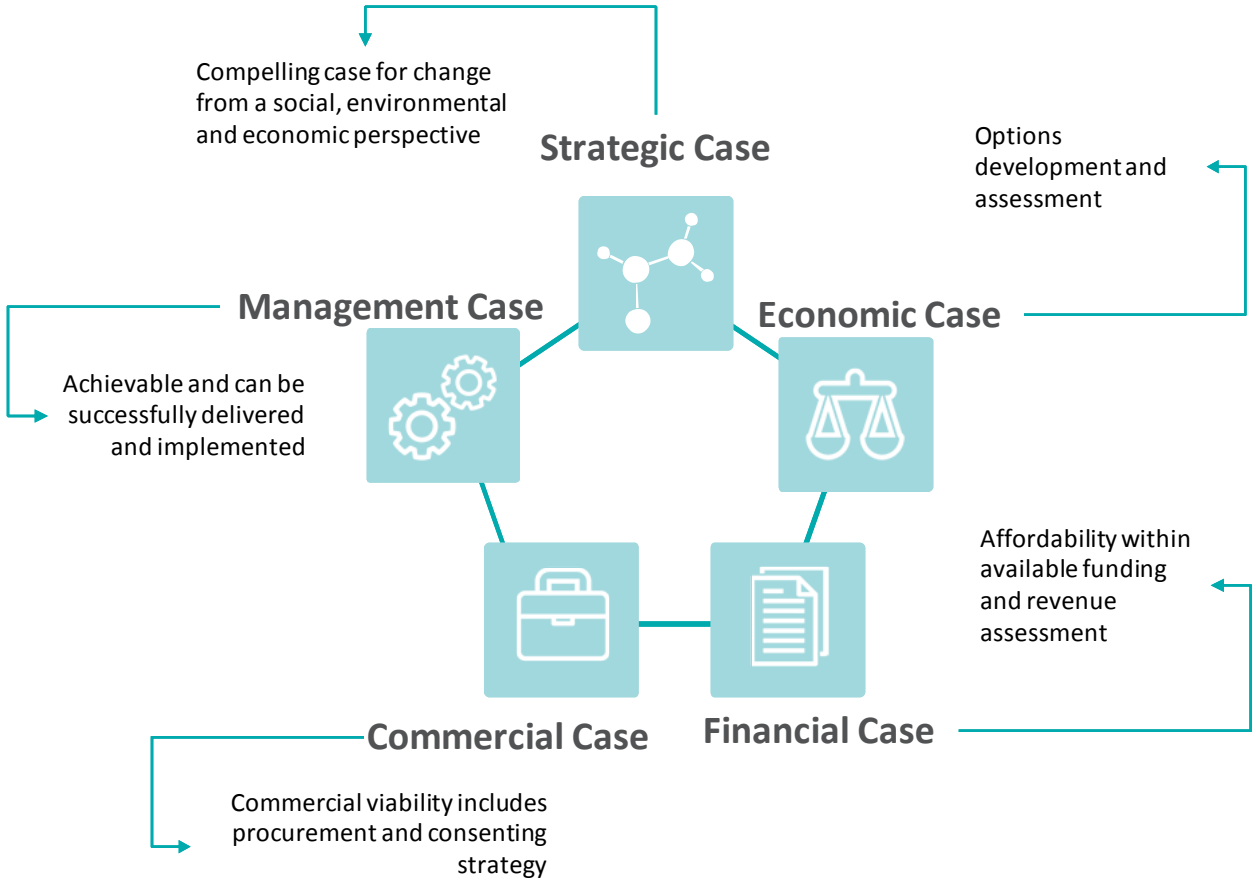
- Natural Environment Improvement Capability; Public Health Protection; Cultural Impact/Benefit; Flexibility, Scalability and Risk; Whole of life costs; Sustainability

Key Assumptions:

- Growth Scenarios (2045 & 2120+)
- Standardized Treatment performance based on plant size
- Conveyancing requirements
- Estimates using cost curves

AGREED NEXT STEPS:
INITIATE DETAILED BUSINESS CASE PROJECT FOR METRO AREA

BUSINESS CASE PROCESS



CASES INCLUDED IN MEETING AGENDA

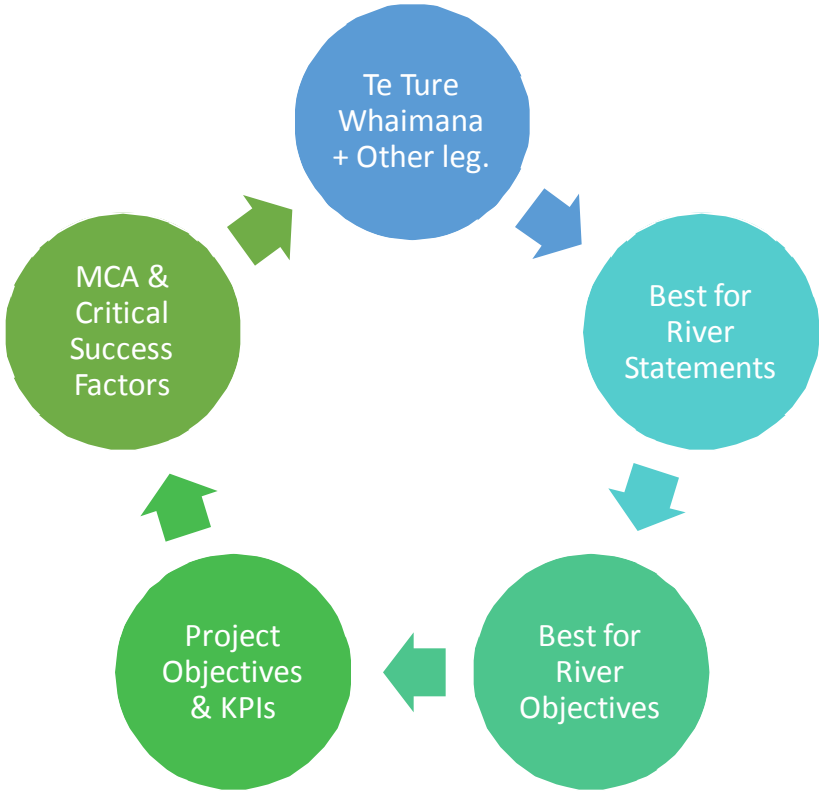
KEY PROJECT OBJECTIVES

- Detailed Business Case for Strategic Wastewater Treatment Facilities for Metro Area that:
  - Meets requirements of Treasury Better Business Case Model
  - Is delivered in time to inform critical investment decisions (e.g. Cambridge)
  - Is deliverable and supported by all partners
  - Maximizes opportunities to transform 3-waters infrastructure
  - Delivers solutions that achieve “Best for River” Outcomes

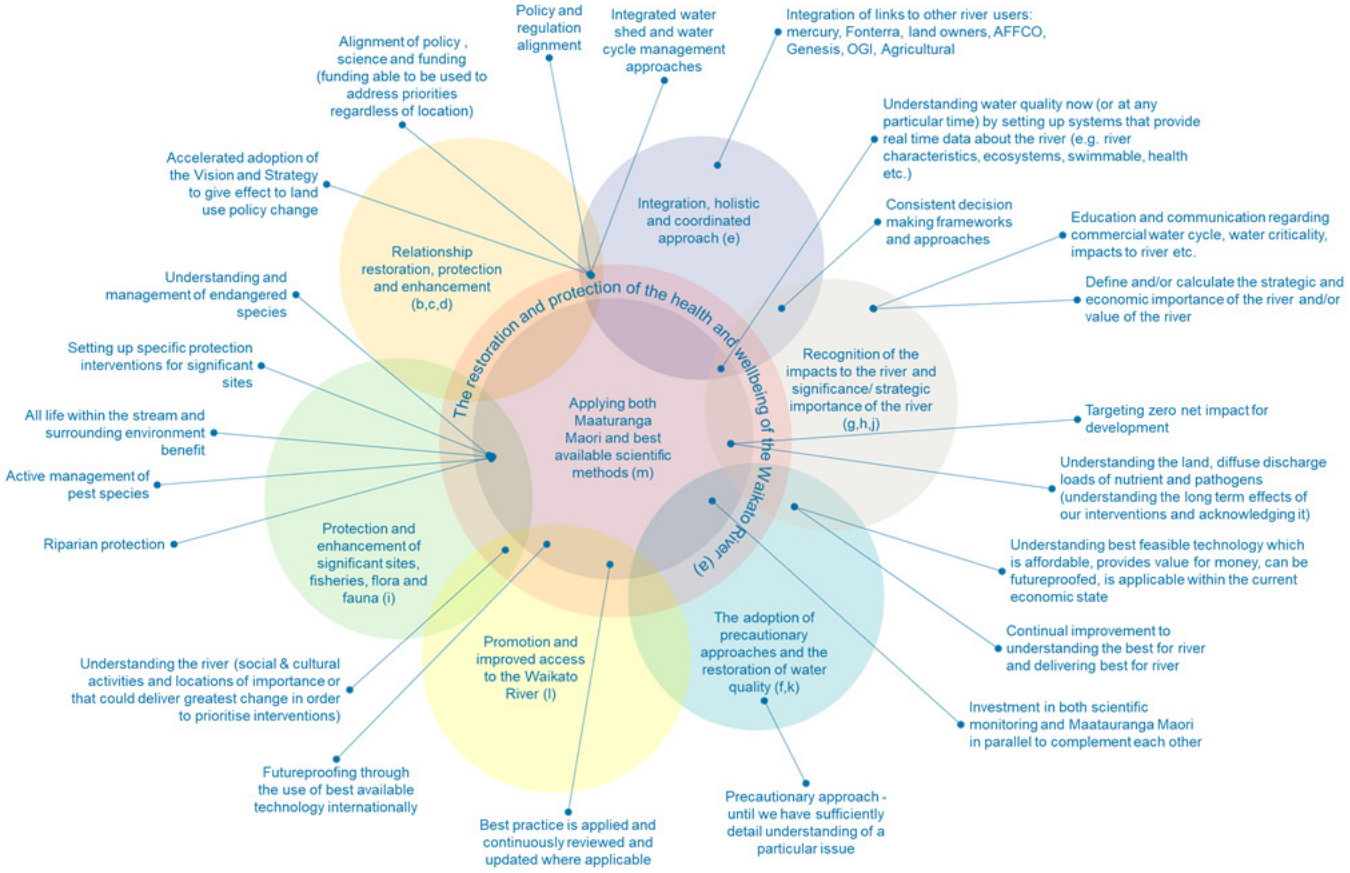
Tooku awa koiora me oona pikonga he kura tangihia o te maataamuri
The river of life, each curve more beautiful than the last

Our 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.

Best for River Objectives



Best for River and Project Objectives



The Best for River definition was first developed as part of the Three Waters Sub-Regional Strategic Case to ensure progress is made towards 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.

Ten Best for River high level objectives were defined throughout this process

Best for River and Project Objectives

BEST FOR RIVER DEFINITION	METRO DBC SMART OBJECTIVES
1. The health and well-being of the Waikato River is restored and enhanced.	*1. By 2050 municipal wastewater treatment plant discharges, as part of cumulative discharges to the river, are no longer impacting the ability of people to swim and collect Kai from the river*
2. All life within the River (which extends beyond the main stem) and surrounding environment benefit	*2. The quality and extent of aquatic and/or terrestrial habitat and biodiversity in and around water bodies affected by municipal wastewater treatment plant discharges is significantly reduced from the baseline by 2050*
8. Achieve net benefit to the environment	
3. All of the community (including industry and businesses) understand and are committed to caring for and protecting the River	*3. Wastewater treatment solutions restore and enhance cultural connectivity with the river so that by 2050 Marae 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*
4. Cultural connectivity with the river is restored and enhanced	
5. Improve access to the Waikato River to better enable sporting, recreational, and cultural opportunities.	
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 (V&S), including RMA instruments, catchment based management approaches.	*4. Achieve net zero greenhouse gas related emissions from wastewater treatment systems by 2050 and maximise efficient use of resources and resource recovery*
7. All river 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.	
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.	*5. The wastewater solution applies best practice to provide sufficient capacity and flexibility to ensure sustainable growth in the Hamilton Waipa Waikato Metro Area in accordance with growth projections for the next fifty years.*

LONG LIST OF OPTIONS

Option 1 - Retain and upgrade existing 7 treatment plants. Construct 2 new plants at Ohaupo & Airport locations. Total of 9 municipal treatment systems

Option 2 - Northern and southern (new site) sub-regional plants + TA. Total of 3 municipal treatment systems.

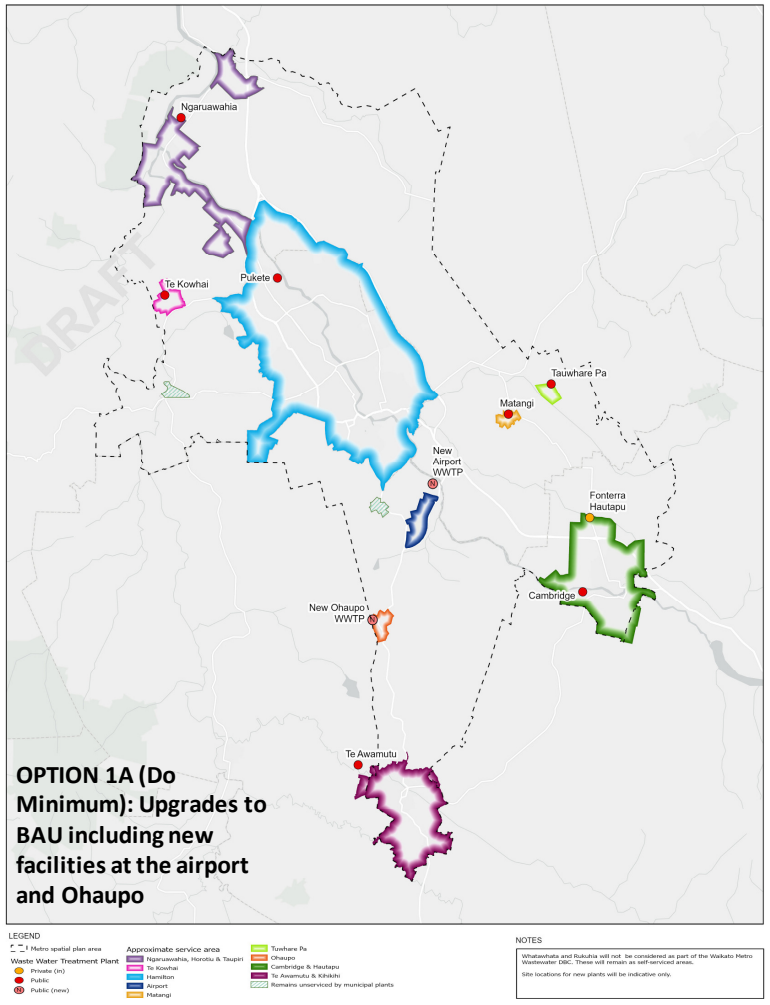
Option 3 - Northern and southern (Cambridge) sub-regional plants + TA. Total of 3 municipal treatment systems.

Option 4 - Retain and upgrade Ngaruawahia, Pukete, Cambridge, Te Awamutu. Construct new plant south of Hamilton. Total of 6 municipal treatment systems.

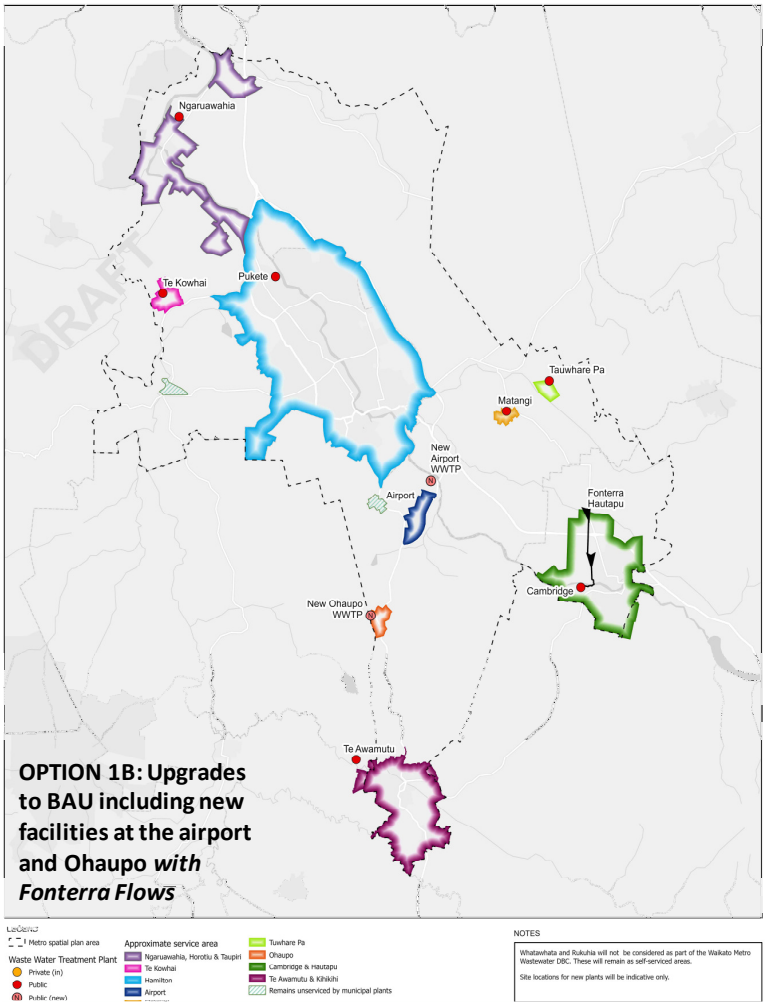
OPTION A variations of Options 1 – 4 assume Fonterra Hautapu continues to be serviced via stand-along private system.

OPTION B variations on Options 1 – 4 include servicing Fonterra Hautapu at the nearest municipal facility

Longlist of Options

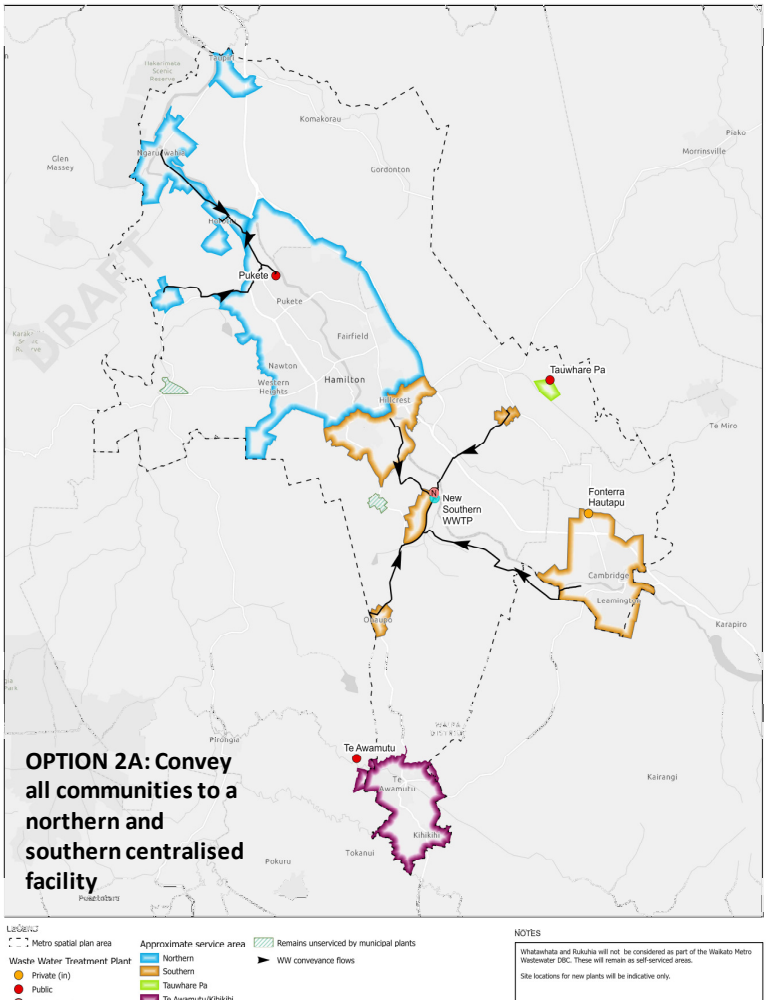


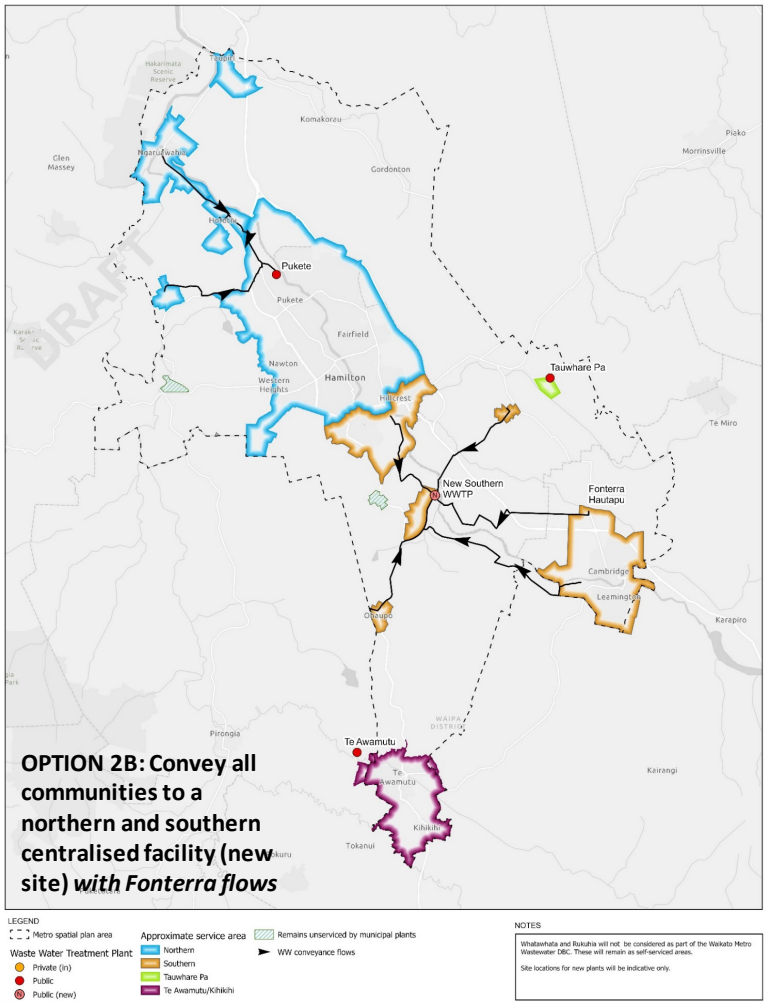
OPTION 1A (Do Minimum): Upgrades to BAU including new facilities at the airport and Ohaupo



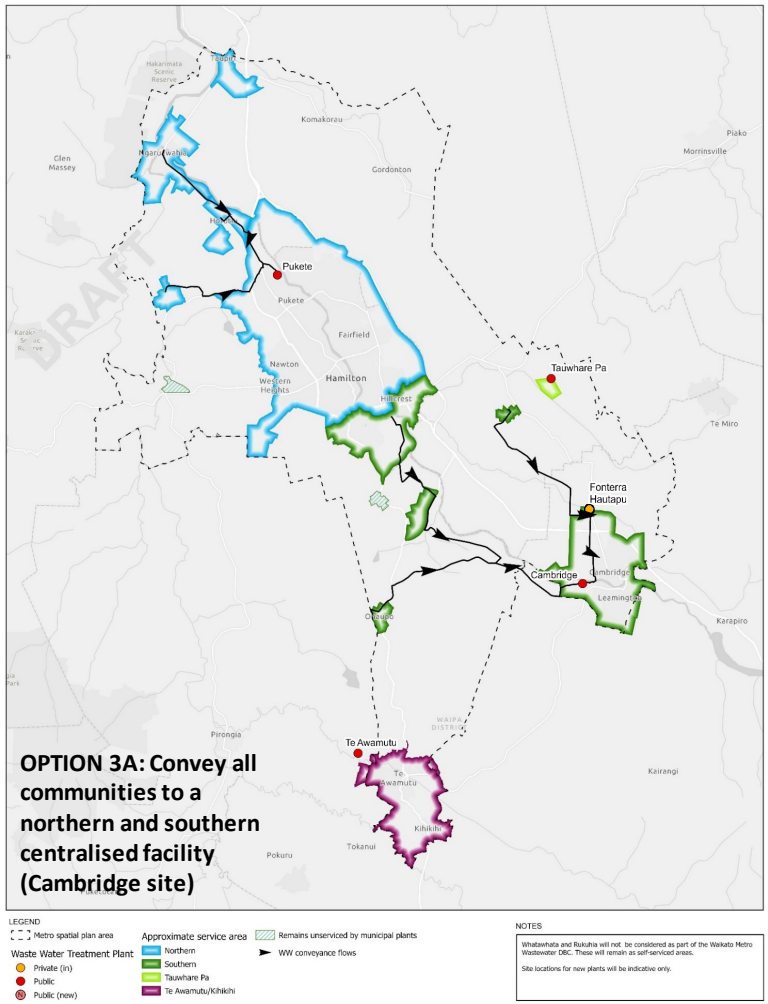
OPTION 1B: Upgrades to BAU including new facilities at the airport and Ohaupo *with Fonterra Flows*

Longlist of Options

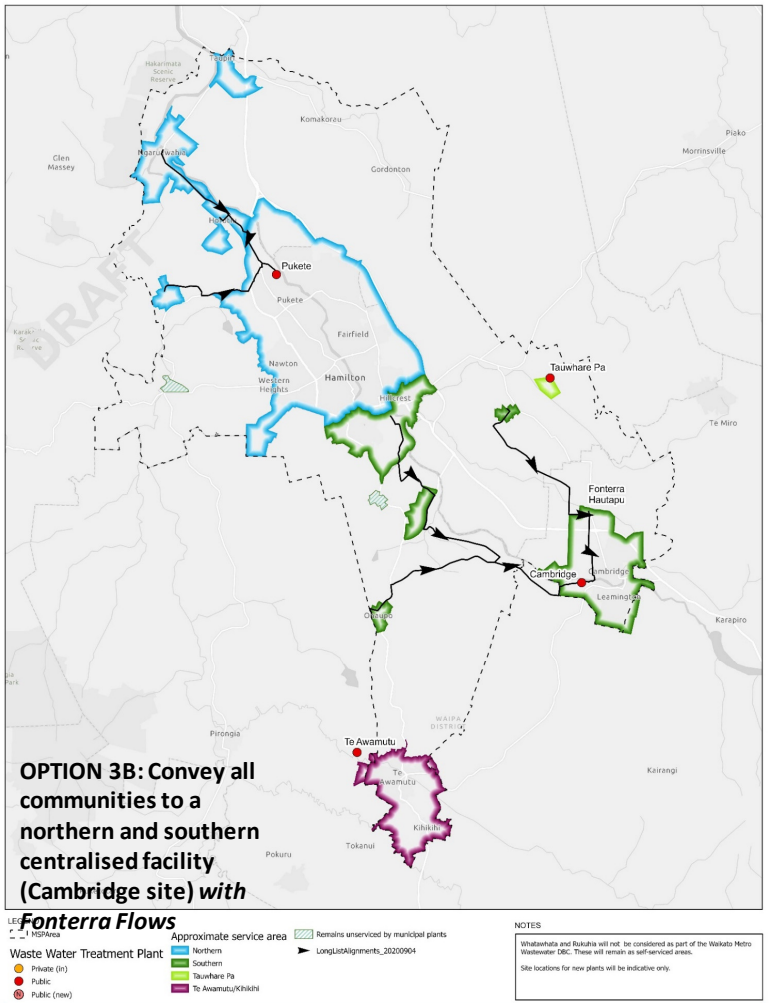




Longlist of Options

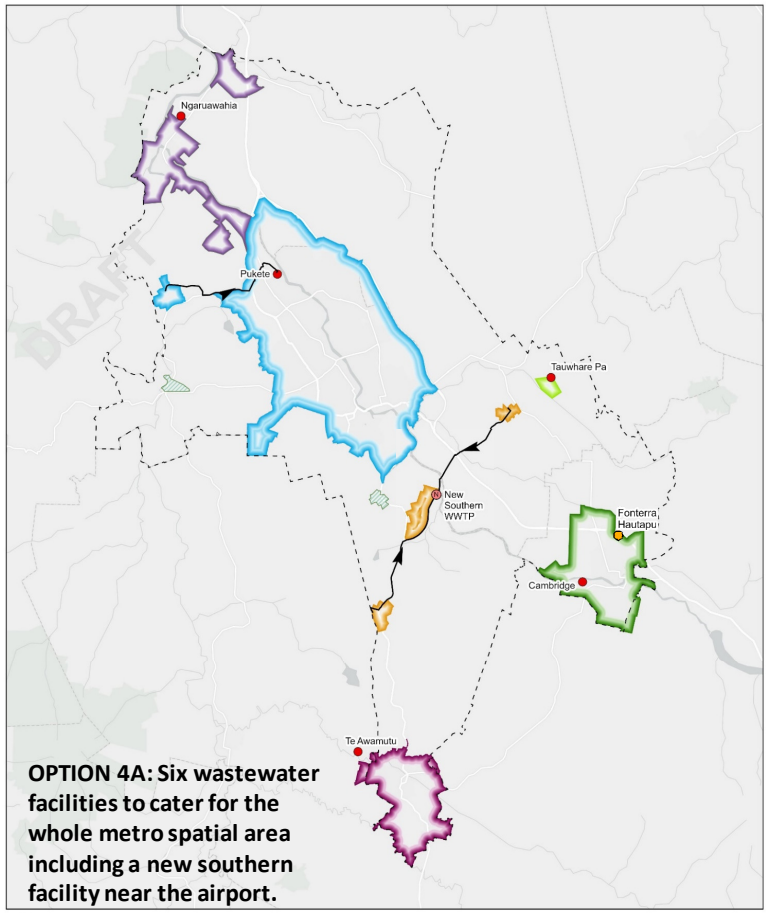


OPTION 3A: Convey all communities to a northern and southern centralised facility (Cambridge site)

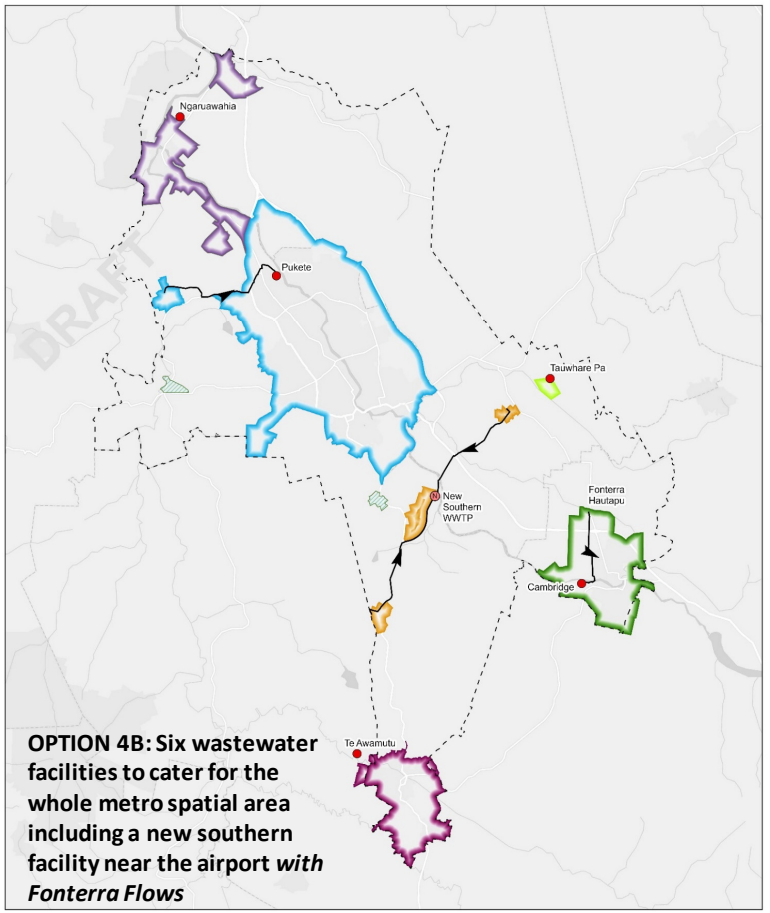


OPTION 3B: Convey all communities to a northern and southern centralised facility (Cambridge site) *with Fonterra Flows*

Longlist of Options



OPTION 4A: Six wastewater facilities to cater for the whole metro spatial area including a new southern facility near the airport.

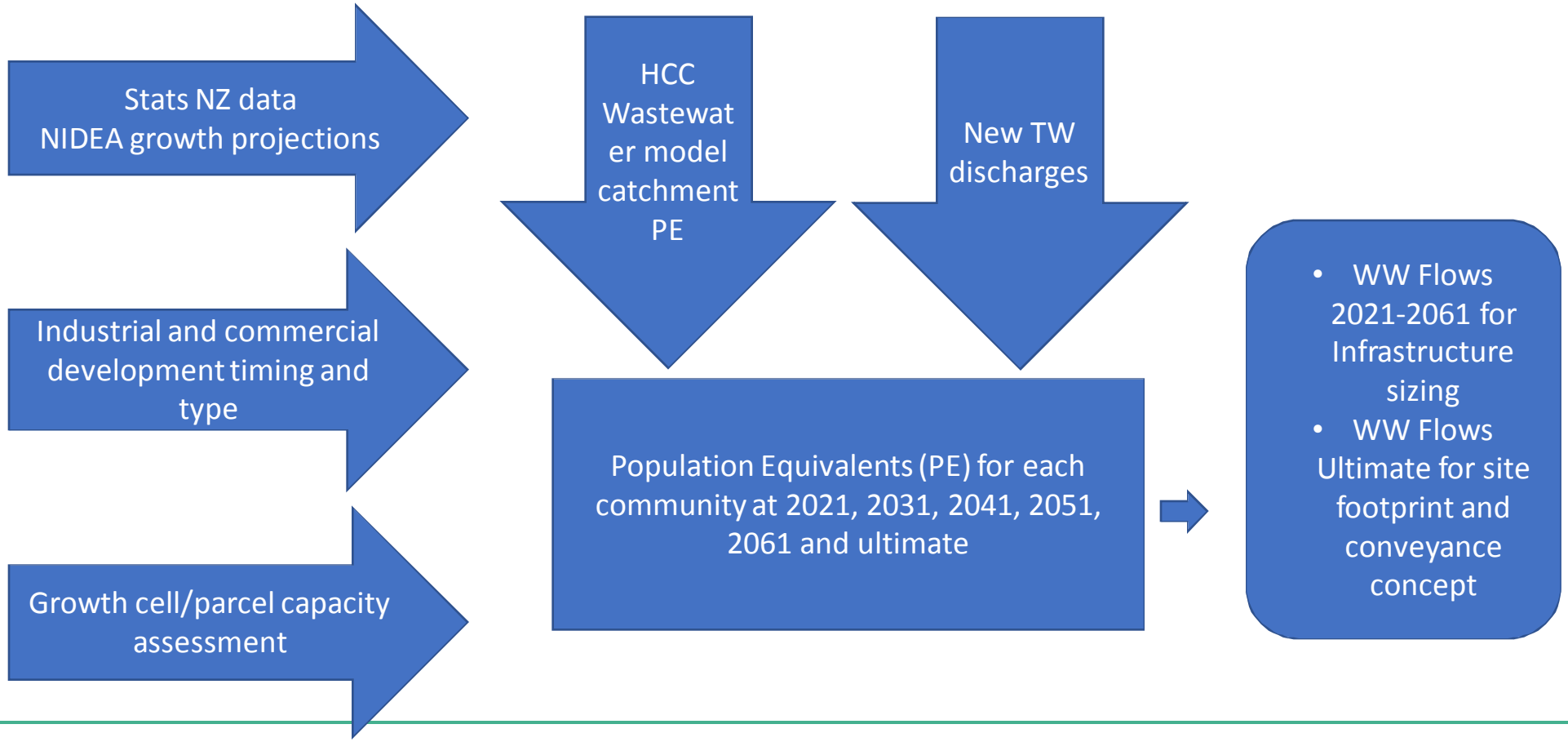


OPTION 4B: Six wastewater facilities to cater for the whole metro spatial area including a new southern facility near the airport *with Fonterra Flows*

Discharge Options – Long List Methodology

- Predicted discharge flows are calculated for each WWTP for the 2031-2061 period
- Once the general location is identified for each WWTP, discharge options are reviewed to see what options could be feasible at each site
- Land disposal area required (including buffer area) calculated
- Terrain and available ground condition information reviewed
- Potential for reuse identified
- 1 discharge option taken forward for long list costing stage
- Further investigation at preferred option stage

Growth Data Sources



Recommendations –Residential

Include servicing

- Taupiri
- Hopuhopu
- Ngaruawahia
- Horotiu
- Te Kowhai
- Hamilton
- Matangi (village only)
- Tauwhare Pa & Village (existing plus growth)
- Ohaupo
- Airport
- Cambridge (incl Hautapu), Karapiro
- Te Awamutu and Kihikihi.
- Metro Area Infill Development

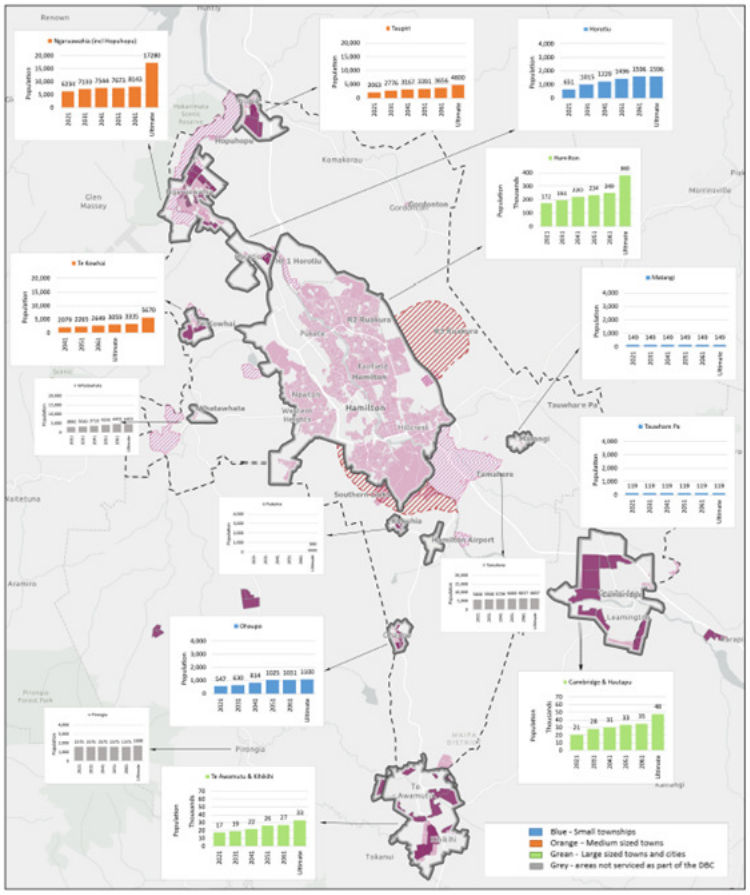
Exclude servicing:

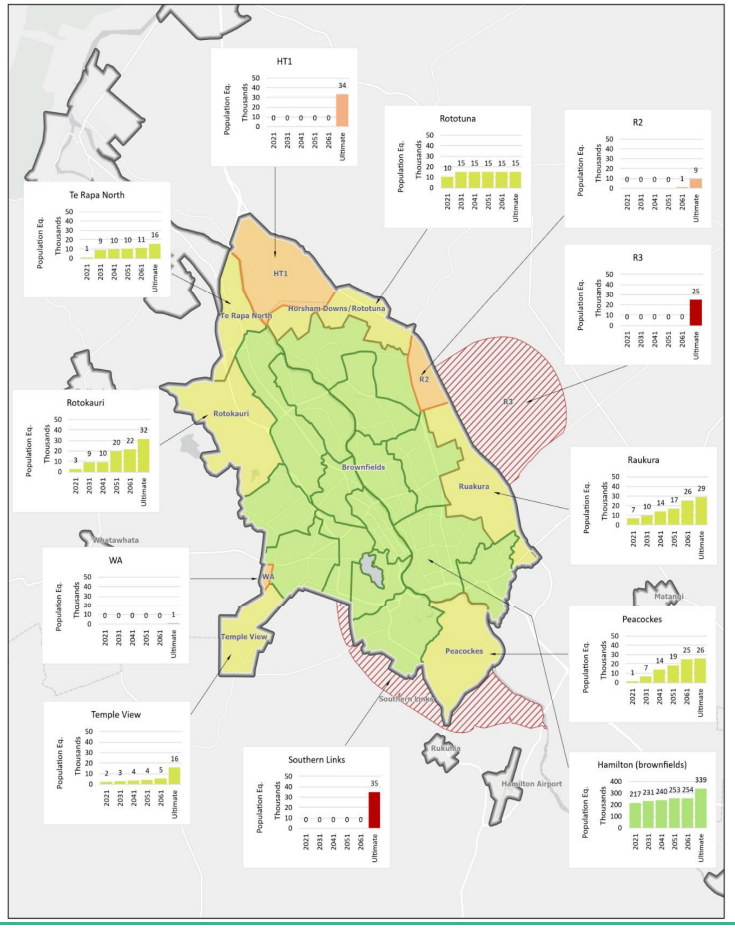
- Pirongia, Tamahere (Country Living), Gordonton (no growth planned), Whatawhata (Country Living) and Rukuhia

Future Growth Areas:

- HT1, R2, WA, Southern Links included for Hamilton (HT1 & R2 from 2041, Southern Links post 2061)
- Consider R3 for ultimate growth (Sensitivity assessment)

Residential





WAIKATO METRO WASTEWATER

Hamilton City Council Te kaunihera o Kirikiriroa | Waikato Regional Council Te Kaunihera ā Rohe o Waikato | Waikato Tainui | Future Proof Te Tau Tītoki | Waikato District Council | Waipa District Council

Recommendations – Non-Residential

Include servicing

- Existing and known future trade waste discharges specifically included (in addition to PE)
- Hamilton Airport and surrounding industrial area
- Hopuhopu Innovation Hub
- All non-residential areas to be developed (zoned, deferred zones and indicated in growth strategies)
- Sensitivity Analysis at preferred options stage to confirm capacity allowance for non-res demand

Specific provision for wet industry:

- Additional flow and load in following locations:
  - Horotiu/Te Rapa
  - Ruakura
  - Airport
  - Cambridge/ Leamington Matos Segedin Industrial Area

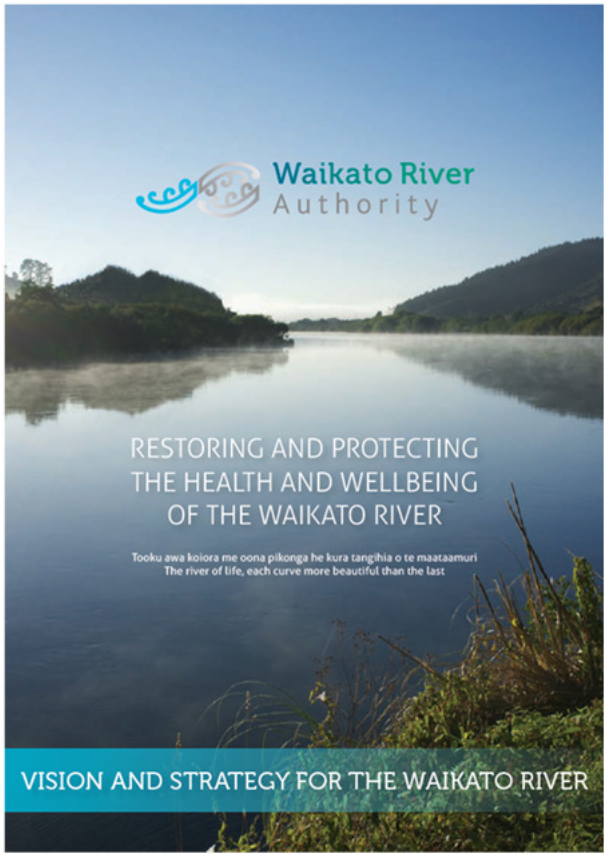
Excluded:

- Large industrial facilities not connected to the existing public system with private wastewater treatment and discharge systems.
- NOTE: Fonterra Hautapu will be considered as a separate parallel workstream

Non-residential

Location	Type of development	Current zoned (incl deferred) ha	Potential additional areas ha	Recommended PE/ha	Comments/Expected Timing
Taupiri	Light Commercial		150	30	West 3-10 yrs, East 10-30 yrs
Te Kowhai Airpark	Mixed use	45		30	3-10 yrs
Hopuhopu Business Park	Commercial/light industrial		35	45	10-30 yrs
Waikato Tainui - Hopuhopu	Mixed use		24	Varies (PE estimate provided[4])	1-30 years
Horotiu	Light Industrial/ logistics	194	50	30	3-10 years
Te Rapa North	Industrial		As per WWMP		As per WWMP
Rotokauri	Light Industrial				
Ruakura	Light Industrial/ logistics				
Tamahere[5]	Business zone	8.5		30	1-10 years.
Airport	Light Industrial	153	100	45	Titanium Park, Meridian 37 by 2035, Montgomery block to 2050, Northern extension post 2050
Cambridge - Hautapu	Industrial	197		45	Small area currently under development, remainder by 2050
Te Awamutu	Light industrial and commercial	37		45	Bond Rd and Paterangi Rd developed by 2030

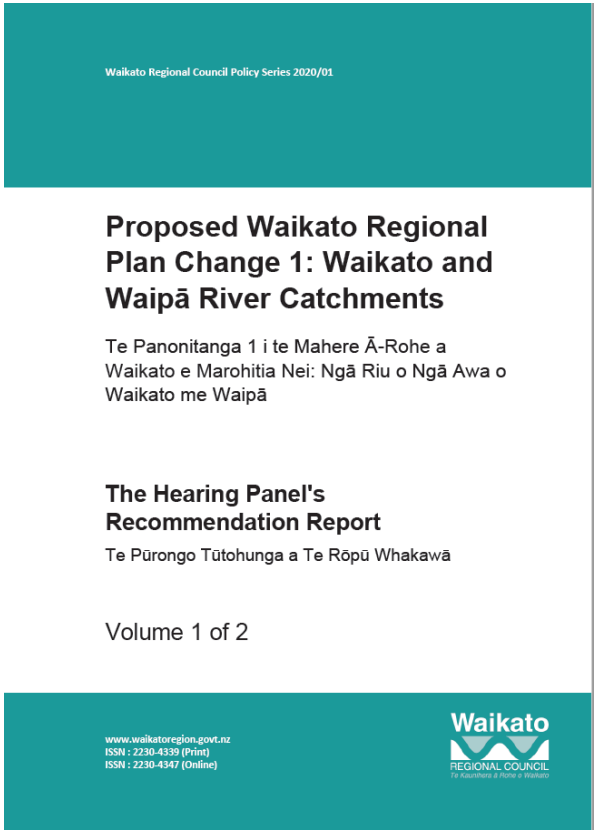
Context – Vision and Strategy



Objectives of the V&S include (amongst others)

- 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.
- Recognition and avoidance of adverse cumulative effects, and potential cumulative effects, of activities undertaken both on the Waikato River and within its catchment.
- The recognition that the Waikato River is degraded and should not be expected to absorb further degradation as a result of human activities.

Context – Plan Change 1



Objective 1/Te Whāinga 1:
In relation to the effects of nitrogen, phosphorus, sediment and microbial pathogens on water quality, the health and wellbeing of the Waikato and Waipā Rivers, including all springs, lakes and wetlands within their catchments, is both restored over time and protected, with the result that in particular, they are safe for people to swim in and take food from at the latest by 2096.

Objective 2 (Freshwater Objective)/Te Whāinga 2 (Te Whāinga Wai Māori):
Progress is made over the life of this Plan towards the restoration and protection of the health and wellbeing of the Waikato and Waipā River catchments in relation to nitrogen, phosphorus, sediment and microbial pathogens by the short-term numeric water quality values in Table 3.11-1 being met no later than 10 years after Chapter 3.11 of this Plan is operative.

Providing for Growth

Our 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.

The Metro area's population is predicted to grow substantially in the future putting even more pressure on wastewater services – how to provide for growth whilst restoring and protecting the awa?

LIQUID STREAM – TA vs Pukekohe

- Both cases – Nutrient limits are Load based

	Te Awamutu (Waipa DC) Granted 2018 – for 25 years		Pukekohe (Watercare) Granted 2017 – for 35 years	
Context	Consent	Design	Consent	Design
Total nitrogen	7.5* mg/l	7.5 mg/l	4.1* mg/l	3.5 mg/l
Total phosphorus	1.2* mg/l	1.2*** mg/l	1.0* mg/l	1.0*** mg/l
E.coli	126 cfu/100ml	10** cfu/100ml	50 cfu/100ml	1 cfu/100ml
$cBOD_5$ (med)	5 mg/l	5 mg/l	5 mg/l	5 mg/l
NH_4-N	0.5 mg/l	0.5 mg/l	1 mg/l	1 mg/l
TSS	15 mg/l	15 mg/l	5 mg/l	2 mg/l

Notes

* Back calc from load. Loads at end of consent.

** Clarifier effluent minus $3\log_{10}$

*** Can be trimmed accurately with chem dosing.

LIQUID STREAM – Metro DBC

	Metro DBC Plants
Context	Mean
Total nitrogen	4 mg/l
Total phosphorus	<1.0 mg/l
E.coli	14 cfu/100ml
$cBOD_5$ (med)	5 mg/l
NH_4-N	1mg/l
TSS	5 mg/l

- DBC Pre-Concept Design to assume / targets in table
- Load based nutrient consents
- But provision for offset mitigation of nutrients
- At this level of performance, nutrients govern design
- Ultimate case standard for DBC purpose. May be a transitional standard for early stages
- Plant designs with maximum flexibility – growth / effluent quality / technology
- Seek to mitigate OECs / CECs

SOLIDS STREAM

Population	Thicken	Dewater	Primary	Digest	Energy Recovery	Advanced Mass Reduction
<4,000						
<40,000						
<150,000						
>150,000						

Principles:

- Stepped technologies. Step sizes tbc. Seek most cost effective
- Landfilling rates increasing
- Treat as resource, extract as much energy as practicable
- Seek beneficial reuse
- Minimum standard allows emergency discharge to landfill
- Seek to mitigate OECs / CECs

ATMOSPHERIC EMMISIONS

- Odour
  - No offensive odour at boundary – standard measures
  - Odour Buffers and Reverse Sensitivity requirements
- GHG Emissions
  - Councils adopt National emissions targets (Zero Carbon Bill)
  - Optimise capital carbon
  - Maximise energy recovery / target energy neutrality – where practicable
  - Targeting ultra low TN will have emissions consequences (more Cap.Carb, biosolids, more N_2O, more energy)
  - Dual role of offset mitigation
- Noise – District Ordinances – Standard measures,

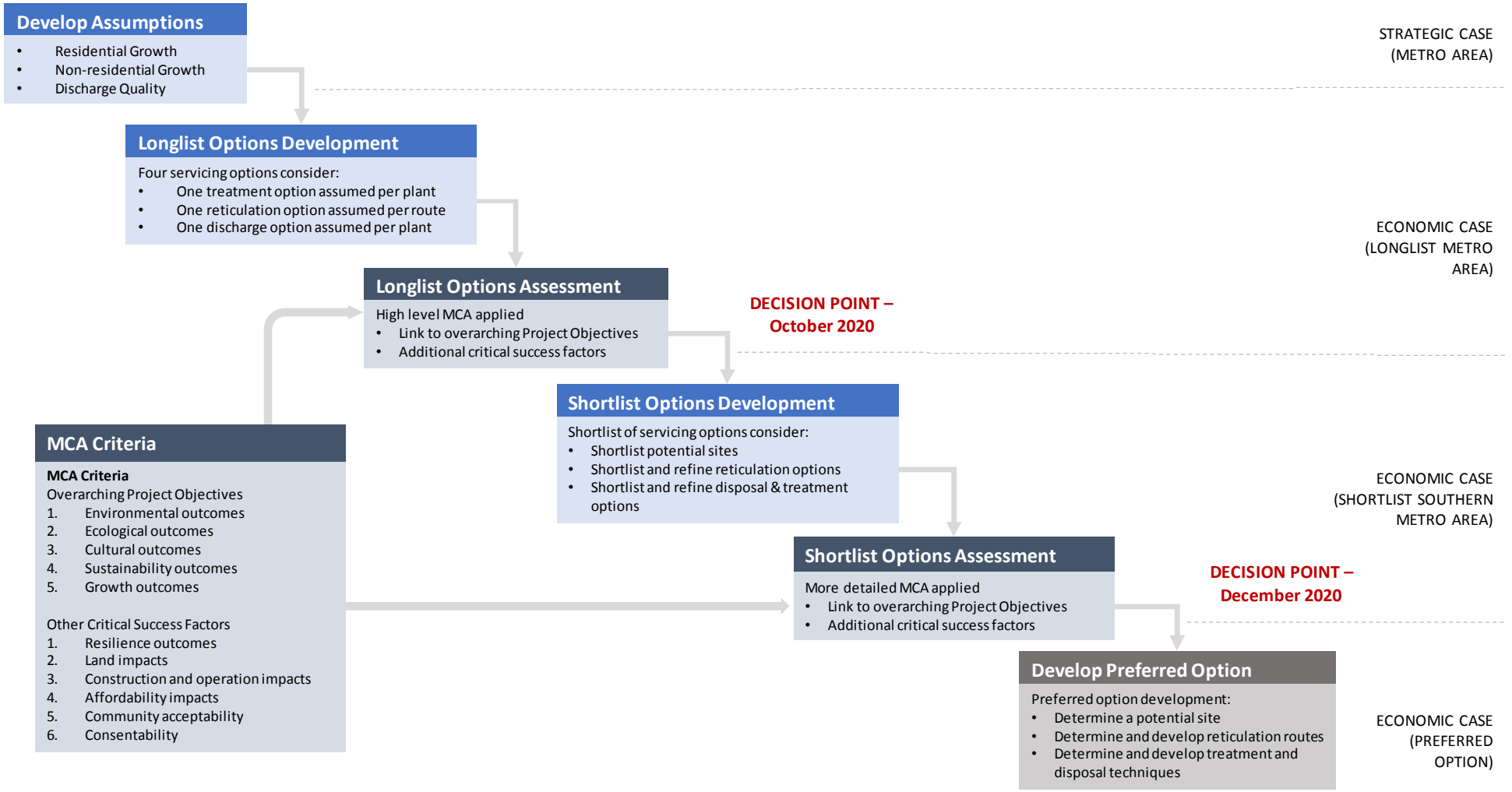
QUESTIONS???

Part 2: Assessment Criteria

PURPOSE

- Review the draft criteria for the multi criteria analysis (MCA) that will inform the wastewater servicing options assessments
- Provide feedback regarding criteria

Option Assessment Methodology



MCA Criteria

PROJECT OBJECTIVE CRITERIA

- **1. Water Quality**
  - Ability to achieve water quality improvements
  - Ability to reduce public health risks
- **2. Ecology**
  - Ability to achieve aquatic ecological improvements
  - Ability to improve vegetation cover / terrestrial ecosystems
- **3. Cultural connectivity**
  - Ability to reduce water/river discharges
  - Ability to enhance cultural connectivity
  - Ability to improve access to the river
- **4. Sustainable Technology**
  - Ability to reuse water
  - Ability to apply carbon neutral technologies
- **5. Sustainable Growth**
  - Ability to provide flexibility to adapt to growth and land use changes?
  - Ability to provide additional growth opportunities which align with the sustainable and planned future growth of the Waikato Metro area?

ADDITIONAL CRITICAL SUCCESS FACTORS CRITERIA

Construction impacts	Constructability risks (geotechnical, utilities impact)
Operational impacts	What is the relative ease or difficulty of operation and maintenance
Land impacts	Land requirements, impacts to properties during construction
Resilience impacts	Resilience against potential failures, climate change impacts and natural hazards
Community Acceptability	Level of support or resistance that can be expected from affected stakeholders
Consentability	Risk of delays during the consenting process
Funding Potential	Affordability and funding potential of options

GROUP SESSION

Topics to consider:

- **Discharge technique and location**
- **Cultural connectivity**
- **Climate change**
- **Energy and carbon footprint**
- **Community acceptability**
- **Any other criteria?**

Part 3: Group Session

PURPOSE

The purpose of this breakout session is to seek feedback on:

- The longlist options assessment
- The emerging shortlist of options

GROUP SESSION

KEY OUTCOMES – WHITE BOARD SESSION

Part 4: Wrap Up

The next steps of the process are:

- Summarise and collate feedback from this workshop
- Incorporate workshop feedback to be incorporated into the MCA process and outcomes
- Confirm the emerging shortlist of options

TO: **Waikato Metro Area Wastewater Wider Stakeholder Group**

DATE: 15 October 2020

SUBJECT: Post Workshop Long List MCA Assessment

This memo summarises the changes to the long list MCA assessment following feedback from stakeholders at the workshop held on 22nd September 2020.

Full details of the feedback provided are included in the meeting record. Only relevant components are detailed in this memo.

1. ASSESSMENT CRITERIA

As part of the Longlist MCA workshop, participants were asked to participate in a number of group breakout sessions. The first stakeholder workshop exercise asked participants to discuss three specific questions. The questions and the changes made to the MCA assessment to reflect the feedback on each question are listed below:

1. **The existing MCA process assumes land discharges are preferable to river discharges (from a cultural perspective). Is this assumption correct? If not how should we assess this distinction?**

   The changes made to criteria and/or the MCA assessment based on stakeholder feedback to this question include:

   - Ensuring water quality is weighted more highly than river vs land criteria
   - Removing land vs water discharge assessment at the longlist stage and revisiting this criteria when shortlisting discharge options.
   - Ensuring that water reuse is weighted more highly than discharging to land

2. **Does the number and location of discharges make a significant difference to the water quality?**

   The changes made to criteria and/or the MCA assessment based on stakeholder feedback to this question include:

   - Removing number and location of discharge assessment at the longlist stage.
   - Assessing the total discharge flows entering the river (regardless of discharge number and location) may be more applicable at the shortlist stage

3. **Cultural connectivity is currently not assessed as part of the longlist MCA. How would this be assessed? Is it appropriate to assess this as part of the longlist or shortlist assessment?**

   The changes made to criteria and/or the MCA assessment based on stakeholder feedback to this question include:

   - Cultural assessment will not be undertaken at a longlist assessment stage
   - Cultural connectivity may be something which is considered through the design of discharge routes or through the discharge option assessment
   - The process of developing and assessing options will continue to engage iwi.

3. MCA ASSESSMENT FEEDBACK

The long list options are:

Option 1 - Retain and upgrade existing 7 treatment plants (I.e. Ngaruawahia, Te Kowhai, Pukete, Matangi, Tauwhare Pa, Cambridge, Te Awamutu). Construct 2 new plants at Ohaupo & Airport locations. Total of 9 municipal treatment systems

Option 2 - Northern and southern (new site) sub-regional plants + TA. Total of 3 municipal treatment systems.

Option 3 - Northern and southern (Cambridge) sub-regional plants + TA. Total of 3 municipal treatment systems.

Option 4 - Retain and upgrade Ngaruawahia, Pukete, Cambridge, Te Awamutu. Construct new plant south of Hamilton. Total of 6 municipal treatment systems.

OPTION A variations of Options 1 – 4 assume Fonterra Hautapu continues to be serviced via stand-along private system.

OPTION B variations on Options 1 – 4 include servicing Fonterra Hautapu at the nearest municipal facility

The initial MCA assessment was released ahead of the workshop and feedback sought at the workshop. The feedback for each option is detailed in the meeting record. Following the workshop the project team met to work through the feedback and the overall MCA assessment again. This process resulted in the final assessment included in this memo.

The feedback was used to modify/update the MCA assessment. In addition, a

The feedback above was included within the assessment. The changes to the assessment are outlined below. Please see Appendix A for further details regarding the rationale for changes made to the MCA.

2. CRITERIA PRIORITIES

Participants were also asked to rank their top 5 criteria. The results are summarised in the table below.

CRITERIA	STAKEHOLDER PRIORITIES												RANK
Water Quality	1	1	1	1	1	1	6	1	1	1	6	1	1
Ecology	6	6	6	6	2	1	6	6	3	1	6	5	5
Cultural connectivity	2	6	2	2	3	2	6	5	5	4	6	2	2
Sustainable Technology	6	2	6	6	4	3	6	2	2	3	6	6	3
Sustainable Growth	6	6	4	3	5	4	6	4	4	2	6	3	4
Constructability	4	6	6	6	6	6	6	6	6	6	6	6	11
Maintenance and operations	6	3	6	6	6	6	6	6	6	6	4	6	9
Land impacts	5	6	6	6	6	6	2	6	6	6	3	6	8
Community acceptability	6	6	6	6	6	6	6	6	6	6	6	6	12
Consentability risks	3	6	6	6	6	6	6	6	6	6	6	6	10
Resilience	6	4	3	6	6	6	3	3	6	6	1	4	5
Funding Potential	6	5	5	6	6	6	1	6	6	3	2	5	7

This exercise identified the top 5 criteria as:

1. Water quality
2. Cultural connectivity
3. Sustainable technology
4. Sustainable growth
5. Ecology and Resilience

Other criteria which were identified as important included:

6. Funding potential
7. Land impacts
8. Operational impacts

The purpose of this exercise was to determine appropriate weightings for a range of sensitivity assessments. Weightings were developed which reflected the following sensitivities:

- Equal weightings across all criteria
- Objective criteria weighted higher than critical success factors
- Stakeholder sensitivity (reflects the outcomes shown above)
- Environmental sensitivity
- Cultural sensitivity
- Operability sensitivity
- Constructability sensitivity
- Affordability sensitivity

At this stage costs are still being developed. A value for money component will be assessed once costs are finalised.

4.POST WORKSHOP MCA EMERGING RESULTS

The preferred short-list of options from both the pre and post workshop MCA assessments are as follows:

- Option 2A is most preferred
- Option 3A is second most preferred
- Option 2B is third most preferred
- Option 3B is the fourth most preferred

Centralised options were considered to be more beneficial and impact the least compared to other options. The inclusion of Fonterra adds additional operational and resilience risks and therefore scores lower. Option 2A scores higher than Option 3A as this option does not require the construction at an existing plant site, meaning the constructability, operability and adaptability of Option 2A is better than Option 3A. Option 3A, however, is likely to be easier to consent given that the site for a plant already exists and it doesn't require the consent of a new discharge.

With regards to decentralised options:

- Option 1A (Do Minimum) is most preferred decentralised option
- Option 4A is the second most preferred decentralised option
- Options 1B and 4B scored the lowest of all options (excluding the Do Nothing option)

These results suggest that the inclusion of Fonterra is more feasible when being included into a sub-regional WWTP. Option 1A scores higher than Option 4A as Option 4A includes the additional risks associated with conveyance. It is expected that both Option 1A and Option 4A will realise the same benefits.

It should be noted that costs have yet to be included as part of this assessment. The 'Value for Money' assessment may change the above results.

5.NEXT STEPS

Next steps include:

- Assess costs as part of MCA and assess value for money
- Confirm short-list of options to take forward for more detailed consideration
- Identify and confirm the preferred option and disposal routes.

APPENDIX 1: MCA Assessment changes

The change in scoring following the workshop is shown in Table 1 below. The actual pre and post workshop MCA scoring is included in Table 2 and 3 respectively.

The scoring against the funding potential criteria has also been revised following review by PWC and are included in the post workshop scoring.

OBJECTIVE CRITERIA		Do Nothing	Option 1A (Do Minimum)	Option 1B	Option 2A	Option 2B	Option 3A	Option 3B	Option 4A	Option 4B
Water quality and health	To what extent does the option reduce the level of Nitrogen, Phosphorous, Nitrates and Ammonia in the quality of the discharge?	-	-	-1	-	-1	-	-1	-	-1
	To what extent does the option reduce the E.coli levels of the discharge to the river?	-	-	-	-	-	-	-	-	-
	To what extent does the option reduce the risk to public health? Measure by assessing risks associated with contamination of groundwater and the location of the discharges. E.coli has been captured above	-	-	-	-1	-1	-	-	-	-
Ecology	To what extent does the option impact or improve river ecosystems and hydrology	-	-	-	-1	-2	-	-	-	-
	To what extent does the option provide the ability to improve vegetation coverage around river bed and terrestrial ecosystems? This will only be applicable if we are including potential riparian areas as part of the options? This may have to remain very high level for now	-	-	-	-	-	-	-	-	-
Cultural Connectivity	To what extent does this option improve the quality of the water in relation to the number and location of discharge points	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time
	What potential is there for land discharge vs water discharge (How much does the option reduce the discharge to the river?). This assumes that land discharges are preferred. However further assessment is required from Iwi	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time
	To what extent does this option enhance and restore cultural connectivity with the river?									

	To what extent does the option increase the opportunity to improve the number of access points to the river and/or other waterways, lakes and wetlands? - measure by considering the potential to rehabilitate existing sites/riparian activities of options/location of site	-	-	-	-	-	+1	+1	-	-
Sustainable Technology	To what extent does the option allow for water reuse?	-	-	-1	-	-1	-	-1	-	-1
	To what extent does the option consider energy and carbon neutral technologies? To what extent do options reduce relative operational carbon associated with conveyance system?	-	-	1	-	-	-	-	-	1
Sustainable Growth	To what extent does the option provide flexibility to adapt to growth and land use changes?	-	-	-1	-	-1	-	-1	-	-1
	To what extent does this option provide additional growth opportunities which align with the sustainable and planned future growth of the Waikato Metro area?	-	-	-	+1	+1	+1	+1	-	-
CRITICAL SUCCESS FACTORS										
Constructability	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)	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-
Maintenance and operations	What is the relative ease or difficulty of operation and maintenance (includes access, odour treatment, resource availability, monitoring, etc.).	-	-	+2	-	-1	-	-1	-	-2
		-	-	-	-1	-	-	-	-	-
Land impacts	Land requirements, impacts to properties during construction, Potential site impacts to environment and potential for impacts to sites of cultural significance	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time
Community acceptability	Level of support or resistance that can be expected from affected stakeholders (including residents, businesses and community groups) during construction and operation. This assumes community will approve of environmental improvement associated with all options.	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time
Consentability opportunities and risks	To what extent will the option require consents for a new site (that require land use consent)? To what extent will the option have discharges that are likely to meet discharge parameters acceptable to the consent authority?	-	-	-	-	+1	-	+2	-	-
Resilience	To what extent will the option provide resilience against potential failures, climate change impacts, natural hazards and labour skill.	-	-	-1	-	-1	-	-1	-	-1

Funding Potential	What is the funding potential of the option?	+3	NC	NC	-1	-1	-1	-1	+2	+2
	What is the distribution of costs across the population base?	+3	+5	+5	-1	-1	-1	-1	+3	+3

Table 1 Pre-workshop MCA results

OBJECTIVE CRITERIA		Do Nothing	Option 1A (Do Minimum)	Option 1B	Option 2A	Option 2B	Option 3A	Option 3B	Option 4A	Option 4B
Water quality and health	To what extent does the option reduce the level of Nitrogen, Phosphorous, Nitrates and Ammonia in the quality of the discharge?	-3	3	3	3	3	3	3	3	3
	To what extent does the option reduce the E.coli levels of the discharge to the river?	-2	2	2	2	2	2	2	2	2
	To what extent does the option reduce the risk to public health? Measure by assessing risks associated with contamination of groundwater and the location of the discharges. E.coli has been captured above	-1	1	1	2	2	1	1	1	1
Ecology	To what extent does the option impact or improve river ecosystems and hydrology	-2	1	1	2	3	1	1	1	1
	To what extent does the option provide the ability to improve vegetation coverage around river bed and terrestrial ecosystems? This will only be applicable if we are including potential riparian areas as part of the options? This may have to remain very high level for now	0	1	1	1	1	1	1	1	1
Cultural Connectivity	To what extent does this option improve the quality of the water in relation to the number and location of discharge points	0	0	0	1	2	0	0	0	0
	What potential is there for land discharge vs water discharge (How much does the option reduce the discharge to the river?). This assumes that land discharges are preferred. However further assessment is required from Iwi	0	2	1	1	0	1	0	1	0
	To what extent does this option enhance and restore cultural connectivity with the river?									
	To what extent does the option increase the opportunity to improve the number of access points to the river and/or other waterways, lakes and wetlands? - measure by considering the potential to rehabilitate existing sites/riparian activities of options/location of site	0	1	1	2	2	1	1	1	1

OBJECTIVE CRITERIA		Do Nothing	Option 1A (Do Minimum)	Option 1B	Option 2A	Option 2B	Option 3A	Option 3B	Option 4A	Option 4B
Sustainable Technology	To what extent does the option allow for water reuse?	0	1	1	3	3	2	2	1	1
	To what extent does the option consider energy and carbon neutral technologies? To what extent do options reduce relative operational carbon associated with conveyance system?	0	-1	-1	1	2	1	2	-1	-1
Sustainable Growth	To what extent does the option provide flexibility to adapt to growth and land use changes?	-3	1	1	3	3	2	2	1	1
	To what extent does this option provide additional growth opportunities which align with the sustainable and planned future growth of the Waikato Metro area?	-3	2	2	2	2	2	2	2	2
CRITICAL SUCCESS FACTORS										
Constructability	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)	0	-2	-3	-1	-2	-2	-3	-2	-3
		0	0	-1	-2	-3	-2	-3	-1	-2
Maintenance and operations	What is the relative ease or difficulty of operation and maintenance (includes access, odour treatment, resource availability, monitoring, etc.).	0	0	0	1	1	1	1	0	0
		0	0	0	-1	-2	-3	-3	-1	-1
Land impacts	Land requirements, impacts to properties during construction, Potential site impacts to environment and potential for impacts to sites of cultural significance	0	-2	-2	-2	-2	0	0	-1	-1
Community acceptability	Level of support or resistance that can be expected from affected stakeholders (including residents, businesses and community groups) during construction and operation. This assumes community will approve of environmental improvement associated with all options.	-3	-2	-2	-1	-1	0	0	-2	-2
Consentability opportunities and risks	To what extent will the option require consents for a new site (that require land use consent)? To what extent will the option have discharges that are likely to meet discharge parameters acceptable to the consent authority?	-4	-3	-3	-1	-3	0	-3	-2	-3
Resilience	To what extent will the option provide resilience against potential failures, climate change impacts, natural hazards and labour skill.	-2	1	1	0	0	0	0	1	1
	What is the funding potential of the option?	-3	-2	-1	2	3	2	3	-2	-1

OBJECTIVE CRITERIA		Do Nothing	Option 1A (Do Minimum)	Option 1B	Option 2A	Option 2B	Option 3A	Option 3B	Option 4A	Option 4B
Funding Potential	What is the distribution of costs across the population base?	0	-3	-3	-1	-1	-1	-1	-3	-3

Table 2 Post workshop MCA results

OBJECTIVE CRITERIA		Do Nothing	Option 1A (Do Minimum)	Option 1B	Option 2A	Option 2B	Option 3A	Option 3B	Option 4A	Option 4B
Water quality and health	To what extent does the option reduce the level of Nitrogen, Phosphorous, Nitrates and Ammonia in the quality of the discharge?	-3	3	2	3	2	3	2	3	2
	To what extent does the option reduce the E.coli levels of the discharge to the river?	-2	2	2	2	2	2	2	2	2
	To what extent does the option reduce the risk to public health? Measure by assessing risks associated with contamination of groundwater and the location of the discharges. E.coli has been captured above	-1	1	1	1	1	1	1	1	1
Ecology	To what extent does the option impact or improve river ecosystems and hydrology	-2	1	1	1	1	1	1	1	1
	To what extent does the option provide the ability to improve vegetation coverage around river bed and terrestrial ecosystems? This will only be applicable if we are including potential riparian areas as part of the options? This may have to remain very high level for now	0	1	1	1	1	1	1	1	1
Cultural Connectivity	To what extent does this option improve the quality of the water in relation to the number and location of discharge points	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time
	What potential is there for land discharge vs water discharge (How much does the option reduce the discharge to the river?). This assumes that land discharges are preferred. However further assessment is required from Iwi	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time
	To what extent does this option enhance and restore cultural connectivity with the river?									
	To what extent does the option increase the opportunity to improve the number of access points to the river and/or other waterways, lakes and wetlands? - measure by considering the	0	1	1	2	2	2	2	1	1

OBJECTIVE CRITERIA		Do Nothing	Option 1A (Do Minimum)	Option 1B	Option 2A	Option 2B	Option 3A	Option 3B	Option 4A	Option 4B
	potential to rehabilitate existing sites/riparian activities of options/location of site									
Sustainable Technology	To what extent does the option allow for water reuse?	0	1	0	3	2	2	1	1	0
	To what extent does the option consider energy and carbon neutral technologies? To what extent do options reduce relative operational carbon associated with conveyance system?	0	-1	0	1	2	1	2	-1	0
Sustainable Growth	To what extent does the option provide flexibility to adapt to growth and land use changes?	-3	1	0	3	2	2	1	1	0
	To what extent does this option provide additional growth opportunities which align with the sustainable and planned future growth of the Waikato Metro area?	-3	2	2	3	3	3	3	2	2
CRITICAL SUCCESS FACTORS										
Constructability	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)	0	-2	-3	-1	-2	-2	-3	-2	-3
		0	0	-1	-2	-3	-2	-3	-1	-2
Maintenance and operations	What is the relative ease or difficulty of operation and maintenance (includes access, odour treatment, resource availability, monitoring, etc.).	0	0	-2	1	0	1	0	0	-2
		0	0	0	-2	-2	-3	-3	-1	-1
Land impacts	Land requirements, impacts to properties during construction, Potential site impacts to environment and potential for impacts to sites of cultural significance	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time
Community acceptability	Level of support or resistance that can be expected from affected stakeholders (including residents, businesses and community groups) during construction and operation. This assumes community will approve of environmental improvement associated with all options.	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time	Not scored at this time
Consentability opportunities and risks	To what extent will the option require consents for a new site (that require land use consent)? To what extent will the option have discharges that are likely to meet discharge parameters acceptable to the consent authority?	-4	-3	-3	-1	-2	0	-1	-2	-3

OBJECTIVE CRITERIA		Do Nothing	Option 1A (Do Minimum)	Option 1B	Option 2A	Option 2B	Option 3A	Option 3B	Option 4A	Option 4B
Resilience	To what extent will the option provide resilience against potential failures, climate change impacts, natural hazards and labour skill.	-2	1	0	0	-1	0	-1	1	0
Funding Potential	What is the funding potential of the option?	0	-2	-1	1	2	1	2	0	1
	What is the distribution of costs across the population base?	3	2	2	-2	-2	-2	-2	0	0

Appendix C – Discharge options

Table 1. Assessment of the feasibility of potential discharge methods for Option 1. KEY - Green – Minimal Constraints, Yellow – Some Constraints, Orange – Major Constraints

Metro WWTP	Option 1 specifics	Discharge to land[1]		Discharge direct to water	Discharge indirectly to water		Industrial and/or potable reuse		Preferred discharge option
		Slow rate irrigation[2]	Rapid infiltration bed	Diffuser to river	Wetlands[3]	Rock passage / land contact	Indirect reuse	Direct reuse	
Ngaruawahia	New plant to be built by 2030	May be feasible provided additional land can be secured for WWTP purposes from the surrounding rural area. Approximately 201 ha of land would be required.	Likely to be feasible, soils in the Ngaruawahia area appear to be well drained. A geotechnical assessment of the specific proposed location for the discharge would be required to confirm this.	The existing discharge is mainly a diffuser to the Waikato River. With a high level of treatment, water quality is expected to improve in the river.	Onsite wetlands were removed as part of a previous consent process due to poor maintenance leading to deterioration in water quality. Approximately 2.2 ha of land would be required.	An existing gravel bed system is also utilised prior to discharge. This discharge method could continue to be used.	Not economically feasible due to the small flows.		Existing discharge to water
Te Kowhai	Upgrade existing plant by 2030	The existing plant discharges to land via a soakage hole and is very constrained, as it is bounded by residential properties. It is likely that a new site will be required to accommodate the expected increase in flows. The preferred land disposal method will depend on the final site selection, area available, and soil drainage. Approximately 14 ha of land would be required for slow rate irrigation.		Directly discharging to the adjacent stream could have adverse environmental effects due to the small flows in the stream but improvement over existing discharge.	Not feasible on the existing site due to the limited land area available. However, it is likely that a new site will be required to accommodate the expected increase in flows, and in this case indirect discharge to water may be feasible. Approximately 1600 m^2 of land would be required for a wetland discharge system.		Not economically feasible due to the small flows.		Discharge to land
Pukete	Upgrade existing plant every 10-15 years	Not feasible due to the lack of available land (site is bounded by industrial and residential areas). Approximately 2706 ha of land would be required.	Unlikely to be feasible due to site constraints and the lack of available land.	The existing discharge is a diffuser to the Waikato River. With a high level of treatment, water quality is expected to improve in the river.	Unlikely to be feasible given the constrained nature of the site, bounded by residential and industrial properties. Approximately 30 ha of land would be required for a wetland disposal system.	The existing plant does not currently discharge indirectly to water; however a rock passage or bankside discharge structure may be feasible.	Feasible assuming treatment discharge quality is high. However, public perception may be an issue.		Existing diffuser to river OR new rock passage system
Matangi	Upgrade existing plant within next 5 years	The existing plant discharges to an ~1500 m^2 disposal field via a dripper line system. The shallow ground water table can cause issues with land disposal options during winter months. Climate change is likely to exacerbate this problem. Providing additional storage could be an option to buffer peak flows and allow irrigation to stop if the ground is saturated. More land would be required by 2061, with a 3ha disposal field required for irrigation to land.		The land is flat and there are no nearby watercourses adjacent to the Matangi plant that are feasible options for discharge to water (directly or indirectly).			Not economically feasible due to the small flows.		Discharge to land
Tauwhare Pa	Upgrade existing plant	Likely to be feasible provided additional land can be secured for WWTP purposes from the surrounding rural area. Approximately 2 ha of land would be required.	Unlikely to be feasible given that the soil in the Tauwhare Pa area is mostly poorly draining silt over clay soils. This would need to be confirmed by a geotechnical assessment.	The land is flat and there are no nearby watercourses adjacent to the Tauwhare Pa plant that are feasible options for discharge to water (directly or indirectly).			Not economically feasible due to the small flows.		Irrigation to land
Airport	New plant to be built by 2027	The site of the proposed new southern WWTP has not yet been selected. It is unlikely that slow rate irrigation will be a feasible disposal option as it would require approximately 107 ha of land and a high level of maintenance for the large number of irrigation lines.	The airport is located in a rural area and it is likely that sufficient land could be secured so that discharge to land is feasible. This will also depend on the final site selection and soil drainage properties.	Depending on the location of the site, discharge to the Waikato River via a diffuser is likely to be feasible given the high level of treatment. Given this is a new plant, an alternatives assessment would need to clearly identify discharge directly to the river as the best option for consenting.	Depending on the location of the site, indirect discharge to water options are likely to be feasible. Wetland disposal systems are likely to require more maintenance.		Feasible assuming treatment discharge quality is high. However, public perception may be an issue.		Rapid infiltration bed OR discharge indirectly to water

Metro WWTP	Option 1 specifics	Discharge to land[1]		Discharge direct to water	Discharge indirectly to water		Industrial and/or potable reuse		Preferred discharge option
		Slow rate irrigation[2]	Rapid infiltration bed	Diffuser to river	Wetlands[3]	Rock passage / land contact	Indirect reuse	Direct reuse	
Ohaupo	New plant to be built by 2050	A large amount of land near Ohaupo consists of poorly draining peat soils, not suitable for land discharge methods. This will need to be a consideration in site selection if discharge to land is preferred. Approximately 6 ha of land would be required for slow rate irrigation.		The land is flat and there are no watercourses near Ohaupo that are feasible options for discharge to water (directly or indirectly).			Not economically feasible due to the small flows.		Discharge to land
Cambridge[4]	New plant to be built by 2030	Due to the underlying geology and susceptibility to tomo formation, there are significant geotechnical risks associated with discharge to land. Approximately 270 ha (excluding Fonterra flows) or 490 ha (including Fonterra flows) of land would be required.	The existing plant has rapid infiltration beds but due to the underlying geology, there are significant geotechnical risks with continuing with this discharge method when flows increase in response to population growth.	Directly discharging high quality treated wastewater to the Waikato River is a feasible option, however it may be challenging to consent due to the Pukerimu water intake downstream and cultural opposition to direct discharges to water.	The existing plant has some discharge to wetlands. Indirect discharge to water options are likely to be feasible, however design of any discharge system will need to consider the underlying geology and potential geotechnical risks. Approximately 3 ha (excluding Fonterra flows) or 5.4 ha (including Fonterra flows) of land would be required for a wetland discharge system.		Feasible assuming treatment discharge quality is high. However, public perception may be an issue. Note that direct discharge to river would also become indirect reuse as the Pukerimu water intake is directly downstream.		Discharge to water OR reuse
Te Awamutu	Upgrade existing plant by 2045	It is unlikely that slow rate irrigation will be a feasible disposal option as it would require approximately 216 ha of land and a high level of maintenance for the large number of irrigation lines.	Unlikely to be feasible, due to unsuitable soils in the Te Awamutu area.	The existing land contact system works very well therefore it would be difficult to justify installing a new discharge structure in the bed of the stream.	Land is available for discharge via wetlands to be a feasible option. However, this would require approximately 2.4 ha of land and is likely to require more maintenance that the existing land contact system.	Existing discharge is via gabion baskets to Mangapiko Stream – designed in conjunction with iwi. This discharge method could continue to be used.	Feasible assuming treatment discharge quality is high. However, public perception may be an issue.		Land contact gabion basket system

[1] High-level drainage input sourced from S-Map Online, Manaaki Whenua Landcare Research

[2] Land area required is calculated based on the assumption of irrigation of 5mm/day, 50% buffer/non-irrigated, based on expected 2061 flows.

[3] Land area required is calculated based on the assumption of one day retention time, 300mm water depth, based on expected 2061 flows.

[4] In Option 1A, Fonterra will manage their own wastewater treatment and discharge. Under Option 1B, Fonterra Hautapu wastewater flows will be piped to the Cambridge WWTP for treatment.

Table 2. Assessment of the feasibility of potential discharge methods for Option 2. KEY - Green – Minimal Constraints, Yellow – Some Constraints, Orange – Major Constraints

Metro WWTP	Option 2 specifics	Discharge to land [1]		Discharge direct to water	Discharge indirectly to water		Industrial and/or potable reuse		Preferred discharge option
		Slow rate irrigation [2]	Rapid infiltration bed	Diffuser to river	Wetlands [3]	Artificial rock passage / land contact	Indirect reuse	Direct reuse	
Northern WWTP	Expansion required every 10-15 years. Convert Pukete WWTP to Membrane Bioreactor (MBR) and enhance digestion	Not feasible due to the lack of available land (site is bounded by industrial and residential areas). Approximately 2560 ha of land would be required.	Unlikely to be feasible due to site constraints and the lack of available land.	The existing discharge is a diffuser to the Waikato River. With a high level of treatment, water quality is expected to improve in the river.	Unlikely to be feasible given the constrained nature of the site, bounded by residential and industrial properties. Approximately 29 ha of land would be required for a wetland disposal system.	The existing plant does not currently discharge indirectly to water; however a rock passage or bankside discharge structure may be feasible.	Feasible assuming treatment discharge quality is high. However, public perception may be an issue.		Existing diffuser to river OR new rock passage system
Southern WWTP [4]	New plant located south of Peacockes to be built by 2030. Primary sedimentation, MBR and digestion	The site of the proposed new southern WWTP has not yet been selected. However, given the large number of existing lifestyle properties in this area, it is unlikely that sufficient land could be secured to discharge all flows to land. Approximately 744 ha (excluding Fonterra flows) or 960 ha (including Fonterra flows) of land would be required for slow rate irrigation.		Directly discharging high quality treated wastewater to the Waikato River is a feasible option. Given this is a new plant, an alternatives assessment would need to clearly identify discharge directly to the river as the best option for consenting.	Depending on the location of the site, indirect discharge to water options are likely to be feasible. Wetland disposal systems are likely to require more maintenance. Approximately 8.3 ha (excluding Fonterra flows) or 10.7 ha (including Fonterra flows) of land would be required for a wetland discharge system.		Feasible assuming treatment discharge quality is high. However, public perception may be an issue.		Indirect discharge to water
Tauwhare Pa	Upgrade existing plant	Likely to be feasible provided additional land can be secured for WWTP purposes from the surrounding rural area. Approximately 2 ha of land would be required.	Unlikely to be feasible given that the soil in the Tauwhare Pa area is mostly poorly draining silt over clay soils. This would need to be confirmed by a geotechnical assessment.	The land is flat and there are no nearby watercourses adjacent to the Tauwhare Pa plant that are feasible options for discharge to water (directly or indirectly).			Not economically feasible due to the small flows.		Irrigation to land
Te Awamutu	Upgrade existing plant by converting to MBR by 2045	It is unlikely that slow rate irrigation will be a feasible disposal option as it would require approximately 216 ha of land and a high level of maintenance for the large number of irrigation lines.	Unlikely to be feasible, due to unsuitable soils in the Te Awamutu area.	The existing land contact system works very well therefore it would be difficult to justify installing a new discharge structure in the bed of the stream.	Land is available for discharge via wetlands to be a feasible option. However, this is likely to require more maintenance that the existing land contact system.	Existing discharge is via gabion baskets to Mangapiko Stream – designed in conjunction with iwi. This discharge method could continue to be used.	Not economically feasible due to the small flows.		Land contact gabion basket system

[1] High-level drainage input sourced from S-Map Online, Manaaki Whenua Landcare Research

[2] Land area required is calculated based on the assumption of irrigation of 5mm/day, 50% buffer/non-irrigated, based on expected 2061 flows.

[3] Land area required is calculated based on the assumption of one day retention time, 300mm water depth, based on expected 2061 flows.

[4] In Option 2A, Fonterra will manage their own wastewater treatment and discharge. Under Option 2B, Fonterra Hautapu wastewater flows will be piped to the new Southern WWTP south of Peacockes for treatment.

Table 3. Assessment of the feasibility of potential discharge methods for Option 3. KEY - Green – Minimal Constraints, Yellow – Some Constraints, Orange – Major Constraints

Metro WWTP	Option 3 specifics	Discharge to land [1]		Discharge direct to water	Discharge indirectly to water		Industrial and/or potable reuse		Preferred discharge option
		Slow rate irrigation [2]	Rapid infiltration bed	Diffuser to river	Wetlands [3]	Artificial rock passage / land contact	Indirect reuse	Direct reuse	
Northern WWTP	Expansion of Pukete WWTP required every 10-15 years. Convert WWTP to Membrane Bioreactor (MBR) and enhance digestion	Not feasible due to the lack of available land (site is bounded by industrial and residential areas). Approximately 2560 ha of land would be required.	Unlikely to be feasible due to site constraints and the lack of available land.	The existing discharge is a diffuser to the Waikato River. With a high level of treatment, water quality is expected to improve in the river.	Unlikely to be feasible given the constrained nature of the site, bounded by residential and industrial properties. Approximately 29 ha of land would be required for a wetland disposal system.	The existing plant does not currently discharge indirectly to water; however a rock passage or bankside discharge structure may be feasible.	Feasible assuming treatment discharge quality is high. However, public perception may be an issue.		Existing diffuser to river OR new rock passage system
Southern WWTP [4]	New plant located at Cambridge to be built by 2030. Primary sedimentation, MBR and digestion	The site of the proposed new southern WWTP has not yet been selected. Due to the underlying geology and susceptibility to tomo formation, there are significant geotechnical risks associated with discharge to land.	The existing Cambridge plant has rapid infiltration beds but due to the underlying geology, there are significant geotechnical risks with continuing with this discharge method when flows increase in response to population growth.	Directly discharging high quality treated wastewater to the Waikato River is a feasible option, however it may be challenging to consent due to the Pukerimu water intake downstream and cultural opposition to direct discharges to water.	The existing plant has some discharge to wetlands. Indirect discharge to water options are likely to be feasible, however design of any discharge system will need to consider the underlying geology and potential geotechnical risks. Approximately 9 ha (excluding Fonterra flows) or 11 ha (including Fonterra flows) of land would be required for a wetland discharge system.		Feasible assuming treatment discharge quality is high. However, public perception may be an issue. Note that direct discharge to river may also become indirect reuse as the Pukerimu water intake is directly downstream of the existing plant site.		Discharge to water OR reuse
Tauwhare Pa	Upgrade existing plant	Likely to be feasible provided additional land can be secured for WWTP purposes from the surrounding rural area. Approximately 2 ha of land would be required.	Unlikely to be feasible given that the soil in the Tauwhare Pa area is mostly poorly draining silt over clay soils. This would need to be confirmed by a geotechnical assessment.	The land is flat and there are no nearby watercourses adjacent to the Tauwhare Pa plant that are feasible options for discharge to water (directly or indirectly).			Not economically feasible due to the small flows.		Irrigation to land
Te Awamutu	Upgrade existing plant by converting to MBR by 2045	It is unlikely that slow rate irrigation will be a feasible disposal option as it would require approximately 216 ha of land and a high level of maintenance for the large number of irrigation lines.	Unlikely to be feasible, due to unsuitable soils in the Te Awamutu area.	The existing land contact system works very well therefore it would be difficult to justify installing a new discharge structure in the bed of the stream.	Land is available for discharge via wetlands to be a feasible option. However, this is likely to require more maintenance that the existing land contact system.	Existing discharge is via gabion baskets to Mangapiko Stream – designed in conjunction with iwi. This discharge method could continue to be used.	Not economically feasible due to the small flows.		Land contact gabion basket system

[1] High-level drainage input sourced from S-Map Online, Manaaki Whenua Landcare Research

[2] Land area required is calculated based on the assumption of irrigation of 5mm/day, 50% buffer/non-irrigated, based on expected 2061 flows.

[3] Land area required is calculated based on the assumption of one day retention time, 300mm water depth, based on expected 2061 flows.

[4] In Option 3A, Fonterra will manage their own wastewater treatment and discharge. Under Option 3B, Fonterra Hautapu wastewater flows will be piped to the Southern WWTP at Cambridge for treatment.

Table 4. Assessment of the feasibility of potential discharge methods for Option 4. KEY - Green – Minimal Constraints, Yellow – Some Constraints, Orange – Major Constraints

Metro WWTP	Option 4 specifics	Discharge to land [1]		Discharge direct to water	Discharge indirectly to water		Industrial and/or potable reuse		Preferred discharge option
		Slow rate irrigation [2]	Rapid infiltration bed	Diffuser to river	Wetlands [3]	Artificial rock passage / land contact	Indirect reuse	Direct reuse	
Ngaruawahia	Replace existing plant by 2030	May be feasible provided additional land can be secured for WWTP purposes from the surrounding rural area. Approximately 201 ha of land would be required.	Likely to be feasible, soils in the Ngaruawahia area appear to be well drained. A geotechnical assessment of the specific proposed location for the discharge would be required to confirm this.	The existing discharge is mainly a diffuser to the Waikato River. With a high level of treatment, water quality is expected to improve in the river.	Onsite wetlands were removed as part of a previous consent process due to poor maintenance leading to deterioration in water quality. Approximately 2.2 ha of land would be required.	An existing gravel bed system is also utilised prior to discharge. This discharge method could continue to be used.	Not economically feasible due to the small flows.		Existing discharge to water
Northern WWTP	Expansion of Pukete WWTP required every 10-15 years. Convert to MBR and enhance primary treatment and digestion.	Not feasible due to the lack of available land (site is bounded by industrial and residential areas). Approximately 2720 ha of land would be required.	Unlikely to be feasible due to site constraints and the lack of available land.	The existing discharge is a diffuser to the Waikato River. With a high level of treatment, water quality is expected to improve in the river.	Unlikely to be feasible given the constrained nature of the site, bounded by residential and industrial properties. Approximately 30 ha of land would be required for a wetland disposal system.	The existing plant does not currently discharge indirectly to water; however a rock passage or bankside discharge structure may be feasible.	Feasible assuming treatment discharge quality is high. However, public perception may be an issue.		Existing diffuser to river OR new rock passage system
Southern WWTP	New plant to be built south of Peacockes by 2027 with MBR system	The site of the proposed new southern WWTP has not yet been selected. However, given the large number of existing lifestyle properties in this area, it is unlikely that sufficient land could be secured to discharge all flows to land. Approximately 116 ha of land would be required for slow rate irrigation.		Directly discharging high quality treated wastewater to the Waikato River is a feasible option. Given this is a new plant, an alternatives assessment would need to clearly identify discharge directly to the river as the best option for consenting.	Depending on the location of the site, indirect discharge to water options are likely to be feasible. Wetland disposal systems are likely to require more maintenance. Approximately 1.3 ha of land would be required for a wetland discharge system.		Feasible assuming treatment discharge quality is high. However, public perception may be an issue.		Indirect discharge to water
Cambridge [4]	New plant to be built by 2030	Due to the underlying geology and susceptibility to tomo formation, there are significant geotechnical risks associated with discharge to land.	The existing plant has rapid infiltration beds but due to the underlying geology, there are significant geotechnical risks with continuing with this discharge method when flows increase in response to population growth.	Directly discharging high quality treated wastewater to the Waikato River is a feasible option, however it may be challenging to consent due to the Pukerimu water intake downstream and cultural opposition to direct discharges to water.	The existing plant has some discharge to wetlands. Indirect discharge to water options are likely to be feasible, however design of any discharge system will need to consider the underlying geology and potential geotechnical risks. Approximately 3 ha (excluding Fonterra flows) or 5.5 ha (including Fonterra flows) of land would be required for a wetland discharge system.		Feasible assuming treatment discharge quality is high. However, public perception may be an issue. Limited industrial areas nearby. Note that direct discharge to river would also become indirect reuse as the Pukerimu water intake is directly downstream.		Discharge to water OR reuse
Tauwhare Pa	Upgrade existing plant	Likely to be feasible provided additional land can be secured for WWTP purposes from the surrounding rural area. Approximately 2 ha of land would be required.	Unlikely to be feasible given that the soil in the Tauwhare Pa area is mostly poorly draining silt over clay soils. This would need to be confirmed by a geotechnical assessment.	The land is flat and there are no nearby watercourses adjacent to the Tauwhare Pa plant that are feasible options for discharge to water (directly or indirectly).			Not economically feasible due to the small flows.		Irrigation to land
Te Awamutu	Upgrade existing plant by converting to MBR by 2045	It is unlikely that slow rate irrigation will be a feasible disposal option as it would require approximately 216 ha of land and a high level of maintenance for the large number of irrigation lines.	Unlikely to be feasible, due to unsuitable soils in the Te Awamutu area.	The existing land contact system works very well therefore it would be difficult to justify installing a new discharge structure in the bed of the stream.	Land is available for discharge via wetlands to be a feasible option. However, this is likely to require more maintenance that the existing land contact system.	Existing discharge is via gabion baskets to Mangapiko Stream – designed in conjunction with iwi. This discharge method could continue to be used.	Not economically feasible due to the small flows.		Land contact gabion basket system

[1] High-level drainage input sourced from S-Map Online, Manaaki Whenua Landcare Research
[2] Land area required is calculated based on the assumption of irrigation of 5mm/day, 50% buffer/non-irrigated, based on expected 2061 flows.
[3] Land area required is calculated based on the assumption of one day retention time, 300mm water depth, based on expected 2061 flows.
[4] In Option 4A, Fonterra will manage their own wastewater treatment and discharge. Under Option 4B, Fonterra Hautapu wastewater flows will be piped to Cambridge WWTP for treatment.

Appendix D – Cost estimates

Project:	**Waikato Wastewater Metro DBC**
Document:	**Long List High Level cost Estimate**
Version:	1
Project No's	3257177
Date:	6 October 2020
Author:	Claire Scrimgeour, Cameron McRobie (reviewed John Crawford)

MAIN SUMMARY

1.00 Executive Summary:

1.01 The following high level cost estimates are for the projects identified in the Waikato Metro DBC Long List Report

2.00 Scope of Work:

2.01 The scope includes new pipelines, pump stations, and wastewater treatment plants to provide capacity to 2061

3.00 Estimate Approach & Methodology:

3.01 This estimate has been prepared using high level estimating principles for the key scope items identified. Costs are all in 2020 $.

4.00 Project Risks:

4.01 The following project risks have been identified with the current scheme:

a Land availability
b Geotechnical conditions

5.00 Value Management Opportunities:

5.01 The following Value Management Opportunities have been identified with the current scheme:

a Nil

6.00 Estimate Assumptions:

6.01 Our estimate of cost is based on the following working assumptions:

a The works will be undertaken under normal working hours with no restrictions on timing.

b The works will be tendered and carried out by a variety of contractors, generally grouped into packages for efficient delivery.

c The accuracy of this high level estimate is commensurate with the level of design information available and base assumptions made.

7.00 Estimate Exclusions:

7.01 This concept estimate excludes the following:

a Client management costs

b Legal fees

c Contingency allowances

d Client insurances

e Escalation allowances

f Goods and Services Tax

8.00 Reference Documentation:

8.01 The concept estimate is based on the following documentation: Growth Assumptions Memo

9.00 Disclaimers

9.02 This report has been prepared by Beca on the specific instructions of our Client. It is solely for our Client’s use for the purpose for which it is intended in accordance with the agreed scope of work. Any use or reliance by any person contrary to the above, to which Beca has not given its prior written consent, is at that person's own risk.

9.03 Where another party has supplied information for use in this report, it is assumed to be reliable.

9.04 Beca reserves the right, but not the obligation, to review all calculations included or referred to in this report and, if considered necessary, to revise its opinion in the light of any new or existing information.

9.05 This cost estimate has been developed solely for the purpose of comparing and evaluating options. They cannot be used for budget-setting purposes as common elements between options may have been omitted and/or the works not fully scoped. A functional design should be undertaken if a budget estimate is required.

METRO WASTEWATER DBC LONG LIST ASSUMPTIONS

General Allowance for Design, Consenting **30%**

Flows and Population for Transmission to WWTP		These populations are used to select the pump station and conveyance size		
Parameter	**Average flows**	**Population (max)**	**Flow Range (min)**	**Flow Range (max DW)**
Pop. Size	**L/p/d**	**p**	**m³/d**	**m³/d**
Small	200	2,500	-	500
Medium	200	15,000	500	3,000
Large	200	40,000	3,000	8,000

From GHD - length, diameter
TA - 2035 Stage 4 upgrade as per Concept design $15M, 2044 - upgrade plant with membranes $10M from 3WMP
Nga - new WWTP 2031, size for 2061
Small WWTPs 2031 - size for 2061
Pukete - First 10 years LTP work (MBR), next 30 years costing from ATV models/Pukete sizing spreadsheet

Pipe Sizing

Velocity Assumptions Min WW velocity (m/s) **0.7** Max WW velocity (m/s) **1.5**

Parameter			**Nearest Actual Diameter**	**Pipe Specs**	**Dry weather flow velocity range (m/s)**			**Approx Max System Head Loss**	**Pipe $**
Pipe Size			**ID mm**	**PE 100 PN16**	**m/s**	**m/s**		**m/1000m**	**$/m**
Small			203	DN250	-	0.36		10.0	455
Medium			366	DN450	0.11	0.66		10.0	1,040
Large			513	DN630	0.34	0.90		10.0	2,080

Conveyance Capex and Opex

Parameter	**Peak Flow (2.5 PF)**	**Pumps**			**Total Conveyance**	**Pump Station Capital Cost ($)**		**Power Cost**	**Operations and Maintenance**	**Chemical Dosing Cost**
Pump Station Size	**(L/s)**	**Arrangement**			**Total capital cost**	**Chamber etc ($)**	**Storage ($/m³)**		**Annual 5% capex PS**	$/m3 per year
Small	20	duty, standby			*1,900,000*	1,400,000	500,000		$ 95,000.00	
Medium	90	duty, standby			*4,600,000*	3,600,000	1,000,000	formula based on flow, headloss	$ 230,000.00	43
Large	240	duty, standby			*11,800,000*	9,300,000	2,500,000		$ 590,000.00	

Treatment Plants Assumptions (non BAU)

Capex

Parameter	**Description**	**Population Equivalent**		**Flow (m³/d)**		**Plant Cost ($M)**		**OPEX**	
WWTP Size	**Plant Philosophy**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**$./ML/year**	
Small	Pukekohe or better. High level of nutrient, BOD, Solids and pathogen reduction. Land disposal where feasible.	1000	4000	200	800	0.0	14.0	631000	
Medium	Pukekohe or better. High level of nutrient, BOD, Solids and pathogen reduction. Discharge to water.	4000	40000	800	8000	14.0	35.9	540000	
Large	Pukekohe or better. High level of nutrient, BOD, Solids and pathogen reduction. Plus Energy recovery. Facility for other forms of resource recovery in future such as potable recycling, struvite etc but not installed. Discharge to water or re-use.	40000	500000	8000	100000	47	309	200000	

WWTP Small Opex Capex $M min 9.36

Cost Component	**Useage**		**Throughput**		**Annual**		**Unit Cost**		**Annual Cost**	**Rounded Annual Cost**	
Power (including Tarrifs)	1265	kW.hr/ML	2	ML/D	923450	kW.hr	$ 0.2000	$/kW.hr	$ 184,690	$ 185,000	
Operator	2	FTE					120000	$/FTE	$ 240,000	$ 240,000	
UV Lamp replacement	10						791	$/Lamp	$ 7,913	$ 8,000	
Monitoring & compliance									$ 200,000	$ 200,000	
Maintenance - Civil and Mechanical									$ 190,000	$ 190,000	2%
Chemicals (CIP/Alum/Caustic)									$ 40,000	$ 40,000	
Screenings & Grit							130	$/T	$ 50,000	$ 50,000	
Polymer	11	kg.poly/T.DS	0.3	T.DS/day		kg.poly/yr		$/kg		$ -	
Sludge disposal			1.6	T/day	588	T/yr	$ 400.00	$/T	$ 235,060	$ 235,000	Transfer to Central site a
Sub- Total									$ 1,147,663	$ 1,148,000	
Contingency									$ 114,766		Annual Cost per MLD
Estimated Annual OPEX									**$ 1,262,429**	**$ 1,262,000**	$ 631,000

WWTP Medium Opex Capex $M min 31.2

Cost Component	**Useage**		**Throughput**		**Annual**		**Unit Cost**		**Annual Cost**	**Rounded Annual Cost**	
Power (including Tarrifs)	1265	kW.hr/ML	5	ML/D	2308625	kW.hr	$ 0.2000	$/kW.hr	$ 461,725	$ 462,000	
Operator	4	FTE					120000	$/FTE	$ 480,000	$ 480,000	
UV Lamp replacement	20						791	$/Lamp	$ 15,826	$ 16,000	
Monitoring & compliance									$ 200,000	$ 200,000	
Maintenance - Civil and Mechanical									$ 624,000	$ 624,000	2%
Chemicals (CIP/Alum/Caustic)									$ 100,000	$ 100,000	

Screenings & Grit							130	$/T	$ 100,000	$ 100,000		
Polymer	11	kg.poly/T.DS	0.8	T.DS/day	3232	kg.poly/yr	$ 12.00	$/kg	$ 38,785	$ 39,000		
Sludge disposal			4.0	T/day	1469	T/yr	$ 300.00	$/T	$ 440,738	$ 441,000		
Sub- Total									$ 2,461,073	$ 2,461,000		
Contingency									$ 246,107		Annual Cost per MLD	
Estimated Annual OPEX									**$ 2,707,181**	**$ 2,707,000**	$	541,400

WWTP Large Opex Capex $M min 73

Cost Component	**Useage**		**Throughput**		**Annual**		**Unit Cost**		**Annual Cost**	**Rounded Annual Cost**		
Power (including Tarrifs)	632.5	kW.hr/ML	50	ML/D	11543125	kW.hr	$ 0.2000	$/kW.hr	$ 1,962,331	$ 1,962,000		
Operator	8	FTE					120000	$/FTE	$ 960,000	$ 960,000		
UV Lamp replacement	50						791	$/Lamp	$ 39,565	$ 40,000		
Monitoring & compliance									$ 500,000	$ 500,000		
Maintenance - Civil and Mechanical									$ 1,460,000	$ 1,460,000		2%
Chemicals (CIP/Alum/Caustic)									$ 500,000	$ 500,000		
Screenings & Grit							130	$/T	$ 500,000	$ 500,000		
Polymer	11	kg.poly/T.DS	5.5	T.DS/day	21932	kg.poly/yr	$ 12.00	$/kg	$ 263,183	$ 263,000		
Sludge disposal			27.3	T/day	9969	T/yr	$ 300.00	$/T	$ 2,990,719	$ 2,991,000		
Sub- Total									$ 9,175,798	$ 9,176,000		
Contingency									$ 917,580		Annual Cost per MLD	
Estimated Annual OPEX									**$ 10,093,378**	**$ 10,093,000**	$	201,860

OPTION 1A

Area	Treatment Plant Size 2061 (m^3/d)	WWTP Name	Type of plant	WWTP Capital Cost ($)	WWTP Operational Cost ($)	PS Size	PS Capital Cost ($)	PS Operational Cost ($)	Conveyance (km)	Conveyance Size	Conveyance ($)	Land disposal irrigation costs	Land disposal land costs
Taupiri & Hopuhopu													
Ngaruawahia	6,685	Ngaruawhia	Medium	34,550,000	3,610,163								
Horotiu													
Te Kowhai	474	Te Kowhai	Small	8,170,000	299,157		-	-	-			948,200	1,137,840
Whatawhata													
Hamilton North									-				
East of Hamilton	90,191	Pukete	Large	225,000,000	18,038,200				-				
Hamilton South									-				
	93	Matangi	Small	3,408,320	58,557		0	-	-			185,600	222,720
Matangi							-	-	-				
Airport	3,570	Airport	Medium	28,300,000	1,928,016		-	-	-				
Ohaupo	206	Ohaupo	Small	5,907,280	130,112		-	-	-			412,400	494,880
Cambridge & Hautapu	9,006	Cambridge	Large	77,990,000	1,801,240		-	-	-				
Te Awamutu & Kihikhi	7,200	Te Awamutu	Medium	25,000,000	3,888,000		-	-	-				
	-		-	-			**0**	-	-				
Totals				**409,000,000**	**29,754,000**		**-**	**-**	**0**	**-**	**-**	**1,547,000**	**1,856,000**

OPTION 2A

Area	Treatment Plant Size 2061 (m^3/d)	WWTP Name	Type of plant (2045)	WWTP Capital Cost ($)	WWTP Operational Cost ($)	PS Size	PS Capital Cost ($)	PS Operational Cost ($)	Conveyance (km)	Conveyance Size	Conveyance ($)
Taupiri & Hopuhopu											
Ngaruawahia						Large	11,800,000	894,219	11	Large	22,880,000
Horotiu						Medium	4,600,000	548,034	5.8	Medium	6,032,000
Te Kowhai	85,426	Pukete	Large	220,000,000	17,085,106	Small	1,900,000	130,306	6.1	Small	2,775,500
Hamilton North						-			-	-	
East of Hamilton											
Hamilton South						Large	11,800,000	1,592,890	7.3	Large	22,776,000
Matangi						Small	1,900,000	101,711	7.7	Small	3,503,500
Airport	24,801	Airport subregional	Large	136,030,000	4,960,174						
Ohaupo						Small	1,900,000	111,619	9.5	Small	4,322,500
Cambridge & Hautapu						Large	11,800,000	1,455,613	14.5	Large	37,700,000
Te Awamutu & Kihikhi	7,200	Te Awamutu	Medium	25,000,000	3,888,000		-	-	-	-	
	-										
Totals				**382,000,000**	**25,934,000**	**-**	**46,000,000**	**4,835,000**	**61.9**	**0**	**99,990,000**

OPTION 3A

Area	Treatment Plant Size 2061 (m^3/d)	WWTP Name	Type of plant (2061)	WWTP Capital Cost ($)	WWTP Operational Cost ($)	PS Size	PS Capital Cost ($)	PS Operational Cost ($)	Conveyance (km)	Conveyance Size	Conveyance ($)
Taupiri & Hopuhopu											
Ngaruawahia						Large	11,800,000	894,219	11	Large	22,880,000
Horotiu						Medium	4,600,000	548,034	5.8	Medium	6,032,000
Te Kowhai	85,426	Pukete	Large	220,000,000	17,085,106	Small	1,900,000	130,306	6.1	Small	2,775,500
Whatawhata											
Hamilton North						-	-	-	-	-	-
East of Hamilton											
Hamilton South						Large	11,800,000	2,278,466	21.8	Large	68,016,000
Tauwhare											
Matangi						Small	1,900,000	102,265	7.7	Small	3,503,500
Airport	24,856	Cambridge sub-regional	Large	149,210,000	4,971,174	Medium	4,600,000	631,402	14.5	Medium	15,080,000
Ohaupo						Small	1,900,000	112,439	9.5	Small	4,322,500
Cambridge & Hautapu						-	-	-	-	-	
Te Awamutu & Kihikhi	7,200	Te Awamutu	Medium	25,000,000	3,888,000		-	-	-	-	
	-		-	-							
Totals				**395,000,000**	**25,945,000**	**-**	**39,000,000**	**4,698,000**	**76.4**	**-**	**122,610,000**

OPTION 4A

Area	Treatment Plant Size 2061 (m^3/d)	WWTP name	Type of plant (2045)	WWTP Capital Cost ($)	WWTP Operational Cost ($)	PS Size	PS Capital Cost ($)	PS Operational Cost ($)	Conveyance (km)	Conveyance Size	Conveyance ($)
Taupiri & Hopuhopu											
Ngaruawahia	6,685	Ngaruawahia	Medium	34,548,000	3,610,163						
Horotiu											
Te Kowhai						Small	1,900,000	129,514	5.9	Small	2,684,500
Whatawhata											
Hamilton North	90,665	Pukete	Large	225,000,000	18,133,062						
East of Hamilton						-	-	-	-	-	
Hamilton South											
Tauwhare											
Matangi	3,869	Airport	Small	29,100,000	2,441,591	Small	1,900,000	101,594	7.41	Small	3,371,550
Airport											
Ohaupo						Small	1,900,000	110,351	8.64	Small	3,931,200
Cambridge & Hautapu	9,006	Cambridge	Large	77,990,000	1,801,240		-	-	-	-	
Te Awamutu & Kihikhi	7,200	Te Awamutu	Medium	25,000,000	3,888,000		-	-	-	-	
	-	-	-								
Totals				**392,000,000**	**29,875,000**	**-**	**6,000,000**	**342,000**	**21.95**	**0**	**9,988,000**

Appendix E – Detailed MCA

MCA	KPI equivalent	Criteria measure																		
OBJECTIVE CRITERIA			Do Nothing (for comparative purposes only)		Option 1A (Do Minimum)		Option 1B		Option 2A		Option 2B		Option 3A		Option 3B		Option 4A		Option 4B	
1.By 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 restoring and protecting the health and wellbeing of the river	KPI 1.1: Public health risks caused by the concentration of E.coli within the WWTP discharges	To what extent does the option reduce the level of Nitrogen, Phosphorous, Nitrates and Ammonia in the quality of the discharge?	-3	The existing discharges do not meet current consenting conditions for 6 of the 7 municipal plants. The consenting conditions for some of the smaller plants (such as Matangi) are out dated. New consenting conditions will likley require higher performances from all plants. Existing plants will not be able to meet increasing standards. Increasing population and flows will likely increase the level of Nitrogen, Phosphorus, Nitrates and Ammonia entering the river	3	All plants will be upgraded or built to produce a very high discharge quality (as per water quality memo). This is considered a very high quality for WW discharges and is significantly higher than the current quality of discharges. Particularly for smaller plants (i.e. Te Kowhai, Matangi, Tauwhare Pa and the airport). The Fonterra standalone facility will be upgrading there existing facilities to produce a discharge at a high quality (not as high as other municpal plants) but still significantly better than the current process.	2	All plants will be upgraded or built to produce a very high discharge quality (as per water quality memo). This is considered a very high quality for WW discharges and is significantly higher than the current quality of discharges. Particularly for smaller plants (i.e. Te Kowhai, Matangi, Tauwhare Pa and the airport). It is expected that a high quality discharge can still be achieved if fonterra flows are conveyed to a municiple plant. However, additional flows and significantly high concentration in loads which will be discharged to the river. As part of Option A, Fonterra flows will be discharged to land, which reduces the concentration loads to the river.	3	All plants will be upgraded or built to produce a very high discharge quality (as per water quality memo). This is considered a very high quality for WW discharges and is significantly higher than the current quality of discharges. The Fonterra standalone facility will be upgrading there existing facilities to produce a discharge at a high quality (not as high as other plants) but still significantly better than the current process.	2	All plants will be upgraded or built to produce a very high discharge quality (as per water quality memo). This is considered a very high quality for WW discharges and is significantly higher than the current quality of discharges. Particularly for smaller plants (i.e. Te Kowhai, Matangi, Tauwhare Pa and the airport). It is expected that a high quality discharge can still be achieved if fonterra flows are conveyed to a municiple plant. However, additional flows and significantly high concentration in loads which will be discharged to the river. As part of Option A, Fonterra flows will be discharged to land, which reduces the concentration loads to the river.	3	All plants will be upgraded or built to produce a very high discharge quality (as per water quality memo). This is considered a very high quality for WW discharges and is significantly higher than the current quality of discharges. The Fonterra standalone facility will be upgrading there existing facilities to produce a discharge at a high quality (not as high as other plants) but still significantly better than the current process.	2	All plants will be upgraded or built to produce a very high discharge quality (as per water quality memo). This is considered a very high quality for WW discharges and is significantly higher than the current quality of discharges. Particularly for smaller plants (i.e. Te Kowhai, Matangi, Tauwhare Pa and the airport). It is expected that a high quality discharge can still be achieved if fonterra flows are conveyed to a municiple plant. However, additional flows and significantly high concentration in loads which will be discharged to the river. As part of Option A, Fonterra flows will be discharged to land, which reduces the concentration loads to the river.	3	All plants will be upgraded or built to produce a very high discharge quality (as per water quality memo). This is considered a very high quality for WW discharges and is significantly higher than the current quality of discharges. Particularly for smaller plants (i.e. Tauwhare Pa and the airport). The Fonterra standalone facility will be upgrading there existing facilities to produce a discharge at a high quality (not as high as other plants) but still significantly better than the current process.	2	All plants will be upgraded or built to produce a very high discharge quality (as per water quality memo). This is considered a very high quality for WW discharges and is significantly higher than the current quality of discharges. Particularly for smaller plants (i.e. Te Kowhai, Matangi, Tauwhare Pa and the airport). It is expected that a high quality discharge can still be achieved if fonterra flows are conveyed to a municiple plant. However, additional flows and significantly high concentration in loads which will be discharged to the river. As part of Option A, Fonterra flows will be discharged to land, which reduces the concentration loads to the river.
	KPI 1.2 Concentration of Total Nitrogen contaminants impacting the river and connected waterways from WWTPs																			
	KPI 1.3: Concentration of Total Phosphorous contaminants impacting the river and connected waterways from WWTPs	To what extent does the option reduce the E.coli levels of the discharge to the river?	-2	It is expected that plants such as Ngaruawahia and Te Kowhai will struggle to reduce E.coli levels as population and flow loads start increasing.	2	All plants will be upgraded or built to produce lower levels of E.coli. However it is expected that plants will achieve a much greater reduction for other nutrient levels (nitrogen and phosphorus) than for E.coli.	2	All plants will be upgraded or built to produce lower levels of E.coli. However it is expected that plants will achieve a much greater reduction for other nutrient levels (nitrogen and phosphorus) than for E.coli.	2	All plants will be upgraded or built to produce lower levels of E.coli. However it is expected that plants will achieve a much greater reduction for other nutrient levels (nitrogen and phosphorus) than for E.coli.	2	All plants will be upgraded or built to produce lower levels of E.coli. However it is expected that plants will achieve a much greater reduction for other nutrient levels (nitrogen and phosphorus) than for E.coli.	2	All plants will be upgraded or built to produce lower levels of E.coli. However it is expected that plants will achieve a much greater reduction for other nutrient levels (nitrogen and phosphorus) than for E.coli.	2	All plants will be upgraded or built to produce lower levels of E.coli. However it is expected that plants will achieve a much greater reduction for other nutrient levels (nitrogen and phosphorus) than for E.coli.	2	All plants will be upgraded or built to produce lower levels of E.coli. However it is expected that plants will achieve a much greater reduction for other nutrient levels (nitrogen and phosphorus) than for E.coli.	2	All plants will be upgraded or built to produce lower levels of E.coli. However it is expected that plants will achieve a much greater reduction for other nutrient levels (nitrogen and phosphorus) than for E.coli.
	KPI 1.4: Proportion of plants which are compliant against discharge quality consent conditions	To what extent does the option reduce the risk to public health? measure by assessing risks associated with contamination of groundwater and the location of the discharges. Ecoli has been captured above	-1	Currently there is a heavy reliance on septic tanks used for large lifestyle blocks and some rural towns and small communities which have a risk of failure. This has the potential to lead to public health issues. A continuing reliance on individual septic tanks may have public health implications in the future as they could fail and contaminate groundwater or potenetially nearby water bores. This is particularly true for Te Kowhai which is likley to see large population increases and a large increase in septic tank use.	1	New plants at Ohaupo, airport and the upgrades at Te Kowhai will reduce the number of properties relying on septic tanks, reducing the risk of failure and therefore the risk to public health. Land disposal will be used for some of the smaller plants (i.e. Ohaupo, airpot, Te Kowhai and Matangi). However, the high quality of effluent being used for land discharge will mean limited impacts on groundwater.	1	New plants at Ohaupo, airport and the upgrades at Te Kowhai will reduce the number of properties relying on septic tanks, reducing the risk of failure and therefore the risk to public health. Land disposal will be used for some of the smaller plants (i.e. Ohaupo, airpot, Te Kowhai and Matangi). However, the high quality of effluent being used for land discharge will mean limited impacts on groundwater.	1	Similar to option 1, this option will reduce the public health risk associated with potential fails of septic tanks at Ohaupo and Te Kowhai. The improved discharge quality will reduce health risks assicated with swimming and collected kai from the river. It should be noted that the change in the discharge location in realation to the water intake will not make a significant difference to public health risks.	1	Similar to option 1, this option will reduce the public health risk associated with potential fails of septic tanks at Ohaupo and Te Kowhai. The improved discharge quality will reduce health risks assicated with swimming and collected kai from the river. It should be noted that the change in the discharge location in realation to the water intake will not make a significant difference to public health risks.	1	Similar to option 1, this option will reduce the public health risk associated with potential fails of septic tanks at Ohaupo and Te Kowhai. The improved discharge quality will reduce health risks assicated with swimming and collected kai from the river.	1	Similar to option 1, this option will reduce the public health risk associated with potential fails of septic tanks at Ohaupo and Te Kowhai. The improved discharge quality will reduce health risks assicated with swimming and collected kai from the river.	1	Similar to option 1, this option will reduce the public health risk associated with potential fails of septic tanks at Ohaupo and Te Kowhai. The improved discharge quality will reduce health risks assicated with swimming and collected kai from the river.	1	Similar to option 1, this option will reduce the public health risk associated with potential fails of septic tanks at Ohaupo and Te Kowhai. The improved discharge quality will reduce health risks assicated with swimming and collected kai from the river.
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 eco-system re-entry impacts by 2050	KPI 2.1: Amount of algal biomass in the Waikato River as measured by chlorophyll a concentrations attributable to treated wastewater discharges	To what extent does the option impact or improve river ecosystems and hydrology	-2	River ecology may be impacted by increasing discharges to the river. Discharges currently do no meet consenting requirements and will likely to continue to degrade the river, with increasing nutrient loads. This reduces the oxygen in the water and therefore impacts on aquatic health.	1	Water quality improvements can be achieved through improved discharge qualities. This will likely improve the number and variety of aqualitic life in the river. The number and location of discharges is unlikely to make a significant difference to ecologyical health. Water quality improvements will have a much greater impact on this criteria. Therefore all options will achieve the same benefit with regards to ecological health improvements	1	Water quality improvements can be achieved through improved discharge qualities. This will likely improve the number and variety of aqualitic life in the river. The number and location of discharges is unlikely to make a significant difference to ecologyical health. Water quality improvements will have a much greater impact on this criteria. Therefore all options will achieve the same benefit with regards to ecological health improvements. Fonterra discharges to river will have limited effect on ecology and hydrology as the flows are not significant in comparison to the overall flows of the river.	1	Water quality improvements can be achieved through improved discharge qualities. This will likely improve the number and variety of aqualitic life in the river. The number and location of discharges is unlikely to make a significant difference to ecologyical health. Water quality improvements will have a much greater impact on this criteria. Therefore all options will achieve the same benefit with regards to ecological health improvements	1	Water quality improvements can be achieved through improved discharge qualities. This will likely improve the number and variety of aqualitic life in the river. The number and location of discharges is unlikely to make a significant difference to ecologyical health. Water quality improvements will have a much greater impact on this criteria. Therefore all options will achieve the same benefit with regards to ecological health improvements. Fonterra discharges to river will have limited effect on ecology and hydrology as the flows are not significant in comparison to the overall flows of the river.	1	Water quality improvements can be achieved through improved discharge qualities. This will likely improve the number and variety of aqualitic life in the river. The number and location of discharges is unlikely to make a significant difference to ecologyical health. Water quality improvements will have a much greater impact on this criteria. Therefore all options will achieve the same benefit with regards to ecological health improvements	1	Water quality improvements can be achieved through improved discharge qualities. This will likely improve the number and variety of aqualitic life in the river. The number and location of discharges is unlikely to make a significant difference to ecologyical health. Water quality improvements will have a much greater impact on this criteria. Therefore all options will achieve the same benefit with regards to ecological health improvements. Fonterra discharges to river will have limited effect on ecology and hydrology as the flows are not significant in comparison to the overall flows of the river.	1	Water quality improvements can be achieved through improved discharge qualities. This will likely improve the number and variety of aqualitic life in the river. The number and location of discharges is unlikely to make a significant difference to ecologyical health. Water quality improvements will have a much greater impact on this criteria. Therefore all options will achieve the same benefit with regards to ecological health improvements	1	Water quality improvements can be achieved through improved discharge qualities. This will likely improve the number and variety of aqualitic life in the river. The number and location of discharges is unlikely to make a significant difference to ecologyical health. Water quality improvements will have a much greater impact on this criteria. Therefore all options will achieve the same benefit with regards to ecological health improvements. Fonterra discharges to river will have limited effect on ecology and hydrology as the flows are not significant in comparison to the overall flows of the river.
	KPI 2.2: Health and abundance of mahinga kai species																			
	KPI 2.3: Number and variety of terrestrial species at specific locations within the metro area	To what extent does the option provide the ability to improve vegetation coverage around river bed and terrestrial ecosystems? - this will only be applicable if we are including potential riparian areas as part of the options? This may have to remain very high level for now	0	No change or improvement to terrestrial ecosystems	1	All options will consider carbon offsetting, riparian vegetation and rehabilitation. At this stage no one option can achieve this better than another. Therefore all options will achieve the same benefit with regards to terrestrial ecostystems.	1	All options will consider carbon offsetting, riparian vegetation and rehabilitation. At this stage no one option can achieve this better than another. Therefore all options will achieve the same benefit with regards to terrestrial ecostystems.	1	All options will consider carbon offsetting, riparian vegetation and rehabilitation. At this stage no one option can achieve this better than another. Therefore all options will achieve the same benefit with regards to terrestrial ecostystems.	1	All options will consider carbon offsetting, riparian vegetation and rehabilitation. At this stage no one option can achieve this better than another. Therefore all options will achieve the same benefit with regards to terrestrial ecostystems.	1	All options will consider carbon offsetting, riparian vegetation and rehabilitation. At this stage no one option can achieve this better than another. Therefore all options will achieve the same benefit with regards to terrestrial ecostystems.	1	All options will consider carbon offsetting, riparian vegetation and rehabilitation. At this stage no one option can achieve this better than another. Therefore all options will achieve the same benefit with regards to terrestrial ecostystems.	1	All options will consider carbon offsetting, riparian vegetation and rehabilitation. At this stage no one option can achieve this better than another. Therefore all options will achieve the same benefit with regards to terrestrial ecostystems.	1	All options will consider carbon offsetting, riparian vegetation and rehabilitation. At this stage no one option can achieve this better than another. Therefore all options will achieve the same benefit with regards to terrestrial ecostystems.
	KPI 2.4: Area coverage of native riparian vegetation surrounding water bodies and within the catchment area																			
3. Wastewater treatment solutions restore and enhance cultural connectivity with the river so that by 2050 Marae and iwi access to the river and other sites of significance within the metro spatial area is no longer impeded by wastewater treatment solutions	KPI 3.1: Maatauranga Maaori Cultural Health Index	To what extent does this option improve the quality of the water in relation to the number and location of discharge points	Not scored at this time	At this stage of the assessment, the number and location of the river discharges will not significantly change the health and wellbeing of the river. Localised benefits at locations where discharges are removed are offset by the additional discharges at other locations (i.e. transfer of impact from one location to another, therefore does not matter form a whole of river persepctive)	Not scored at this time	At this stage of the assessment, the number and location of the river discharges will not significantly change the health and wellbeing of the river. Localised benefits at locations where discharges are removed are offset by the additional discharges at other locations (i.e. transfer of impact from one location to another, therefore does not matter form a whole of river persepctive)	Not scored at this time	At this stage of the assessment, the number and location of the river discharges will not significantly change the health and wellbeing of the river. Localised benefits at locations where discharges are removed are offset by the additional discharges at other locations (i.e. transfer of impact from one location to another, therefore does not matter form a whole of river persepctive)	Not scored at this time	At this stage of the assessment, the number and location of the river discharges will not significantly change the health and wellbeing of the river. Localised benefits at locations where discharges are removed are offset by the additional discharges at other locations (i.e. transfer of impact from one location to another, therefore does not matter form a whole of river persepctive)	Not scored at this time	At this stage of the assessment, the number and location of the river discharges will not significantly change the health and wellbeing of the river. Localised benefits at locations where discharges are removed are offset by the additional discharges at other locations (i.e. transfer of impact from one location to another, therefore does not matter form a whole of river persepctive)	Not scored at this time	At this stage of the assessment, the number and location of the river discharges will not significantly change the health and wellbeing of the river. Localised benefits at locations where discharges are removed are offset by the additional discharges at other locations (i.e. transfer of impact from one location to another, therefore does not matter form a whole of river persepctive)	Not scored at this time	At this stage of the assessment, the number and location of the river discharges will not significantly change the health and wellbeing of the river. Localised benefits at locations where discharges are removed are offset by the additional discharges at other locations (i.e. transfer of impact from one location to another, therefore does not matter form a whole of river persepctive)	Not scored at this time	At this stage of the assessment, the number and location of the river discharges will not significantly change the health and wellbeing of the river. Localised benefits at locations where discharges are removed are offset by the additional discharges at other locations (i.e. transfer of impact from one location to another, therefore does not matter form a whole of river persepctive)	Not scored at this time	At this stage of the assessment, the number and location of the river discharges will not significantly change the health and wellbeing of the river. Localised benefits at locations where discharges are removed are offset by the additional discharges at other locations (i.e. transfer of impact from one location to another, therefore does not matter form a whole of river persepctive)
		What potential is there for land discharge vs water discharge (How much does the option reduce the discharge to the river?) This assumes that land discharges are preferred. However further assessment is required from Iwi	Not scored at this time	At this stage of the assessment, the potential for land discharges is still unknown. Large plants have potential for some land discharge opportunities. It is unclear if this is greater, worse of th same as small plants options at this stage.	Not scored at this time	At this stage of the assessment, the potential for land discharges is still unknown. Large plants have potential for some land discharge opportunities. It is unclear if this is greater, worse of th same as small plants options at this stage.	Not scored at this time	At this stage of the assessment, the potential for land discharges is still unknown. Large plants have potential for some land discharge opportunities. It is unclear if this is greater, worse of th same as small plants options at this stage. It is likely that the inclusion of Fonterra flows will mean that greater concentration loads will be discharged to the river than when compared with Option A. This has been captured within the water quality criteria and the water reuse criteria.	Not scored at this time	At this stage of the assessment, the potential for land discharges is still unknown. Large plants have potential for some land discharge opportunities. It is unclear if this is greater, worse of th same as small plants options at this stage.	Not scored at this time	At this stage of the assessment, the potential for land discharges is still unknown. Large plants have potential for some land discharge opportunities. It is unclear if this is greater, worse of th same as small plants options at this stage. It is likely that the inclusion of Fonterra flows will mean that greater concentration loads will be discharged to the river than when compared with Option A. This has been captured within the water quality criteria and the water reuse criteria.	Not scored at this time	At this stage of the assessment, the potential for land discharges is still unknown. Large plants have potential for some land discharge opportunities. It is unclear if this is greater, worse of th same as small plants options at this stage.	Not scored at this time	At this stage of the assessment, the potential for land discharges is still unknown. Large plants have potential for some land discharge opportunities. It is unclear if this is greater, worse of th same as small plants options at this stage. It is likely that the inclusion of Fonterra flows will mean that greater concentration loads will be discharged to the river than when compared with Option A. This has been captured within the water quality criteria and the water reuse criteria.	Not scored at this time	At this stage of the assessment, the potential for land discharges is still unknown. Large plants have potential for some land discharge opportunities. It is unclear if this is greater, worse of th same as small plants options at this stage.	Not scored at this time	At this stage of the assessment, the potential for land discharges is still unknown. Large plants have potential for some land discharge opportunities. It is unclear if this is greater, worse of th same as small plants options at this stage. It is likely that the inclusion of Fonterra flows will mean that greater concentration loads will be discharged to the river than when compared with Option A. This has been captured within the water quality criteria and the water reuse criteria.
		To what extent does this option enhance and restore cultural connectivity with the river?	Not scored at this time	Cultural assessment will not be undertaken for a longlist assessment.	Not scored at this time	Cultural assessment will not be undertaken for a longlist assessment.	Not scored at this time	Cultural assessment will not be undertaken for a longlist assessment.	Not scored at this time	Cultural assessment will not be undertaken for a longlist assessment.	Not scored at this time	Cultural assessment will not be undertaken for a longlist assessment.	Not scored at this time	Cultural assessment will not be undertaken for a longlist assessment.	Not scored at this time	Cultural assessment will not be undertaken for a longlist assessment.	Not scored at this time	Cultural assessment will not be undertaken for a longlist assessment.	Not scored at this time	Cultural assessment will not be undertaken for a longlist assessment.
	KPI 3.2: Number and quality of access points to the river for cultural and recreational activities	To what extent does the option increase the opportunity to improve the number of access points to the river and/or other waterways, lakes and wetlands? - measure by considering the potential to rehabilitate existing sites/riparian activities of options/location of site	0	No change to access points	1	It is assumed that all options will seek to improve the quality of access particularly around and near the existing and new plants	1	It is assumed that all options will seek to improve the quality of access particularly around and near the existing and new plants	2	It is assumed that all options will seek to improve the quality of access particularly around and near the exitsing plants. A new plant south of Peacockes may incorporate some additional access points to the river for monitoring purposes. Cambridge and Ngaruawahia site has a greater opportunity for improvements to public access to the river due to its location next to the river. Other sites are not near river or other waterways. This option allows for greater opportunities at Cambridge site which will no longer be a WWTP site.	2	It is assumed that all options will seek to improve the quality of access particularly around and near the exitsing plants. A New plant south of Peacockes may incorporate some additional access points to the river for monitoring purposes. Cambridge and Ngaruawahia site has a greater opportunity for improvements to public access to the river due to its location next to the river. Other sites are not near river or other waterways. This option allows for greater opportunities at Cambridge site which will no longer be a WWTP site.	2	It is assumed that all options will seek to improve the quality of access particularly around and near the exitsing plants. Ngaruawahia site has a greater opportunity for improvements to public access to the river due to its location next to the river. Other sites are not near river or other waterways.	2	It is assumed that all options will seek to improve the quality of access particularly around and near the exitsing plants. Ngaruawahia site has a greater opportunity for improvements to public access to the river due to its location next to the river. Other sites are not near river or other waterways.	1	It is assumed that all options will seek to improve the quality of access particularly around and near the existing and new plants	1	It is assumed that all options will seek to improve the quality of access particularly around and near the existing and new plants
4. Maximise efficient use of resources and resource recovery to contribute to net zero greenhouse gas related emissions from wastewater treatment systems by 2050	KPI 4.1: Water reuse, water allocations and accounting	To what extent does the option allow for water reuse?	0	No potential for reuse - quality and technology not available to achieve reuse	1	Limited potential for industrial reuse of water. Most of the plants remain at a smaller scale and there uneconomical to build in infrastructure to cater for industrial reuse. Pukete may have the ability for reuse in the future, when flows and infrastructure become economical. Smaller plants have the ability for irrigation reuse / disposal to land is more feasible with lower flows. A Fonterra standalone option will also continue reusing water for irrigation purposes and therefore all Option A's score higher than Option B's.	0	Limited potential for industrial reuse of water. Most of the plants remain at a smaller scale and there uneconomical to build in infrastructure to cater for industrial reuse. Pukete may have the ability for reuse in the future, when flows and infrastructure become economical. Smaller plants have the ability for irrigation reuse / disposal to land is more feasible with lower flows. A Fonterra standalone option will also continue reusing water for irrigation purposes and therefore all Option A's score higher than Option B's.	3	High potential for water reuse with nearby industrial sector at the airport. There is greater industrial growth potential (100ha) near the airpot than at Cambridge High potential to maximise resource recovery given the size of flows available. A Fonterra standalone option will also continue reusing water for irrigation purposes and therefore all Option A's score higher than Option B's.	2	High potential for water reuse with nearby industrial sector at the airport. There is greater industrial growth potential (100ha) near the airpot than at Cambridge High potential to maximise resource recovery given the size of flows available. A Fonterra standalone option will also continue reusing water for irrigation purposes and therefore all Option A's score higher than Option B's.	2	High potential for water reuse with nearby industrial sector at Cambridge. However industrial growth potential is smaller than Option 2 High potential to maximise resource recovery given the size of flows available. A Fonterra standalone option will also continue reusing water for irrigation purposes and therefore all Option A's score higher than Option B's.	1	High potential for water reuse with nearby industrial sector at Cambridge. However industrial growth potential is smaller than Option 2 High potential to maximise resource recovery given the size of flows available. A Fonterra standalone option will also continue reusing water for irrigation purposes and therefore all Option A's score higher than Option B's.	1	Limited potential for industrial reuse of water. Most of the plants remain at a smaller scale and there uneconomical to build in infrastructure to cater for industrial reuse. Pukete may have the ability for reuse in the future, when flows and infrastructure become economical. Smaller plants have the ability for irrigation reuse / disposal to land is more feasible with lower flows. A Fonterra standalone option will also continue reusing water for irrigation purposes and therefore all Option A's score higher than Option B's.	0	Limited potential for industrial reuse of water. Most of the plants remain at a smaller scale and there uneconomical to build in infrastructure to cater for industrial reuse. Pukete may have the ability for reuse in the future, when flows and infrastructure become economical. Smaller plants have the ability for irrigation reuse / disposal to land is more feasible with lower flows. A Fonterra standalone option will also continue reusing water for irrigation purposes and therefore all Option A's score higher than Option B's.
	KPI 4.2: Carbon footprint / Energy requirements of plant and plant systems (i.e. pumps)	To what extent does the option consider energy and carbon neutral technologies. To what extent do options reduce relative operational carbon associated with conveyance system. Biosolid reuse potential	0	Currently unable to achieve any sustainable improvements.	-1	In order to achieve high water quality a higher energy is required when compared with a Do Nothing option. Additionally this option requires the operation of 10 facilities (as opposed to 4 or 5). However this option will not require significant energy for conveyance acorss long distances. Small plants have limited ability to become energy neutral in the long term and limited ability to reuse biosolids. Fonterra standalone option could reuse biosolids as fertislisers.	0	In order to achieve high water quality a higher energy is required when compared with a Do Nothing option. Additionally this option requires the operation of 10 facilities (as opposed to 4 or 5). However this option will not require significant energy for conveyance acorss long distances. Small plants have limited ability to become energy neutral in the long term and limited ability to reuse biosolids. Including Fonterra flows into the Cambridge plant will make it possible to reuse biosolids and the plant will be of a size where energy neutral technology will be more economical	1	In the long term, larger plants at Pukete and south of Hamilton have the ability to become energy neutral, for the operation of the plants. At this stage it is unknown if the conveyancing costs can be offset. The energy requiremetns for conveyance will be significant as will the carbon footprint created during construction of a new plant and pipelines. Fewer plants will mean there will be lower operational energy requirements (5 plants compared with 10 plants in option 1).	2	In the long term, larger plants at Pukete and south of Hamilton have the ability to become energy neutral, for the operation of the plants. At this stage it is unknown if the conveyancing costs can be offset. The energy requiremetns for conveyance will be significant as will the carbon footprint created during construction of a new plant and pipelines. Fewer plants will mean there will be lower operational energy requirements (4 plants compared with 10 plants in option 1). Including Fonterra flows into the Cambridge plant will make it possible to reuse biosolids and the plant will be of a size where energy neutral technology will be more economical	1	In the long term, larger plants at Pukete and Cambridge have the ability to become carbon neutral, for the operation of the plants. At this stage it is unknown if the conveyancing costs can be offset. The energy requiremetns for conveyance will be significant as will the carbon footprint created during construction of a new plant and pipelines. Fewer plants will mean there will be lower operating costs (compared with 10 plants in option 1).	2	In the long term, larger plants at Pukete and Cambridge have the ability to become energy neutral, for the operation of the plants. At this stage it is unknown if the conveyancing costs can be offset. The energy requiremetns for conveyance will be significant as will the carbon footprint created during construction of a new plant and pipelines. Fewer plants will mean there will be lower operational energy requirements (4 plants compared with 10 plants in option 1). Including Fonterra flows into the Cambridge plant will make it possible to reuse biosolids and the plant will be of a size where energy neutral technology will be more economical	-1	In order to achieve high water quality a higher energy is required when compared with a Do Nothing option. Additionally this option requires the operation of 7 facilities (as opposed to 4 or 5). However this option will not require significant energy for conveyance acorss long distances. Small plants have limited ability to become energy neutral in the long term and limited ability to reuse biosolids. Fonterra standalone option could reuse biosolids as fertislisers.	0	In order to achieve high water quality a higher energy is required when compared with a Do Nothing option. Additionally this option requires the operation of 6 facilities (as opposed to 4 or 5). However this option will not require significant energy for conveyance acorss long distances. Small plants have limited ability to become energy neutral in the long term and limited ability to reuse biosolids. Including Fonterra flows into the Cambridge plant will make it possible to reuse biosolids and the plant will be of a size where energy neutral technology will be more economical
	KPI 4.3 Proportion of biosolids that are able to be safely reused for beneficial purposes																			
5. The wastewater solution provides sufficient capacity to ensure sustainable growth in the metro spatial area in accordance with growth projections assumptions for the next 100 years	KPI 5.2: Proportion of Industrial areas which are serviced by municipal plants sustainably	To what extent does the option provide flexibity to adapt to growth and land use changes?	-3	Limited ability to respond to land use changes (given there are many locations no currently serviced). Industrial land uses in particular will be constrained	1	There is a greater agility to respond to growth through relatively limited immediate investment. However this simply defers long term investment decisions. Given rapid change in technology, this could be an advantage over large scale capital investment required by centralisation. However this works up to the maximum capacity of a small plant. Greater technological upgrades is required for a move to large scale plants.	0	There is a greater agility to respond to growth through relatively limited immediate investment. However this simply defers long term investment decisions. Given rapid change in technology, this could be an advantage over large scale capital investment required by centralisation. However this works up to the maximum capacity of a small plant. Greater technological upgrades is required for a move to large scale plants. The inclusion of Fonterra to Cambridge will mean Cambridge WWTP is required to make significant infrastructure upgrades in the short term and removes the ability for staged upgrades overtime. Loads will increase at Cambridge WWTP from a PE of 40,000 to a PE of 140,000	3	A new plant to the south can be master planned and custom built and therefore easier for this facility to adapt to growth and land use changes and technology changes. This option also provides the opportunity for infrastructure led landuse. E.g. locating appropriate activities around new resource recovery facilities.	2	A new plant to the south can be master planned and custom built and therefore easier for this facility to adapt to growth, land use changes and technology changes. This option also provides the opportunity for infrastructure led landuse. E.g. locating appropriate activities around new resource recovery facilities. The inclusion of Fonterra to the new subregional plant will mean this plant is required to make significant infrastructure upgrades in the short term and removes the ability for staged upgrades overtime.	2	There is less flexibility at the existing Cambridge site due to the need to keep the existing facility operational during construction. This will make it more difficult (than Option 2) to master plan the sub-regional facility so it can adapt to changes in the future.	1	There is less flexibility at the existing Cambridge site due to the need to keep the existing facility operational during construction. This will make it more difficult (than Option 2) to master plan the sub-regional facility so it can adapt to changes in the future. The inclusion of Fonterra to the new subregional plant will mean this plant is required to make significant infrastructure upgrades in the short term and removes the ability for staged upgrades overtime.	1	A new plant to the south can be custom built and therefore easier for this facility to adapt to growth and land use changes and technology changes. This option also provides the opportunity for infrastructure led landuse. E.g. locating appropriate activities around new resource recovery facilities. Option potentially provides for improved staging and deliverability through staggered major investment. Would enable trigger points to be established, at which time transition to further centralisation may occur. However, could also result in significant investment in facilities that become redundant before the asset life.	0	There is a greater agility to respond to growth through relatively limited immediate investment. However this simply defers long term investment decisions. Given rapid change in technology, this could be an advantage over large scale capital investment required by centralisation. However this works up to the maximum capacity of a small plant. Greater technological upgrades is required for a move to large scale plants. The inclusion of Fonterra to Cambridge will mean Cambridge WWTP is required to make significant infrastructure upgrades in the short term and removes the ability for staged upgrades overtime. Loads will increase at Cambridge WWTP from a PE of 40,000 to a PE of 140,000
	KPI: 5.3 Proportion of residents in the metro area serviced by municipal treatment plants sustainably	To what extent does this option provide additional growth opportunities which align with the sustainable and planned future growth of the Waikato Metro area?	-3	The current situation will not be able to service the area in the medium to long term. Ohaupo are not currently serviced but will soon require plant facilities. Growth at the airport will be limited based on the existing systems available at the airport	2	All options have been designed in line with the population assumptions outlined within the assumptions memo. This recognises industrial growth and wet industries.	2	All options have been designed in line with the population assumptions outlined within the assumptions memo. This recognises industrial growth and wet industries.	3	All options have been designed in line with the population assumptions outlined within the assumptions memo. This recognises industrial growth and wet industries. Option 2 and 3 free up capacity at Peacockes which is then able to service other potential growth areas (e.g. R3 and Southern Links area)	3	All options have been designed in line with the population assumptions outlined within the assumptions memo. This recognises industrial growth and wet industries. Option 2 and 3 free up capacity at Peacockes which is then able to service other potential growth areas (e.g. R3 and Southern Links area)	3	All options have been designed in line with the population assumptions outlined within the assumptions memo. This recognises industrial growth and wet industries. Option 2 and 3 free up capacity at Peacockes which is then able to service other potential growth areas (e.g. R3 and Southern Links area)	3	All options have been designed in line with the population assumptions outlined within the assumptions memo. This recognises industrial growth and wet industries. Option 2 and 3 free up capacity at Peacockes which is then able to service other potential growth areas (e.g. R3 and Southern Links area)	2	All options have been designed in line with the population assumptions outlined within the assumptions memo. This recognises industrial growth and wet industries.	2	All options have been designed in line with the population assumptions outlined within the assumptions memo. This recognises industrial growth and wet industries.
CRITICAL SUCCESS FACTORS																				
Constructability	Treatment	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)	0	No construction impacts/no construction activities beyond what is proposed in the LTP	-2	Two new sites for two new plants. Cambridge has large expansive area for its treatment. Te Kowhai and Ngaruawahia also have very constrained sites and will likley need additional sites nearby or totally new sites. Constructing whilst keeping the Cambridge operational will be extremely diffcult. Difficult to master plan a long term site. Cambridge is located near a river - which means its at risk of lateral spread. Greater costs associated with rehabilitating site to meet seismic standards. Diffcult to do in retrospect.	-3	Fonterral loads may mean you'll need to a plant with more unit processes (bigger than existing Cambridge). Need another part of the site to establish advance biosolids processes..	-1	One new plant and new location for plant south of peacockes. However a new site will be easier to construct and more flexible as we can choose site based on miminising impacts	-2	Fonterral loads may mean you'll need to a plant with more unit processes (bigger than existing Cambridge). Need another part of the site to establish advance biosolids processes..	-2	Constructing whilst keeping the Cambridge operational will be extremely diffcult. Difficult to master plan a long term site. Cambridge is located near a river - which means its at risk of lateral spread. Greater costs associated with rehabilitating site to meet seismic standards. Diffcult to do in retrospect.	-3	Fonterral loads may mean you'll need to a plant with more unit processes (bigger than existing Cambridge). Need another part of the site to establish advance biosolids processes..	-2	Constructing whilst keeping the Cambridge operational will be extremely diffcult. Difficult to master plan a long term site. Cambridge is located near a river - which means its at risk of lateral spread. Greater costs associated with rehabilitating site to meet seismic standards. Diffcult to do in retrospect. This option will also require a new site south of Peacockes	-3	Fonterral loads may mean you'll need to a plant with more unit processes (bigger than existing Cambridge). Need another part of the site to establish advance biosolids processes..

MCA	KPI equivalent	Criteria measure	Do Nothing (for comparative purposes only)		Option 1A (Do Minimum)		Option 1B		Option 2A		Option 2B		Option 3A		Option 3B		Option 4A		Option 4B	
OBJECTIVE CRITERIA																				
Maintenance and operations	Reticulation		0	No construction impacts/no construction activities beyond what is proposed in the LTP	0	No construction impacts/no construction activities beyond what is proposed in the LTP	-1	Very small conveyancing requirements. Crossing of SH1 for Te Kowhai as well as crossing of SH1 and Waikato River required for Fonterra pipeline - presents considerable risk for consenting and construction due to large diameter pipe. Rest of pipelines in road reserve, considered relatively low risk. Only one pipeline means low risk	-2	Considerable conveyancing requirements. Crossing of SH1 for Te Kowhai as well as crossing of SH1 and Waikato River required for Matangi pipeline - reasonable risk for consenting and construction, however small diameter pipe reduces risk. Rest of pipelines in road reserves on arterial roads, considered relatively low risk	-3	Considerable conveyancing requirements. Crossing of SH1 for Te Kowhai as well as crossing of SH1 and Waikato River required for Matangi pipeline and Fonterra pipeline - both present considerable risk for consenting and construction. Rest of pipelines in road reserves on arterial roads, considered relatively low risk	-2	Considerable conveyancing requirements. Crossing of SH1 for Te Kowhai as well as crossing of SH1 and Waikato River required for Matangi pipeline - reasonable risk for consenting and construction construction, however small diameter pipe reduces risk. Rest of pipelines in road reserves on arterial roads, considered relatively low risk	-3	Considerable conveyancing requirements. Crossing of SH1 for Te Kowhai as well as crossing of SH1 and Waikato River required for Matangi pipeline and Fonterra to Southern pipeline - both present considerable risk for construction. Rest of pipelines in road reserves on arterial roads, considered relatively low risk	-1	Reasonable conveyancing requirements. Crossing of SH1 for Te Kowhai as well as crossing of SH1 and Waikato River required for Matangi pipeline - reasonable risk for consenting and construction construction, however small diameter pipe reduces risk. Rest of pipelines in road reserves on arterial roads, considered relatively low risk	-2	Reasonable conveyancing requirements. Crossing of SH1 required for Te Kowhai as well as crossing of SH1 and Waikato River required for Matangi to Southern pipeline and Fonterra to Southern pipeline - both present considerable risk for construction. Rest of pipelines in road reserves on arterial roads, considered relatively low risk
	Treatment	What is the relative ease or difficulty of operation and maintenance (includes access, odour treatment, resource availability, monitoring, etc.) - Reliability	0	No change to operation of plants	0	Small plants are worse because they require (in total) more full time operators to cover the requisite number of sites. Small plants are likely to have a poorer Quality Assurance regime than large plants. The consents are more likely to be based on monthly or fortnightly compliance sampling and so it is more likely that regular process monitoring sampling will be done on the same time scale. Small plants are more poorly resourced in terms of on-site maintenance and repair capability. Therefore, failures, calibration and breakdowns are more likely to go unattended for longer in a smaller plant.	-2	The inclusion of Fonterra flows to the municipal plant at Cambridge will significantly increase the operational risks for Cambridge facility. When compared to a comparatively stable domestic treatment plant whose largest fluctuations are morning ablutions and significant rain events, adding a very large and sometimes harsh and rapidly changing industrial load can be very challenging to stable, compliant plant operation. Fonterson Flows can cause extremes in pH and temperature and so, if not adequately buffered, can lead to significant process upsets in an otherwise well operating biological treatment plant.	-1	Both Option 2 and 3 will reduce the total number of facilities from 10 to 5. The reduction in the number of plants will improve the performance consistency and quality of monitoring and testing. The larger plants will attract more skilled staff and allow for the substitution of staff between facilities (as they are likely to use the same technology).	0	The inclusion of Fonterra flows to a subregional facility will increase the operational risks for the subregional facility. The addition of Fonterra flows increase both the likelihood and the consequence of an operational failure. When compared to a comparatively stable domestic treatment plant whose largest fluctuations are morning ablutions and significant rain events, adding a very large and sometimes harsh and rapidly changing industrial load can be very challenging to stable, compliant plant operation. Fonterson Flows can cause extremes in pH and temperature and so, if not adequately buffered, can lead to significant process upsets in an otherwise well operating biological treatment plant.	-1	Both Option 2 and 3 will reduce the total number of facilities from 10 to 5. The reduction in the number of plants will improve the performance consistency and quality of monitoring and testing. The larger plants will attract more skilled staff and allow for the substitution of staff between facilities (as they are likely to use the same technology).	0	The inclusion of Fonterra flows to a subregional facility will increase the operational risks for the subregional facility. The addition of Fonterra flows increase both the likelihood and the consequence of an operational failure. When compared to a comparatively stable domestic treatment plant whose largest fluctuations are morning ablutions and significant rain events, adding a very large and sometimes harsh and rapidly changing industrial load can be very challenging to stable, compliant plant operation. Fonterson Flows can cause extremes in pH and temperature and so, if not adequately buffered, can lead to significant process upsets in an otherwise well operating biological treatment plant.	0	Small plants are worse because they require (in total) more full time operators to cover the requisite number of sites. Small plants are likely to have a poorer Quality Assurance regime than large plants. The consents are more likely to be based on monthly or fortnightly compliance sampling and so it is more likely that regular process monitoring sampling will be done on the same time scale. Small plants are more poorly resourced in terms of on site maintenance and repair capability. Therefore, failures, calibration and breakdowns are more likely to go unattended for longer in a smaller plant.	-2	The inclusion of Fonterra flows to the municipal plant at Cambridge will significantly increase the operational risks for Cambridge facility. When compared to a comparatively stable domestic treatment plant whose largest fluctuations are morning ablutions and significant rain events, adding a very large and sometimes harsh and rapidly changing industrial load can be very challenging to stable, compliant plant operation. Fonterson Flows can cause extremes in pH and temperature and so, if not adequately buffered, can lead to significant process upsets in an otherwise well operating biological treatment plant.
	Reticulation		0	No additional conveyance (i.e. trunk lines)	0	No additional conveyance (i.e. trunk lines)	0	Very small conveyancing requirements, however flows will need to cross the Waikato River. Aerial river crossings would present higher operations and maintenance issues and risk of contamination in event of failure.	-2	Conveyance across large distances will lead to greater captivity risks than BAU or decentralisation. The greatest distance being 14.5km. This is less than option 3 but greater than the Do Minimum or BAU. It is proposed to include chemical dosing in any of the pipelines that have more than 8 hours average retention time to address captivity and odour issues. Aerial river crossing would present higher operations and maintenance issues and risk of contamination in event of failure.	-3	Conveyance across large distances will lead to greater captivity risks than BAU or decentralisation. The greatest distance being 21.8km. This is greater than all other options. It is proposed to include chemical dosing in any of the pipelines that have more than 8 hours average retention time to address captivity and odour issues. Aerial river crossings would present higher operations and maintenance issues and risk of contamination in event of failure. The operational of Fonterra pipelines will have minimal impact of overall operability of conveyancing	-3	Conveyance across large distances will lead to greater captivity risks than BAU or decentralisation. The greatest distance being 21.8km. This is greater than all other options. It is proposed to include chemical dosing in any of the pipelines that have more than 8 hours average retention time to address captivity and odour issues. Aerial river crossings would present higher operations and maintenance issues and risk of contamination in event of failure. The operational of Fonterra pipelines will have minimal impact of overall operability of conveyancing	-1	Fewer conveyance requirements than option 2 and 3 with the greatest distance being 9.5km. It is proposed to include chemical dosing in any of the pipelines that have more than 8 hours average retention time to address captivity and odour issues. Aerial river crossings would present higher operations and maintenance issues and risk of contamination in event of failure. The operational of Fonterra pipelines will have minimal impact of overall operability of conveyancing	-1	Fewer conveyance requirements than option 2 and 3 with the greatest distance being 9.5km. It is proposed to include chemical dosing in any of the pipelines that have more than 8 hours average retention time to address captivity and odour issues. Aerial river crossings would present higher operations and maintenance issues and risk of contamination in event of failure. The operational of Fonterra pipelines will have minimal impact of overall operability of conveyancing
Land impacts	Both reticulation and treatment	Land requirements, impacts to properties during construction, Potential cite impacts to environment and potential for impacts to sites of cultural significance	Not scored at this time	No land impacts	Not scored at this time	Designations for additional sites is assessed as part of the consenting criteria and indicative costs to include property costs. The event of property impacts, environmental impacts, cultural impacts and any other land based impacts is unknown at this time. However it is likely that Option 1 will need to acquire a greater number of land packages than other options.	Not scored at this time	Designations for additional sites is assessed as part of the consenting criteria and indicative costs to include property costs. The event of property impacts, environmental impacts, cultural impacts and any other land based impacts is unknown at this time. However it is likely that Option 1 will need to acquire a greater number of land packages than other options. It is also likley that the addition of Fonterra will mean additional land requirements at the Cambridge site.	Not scored at this time	Designations for additional sites is assessed as part of the consenting criteria and indicative costs to include property costs. The event of property impacts, environmental impacts, cultural impacts and any other land based impacts is unknown at this time. However it is likely that Option 2 will require a significant portion of land for a new subregional plant.	Not scored at this time	Designations for additional sites is assessed as part of the consenting criteria and indicative costs to include property costs. The event of property impacts, environmental impacts, cultural impacts and any other land based impacts is unknown at this time. However it is likely that Option 2 will require a significant portion of land for a new subregional plant. The addition of Fonterra will mean additional land, but this may be minimal additional impacts.	Not scored at this time	Designations for additional sites is assessed as part of the consenting criteria and indicative costs to include property costs. The event of property impacts, environmental impacts, cultural impacts and any other land based impacts is unknown at this time. However it is likely that Option 2 will require a significant portion of land for a new subregional plant. The addition of Fonterra may require additional land, but this may be minimal additional impacts.	Not scored at this time	Designations for additional sites is assessed as part of the consenting criteria and indicative costs to include property costs. The event of property impacts, environmental impacts, cultural impacts and any other land based impacts is unknown at this time. However it is likely that Option 3 will require a significant portion of land for a new subregional plant. The addition of Fonterra may require additional land, but this may be minimal additional impacts.	Not scored at this time	Designations for additional sites is assessed as part of the consenting criteria and indicative costs to include property costs. The event of property impacts, environmental impacts, cultural impacts and any other land based impacts is unknown at this time. However it is likely that the existing Cambridge site will not be big enough to accommodate a subregional plant and Fonterra, therefore additional land may need to be acquired.	Not scored at this time	Designations for additional sites is assessed as part of the consenting criteria and indicative costs to include property costs. The event of property impacts, environmental impacts, cultural impacts and any other land based impacts is unknown at this time. However it is likely that Option 4 will need to acquire land for the new plant south of Hamilton. It is also likley that the addition of Fonterra will mean additional land requirements at the Cambridge site.	Not scored at this time	Designations for additional sites is assessed as part of the consenting criteria and indicative costs to include property costs. The event of property impacts, environmental impacts, cultural impacts and any other land based impacts is unknown at this time. However it is likely that Option 4 will need to acquire land for the new plant south of Hamilton. It is also likley that the addition of Fonterra will mean additional land requirements at the Cambridge site.
Community acceptability	Both reticulation and treatment	Level of support or resistance that can be expected from affected stakeholders (including residents, businesses and community groups) during construction and operation. This relates to residents/business/industries being located near to any new WWTP site and reticulation where concerns will be aesthetic, environmental issues (eg odour), perception of impacts on property values. This assumes community will approve of environmental improvement associated with all options.	Not scored at this time	Evidence suggests that there is increasing number of residents in the Waikato region which are concerned about environmental regulation. This would indicate the community would not be supportive of plants which are not meeting their consenting conditions. It is therefore the expected that the BAU would not be accepted by the community	Not scored at this time	It is expected that upgrades to the high discharge quality would be acceptable from a community point of view. However there may be small community push back regarding the location of the 2 new plants. Te Kowhai and Hill would also require more land because the existing sites are too small for new plants.	Not scored at this time	It is expected that upgrades to the high discharge quality would be acceptable from a community point of view. However there may be small community push back regarding the location of the 2 new plants.	Not scored at this time	It is expected that upgrades to the high discharge quality would be acceptable from a community point of view. Generally tried to no push back from the community regarding conveyance and pipes	Not scored at this time	It is expected that upgrades to the high discharge quality would be acceptable from a community point of view. However there may be small community push back regarding the location of the 2 new plants and the large conveyance of wastewater across large distances.	Not scored at this time	It is expected that upgrades to the high discharge quality would be acceptable from a community point of view. However there may be small community push back regarding the location of the 2 new plants and the large conveyance of wastewater across large distances.	Not scored at this time	It is expected that upgrades to the high discharge quality would be acceptable from a community point of view. However there may be small community push back regarding the location of the new plant location and conveyance requirements	Not scored at this time	It is expected that upgrades to the high discharge quality would be acceptable from a community point of view. However there may be small community push back regarding the location of the new plant location and conveyance requirements	Not scored at this time	It is expected that upgrades to the high discharge quality would be acceptable from a community point of view. However there may be small community push back regarding the location of the new plant location and conveyance requirements
Consentability opportunities and risks	Both reticulation and treatment	What are the relative risk of delays during the consenting process for the option? And are there any consenting fatal flaws? To what extent will the option require consents for a new cite (that require land use consent)? To what extent will the option have discharges that are likely to meet discharge parameters acceptable to the consent authority?	-4	No additional consenting requirements beyond what is already planned. However, ability to consent BAU in current and likely future planning environment is extremely limited.	-4	This will require two new sites to be consented for a new WWTP. This will also require a new discharge consent to the river at the airport and a new discharge consent at Ohaupo. A total of 10 plants will need to undergo consenting processes.	-4	This will require two new sites to be consented for a new WWTP. This will also require a new discharge consent to the river at the airport and a new discharge consent at Ohaupo. A total of 10 plants will need to undergo consenting processes. Fonterra will require a short term consent process to be in place in the interim. Consenting strategy is to seek a long term consent to deliver a WWTP by 2030 to align with the Metro timeline, including interim improvements necessary to address environmental effects, built in to it to allow for time before Metro plant comes into operation. Interim improvements could be a significant cost, hence disadvantage for Municipal option, to the extent could be a fatal flaw if costs too high.	-1	In addition to renewing the existing discharge consent for Pukete, there is a requirement to consent a new location and a new discharge point.	-2	In addition to renewing the existing discharge consent for Pukete, there is a requirement to consent a new location and a new discharge point. Fonterra will require a short term consent process to be in place in the interim. Consenting strategy is to seek a long term consent to deliver a WWTP by 2030 to align with the Metro timeline, including interim improvements necessary to address environmental effects, built in to it to allow for time before Metro plant comes into operation. Interim improvements could be a significant cost, hence disadvantage for Municipal option, to the extent could be a fatal flaw if costs too high.	0	No requirement to consent a new site or new discharge point. However new consents will be required to provide for increased discharge volumes and contaminant loads. New flow loads will need greater consideration for consenting. Additionally it is closer to residential areas which may be problematic.	-1	No requirement to consent a new site or new discharge point. However new consents will be required to provide for increased discharge volumes and contaminant loads. Fonterra will require a short term consent process to be in place in the interim. Consenting strategy is to seek a long term consent to deliver a WWTP by 2030 to align with the Metro timeline, including interim improvements necessary to address environmental effects, built in to it to allow for time before Metro plant comes into operation. Interim improvements could be a significant cost, hence disadvantage for Municipal option, to the extent could be a fatal flaw if costs too high.	-2	In addition to renewing existing discharge consents, consents for new location and discharge point will be needed. An additional 6 consenting processes will need to be undertaken every few years	-3	In addition to renewing existing discharge consents, consents for new location and discharge point will be needed. An additional 6 consenting processes will need to be undertaken every few years Fonterra will require a short term consent process to be in place in the interim. Consenting strategy is to seek a long term consent to deliver a WWTP by 2030 to align with the Metro timeline, including interim improvements necessary to address environmental effects, built in to it to allow for time before Metro plant comes into operation. Interim improvements could be a significant cost, hence disadvantage for Municipal option, to the extent could be a fatal flaw if costs too high.
Resilience	Treatment and Reticulation	To what extent will the option provide resilience against potential failures, climate change impacts and natural hazards - external factors	-2	Wastewater plant network is not currently resilient to disruptions.	1	Option 1A and Option 4A are the highest as there are multiple plants for the metro area. The plant sizes are smaller, meaning it is more difficult to build in redundancies. This increases the likelihood of failure, but the consequence is significantly smaller (as each plant services a smaller population).	0	Fonterra option (Option B's) always score slightly lower than the option counterpart. This is because the risk of failure increases once Fonterra flows are included into the plant.	0	The larger plant options (2 & 3) scored better because they are almost certain to be better resourced in terms of standby systems and redundant plant. options 2 and 3 score down because they both employ long lengths of intensodal conveyance pipeline to get all wastewater into the centralised processing facilities. The long lengths of conveyance pipeline scored down because they introduce many more points of vulnerability to significant damage and, if that happens, lead to loss of service for larger populations.	-1	Fonterra option (Option B's) always score slightly lower than the option counterpart. This is because the risk of failure increases once Fonterra flows are included into the plant.	0	The larger plant options (2 & 3) scored better because they are almost certain to be better resourced in terms of standby systems and redundant plant. options 2 and 3 score down because they both employ long lengths of intensodal conveyance pipeline to get all wastewater into the centralised processing facilities. The long lengths of conveyance pipeline scored down because they introduce many more points of vulnerability to significant damage and, if that happens, lead to loss of service for larger populations.	-1	Fonterra option (Option B's) always score slightly lower than the option counterpart. This is because the risk of failure increases once Fonterra flows are included into the plant.	1	Option 1A and Option 4A scores the highest as there are multiple plants for the metro area. The plant sizes are smaller, meaning it is more difficult to build in redundancies. This increases the likelihood of failure, but the consequence is significantly smaller (as each plant services a smaller population).	0	Fonterra option (Option B's) always score slightly lower than the option counterpart. This is because the risk of failure increases once Fonterra flows are included into the plant.
Funding Potential	Both reticulation and treatment	What is the funding potential of the option?	0	Not applicable as the do nothing option would not require new funding and financing options to be considered.	-2	Upgrading existing plants is not expected to unlock further funding and financing options beyond what is currently available.	-1	Upgrading existing plants is not expected to unlock further funding and financing options beyond what is currently available, though Fonterra's involvement brings a potential additional source of funding.	1	Opportunity to utilise a broader set of funding and financing tools with the added scale of a centralised solution. This may include consideration of off balance sheet financing options and potential access to Crown Three Waters Reform funding.	2	Opportunity to utilise a broader set of funding and financing tools with the added scale of a centralised solution. This may include consideration of off balance sheet financing options and potential access to Crown Three Waters Reform funding. Fonterra involvement brings a potential additional source of funding and financing.	1	Opportunity to utilise a broader set of funding and financing tools with the added scale of a centralised solution. This may include consideration of off balance sheet financing options and potential access to Crown Three Waters Reform funding.	2	Opportunity to utilise a broader set of funding and financing tools with the added scale of a centralised solution. This may include consideration of off balance sheet financing options and potential access to Crown Three Waters Reform funding.	0	This option is less likely to unlock further funding and financing tools when compared to more centralised solutions.	1	This option is less likely to unlock further funding and financing tools when compared to more centralised solutions, though Fonterra's involvement brings a potential additional source of funding and financing.
		To who extent does the option promote ratepayer affordability?	3	The do nothing option would require no additional capital funding.	2	*Nine municipal plants, one private facility.* A higher number of standalone treatment plants is likely to have better ratepayer affordability compared to a smaller number of centralised plants. This is based on the assumption that the economies of scale delivered by the centralised plants are outweighed by the added reticulation costs. Assumption to be confirmed when Beca provide indicative costs.	2	*Nine municipal plants.* A higher number of standalone treatment plants is likely to have better ratepayer affordability compared to a smaller number of centralised plants. This is based on the assumption that the economies of scale delivered by the centralised plants are outweighed by the added reticulation costs. Assumption to be confirmed when Beca provide indicative costs.	-2	*Four municipal plants, one private facility.* A lower number of centralised treatment plants is likely to have worse ratepayer affordability compared to a higher number of standalone plants. This is based on the assumption that the economies of scale delivered by the centralised plants are outweighed by the added reticulation costs. Assumption to be confirmed when Beca provide indicative costs. The impact of Fonterra's involvement on ratepayer affordability is dependent on cost sharing arrangements and is therefore unclear at this point.	-2	*Four municipal plants.* A lower number of centralised treatment plants is likely to have worse ratepayer affordability compared to a higher number of standalone plants. This is based on the assumption that the economies of scale delivered by the centralised plants are outweighed by the added reticulation costs. Assumption to be confirmed when Beca provide indicative costs. The impact of Fonterra's involvement on ratepayer affordability is dependent on cost sharing arrangements and is therefore unclear at this point.	-2	*Four municipal plants, one private facility.* A lower number of centralised treatment plants is likely to have worse ratepayer affordability compared to a higher number of standalone plants. This is based on the assumption that the economies of scale delivered by the centralised plants are outweighed by the added reticulation costs. Assumption to be confirmed when Beca provide indicative costs. The impact of Fonterra's involvement on ratepayer affordability is dependent on cost sharing arrangements and is therefore unclear at this point.	-2	*Four municipal plants.* A lower number of centralised treatment plants is likely to have worse ratepayer affordability compared to a higher number of standalone plants. This is based on the assumption that the economies of scale delivered by the centralised plants are outweighed by the added reticulation costs. Assumption to be confirmed when Beca provide indicative costs. The impact of Fonterra's involvement on ratepayer affordability is dependent on cost sharing arrangements and is therefore unclear at this point.	0	*Six municipal plants, one private facility.* A higher number of standalone treatment plants is likely to have better ratepayer affordability compared to a smaller number of centralised plants. This is based on the assumption that the economies of scale delivered by the centralised plants are outweighed by the added reticulation costs. Assumption to be confirmed when Beca provide indicative costs.	0	*Six municipal plants.* A higher number of standalone treatment plants is likely to have better ratepayer affordability compared to a smaller number of centralised plants. This is based on the assumption that the economies of scale delivered by the centralised plants are outweighed by the added reticulation costs. Assumption to be confirmed when Beca provide indicative costs. The impact of Fonterra's involvement on ratepayer affordability is dependent on cost sharing arrangements and is therefore unclear at this point.
MCA SCORE																				
MCA total score				See Summary tab for MCA score summaries		See Summary tab for MCA score summaries		See Summary tab for MCA score summaries		See Summary tab for MCA score summaries		See Summary tab for MCA score summaries		See Summary tab for MCA score summaries		See Summary tab for MCA score summaries		See Summary tab for MCA score summaries		See Summary tab for MCA score summaries
COST CRITERIA																				
Capital Costs		Capital Cost	DNS		DNS	$481,000,000	DNS	$491,000,000	DNS	$588,000,000	DNS	$608,000,000	DNS	$612,000,000	DNS	$622,000,000	DNS	$479,000,000	DNS	$489,000,000
Operational Costs		Annual Operating Costs	DNS		DNS	$30,155,000	DNS		DNS	$30,769,000	DNS		DNS	$30,698,000	DNS		DNS	$30,618,000	DNS	
VALUE FOR MONEY ASSESSMENT																				
Value for Money / Economic Assessment	Summary of above costs and benefits	This is a summary of the above benefits and costs - A Cost Equivalence Value can be applied here if necessary OR qualitative assessment of above benefits and costs																		

SCORE	
3	Significant positive impact compared with other options overtime
2	Moderate positive impact compared with other options overtime
1	Minor positive impact compared with other options overtime
0	Very limited to no positive or negative impact (neutral) overtime
-1	Minor negative impact compared with other options overtime
-2	Moderate negative impact compared with other options overtime
-3	Significant negative impact compared with other options overtime
-4	Fatally flawed

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