



Whangārei Wastewater Treatment Plant Discharges

**Resource Consent Application and
Assessment of Effect on the Environment**

Whangārei District Council

13 December 2021

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Overview

The Whangārei Wastewater Treatment Plant (WWTP) at 79 Kioreroa Road, Whangārei is owned and operated by the Whangārei District Council (WDC). The WWTP is authorised by a suite of consents (AUT.004352.01 - 05) for the discharge of contaminants to the coastal marine area (Limeburners (Hāhā) Creek), land and to air, and the establishment and use of a structure in the coastal marine area issued by Northland Regional Council (NRC) on 3 May 2004 and are due to expire on 30 April 2022. In addition, WDC currently hold short-term consents for the discharge of treated wastewater to Council gardens and closed sports fields during times of water restrictions (AUT.041633.01 - 02) issued by NRC on 4 March 2020 and which are due to expire on 23 February 2023.

WDC seek to replace these consents with long-term consents for the continued discharge of treated wastewater to land and water including a natural wetland (coastal mangrove wetland), and associated discharge to air (odour), and use and occupation of a structure in the coastal marine area in accordance with Rules 12 and 15 of the Proposed Regional Plan for Northland (Appeals Version) and Section 47 of the National Environmental Standard for Freshwater, as a discretionary activity.

To accommodate for uncertainty over the Whangārei WWTP's planning horizon, with regards to changing regulations, future growth, climate change outcomes, and future community demands/desires, WDC have taken an Adaptive Pathway Planning approach to decision making of upgrade options. Managing risk and the need to accommodate change over time is proposed to be managed via robust system and environmental monitoring, and a more comprehensive review and engagement process.

The Adaptive Pathway Planning approach WDC proposes over the short-medium term includes:

- “Augmentation works” on the existing process to increase plant capacity in the short-term to improve plant performance and resilience to meet existing consent discharge limits, focusing particularly on improved treatment of ammonia, suspended solids, pathogens and odour management.
- Significant upgrades to the plant in the medium term (approximately next 10 years) following review of the draft Adaptive Pathway Plan, to improve effluent quality and prevent further degradation of the receiving environment whilst accommodating forecasted population growth and any other drivers for change as they present themselves.
- Implementation of a 12 month comprehensive baseline monitoring programme of the WWTP discharges and receiving water environment to support the development of long-term trigger values and a long-term monitoring programme, to ensure no further degradation of the upper harbour water quality occurs as a result of the WWTP operations, in line with the intent of the Proposed Regional Plan for Northland.
- Implementation of six monthly odour surveys and annual recommendation reporting to ensure no deterioration of air quality occurs as a result of the WWTP operations.
- Development of a suite of Management Plans and supporting Monitoring Plans to give effect to the Adaptive Pathway Planning approach to managing the receiving environment with regular review and stakeholder engagement on the plans over the term of consent.

The implementation of the Adaptive Pathway Planning approach relies upon monitoring and responding to change over the long term. Commitment to the approach to achieve a successful outcome can best be provided through a long term consent. As such, the applications seek the maximum term of 35 years.

This application has considered all relevant statutory and planning provisions. In addition, a detailed assessment of environmental effects based on monitoring data collected over the past two years by 4sight Consulting and NRC's State of the Environment Monitoring, and a number of other supporting investigations. The effects assessment has informed the Adaptive Pathway Planning approach and development of a suite of proposed consent conditions to ensure any potential effects on the receiving environment are appropriately mitigated and no further degradation of the receiving environment results from the proposed activity. Overall, the proposal is considered consistent with the objectives and policies of the relevant statutory and planning provisions.

WDC has undertaken extensive consultation with tangata whenua (which continues with the development of a Te Parawhau Hapū Cultural Impact Assessment), key stakeholders and the wider community. WDC acknowledges there is likely to be interest in the proposed activity and therefore requests that the application is publicly notified.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.3 and the assumptions and qualifications contained throughout the Report.

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Abbreviations and glossary

Abbreviation	Term
AEE	Assessment of Effects on the Environment
ANZECC	Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)
AQNES	Ministry for the Environment, Resource Management (National Environmental Standards for Air Quality) Regulations, 2004
AWS	Automated Weather Station
BOD ₅ / cBOD ₅	5 day Biochemical Oxygen Demand / Carbonaceous Biochemical Oxygen Demand
CFU/100 mL	Colony forming units per 100mL
CMA	Coastal Marine Area
CIA	Cultural Impact Assessment
DAPP	Dynamic Adaptive Pathway Planning
FIDOL	Frequency (F) intensity (I), duration of exposure (D), offensiveness (O) and the location (L)
g	Grams
kg	Kilograms
km	Kilometres
m	Metres
m ³	Cubic metres
m ³ /d	Cubic metres per day
MCI	Macroinvertebrate Community Index
MfE	Ministry for Environment
MPN/100 mL	Most probably number per 100mL
NES DW	Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations (2007)
NES FW	Resource management (National Environmental Standards for Freshwater) Regulations (2020)
NH ₄ -N	Ammoniacal Nitrogen
NO ₂ and NO ₃	Nitrite and Nitrate
NPS FM	National Policy Statement for Freshwater Management (2020)
NRC	Northland Regional Council
NZAAQG	Ministry for the Environment, Ambient Air Quality Guidelines (2002 update)
NZCPS	New Zealand Coastal Policy Statement (2010)
PNPSIB	Proposed National Policy Statement for Indigenous Biodiversity (2020)
PRPN	Proposed Regional Plan for Northland (Appeal Version October 2021)
RCP	Northland Regional Coastal Plan
RL	Relative Level
RMA	Resource Management Act (1991)
RPS	Regional Policy Statement for Northland (2016)
SOE	State of Environment Monitoring undertaken by NRC
TOC	Total Organic Carbon
TN	Total Nitrogen
TP	Total Phosphorus

Abbreviation	Term
TSS	Total Suspended Solids
WHO AQG	World Health Organisation air quality guideline - Global Update 2005
WMP	Wastewater Management Plan
WDC	Whangarei District Council
WWTP	Wastewater Treatment Plant
UV	Ultra-Violet

1. Introduction

1.1 Background

Whangārei District Council (WDC) is legally responsible for the operation of Whangārei's wastewater treatment and disposal facilities. The Whangārei Wastewater Treatment Plant (WWTP), located at 79 Kioreroa Road, Whangārei, services an area extending from Kamo in the north, Maunu in the west, Raumanga in the south and Onerahi / Whangārei Heads in the east. The Whangārei WWTP is a critical infrastructure asset for the city with an optimised replacement value of \$37M (WDC 2019, revaluation).

Wastewater from Whangārei undergoes advanced secondary and tertiary treatment at the Kioreroa Road WWTP before discharging via two constructed wetlands (wetland 1 and 2) into Limeburners (Hāhā) Creek and ultimately the Hātea River (also referred to as the "Upper Whangārei Harbour"). A location map of the plant is provided in Figure 1.

Plant Location:	79 Kioreroa Rd, Whangarei
Map Reference:	-35.74433, 174.32449 NZMG (258,556 mE 6,014,007 mS NZTM)
Legal Description:	Pt Lot 1 DP 50540, Pt Lot 1 and Lot 2 DP65087 (mechanical wastewater treatment plant site), Lot 1 DP 96770, Lots 3 and 5 DP 96772 Blk IX or XIII Whangarei SD (wetlands 1 and 2) (Certificate of Title is provided in Appendix B).

The original suite of consents (AUT.004352.01 - 05) for the Whangārei WWTP were issued by Northland Regional Council (NRC) on 3 May 2004 and are due to expire on 30 April 2022. These consents provide for the:

- Discharge of treated wastewater via the wetland treatment system to the coastal marine area (Limeburners (Hāhā) Creek) (01).
- Discharge of primary and UV treated wastewater via the emergency bypass outfall to the coastal marine area (Limeburners (Hāhā) Creek) (02).
- Discharge of contaminants to land (from the base of the wetland treatment system) (03).
- Discharge of contaminants to air (primarily odours) from the wastewater treatment plant (04).
- Establishment and use of a structure within the coastal marine area (emergency bypass outfall into Limeburners (Hāhā) Creek) (05).

A number of variations have subsequently been granted by NRC, those variations in the past 10 years are summarised below:

- A variation granted in March 2012 to increase the volume (90ML/d to 140ML/d) of primary treated wastewater to be discharged to Limeburners (Hāhā) Creek during extreme wet weather conditions.
- A variation granted in 2014 to increase the volume (57.4 ML/d to 140 ML/d) of daily discharge from the wetland system into the coastal marine area but retain the ability of extreme wet weather discharges directly to Limeburners (Hāhā) Creek if required (the later has not been enacted since the consent change was granted).
- A variation granted in 2015 to increase the allowable level of suspended solids (10 milligrams per litre (mg/L) to 15 mg/L) in the effluent discharge.

A copy of the current consents (AUT.004352.01.06, AUT.004352.02.03, AUT.004352.03.01, AUT.004352.04.01 and AUT.004352.05.01) are included in Appendix C.

To enable the operation of the WWTP to continue lawfully a renewal consent application must be lodged with NRC 6 months prior to the expiry date (before 30 October 2021)¹, unless an extension to the lodgment date has been granted by NRC as was received by WDC on 18 October 2021².

In addition, WDC would like to incorporate into the suite of Whangārei WWTP consents, long-term consents for the reuse of treated wastewater on Council gardens and sports fields during drought restriction level 1 (as a voluntary

¹ Section 124 of the Resource Management Act 1991

² NRC agreed to a lodgment date 3 months prior to the expiry date of 31 January 2022.

activity to manage water use) and Drought restriction level 2 and above. WDC currently hold short-term consents (AUT.041633.01.01 and AUT.041633.02.01) issued by Northland Regional Council (NRC) on 4 March 2020 and which are due to expire on 23 February 2023 and seek to replace these consents with long-term consents for the:

- Discharge of tertiary treated wastewater to land (01).
- Discharge of contaminants (odour) to air (02).

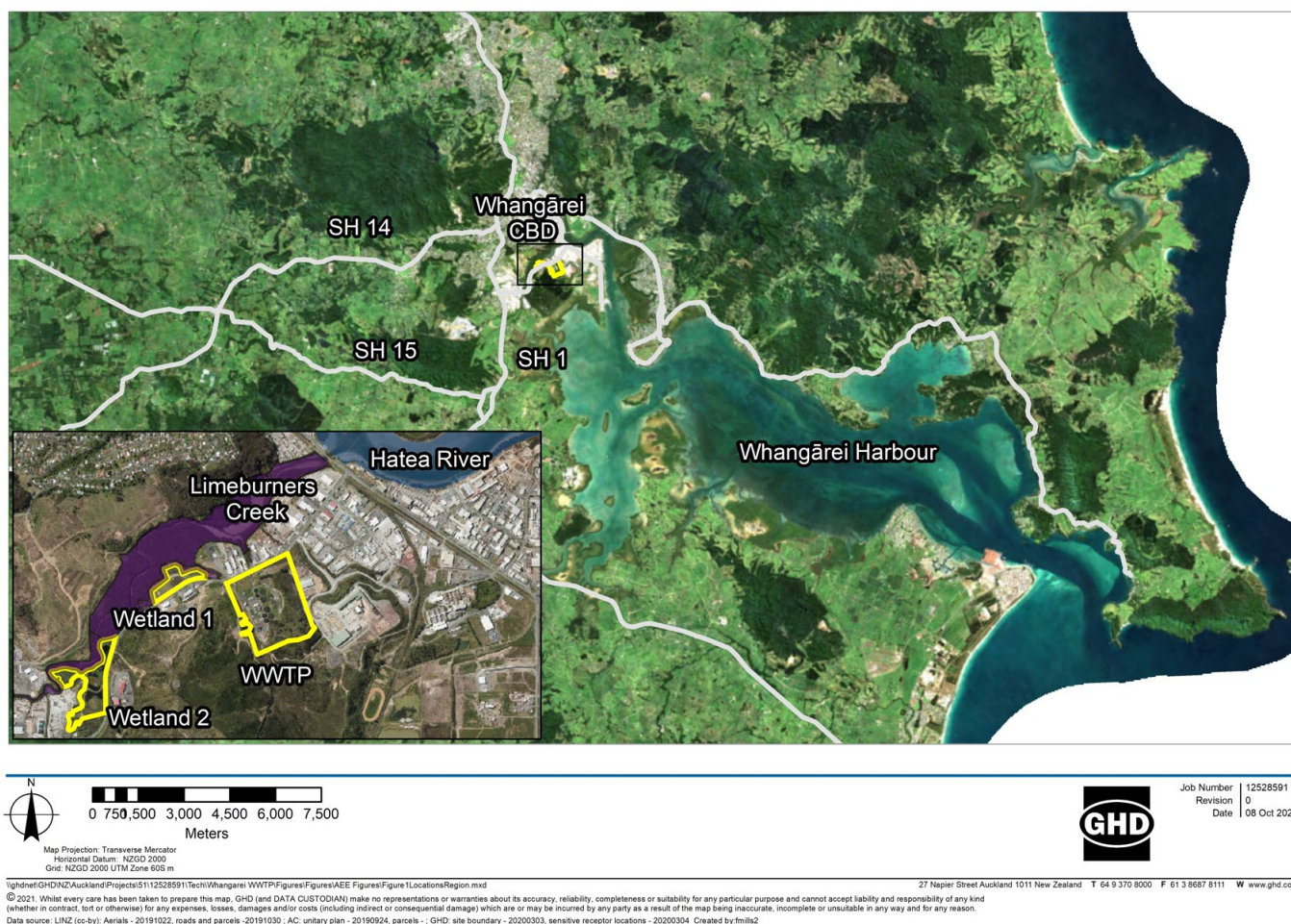


Figure 1 Whangārei WWTP Site Location

1.2 Purpose of this report

This Assessment of Effects on the Environment (AEE) has been prepared by GHD New Zealand Ltd (GHD) on behalf of Whangārei District Council's (WDC) to support an application for discharge consents to land, air and the coastal marine area, including to natural wetlands, in relation to the activities carried out at the Whangārei Wastewater Treatment Plant (WWTP) and the reuse of treated wastewater onto Council owned gardens / sports fields in accordance with Section 88 of the RMA. The relevant application forms are attached to this report in Appendix A.

The resource consent application has been prepared in accordance with the Fourth Schedule of the Resource Management Act 1991 (RMA), and provides the following information:

- Application details and description of the site and existing environment (Sections 2 - 3).
- A description of the proposal (Section 4).
- The activity status of the proposal and summary of the resource consents sought under the relevant planning documents (Section 5).
- An assessment of actual and potential effects on the environment and measures to avoid, remedy and mitigate effects (Section 6).
- An assessment of relevant statutory provisions (Sections 7).

- A summary of consultation undertaken (Section 8).
- An a suite of proposed conditions (Section 9).

To accommodate for uncertainty over the Whangārei WWTP's planning horizon, with regards to changing regulations, future growth, climate change outcomes, and future community demands/desires, WDC have taken an Adaptive Pathway Planning approach to decision making of upgrade options. Managing risk and the need to accommodate change over time is proposed to be managed via robust system and environmental monitoring, and a more comprehensive review and engagement process.

The implementation of the Adaptive Pathway Planning approach relies upon monitoring and responding to change over the long term. Commitment to the approach to achieve a successful outcome can best be provided through a long term consent. As such, the applications seek the maximum term of 35 years. A full explanation and rationale of the proposed maximum term is included in section 7.2.6 of this report.

As part of this application, WDC has undertaken extensive consultation with iwi, key stakeholders and the wider community, this is detailed in Section 8. WDC acknowledges there is likely to be interest in the proposed activity and therefore requests that the application is publicly notified.

There are a number of documents appended to this report which provide substantial technical information to support the resource consent application. In an attempt to avoid repetition of this information in this report, reference has been made to it and an outline/summary of this information provided only where considered necessary.

1.3 Scope and limitations

This report: has been prepared by GHD Limited for Whangārei District Council and may only be used and relied on by Whangārei District Council for the purpose agreed between GHD and the Whangārei District Council as set out in section 1.2 of this report. GHD otherwise disclaims responsibility to any person other than Whangārei District Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report. The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

GHD has prepared this report on the basis of information provided by Whangārei District Council and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work, unless specifically stated in this document (with particular respect to the on-site bore survey conducted by GHD). GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from a site walkover of specific observation points. Site conditions at other parts of the site may be different from the site conditions found at the specific observation points. Observations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services, topography, accessibility and vegetation. As a result, not all relevant site features and conditions may have been identified in this report. Site conditions may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change. The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Site and existing activity description

In 2020, GHD undertook a desktop assessment on the process unit capacity and current consent compliance of the Whangārei WWTP (GHD, 2020). This assessment (Appendix A to the Master Plan provided in Appendix H) provides a detailed description of the current WWTP and the following section presents an outline of the site and existing WWTP only.

2.1 Wastewater catchment network

The Whangārei WWTP services an area extending to Springs Flat in the North, Maunu in the west, Raumanga in the South and Onerahi / Whangārei Heads in the east as shown in Figure 2. The majority of the influent to the treatment plant is delivered from the Okara Park Pump Station with the remainder coming from the Otaika, Onerahi (including Whangārei Heads) and Port catchments, as shown in Figure 3.

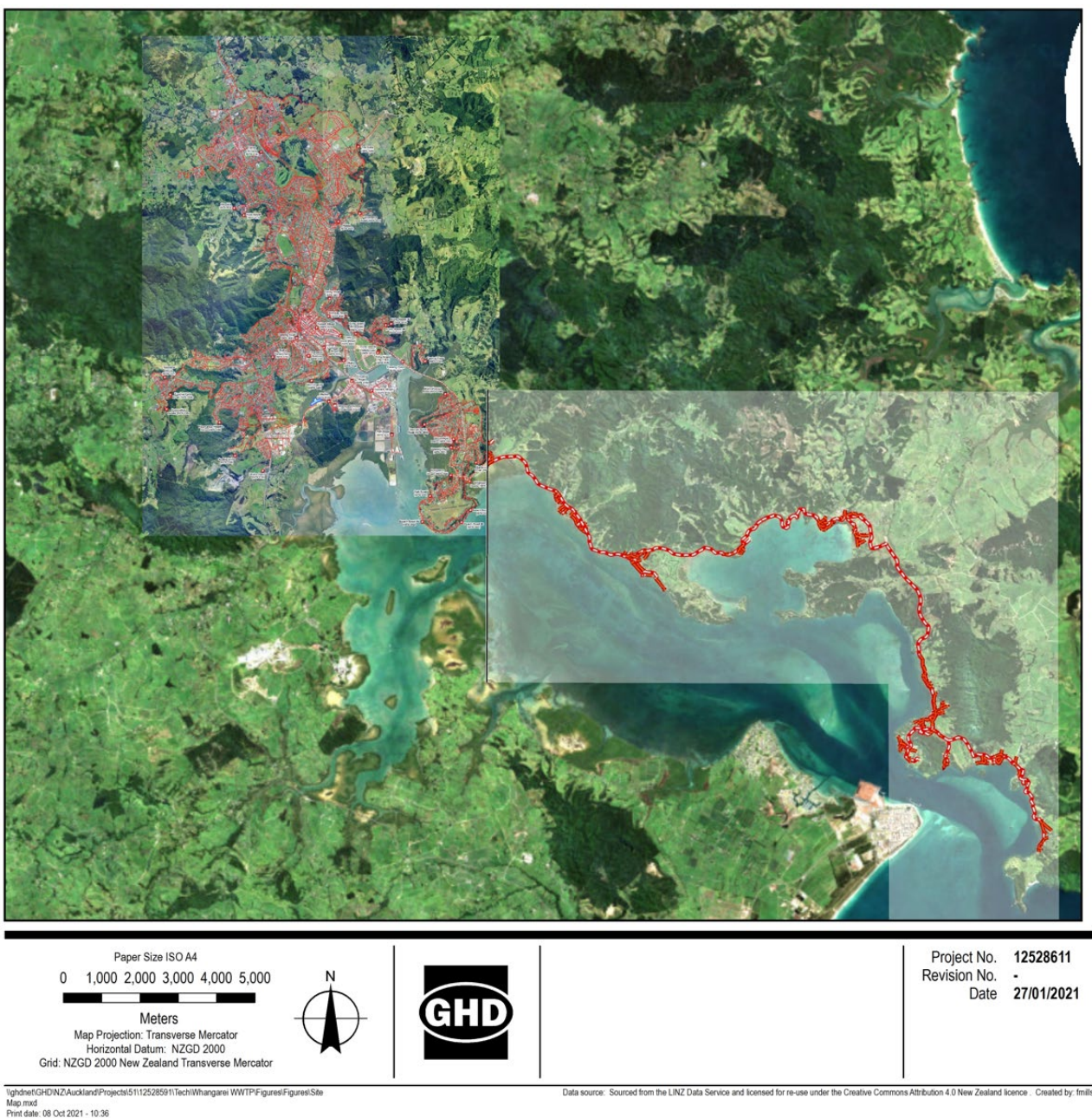


Figure 2 Whangārei City wastewater network extent serviced by the Whangārei WWTP.

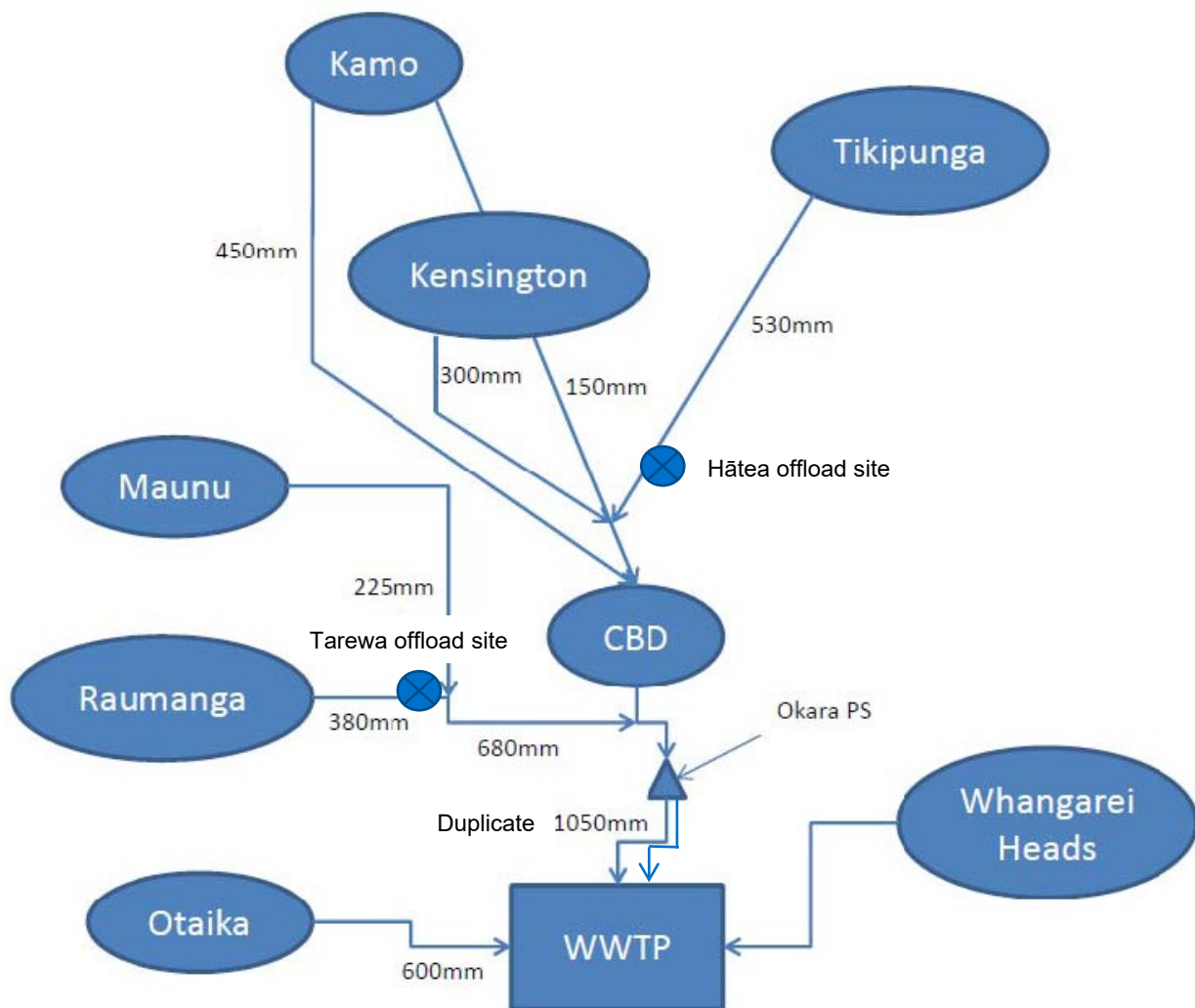


Figure 3 Schematic of the Whāngarei Wastewater Network³(modified from WDC, 2013)

The treatment plant also receives wastewater from industries in the area (including reasonable discharges from commercial laundries, vehicle washes, supermarkets, major restaurants, water treatment, fish processing plants, campgrounds, aquatic centre, food and concrete manufacturers, ship maintenance facilities, landfill leachate (Pohe) with smaller but cumulatively reasonable discharges from cafes, small restaurants, butchers, dentists, takeaways and hairdressers) and septage waste via trucks (including septic tank sludge, grease trap waste, landfill leachate (Puwera) and industrial and dairy factory wastewater).

2.2 Existing influent flows and loads

The current population connected to the Whangārei WWTP is approximately 65,000. Based on the plant influent flow data between January 2015 – April 2020 (see Figure 4), this provides an average daily flow (ADF) of 15,250 m³/day (or 235 litres/day per EP). The maximum daily flow to the plant was recorded during this period as 100,084 m³/day (corresponding ratio of Maximum Daily Flow to Annual Average Flow ~ 6.5x). This maximum figure does not include the 1 in 500-year storm event which occurred in July 2020 and resulted in 146,000 m³/day being received by the plant (WDC, 2020)⁴.

³ Note: the duplicate rising main from Okara PS to the WWTP which was installed 2010-2011 which has significant increased conveyance capacity to the WWTP is not shown here.

⁴ Around the same time a maximum discharge of 102,400 m³/d was recorded. This is the largest known flow event the plant has received to date.

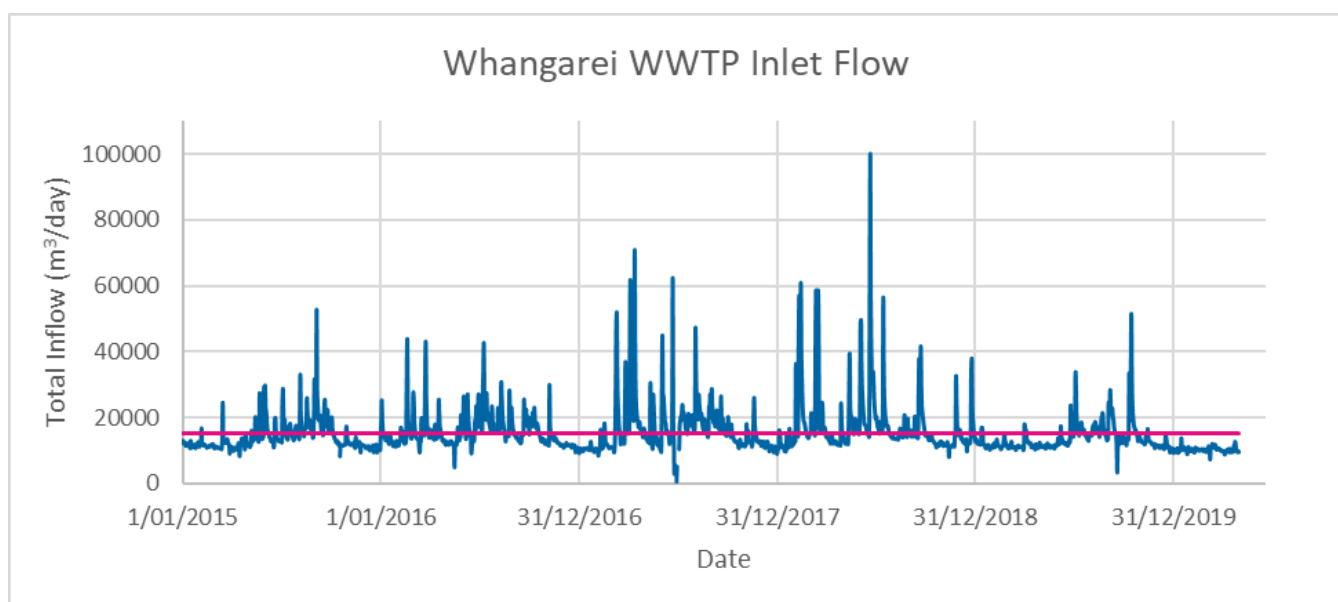


Figure 4 Daily wastewater influent flows (1st January 2015 – 30th April 2020)

A review of rainfall and influent flow shows wastewater flow volume is highly influenced by the intensity of the rainfall. To better understand the wastewater flow distribution, a wastewater flow percentile plot is shown in Figure 5. From the inlet flow percentile curve, flows of <21,000 m³/d (termed “normal flow” in the current consent) are shown to occur 90% of the wastewater flow scenarios with a majority of wet weather events existing above the 90th percentile, with a range from 20,817 to 100,080 m³/day.

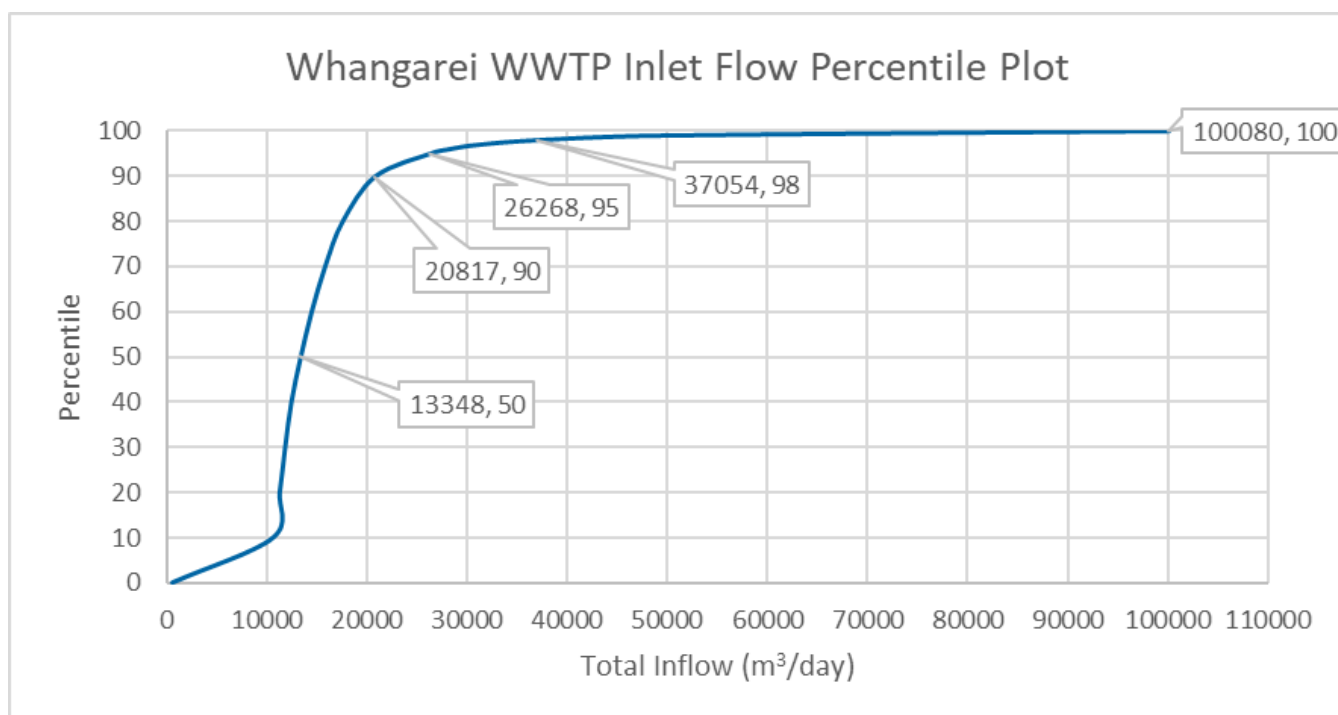


Figure 5 Whangārei WWTP Inlet Flow Percentiles

As stated in the above section, Whangārei WWTP flows also include trucked waste which contributes to approximately 0.8%⁵ of the average plant influent. Table 1 presents the combined loading rates for the WWTP influent, including trucked waste. The Plant Assessment (Appendix A to the Master Plan provided in Appendix H) states that the wastewater characteristics observed are similar to those typically observed in municipal data, and

⁵ Based on an assessed volume of truck waste of 120 m³/d (as at 2020).

whilst the trucked waste only contributes a small increase in plant inflow, the waste stream does represent a noticeable increase in loads to the treatment plant.

Table 1 Current (2020) WWTP combined incoming loads (municipal and trucked waste)

	2020 WWTP Mass Load (kg/d)	2020 Septage Mass Load (kg/d)	2020 Total Mass Load (kg/d)
TSS	7,900	568	8,468
cBOD ₅ *	5,228	No data	5,228*
COD	13,567	1490	15,057
AmmN*	888	No data	888*
TP*	157	No data	157*
TKN**	933	65	998

*Septage loading unknown

**TKN sampling implemented after revision of WDC's sampling plan in October 2020 (thus fewer than 10 samples)

2.3 Existing treatment plant and processes

The original treatment plant was built in 1968 and consisted of pre-treatment, primary treatment, and single stage trickling filter treatment followed by secondary sedimentation. The first upgrade was completed in 1980 to include one additional primary clarifier, two additional trickling filters, and two additional secondary sedimentation tanks. In 1986 a new sludge dewatering facility was installed as part of WDC's sludge management strategy. Wastewater treatment was further improved by 1990, when advanced secondary treatment (activated sludge), tertiary treatment including sand filtration and UV disinfection and wetlands were also incorporated prior to disposal into Limeburners (Hāhā) Creek. More recent upgrades occurred between 2012 and 2014, including further upgrades to the UV disinfection system (i.e. the addition of high-flow UV) to allow all flows to be UV treated and diversion of all flows through the upgraded floating wetlands (cessation of the bypass outfall).

The Whangārei WWTP liquid treatment train currently comprises the following treatment processes:

- Influent enters an inlet chamber from both the network, and a septage receiving facility. The septage receiving facility discharges to the inlet works via gravity.
- The main preliminary treatment consists of 2x band screens and 2x vortex grit removal; if the incoming flow exceeds the band screen capacity, excess flows are diverted to a high-flow inlet works comprising 3x inclined screw screens and an equalisation basin to achieve side stream balancing.
- Water is either pumped from the equalisation basin back into the main treatment train to maintain a stable flow entering the treatment plant, or in high flow conditions, the equalisation basin has an overflow weir to discharge to the high-flow UV system when there is no capacity in the treatment train (primary clarifiers, trickling filters and activated sludge basin) at very high incoming flows.
- Flow from the preliminary treatment inlet works is then treated in three primary clarifiers, which operate in parallel.
- Primary clarifier effluent passes through the trickling filters, which are arranged in a semi two-stage configuration:
 - Under normal flows (<21,000 m³/day), flow is directed to trickling filters no. 1 – 3 (operating in parallel) and trickling filter no. 4 acts as a second stage trickling filter. Trickling filters no 1- 3 operate with a recirculation back to the trickling filter flowsplitter.
 - During high flows, effluent from trickling filters no. 1 to 3 is directed to secondary clarifiers 3 and 4, via a weir. Recirculation flow via the Archimedes screw is stopped during high flow.
- Downstream of trickling filter no. 4, there is an activated sludge process in an aeration basin (currently only one of two in operation), before passing through secondary clarifiers 1 and 2, low-flow UV treatment, and then discharge to:
 - Wetlands 1 (floating type) via gravity.

- Wetlands 2 (surface flow type) via pumping, limited to 10,000 m³/d flow⁶.
- Wastewater in secondary clarifiers 3 and 4 (storm clarifiers) are diverted into the high-flow UV treatment system, and discharge to the wetlands.
- From the wetlands, treated wastewater discharges via 6 cascade structures at wetland 1 and 6 cascades at wetland 2 (although 2 are currently not in operation due to past scouring issues) and through a dense mangrove forest into Limeburners (Hāhā) Creek before being ultimately discharged into the Hātea River at Port Road Bridge and then into the Whangārei Harbour. Discharge point locations are shown in Figure 6.
- There are no direct discharges to Limeburners (Hāhā) Creek via the Emergency Bypass Outlet. This outlet is manually isolated by a closed valve and padlock. However, this facility has been retained in the event where flows to the wetland system are not practical, such as:
 - The unlikely failure of infrastructure between the treatment plant and wetland or beneath the wetland (gravity main).
 - Unplanned or unforeseen events that otherwise effects discharges from the WWTP to the wetlands. This could include unusual hydraulic conditions that risk the treatment facility, infrastructure or public health.
 - A situation that requires the wetlands to be isolated.
- UV disinfected wastewater is also collected during times of drought (when water use restrictions of level 1 or above are implemented in the Whangārei District) for reuse onto Council gardens, trees and sports fields. Water tankers are filled of tertiary treated wastewater following the UV disinfection plant, with chlorine added to the tankers for additional disinfection. Testing of the first tanker is undertaken to ensure appropriate chlorine levels are being achieved. In addition, private consents also are in place for treated water reuse by the adjacent Alternatives Nursery.

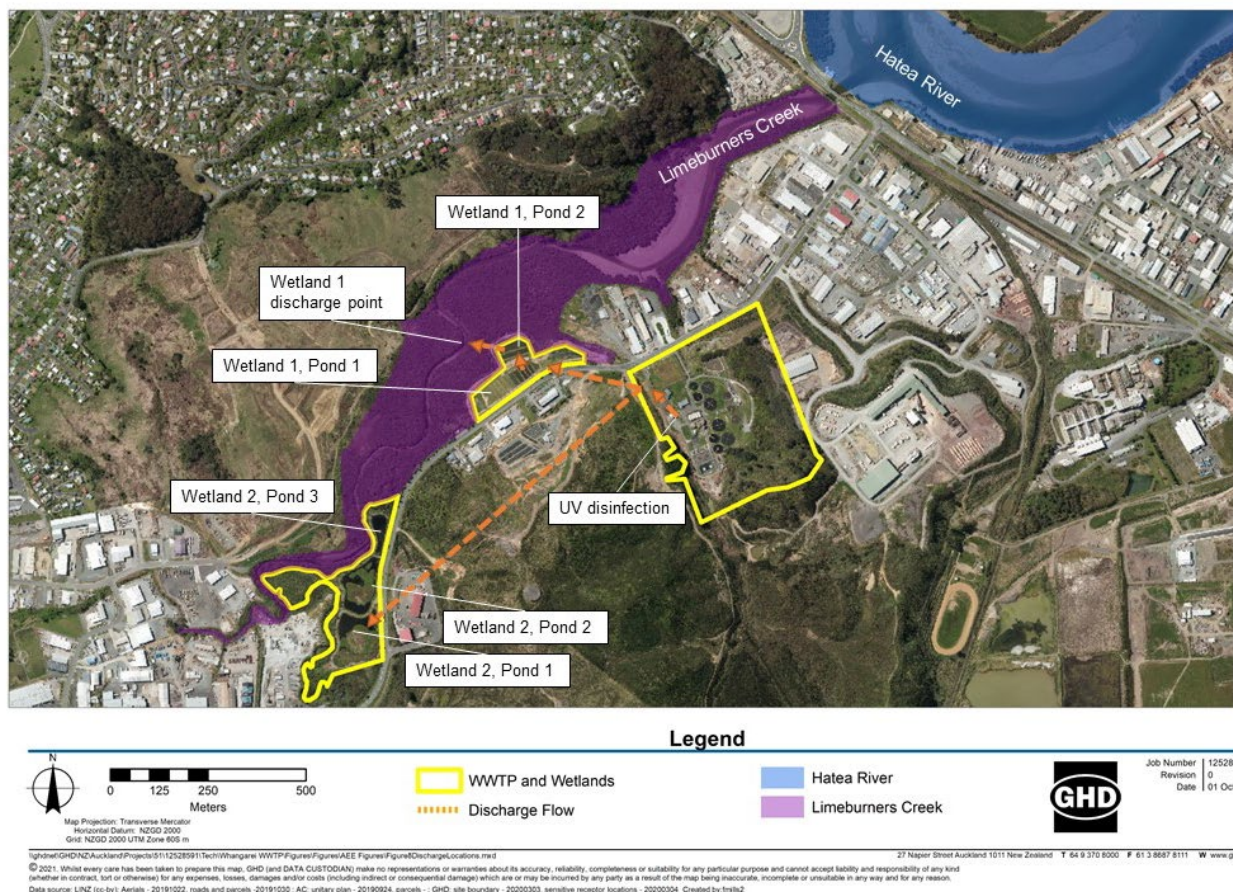


Figure 6 Whangārei WWTP discharge location (zone of reasonable mixing for major discharges (purple) PRPN (Decisions version))

⁶ When flow exceeds the wetland 2 pump capacity (set to achieve <10,000m³/d) the overflow gravity feeds to Wetland 1, thus Wetland 1 receives a majority of the discharge.

The Whangārei WWTP sludge treatment train consists of the following process steps:

- Screenings are washed, compacted and transported to landfill.
- Primary clarifier sludge is screened, then thickened by two gravity thickeners.
- Thickened primary sludge then passes through heat exchangers, upstream of two digesters operated at mesophilic temperature (approximately 35-37°C). Biogas from the digesters is used for a co-generation engine and hot water heating.
- Digested sludge is then blended with thickened Waste Activated Sludge (WAS), which has been thickened via a gravity belt thickener.
- Blended sludge is transferred to a sludge holding tank prior to being centrifuged and finally carted offsite to the Purewa landfill, about 10 km south of Whangārei.

A process flow diagram of the liquid and solids treatment train is provided in Figure 7 and a layout drawing of the plant is provided in Figure 8. Photos of key process components of the plant are provided in the Plant Assessment report in Appendix A of Appendix H, and photos of the wetlands, cascades, and bypass outfall are provided in Appendix D.

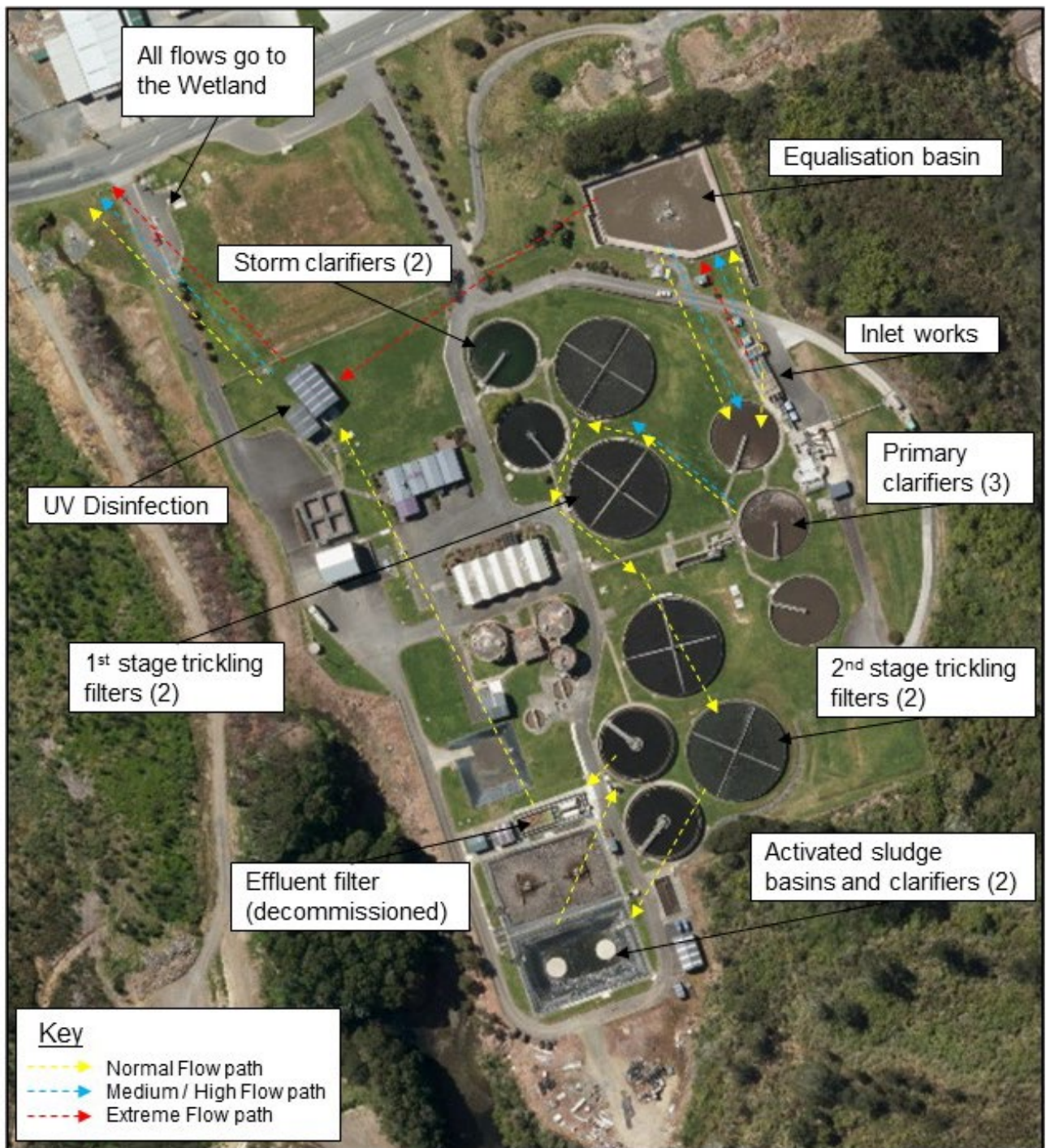


Figure 8 Whangārei WWTP process layout

In summary, the Whangārei WWTP has flexible configurations to handle the range of wastewater flow entering the facility, as follows:

- The activated sludge basin and secondary clarifiers are downstream of trickling filter no. 4, and treat up to 21,000 m³/day.
- When high flow occurs, excess flow unable to be treated via the activated sludge basin and secondary clarifiers is treated by trickling filters no. 1 to 3 and solids are separated by storm clarifiers no. 1 and 2.
- Effluent from the secondary clarifiers and storm clarifiers combines upstream of the UV systems. The high-flow UV system is brought online when plant flow exceeds the capacity of the low flow UV system of 50,000 m³/d.

- The equalisation basin is operated as a night flow buffer as well as excess wet weather temporary storage and settled effluent from the equalisation basin will also receive UV disinfection prior to discharge to the wetlands.

The flow rates set out in the existing consent describe the theoretical capacity of the Whangārei WWTP if it was to operate at a constant flow rate over 24 hours (e.g. 21,000 m³/d). In practical terms this will not actually occur as network flows, under both normal and storm conditions, will vary during any 24 hour period. The flow to, and through the Whangārei WWTP will reflect this as there is no significant storage in the system to smooth the flows other than the equalisation basin. Therefore, while the Whangārei WWTP might record a flow volume of 21,000 m³ for the day, which translates to an instantaneous flow rate of 243 litres per second, the actual flow-rates through the plant during the day may exceed this at times of peak flow and will be less at other times. Similarly, while the total daily flow to the WWTP might be only 15,000 m³, there may be periods during the day when the instantaneous flow rate exceeds 243 l/s. As such the description of the plant operating at 21,000 m³/day is more descriptive of an operating mode than an exact flow rate.

2.4 Wastewater discharge flows and quality

Discharge volumes assessed between 2nd October 2015 and 22nd November 2019 as part of the Plant Assessment (Appendix A to the Master Plan provided in Appendix H) are tabled below. It is noted that the 1 in 500 yr ARI storm event in July 2020 saw a maximum discharge volume of 102,400 m³/d.

Table 2 Whangārei WWTP Discharge Volume Statistics (2015 to 2019)

	Discharge Volume (m ³ /day) 2 October 2015 to 22 November 2019
Average	18,491
Median	15,632
95 th percentile	37,441
Maximum	88,544**

As a function of inflow and infiltration into the wastewater network, rates of wastewater inflow to the WWTP increase during rain events. Correspondingly, discharge rates increase during such events. As noted earlier in Section 2.3, the Whangārei WWTP has several treatment pathways it operates to handle the range of wastewater flows entering the facility. The influence of higher inflows results in portions of flow receiving a reduced level of treatment and a shorter residence time in the wetlands prior to discharge. The current consented quality limits for treated wastewater are dependent upon the rate of discharge, as outlined in Table 3. The current consent also contains conditions related to UV treatment performance via applying a minimum UV dose requirement.

Table 3 Consent limits for treated wastewater

	Conditions based on daily discharge volume			
	Up to 21,000 m ³ /d “Normal Daily Flow”	21,000 to 30,400 m ³ /day “Medium Wet Weather Flows”	30,400 to 57,400 m ³ /day “High Wet Weather Flows”	57,400 to 140,000 m ³ /day “Extreme Wet Weather Flows”
BOD ₅ (mg/L) - 50 th ile/Median	15	20	25	
BOD ₅ (kg/day) - Median	300	-	-	
BOD ₅ (kg/day) - 90 th ile	500	-	-	
TSS (mg/L) - Median	15	25	25	
TSS (kg/day) - Median	300	-	-	
TSS (kg/day) - 90 th ile	500	-	-	
Ammonia (mg/L as N) - Median	5	10	15	

	Conditions based on daily discharge volume			
	Up to 21,000 m ³ /d “Normal Daily Flow”	21,000 to 30,400 m ³ /day “Medium Wet Weather Flows”	30,400 to 57,400 m ³ /day “High Wet Weather Flows”	57,400 to 140,000 m ³ /day “Extreme Wet Weather Flows”
Minimum UV dose (mWs/cm ²) – 10 minutes average	30		40	
E.coli (cfu/100mL) – Median				<1,000
E.coli (cfu/100mL) – 90 th %ile				<3,000
F-specific bacteriophage and culturable rotavirus concentration				1.5 log reduction between influent and effluent results.

Table 4 outlines the historical performance (July 17 to November 19) when the WWTP has been operating below 21,000 m³/day, and more recent plant performance following a recent sampling campaign (October to December 2020). The consent compliance is based on collection of 15 samples every three months.

Table 4 Whangārei WWTP discharge effluent quality for flows <21,000 m³/d (2017-2019 and 2020)

Determinant	Current Consent Limit for Flows <21,000 m ³ /d		Historical Performance Jul 17 to Nov 19		Recent Plant Effluent Results Oct to Dec 20 (7 weeks)
	Median	90%tile	Median	90%tile	Median
BOD ₅ (mg/L)	15	-	12	25	19
BOD ₅ (kg/day)	300	500	178	340	239
TSS (mg/L)	15	-	18	32	38
TSS (kg/day)	300	500	274	483	432
Ammonia-N (mg/L as N)	5	-	4.2	11.1	9.0
TN (mg/L as N)	-	-	30*	37.2	31*
TP (mg/L as P)	-	-	3.6**	4.2	4.4**
Faecal coliform	-	-			8,727 (cfu/100ml)
<i>E.coli</i>					4,106 (MPN/100ml)

* Number of TN samples between 2017 to 2019 and Oct to Dec 2020 were 25 and 6, respectively.

** Number of TP samples between 2017 to 2019 and Oct to Dec 2020 were 4 and 6, respectively.

Historically the above results show a poor performance in TSS reduction which is thought to be attributable to poor sludge settling characteristics. It is recognised that an elevated TSS concentration in the final effluent may also impact the UV disinfection efficiency. Historically the final effluent median concentration of ammoniacal nitrogen (AmmN) has also been very close to the median consent limit of 5mg/L (as N).

The review of the plant performance of the more recent 2020 plant results also shows a period of non-compliance, with regards to the consent median concentration limits for BOD₅, TSS, and ammoniacal nitrogen. It is understood that there was an incident of illegal dumping of waste into the network in December 2020 which likely resulted in TSS being considerably higher than the consent limit during this month. Solids spikes in the final effluent can also result in elevated BOD₅, which also occurred during this period. In addition, there had been recent deterioration of the plant performance with regards to the biological treatment, due to an extreme wet weather event (1 in 500 yr ARI rainfall event) in July 2020.

Table 5 summarises the plant performance data under Medium Wet Weather Flow Condition (21,000 to 34,000 m³/day) and Table 6 shows plant performance data under High wet weather Flow Condition (30,400 to 57,400 m³/day). The data indicates that the final effluent complies with the discharge standards under these flow conditions.

Table 5 Medium flow conditions - 21,000 to 30,400 m³/day, 25 samples (Jul 17 to Oct 19)

Determinand	Consent Limit (median)	WWTP Monitoring Data	
		Median	90%tile
BOD5 (mg/L)	20	8	16
BOD5 (kg/day)	-	219	386
TSS (mg/L)	25	13	26
TSS (kg/day)	-	299	679
AmmN (mg/L)	10	4.8	12.2

Table 6 High flow conditions - 30,400 to 57,400 m³/day, 18 samples (Aug 17 to Oct 19)

Determinand	Consent Limit (median)	WWTP Monitoring Data	
		Median	90%tile
BOD5 (mg/L)	25	12	26
BOD5 (kg/day)	-	497	1,354
TSS (mg/L)	25	16	35
TSS (kg/day)	-	725	1,807
AmmN (mg/L)	15	4.6	7.7

In terms of pathogen reduction through the plant the Plant Assessment (Appendix H) presented data from between 2015 and 2019. The data shows that at times the UV dose falls below the minimum required by the consent and that elevated levels of *E.coli* in the wetland influent sampling point indicates greater control on treatment or more robust UV treatment and performance tracking is required.

Table 7 Wetland Inlet and Outlet *E. coli* concentration (from 2015 to 2019)

	No. samples	Median <i>E. coli</i> (MPN/100mL)	90 th percentile <i>E. coli</i> (MPN/100mL)	Minimum UV Dose
Normal Flow UV Outlet	83844 (Dose)	No data	No data	14.4 mws/cm ² *
High Flow UV Outlet	45 (<i>E. coli</i>) 126709 (Dose)	1868.5	13634.1	33.7 mws/cm ²
Wetland Influent	14	1179.5	51678.9	N/A
Wetland 1 – effluent	17	209	886	N/A
Wetland 2 - effluent	3	364	1751	N/A

Although the compliance point for effluent quality is prior to the wetlands, it is noted that the wetlands do provide further treatment of the wastewater prior to discharge, through settlement of sediment, oxidation in exposed water areas, and assimilation of nutrients by the floating wetland vegetation. Analysis of final effluent at the treatment plant compared to water discharging from the wetlands, as shown in Table 8, indicates that there is removal of total suspended sediment, a reduction in biological oxygen demand, and net removal of both nitrogen and phosphorous through the wetland. In addition based on the data presented above in Table 7, there appears to be a marked improvement in *E.coli* concentration post the wetlands. The performance of the wetlands is expected to be dependent on the rate of flow and correspondingly the residence time of water in the wetlands.

Table 8 Wetland effluent results (November 2020 to April 2021).

Parameter	Average concentration (mg/L)			Number of samples		
	Final Effluent	Wetland 1	Wetland 2	Final Effluent	Wetland 1	Wetland 2
TSS	26	5	6	34	27	27
BOD ₅	16	4	4	32	27	27
AmmN	5.1	2.6	2.4	34	27	27
TN	36	25	22	18	25	25
TP	5.3	4.9	4.9	19	25	25

2.5 Consent compliance

Based on a review of the NRC consent compliance monitoring reports from June 2017 – September 2021 (18 reports), there have been some areas of non-compliance with consent conditions. In particular:

- Condition 9 – Normal Flow UV dose was found to be insufficiently meeting the minimum dose of 30mWs/cm² and exceedance of ammoniacal nitrogen, BOD and suspended solids criteria were noted in several reports.
- Condition 10 – High Flow UV dose was found to be insufficiently meeting the minimum dose requirements. Non-compliance with microbiological criteria was noted in April and July 2018 reports.
- Condition 15 – On a number of occasions DO readings in Limeburners (Hāhā) Creek did not meet consent limits.
- Condition 21 – The April 2019 report noted offensive odour as being detected at the time of NRC inspection.

In summary, common issues identified in review of compliance data include insufficient UV dosing, insufficient sampling to determine plant flow rates, low dissolved oxygen levels in Limeburners (Hāhā) Creek, microbial and TSS non-compliance for the final effluent, and elevated ammoniacal nitrogen at times.

2.6 Plant Performance

The Plant Assessment Report (Appendix H) documents an assessment of the existing facility and the plant's current operation. Table 9 below is adapted from the Plant Assessment Report and summarises the capacity issues experienced at the WWTP, highlighting wastewater and sludge treatment 'pinch points'.

Table 9 Whangārei WWTP process pinch points (modified from the Plant Assessment Report)

Process	Degree of Constraint	Comments	Requires attention to achieve compliance
Capacity Issues Required Immediate Attention			
Activated Sludge Basin		<i>Additional aeration basin/capacity required.</i>	✓
Normal Flow UV		<i>Low UV dose issue requires attention</i>	✓
Centrifuges		<i>Centrifuge in operation over 30+ years. Limited by truck transport capacity</i>	
Primary Clarifiers		<i>Capacity likely limiting in peak flow condition, but ample capacity during normal flow condition.</i>	
Storm Clarifiers		<i>Additional peak weather capacity required in future flows</i>	
Inlet Works		<i>Additional capacity required as Band Screens and Vortex Grit are limited to 100 ML/d. Blinding often observed immediately after septic truck deliveries</i>	
Capacity Issues likely to be experienced in future			
Power Supply / Backup Power		<i>Backup generator recommended for additional resilience</i>	✓

Process	Degree of Constraint	Comments	Requires attention to achieve compliance
Trickling Filters – normal flow		<i>Stage 2 trickling filter loading rate is moderately high.</i>	
Trickling Filters – high flows		<i>Additional capacity required as future peak flow increases</i>	
Anoxic Selector		<i>Poor sludge settling requires attention</i>	✓
Secondary Clarifiers		<i>Poor sludge settling requires attention</i>	✓
Gravity Thickeners		<i>Hydraulic loading rate is high, possibly can be resolved by thicker primary sludge stream through primary clarifier sludge withdrawal.</i>	
Gravity Belt Thickeners		<i>Single unit at present, second unit will be required.</i>	
Sludge Digesters		<i>Digester retention time is close to borderline.</i>	
Items have sufficient capacity in the foreseeable future			
High Flow UV		<i>Room for capacity expansion, compliance issue to be investigated</i>	✓
Items not assessed			
Polymer Dosing	--	<i>Not reviewed</i>	
Recycled Water	--	<i>Not reviewed</i>	
Biogas Storage and Flare	--	<i>Not reviewed</i>	
Digester Mixing	--	<i>Not reviewed</i>	
Odour Control	--	<i>Not reviewed</i>	

Colour legend: Orange – Capacity issue observed, Yellow – likely capacity bottleneck in future, Green – spare capacity available

Taking into consideration the results of the capacity review, effluent quality review, consent compliance and in discussion with the WDC operations team, the following immediate improvements have been identified (referred to later in this report as “augmentation works”):

1. Tertiary filtration to minimise solids spikes and improve UV performance.
2. Additional biological capacity (e.g. re-commissioning of second aeration basin) to cater for projected short term growth.
3. Separate septage receiving station for septic tank trucked waste to avoid screen blinding.
4. Centrifuge replacement due to aging infrastructure.

3. Description of the environment

3.1 Land use

The land surrounding the Whangārei WWTP includes rural production, open space and business /heavy industrial land uses, Figure 9 shows the WDC land use zones for the area. Overall, the location of the Whangārei WWTP is considered to be commensurate with the surrounding land use which is predominantly industrial/or rural.

In addition to the Whangārei WWTP, WDC own a number of other properties which surround the Site. These properties are shown as the blue hashed areas in the below figure. Furthermore, some of the adjacent properties include a covenant on their land title which restricts the property owner from making odour complaints (these locations are shown as orange hashed areas).

The land to the southwest of the site is zoned as Papakainga Development known as the Rewarewa D block, this zone allows for the development of ancestral Maori land. The developments are of a communal nature, and may not solely focus on residential housing, but can also include community, education and recreational facilities, and industrial and commercial activities.

The general residential zone to the northwest of the site has undergone a private plan change by Pipiwai Investments Limited from Living 3 one to Living 1 Environment. This change allows for greater development, as the minimum lot size in the Living 1 Environment zone is 500m², this will therefore allow for approximately 220 houses to be built.

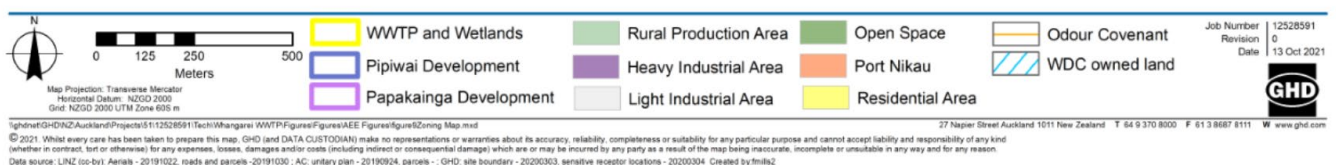
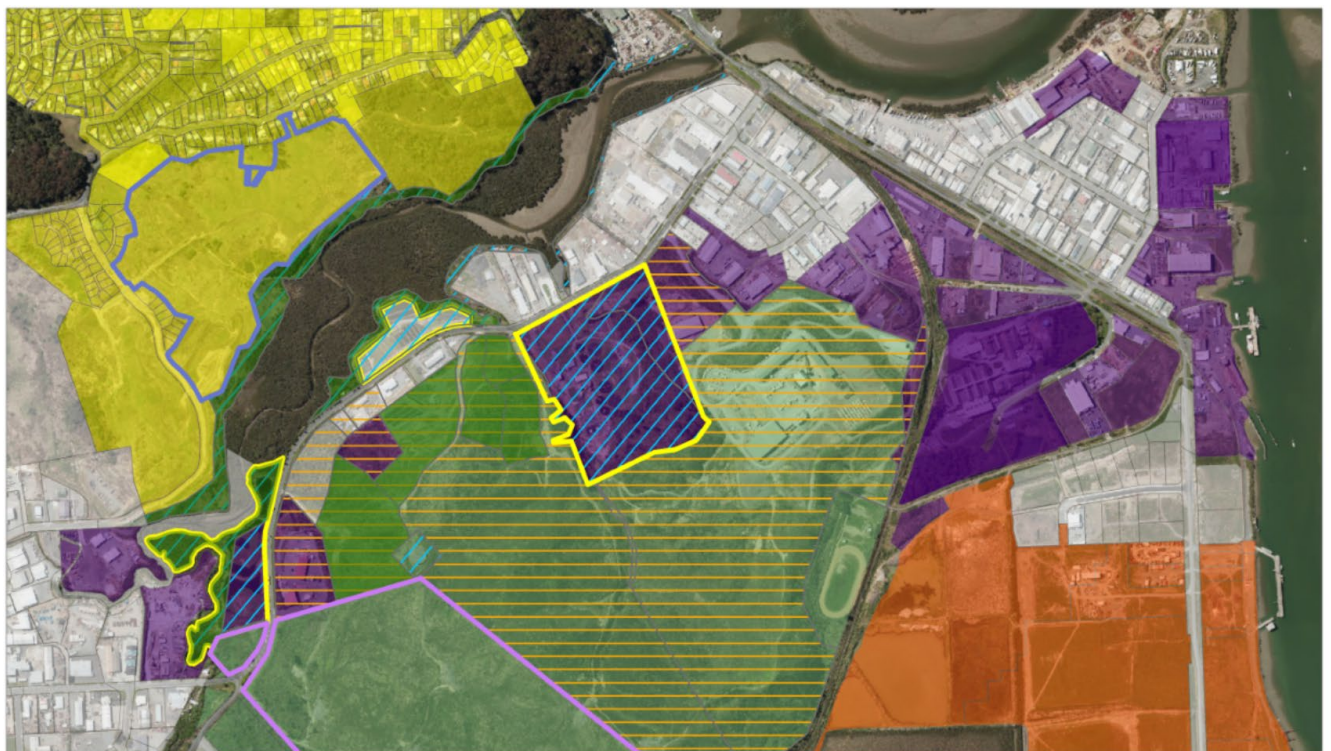


Figure 9 Whangārei District Council Land use zones surrounding the plant and WDC owned property and properties with odour covenants.

3.2 Site topography

The WWTP is located on largely flat terrain sloping gently to the north toward Limeburners (Hāhā) Creek, constrained within a valley with hills close to the site boundary on the east and west converging to the south as shown in Figure 10. Kioreroa Road is at a similar elevation to the Site and gently slopes downhill towards the northeast where Limeburners (Hāhā) Creek flows to meet the Hātea River. Limeburners (Hāhā) Creek itself also sits within a valley, with hills rising to the North of the creek and site.

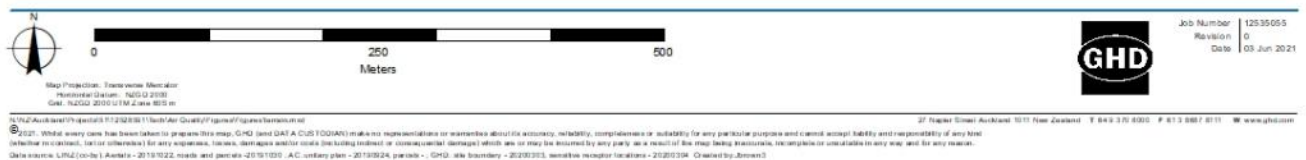
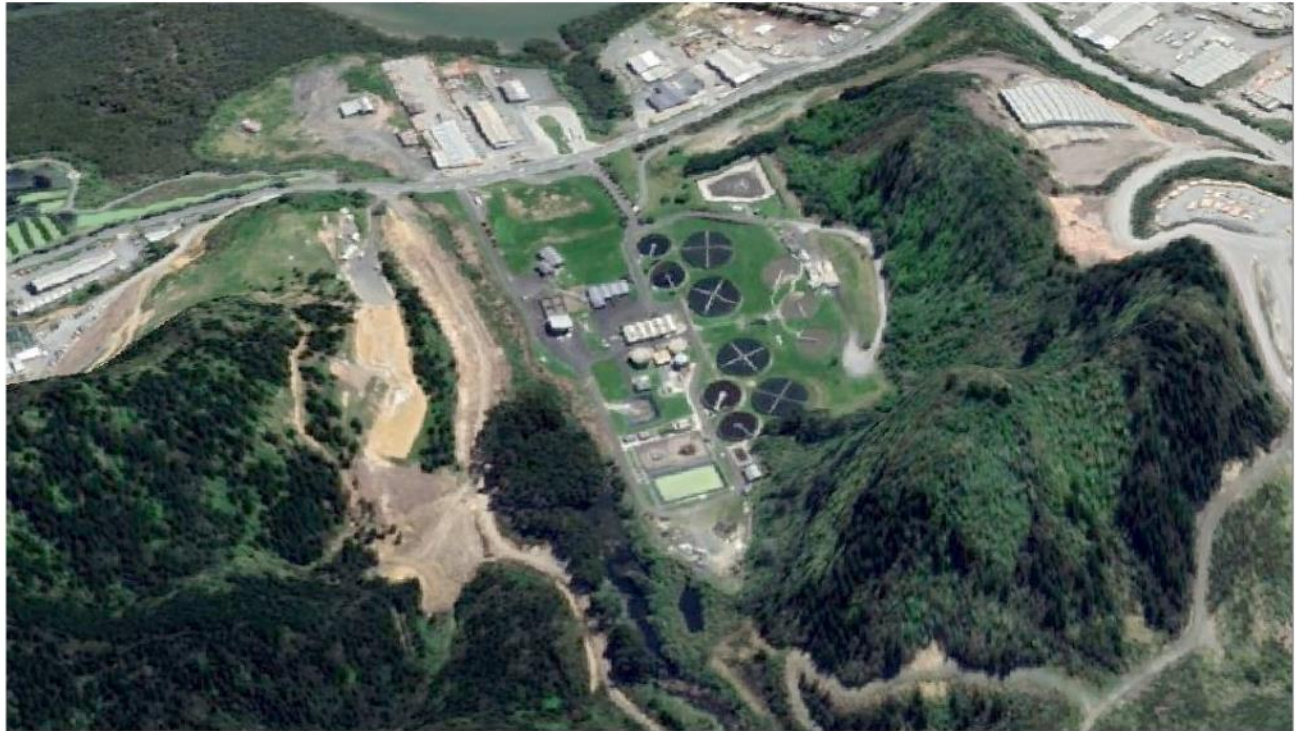


Figure 10 Terrain around the Site

3.3 Receiving Waters

Limeburners (Hāhā) Creek into which the Whangārei WWTP discharges, is a tributary of the Hātea River and ultimately feeds into the Whangārei Harbour as shown in Figure 11. The hydrodynamics, physical habitat and ecology, water and sediment quality of these receiving environments is described in detail in the GHD Water Quality and Public Health Assessment (GHD, 2021b). This is supported by a report from 4Sight Consulting Limited, engaged by WDC to characterise the ecology and sediment quality of Limeburners (Hāhā) Creek and the Hātea River receiving environment. The GHD (2021b) report and 4Sight reports (Baseline Monitoring Report (4Sight, 2020), Water Quality Monitoring Report (4Sight, 2021a) and Ecological Assessment Report (4Sight, 2021b)) are provided in Appendix E. The following sections provide a summary of the status of the current receiving water environments based on this reporting.

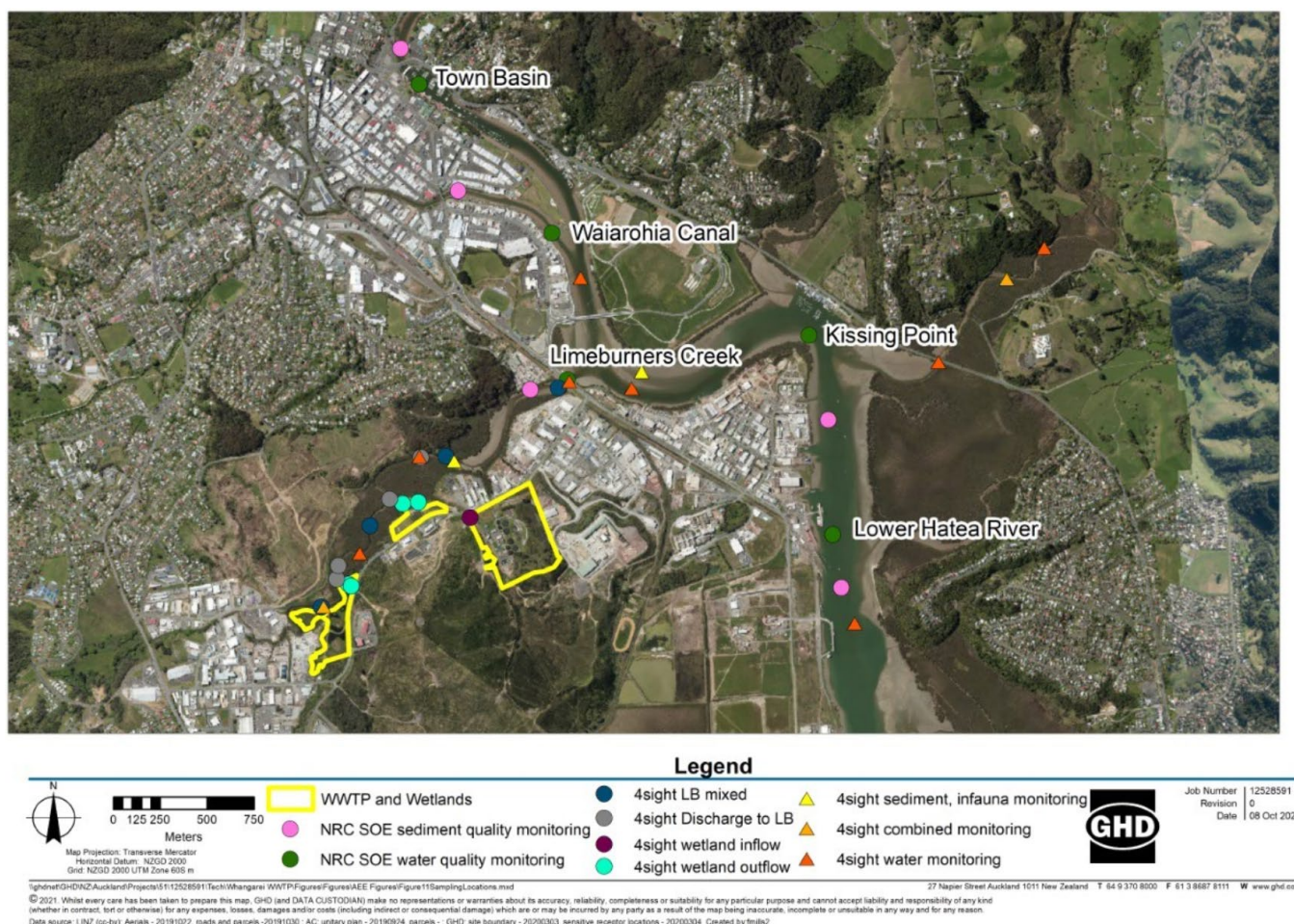


Figure 11 Limeburners (Hāhā) Creek, Hātea River and the wider Whangārei Harbour and relevant sampling locations.

3.3.1 Limeburners (Hāhā) Creek

Physical habitat

Limeburners (Hāhā) Creek joins the Hātea River from the west and drains a catchment area of approximately 1,280 ha. The catchment is predominantly undeveloped indigenous forest or rural, with just 16% of the catchment as developed urban land of which a majority is heavily urbanised (NRC and WDC, 2012). The area immediately upgradient of Limeburners (Hāhā) Creek into which the Whangārei WWTP discharges includes extensive industrial development. In the lower reach of Limeburners (Hāhā) Creek the flow direction is dictated by the tide, with water levels fluctuating by approximately 2 m at the confluence with the Hātea River. The lower reach of the Creek is dominated by mangrove forests growing on tidal mud flats (refer to Figure 12).

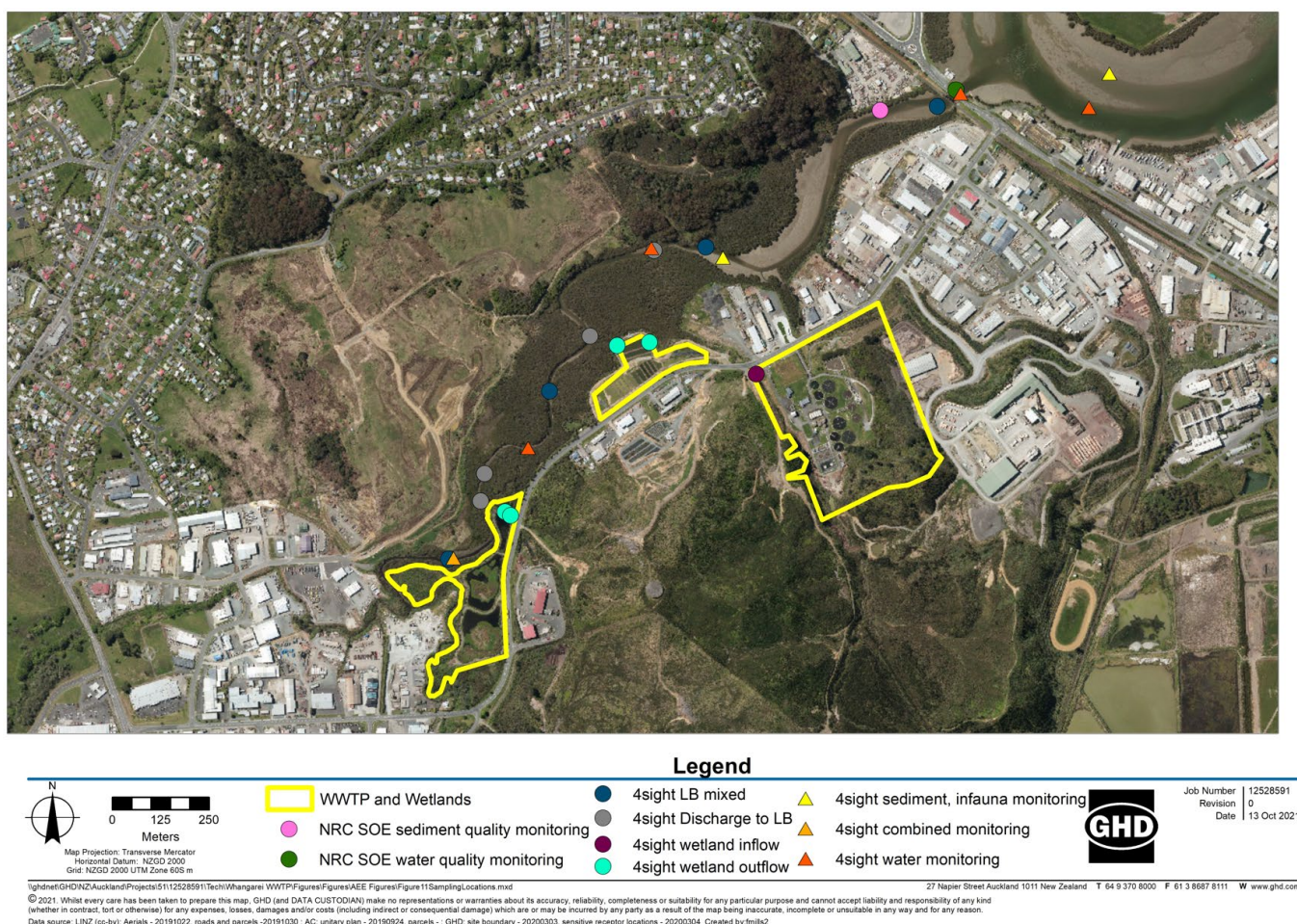


Figure 12 Limeburners (Hāhā) Creek Catchment

The Proposed Regional Plan for Northland (PRPN October 2021 – Appeals version) designates the lower reaches of Limeburners (Hāhā) Creek, to its confluence with the Hātea River at the Port Road bridge, as a zone of reasonable mixing for a major discharge (i.e. discharge from the Whangārei WWTP), as shown in Figure 6 (area shaded purple). As such, the water quality within this mixing zone is not required to meet the coastal water quality standards for the Hātea River prescribed in Policy H.3.3 (PRPN Table 22); however acute toxicity effects must be avoided (PRPN Policy D4.4). This includes the physical, chemical, and biological attributes and associated water quality values.

The below sections provide a high-level overview of the quality of Limeburners (Hāhā) Creek environment. Where applicable the water quality has been compared to the PRPN water quality values for the Hātea River to provide context.

Sediment quality

The composition of the intertidal sediment of Limeburners (Hāhā) Creek was determined by 4Sight as fine grained, with the dominant size fractions typically being mud, fine sand, and very fine sand. In the upper reaches of Limeburners (Hāhā) Creek the sediment is also comprised of approximately 25% gravel.

The sediment quality of Limeburners (Hāhā) Creek was summarised by 4Sight using data collected from surveys in March 2019 and February 2020 (the sampling locations of which are shown in Figure 11 above). The data collected showed:

- Sediment metal concentrations at Limeburners (Hāhā) Creek were below the NRC coastal sediment quality standards, indicating low risk of toxicity to benthic organisms.

- Sediment total organic carbon (TOC) (an indicator of the organic character) was comparable between the upstream and downstream site⁷, and both sites had considerably lower TOC concentrations compared to the Hātea River.
- The mean sediment chlorophyll-a concentration (an indicator of algal growth (biomass)) was higher at the downstream site compared to the upstream site. 4Sight considered this to be a result of the greater freshwater influence upstream, and therefore a less suitable environment for benthic algal growth, and greater exposure to nutrient loads and volumes of water passing by the downstream location.
- Sediment total nitrogen content (an indicator of additional nutrient sources) was similar across the upstream and downstream site and showed little variation from the content noted in the Hātea River sample.
- Sediment total phosphorous content (an indicator of additional nutrient sources) was noticeably higher at the upstream site compared to the downstream site, and again compared to the Hātea River. It was concluded by 4Sight this was a consequence of the discharges in the Creek, i.e., the WWTP.
- The oxidation-reduction potential ('redox') measures (an indicator of the systems retention and release of nutrients and carbon) were highly variable with redox measures being comparable between the Limeburners sites and the Hātea River site.

It is important to note that as only two surveys were undertaken there is insufficient information to assess trends or change over time.

Water quality

The water quality of the Limeburners (Hāhā) Creek has been characterised by 4Sight (2021a) using data collected monthly, from various locations along the Limeburners (Hāhā) Creek, from January 2020 to February 2021. The sample locations included locations upstream of the discharge, at the discharge point and downstream of the discharge, recognising Limeburners is influenced in this area by tidal movements (the sampling locations are shown in Figure 11 and 12 above). The study also looked at the water quality of the discharge points from the WWTP, including the wetlands, the performance of the WWTP and wetlands has been outlined earlier in Section 2.4. The monitoring results were compared to the PRPN water quality criteria for the Hātea River for reference purposes only. The data collected showed:

- The water quality at the discharge point and Limeburners (Hāhā) Creek upper site are similar for all variables monitored. This is not unexpected as the flow in Limeburners (Hāhā) Creek reverses on the incoming tide. The sampling conducted by 4Sight was carried out within 1 – 3 hours following high tide, at which time the influence of treated wastewater was typically greatest upstream (reversed flow) of the discharge locations..
- Dissolved oxygen saturation is likewise similar at the discharge and upstream sites, and consistently within the coastal water quality standards at the confluence of the creek with the Hātea River. Continuous monitoring indicates that tidal action provides regular flushing of the creek and refreshment of dissolved oxygen. Even at the lowest levels, which occur at low tide, dissolved oxygen levels remain sufficiently high as to avoid acute effects to ecology, such as fish asphyxiation (suffocation) events.
- Ammoniacal nitrogen concentrations in the creek water were elevated for short periods, reflecting variation in the degree of treatment achieved and the influence of tidal conditions. This shows accumulation and mixing of treated wastewater in the creek on the incoming tide and discharge on the outgoing tide. The measured concentrations are not considered to be resulting in acute toxicity effects.
- Increases in turbidity and suspended solids were noted at the downstream monitoring site. This is an expected observation given the freshwater and marine interface is known to cause re-suspension of particles.

Ecology

The 4Sight ecological surveys found approximately 24% of the total catchment area was covered by mangrove forests and this area equated to approximately 74% of the estuary area of the Limeburners (Hāhā) Creek. Small patches of macroalgae were also identified in the Creek.

Surveys of the benthic macroinvertebrate community were taken at two locations along the Limeburners (Hāhā) Creek, an upstream site, and a downstream site⁸. A comparison of these sites identified the downstream site was more populated and diverse, a likely and expected result of the different habitats, cobbled mud upstream and soft

⁷ Upstream and downstream sites to the WWTP discharge, as shown in Figure 12 .

⁸ In reference to the WWTP discharge as shown in Figure 12.

mud downstream, and the stronger freshwater influence leading to larger salinity gradients at the upstream location. The benthic macroinvertebrate communities found at the downstream site was categorised similar to that of the Awaroa site, a reference site.

Species of note identified in the Limeburners (Hāhā) Creek included infaunal deposit-feeding oligochaete worms, and Copepods at the lower sites and the estuarine snail *Potamopyrgus estuarinus* found at the upper site.

The NRC state of the environment monitoring shows small populations of cockles (*Austrovenus stutchburyi*), wedge shells (*Macomona liliiana*) and oysters are also present in the mouth of the Limeburners (Hāhā) Creek. Three non-indigenous species of shellfish were also identified.

Fish and bird surveys were not undertaken by 4Sight however they reported species identified during sampling and those noted during previous work in the area. A review of the New Zealand freshwater fish database, by 4Sight, found 10 records from sites in the upper Limeburners (Hāhā) Creek headwater tributaries. The records were from 2018 and included shortfin eel, banded kokoi and longfin eel. A review of the online eBird checklist program in New Zealand, by 4Sight, identified the Limeburners (Hāhā) Creek Wetlands as a popular spot for bird records with 29 species being recorded since 2020.

Contact recreational activities

The likely use of Limeburners (Hāhā) Creek currently for recreation or shellfish gathering is low, especially with the use of the creek as a mixing zone recognised by the zone designation in the PRPN.

Enterococci concentrations, an indicator of potential risk to public health associated with recreational use of the creek, were variable and had similar medians across sampling sites. While the median Enterococci concentration at the downstream monitoring location (confluence with the Hātea River) was relatively low 41 MPN / 100 mL over the monitoring period, periodic spikes in Enterococci are evident in Limeburners (Hāhā) Creek, as they are in the Hātea River and other tributaries to the river (discussed in more detail below). The widespread influences of catchment sources of microbial contaminants and implications for recreational use of the Hātea River are described in Section 3.3.2 below.

Sensitivity of the receiving environment

The 4Sight and SoE monitoring, including the microbiological water quality assessments, and the ecological surveys indicate Limeburners (Hāhā) Creek is not currently a sensitive receiving environment. Given the Creek is designated as a mixing zone, and the use of the environment for recreational activities and shellfish collection is not promoted or recommended, the Creek can be considered a degraded environment with low sensitivity. The results from the monitoring to date indicates the discharge from Limeburners (Hāhā) Creek has intermittently elevated ammoniacal nitrogen, total nitrogen and total phosphorous levels, due to the WWTP discharges, with this influencing the water quality of the Hātea River at the confluence of the two water bodies at times (refer to Section 3.3.2 below). Additionally, the levels of enterococci and faecal coliforms are elevated during high flow discharges or rainfall events because of upstream sources and discharges, including the WWTP. These results indicate water quality in the creek is influenced by the WWTP discharges. However, the degree of influence is typically comparable to those recorded in the Waiarohia Canal and the Town Basin, further indicating the influence of local catchment sources on water quality.

3.3.2 Upper Whāngarei Harbour (Hātea River)

Physical habitat

The Hātea River flows from the north-east of Whangārei southwards and into the northern head of the Whangārei Harbour (north of Onerahi Beach) (refer to Figure 21 which defines the Coastal Water Quality Management Units and thus planning boundaries for the Hātea River and thus the NRC coastal sediment and water quality standards). The river forms the Upper Whangārei Harbour, with the upper reaches including the Whangārei town basin, and contributing urban tributaries such as the Waiarohia Creek. The catchments that contribute to the Hātea River at the confluence with Limeburners (Hāhā) Creek include the Hātea Catchment (approximately 4,470 Ha of predominantly rural landuse), Whangārei City Catchment (approximately 550 Ha of predominantly general urban landuse) and Waiarohia Catchment (approximately 1,890 Ha of mixed rural and general urban landuse) (NRC and WDC, 2012).

The Hātea River receives road run-off, stormwater and groundwater from Whangārei city and is the receiving environment for the Whangārei WWTP, and a number of industrial and agricultural discharges. The shoreline and hydrology of the river has been significantly altered by saltmarsh drainage and reclamation for urban development.

Sediment quality

The work undertaken by 4Sight, outlined above and in more detail in Appendix E, identified the composition of the intertidal sediment of the Hātea River as fine-grained with mud, fine sand and very fine sand, similar to that of Limeburners (Hāhā) Creek. Of the four sites sampled (refer to Figure 11), the Hātea River had the lowest portion of muds, likely a result of the higher energy environment and greater water flow compared to the Limeburners and Awaroa Creeks.

The two sediment quality surveys undertaken by 4Sight in March 2019 and February 2020 found:

- Concentration of metals in the Hātea River sediment were below the NRC coastal sediment quality standards. 4Sight inferred this indicates a low risk of toxicity to the benthic organisms.
- The TOC content was substantially higher in the Hātea River compared to the Limeburners and Awaroa monitoring sites. A likely reflection of the volume of mud in the Hātea River, which 4Sight noted to be up to waist height in some sampling areas. The elevated TOC content is indicative of a moderate to high stress environment for benthic organisms and was determined by 4Sight as a consequence of the land use change and urbanisation of the catchment over time.
- The sediment chlorophyll-a content varied across sampling sites with the Hātea River content being similar to the downstream Limeburners (Hāhā) Creek site.
- The total nitrogen content was relatively consistent across all sampling sites.
- The total phosphorous content was lower in the Hātea River compared to the Limeburners (Hāhā) Creek monitoring locations.
- The redox measurements were highly variable across the monitoring locations with mean redox values at 1 cm depth of about –50 mV in the Hātea River. It was concluded by 4Sight these mean values indicate sediment oxygen has been consumed resulting in anoxic conditions, a likely result of the fine grain size and high organic carbon content.

Based on the two surveys undertaken there is insufficient information to assess trends or change over time. As such, the sediment quality results were compared by 4Sight to the SoE reporting on coastal sediment quality published in 2016, concluding the quality measures were similar across both investigations except for total organic carbon concentrations. Higher organic carbon concentrations were recorded by 4Sight which may be a result of recent depositional events in the River.

Water quality

The water quality of the Hātea River has been characterised using NRC monthly state of the environment (SoE) monitoring results from 2010 – 2020. The results of this sampling are detailed in Appendix E. The SoE sampling locations include the Town Basin, Waiarohia Canal, Limeburners (Hāhā) Creek, Kissing Point and Lower Hātea River, refer to Figure 11.

The water quality of the Hātea River is summarised as follows:

- Total nitrogen concentrations (noting data was only available from 2016 to 2020) are elevated and unlikely to limit phytoplankton growth. The long-term median concentration at Limeburners (Hāhā) Creek is approximately equivalent to that at Waiarohia and Town Basin, with a notable difference in statistical distribution of the higher concentrations at Limeburners (Hāhā) Creek. In 2020 the annual median total nitrogen concentration at these three locations exceeded the PRPN water quality criteria of 0.860 mg/L. The annual median concentrations of the downstream monitoring locations are typically below the PRPN criteria.
- Nitrite-nitrate nitrogen concentrations in the Hātea River follow a similar trend and distribution to that of the total nitrogen concentrations. The long-term median nitrite-nitrate nitrogen at Town Basin, Waiarohia Canal and Limeburners (Hāhā) Creek are approximately equivalent with a notable difference in statistical distribution of the higher concentrations at Limeburners (Hāhā) Creek. Annual median nitrite-nitrate nitrogen concentrations intermittently exceed the PRPN water quality criteria of 0.580 mg/L at these three sites. The annual median concentrations of the downstream monitoring locations are typically below the PRPN criteria.

- Total phosphorous concentrations become increasingly elevated at Waiarohia Canal and Limeburners (Hāhā) Creek, with the annual median concentrations at both sites routinely exceeding the PRPN criteria of 0.119 mg/L. The annual median concentrations of the downstream monitoring locations are typically below the PRPN criteria.
- Ammoniacal nitrogen concentrations are typically elevated at the Waiarohia Canal and Limeburners (Hāhā) Creek. These elevated concentrations do not correlate with the total nitrogen, nitrite-nitrate nitrogen or total phosphorous concentrations, indicating changes in dissolved oxygen or discharge from the benthic sediments may be contributing to ammoniacal nitrogen concentrations. The annual median concentration for downstream monitoring locations (Kissing Point and Lower Hātea) are typically below the PRPN criteria of 0.099 mg/L, while those of the Town Basin, Waiarohia and Limeburners (Hāhā) Creek show frequent exceedances.
- Chlorophyll-a concentrations are relatively consistent across the Hātea River and indicate a slightly to moderately eutrophic environment. The greatest concentrations over the period of monitoring typically occur in the Town Basin and Waiarohia monitoring locations, with this thought to reflect the lower rate of water flushing that occurs in these upstream locations and, potentially, the lower salinity at such times.
- Dissolved oxygen concentrations are also relatively consistent across the Hātea River. Historically dissolved oxygen has dropped below 5 g/m³ on a small number of occasions, with oxygen levels consistently above 6 g/m³ for the past 10 years. Continuous monitoring of dissolved oxygen at the confluence with Limeburners (Hāhā) Creek indicates that dissolved oxygen cycles with tide, being lowest at low tide and greatest at high tide. During low tide, dissolved oxygen routinely drops below 5 g/m³ at this location.
- Visibility in the Hātea River, measured with secchi depth (m), is typical of a disturbed shallow estuarine environment, with the lowest visibility typically evident in the Waiarohia Canal and Limeburners (Hāhā) Creek area. Visibility does not follow the same distribution as for Chlorophyll-a, suggesting that fine sediment (mud) is likely to be influencing visibility more than phytoplankton growth. Notably, visibility appears to be influenced by both shallow Waiarohia and Limeburners estuarine creeks in a similar manner, suggesting that the urban catchment is a source of fine sediment that is influential on visibility.
- The pH values of the Hātea River are considered typical of an estuarine environment, within pH 7.5 – 8.5. The median and individual pH values are within the PRPN water quality guidelines of 7.0 – 8.5.
- Temperature is found to be typically consistent along the length of the Hātea River.
- Salinity measurements showed an increasing influence of marine water and mixing between freshwater and marine water moving downstream from the Town Basin to the Kissing Point locations. Differences between Kissing Point and Lower Hātea locations are less notable, reflecting limited freshwater input. During peak rainfall events the upper part of the Hātea River down to the Waiarohia monitoring location can be effectively flushed of marine water. Whereas during peak tidal events, droughts and/or with storm surge, the Hātea River may be predominantly marine water. Continuous monitoring of salinity at the confluence with Limeburners (Hāhā) Creek further demonstrates the high degree of flushing, as salinity cycles with tide between 34 psu (high tide) and 26-28 psu (low tide)
- Total copper and total zinc have been monitored in the Hātea River since 2015 and total lead was monitored between 2015 and 2017.
 - The concentration of total copper exceeds the PRPN water quality maximum criteria of 0.0013 mg/L at most monitoring sites, with higher elevations noted at Town Basin, Waiarohia Canal and Limeburners (Hāhā) Creek locations. Prior to August 2019 the detection limit associated with copper analysis was 0.002 mg/L. Consequently, results prior to August 2019 exceed the PRPN criteria by being at or below laboratory analysis detection limit.
 - The zinc concentrations at Town Basin, Waiarohia Canal and Limeburners (Hāhā) Creek have occasionally exceeded the PRPN water quality criteria of 0.015 mg/L, with the concentration reducing towards the lower Hātea River site with increased flushing. Both copper and zinc are likely to be present at elevated concentrations due to stormwater from industrial and urban catchments.
 - During 2015 and 2016 the concentrations of lead were below the allowable PRPN water quality criteria of 0.0044 mg/L, with a singular exception in May 2016 at Waiarohia Canal.

Ecology

The 4Sight baseline ecology surveys included an assessment of the benthic macroinvertebrate communities in the Hātea River. The surveys identified 25 taxa and 743 individual species, of which five species accounted for 68% of the total abundance. Species identified included polychaete worms, including mud tolerant polychaete worms at one of the sample sites, the invasive Asian data mussel and oligochaete worms. 4Sight interpreted the community composition to be reflective of a dynamic environment that offers a variety of habitat types and nutrient conditions. The communities at the Hātea River were deemed suitably different from the other sites and between each sampling year, noting the surveys were conducted in March 2019 and February 2020, providing insufficient information to assess trends or change over time.

The survey results were compared to the NRC Whangārei Harbour Estuary Monitoring Programme carried out in 2012, concluding the community composition reported by 4Sight was comparable to the Hātea River sites reported in 2012. The 4Sight surveys did not assess for shellfish, however the 2012 study showed the presence of populations of cockles and wedge shells in the Hātea River.

Public Health - Contact recreational and shellfish gathering activities

As a highly disturbed tidal environment, heavily influenced by catchment run-off, public use of the Hātea River is predominantly limited to secondary contact, associated with boating and wading. Swimming and shellfish gathering within the Hātea River is uncommon and not promoted.

The microbiological water quality of the Hātea River is characterised by the SoE monitoring and the NRC public health monitoring programme, as described in Appendix E.

A review of the SoE Enterococci concentrations indicated frequent exceedance of secondary contact criteria. Concentrations are typically greatest at the Town Basin and decrease with distance downstream. Monitoring at the Waiarohia Canal often demonstrates enterococci concentrations greater than at the confluence with Limeburners (Hāhā) Creek. These notably elevated microbiological concentrations, upstream of Limeburners (Hāhā) Creek indicates that catchment sources dominant the average microbiological water quality within the Hātea River.

As with other water quality parameters, significant dilution of the Hātea River downstream of Limeburners (Hāhā) Creek is evident, resulting in relatively low Enterococci concentrations occurring at the Kissing Point and Lower Hātea monitoring locations. However, intermittent spikes in Enterococci concentrations are evident at all locations. These events have generally low occurrence and are considered to result from notable rain events which generates catchment run-off.

Review of public health monitoring results at Onerahi Beach, the nearest public swimming location, indicated that the beach was suitable for primary contact as experienced during swimming, with infrequent elevated Enterococci events. The occurrence of these events does not appear to be related to WWTP discharges, instead having a source more local to Onerahi.

Measured faecal coliform concentrations were used to assess the potential risk to public health resulting from shellfish-gathering from the Hātea River, with the Recreational Shellfish-gathering Bacteriological Guideline Values (MfE, 2003) used as a reference concentration. Concentrations show a similar distribution to Enterococci concentrations as outlined above. Results suggest that shellfish gathering should only occur, if at all, at the downstream locations near Kissing Point and Lower Hātea. Noting that even at these well flushed downstream locations, exceedance of the guideline values still periodically occurs. In this context, no shellfish gathering from the river and its tributaries is recommended.

Sensitivity of the receiving environment

The SoE monitoring results summarised above indicate the River intermittently has increases in nutrient concentrations, enterococci, and faecal coliform in the upper reaches. These intermittent nutrient increases are reflective of catchment sources demonstrating that the Hātea River has a notable background contaminant load due to catchment activities. The high flow discharge periods from the upstream catchments, i.e., Limeburners (Hāhā) Creek and Waiarohia Canal, only have minor influence on water quality further downstream, suggesting that mixing within the Hātea River occurs rapidly and that a significant amount of dilution and flushing of the Hātea River occurs downstream of Limeburners (Hāhā) Creek. Fluctuations of physical conditions, including salinity and dissolved oxygen, point to the highly dynamic nature of this flushing and changing water quality. While the Hātea River is at least slightly eutrophic, the nutrient additions to the river from the WWTP do not appear to be

influencing this state, as indicated by the relatively constant Chlorophyll-a concentrations along the river. This is likely due to the high flushing rates and correspondingly short residence time for algae, limiting the amount of algal growth that can occur in the river.

Given the high mixing and flushing that occurs in the Hātea River, and the background water quality being such that public use of the Hātea River for recreation is expected to be limited, it is surmised that the River is already influenced by catchment source inputs to a degree, reducing its overall sensitivity to low.

3.3.3 Lower Whāngarei Harbour

The Lower Whangārei Harbour, into which the Hātea River discharges, near Onerahi/Port Nikau, is a drowned river valley estuary covering approximately 107 km² (refer to Figure 21 which defines the Coastal Water Quality Management Units and thus planning boundaries between the Upper and Lower Whangārei Harbour). The Whangārei Harbour water quality improvement strategy, prepared by NRC and WDC in 2012, describes the harbour and the contributing catchments, the following information has been taken from the strategy document.

The harbour is relatively shallow with extensive intertidal flats. The main navigation channel is on the northern side of the harbour with depths ranging from 15 –31 m, with extensive intertidal mudflats to the south. The harbour is classified into three zones, the upper, middle, and lower harbour. Reference in this report to the lower harbour considers both the middle and lower harbour zones, which range from the east of Matahoke/Limestone Island through Manganese Point and One Tree Point to the harbour entrance.

Degraded water quality in the upper harbour has been reported as having adverse effects on the ecology in parts of the lower harbour. The environment habitats within the harbour include mangroves, saltmarsh, seagrass, intertidal mudflats, and subtidal beds. The range of environment habitats supports a high diversity of vegetation, estuarine bird, shellfish, and fish.

NRC undertake a range of quality monitoring in the Lower Whangārei Harbour, including water quality, coastal sediment, estuary monitoring and the recreational swimming quality programme. Sediment monitoring has found due to flocculation a lot of sediment settles out of the water column in the upper harbour and therefore does not enter the lower harbour. Monitoring has also found the nutrient levels in the lower harbour are lower than the upper harbour, a reflection of the high dilution and flushing rates.

The Lower Whangārei Harbour is used extensively for recreational purposes, including both primary and secondary contact, and for fishing and shellfish gathering. The lower harbour also supports commercial pipi and cockle harvesting, with commercial fin-fishing prohibited. The microbiological monitoring and swimming quality programme indicates the lower harbour is suitable for swimming most of the time with occasional elevations related to rainfall events.

Sensitivity of the receiving environment

Based on the information provided in the Whangārei Harbour water quality improvement strategy (2012) it can be surmised the Whangārei Harbour is a moderately sensitive receiving environment. The lower harbour is highly valued ecologically, socially, and culturally and although it exhibits some degraded quality, compared to historical conditions, the overall quality is better than that of the upper harbour. Given the high value of the harbour there is concern for future degradation in the lower harbour, adding to the sensitivity of this environment.

3.4 Climate

GHD obtained meteorological data from the closest Automated Weather Station (AWS) to the site, operated and maintained by NIWA, for the period between 1 September 2015 to 1 January 2020. The AWS is located directly north-east of the Site, approximately 10 metres from the Site boundary. This data has been used to describe the meteorological conditions at the site.

Whāngarei is considered to be in a sub-tropical climate zone. Consequently, Whangarei has warm summers with temperatures ranging between 23 °C and 30 °C, and mild winters with temperatures between 13 °C and 20 °C as seen in Figure 13, and a high annual rainfall of approximately 1,500 mm throughout the year, shown in Figure 14.

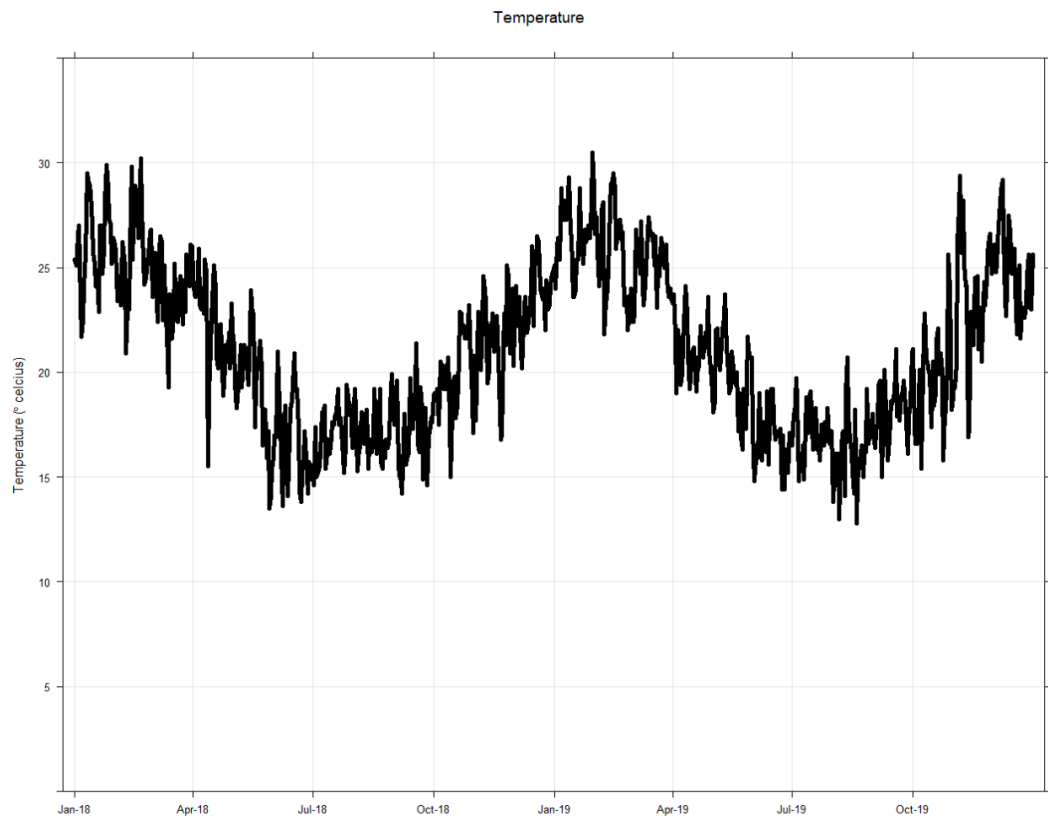


Figure 13 *Whangarei Temperature (°C) over the two-year period from January 2018 – December 2019 (inclusive) measured at Kioreroa Road Met Station*

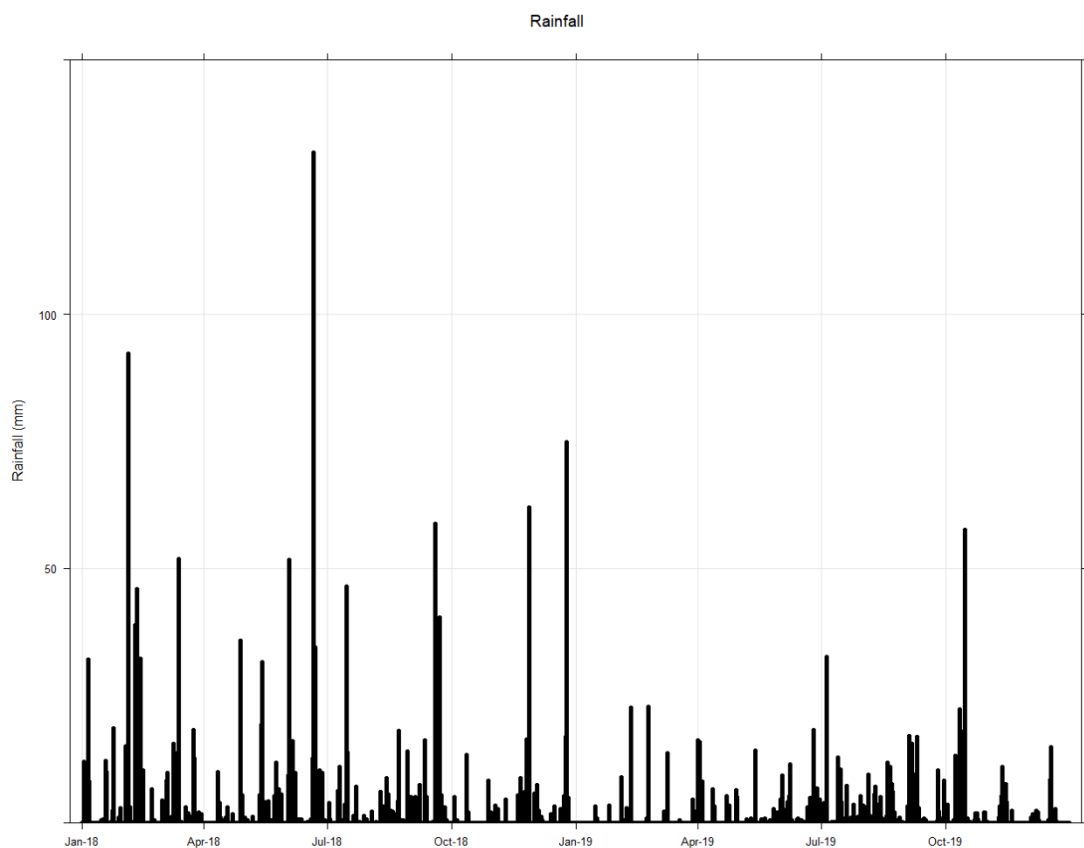


Figure 14 *Whangarei rainfall (mm) over the two-year period from January 2018 – December 2019 (inclusive) measured at Kioreroa Road Met Station*

The 2015 to 2019 hourly wind data indicates that the Site receives winds from all directions, however the predominant winds originate in the south-southeast and south-southwest directions with low windspeeds dominating at the Site (Figure 15).

The dominant wind directions observed at the met station do not change substantially throughout the year with winds most commonly occurring from the southern quarter, a detailed analysis of the wind data is provided in the GHD Air Quality Assessment Report provided in Appendix F.

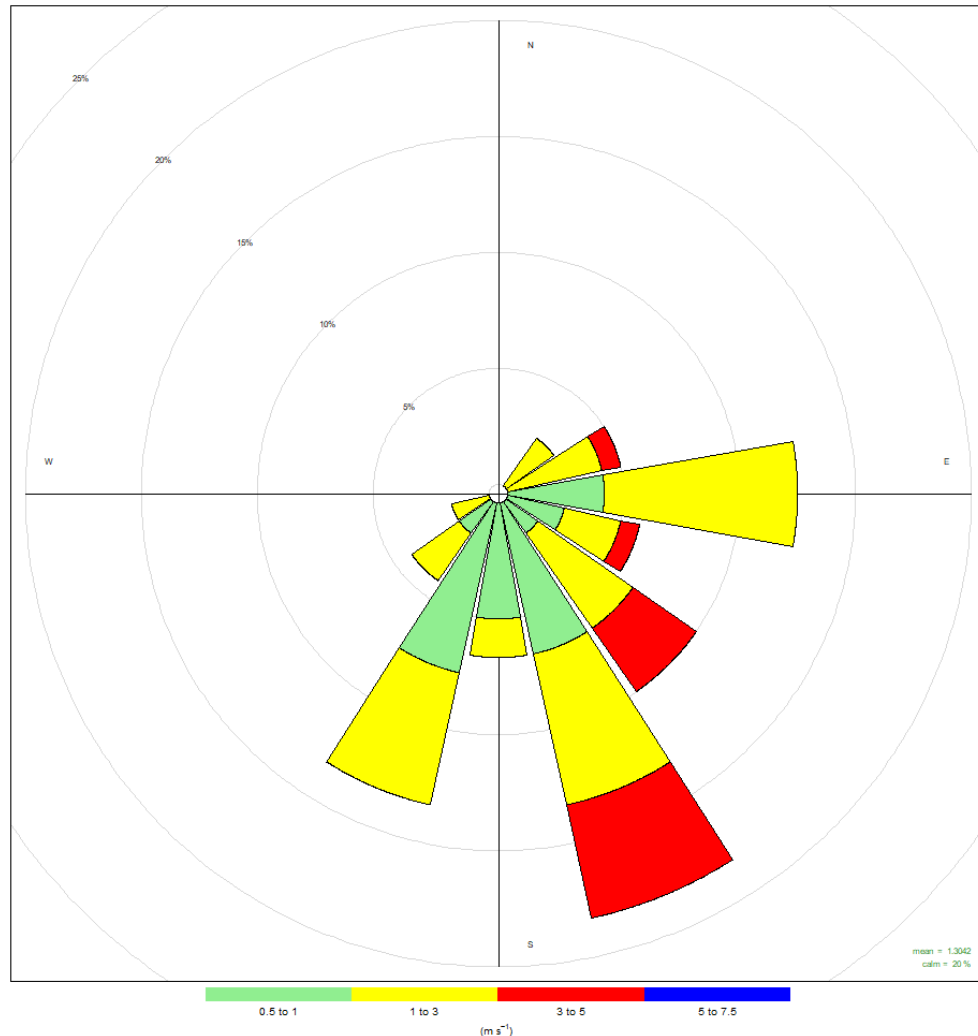


Figure 15 Wind rose showing wind conditions from Whangarei between September 2015 – December 2019.

3.5 Ambient Air Quality

The site is located within the Whāngarei Airshed, air sheds are placed in areas where air quality has or could breach the National Environmental Standards for Air Quality for PM₁₀. The location within the Whāngarei Airshed generally means that creation of particulate matter (PM) from activities such as outdoor burning should be limited and that odour nuisance should not occur outside of the property boundary. As of September 2021 there have been no recorded exceedances of PM₁₀ or PM_{2.5} in the Whāngarei Air Shed (measured at the Robert Street particulate monitor).

The WWTP is located along Kioreroa Road which is designated as an industrial zone under the District plan. The industrial zone is bordered by a mixture of residential and rural zoned areas. In industrial and rural zoned areas there is a lower sensitivity to odours which are typical of that zoning.

3.6 Cultural values

Iwi representatives from Te Parawhau and Rewarewa D Block (Patuharakeke) have contributed greatly to the wastewater technical group that was established to support the options evaluation, which led to the adaptive pathway planning approach being proposed (discussed further in Section 4). Wider engagement with iwi/hapū is now underway to support the development of a Cultural Impact Assessment (CIA) which will inform this consent application. WDC have partnered with Te Parawhau to develop the CIA (refer to a letter from Te Parawhau regarding the CIA development in Appendix G). It is understood the CIA will be available for consideration end of February 2022.

4. Description of the proposed activity

A detailed options evaluation for the Whangārei WWTP has been undertaken in consultation through a series of hui with the Wastewater Technical Working Group established for this purpose and with representatives from key stakeholders including Northland District Health Board, Fish and Game, Department of Conservation, and local hapu (Te Parawhau and Rewarewa D) in attendance. Forest and Bird were also invited to participate and although they did not attend, minutes and presentations were distributed to their Whangārei office. Details of these hui are presented further in Section 8⁹.

GHD commenced this options evaluation work with an assessment of the capacity and process bottlenecks of the existing WWTP treatment process (presented in the Plant Assessment Report, 2021b) followed by options reporting (presented in the Options Report, 2021c). Both of these reports are provided as appendices to the Whangārei WWTP Master Plan (refer to Appendix H), which in addition to providing an overview of the likely works and capital expenditure required at the plant over the next ten years, also provides a detailed description of the options evaluation process.

To avoid repetition, the following section provides an outline of the options evaluation process, including an introduction to the Adaptive Pathway Planning approach applied and project drivers considered when developing the adaptive pathways, the preferred pathway selection, and details of how the adaptive pathway plan is to be implemented over the term of the consent.

4.1 Alternatives Considered

4.1.1 Long List Options Assessment

A traditional static approach to assessing upgrade options was initially applied to the Whangārei WWTP and aimed to identify a single option (the best practicable option) that would provide for the long-term plant requirements.

Being mindful of the identified capacity pinch points within the existing plant (noted earlier in Section 2.6), high growth projected, and WDC's position on maintaining as a minimum, the receiving water quality conditions (through maintaining nutrient mass load and performance of microbial disinfection), an evaluation of a long-list of options applying a traditional multi-criteria assessment process was undertaken.

Ten long list options were considered for the Whangārei WWTP best practicable option (BPO) assessment in consultation with the Wastewater Technical Working Group. These included combinations of different wastewater treatment and effluent discharge options summarised in Table 10. A streamlining of the shortlisting process by applying a critical flow analysis based on feedback from the stakeholders was carried out and is also presented in the following table.

Table 10 Long-List Options

No.	Option	MCA scoring	Carry forward?
1	Existing Discharge* - Plant Expansion.	2	Yes.
2	Existing Discharge* - Process Intensification.	1	Yes.
3	Existing Discharge* for Whangarei WWTP plus a Satellite Plant (Nth Whangarei) with land-based discharge (~222ha).	-	No, considered difficult to complete the necessary investigations within the pre-consent timeframe. Could be investigated as part of future consent review and may not be limited to North Whangarei.
4	Existing Discharge* for Whangarei WWTP plus a Satellite Plant (Whangarei)	-	No, fatal flaw – caters for small flow only and increased complexity.

⁹ Note that representatives invited from Forest and Bird and NRC did not attend any of the hui.

No.	Option	MCA scoring	Carry forward?
	Heads) with low harbour outfall discharge (2.1 MLD in 2056).		
5	Ocean Discharge (100% flow) - Relocate Whangarei WWTP.	-	No, significant hurdles associated with consent and construction of pipeline and outfall.
6	Ocean Discharge (100% flow) - Existing WWTP and pump to ocean.	-	No, significant hurdles associated with consent and construction of pipeline and outfall although could be investigated as part of future consent review in line with Ruakaka WWTP upgrades.
7	Land-based Discharge (100% ADF, 760ha), wet weather flow to Limeburners (Hāhā) Creek via existing wetlands - Existing WWTP site.	-	No - fatal flaw around land availability, soil suitability and land costs but could be investigated as part of future consent review.
8	Existing Discharge* supplemented with reuse and/or partial summer land-based discharge regime.	3	Yes.
9	Deep Bore Injection (100% flow) - Existing WWTP site.	-	No - fatal flaw around aquifer impact, aquifer recharge necessity, cost, and consent uncertainty.
10	Lower harbour discharge (100% flow) - Existing WWTP.	-	No - fatal flaw around no/lack of support from Tangata whenua.

**Existing effluent discharge to Limburners Creek via existing wetlands*

Through this collaborative process it was identified that over the Whangārei WWTP planning horizon considerable uncertainty exists associated with regulations, discharge requirements and Whangārei city growth, with these influencing the ability to plan effectively for the long-term needs of the treatment plant. For example, uncertainty exists regarding a potential future National Environmental Standard (NES) for coastal discharge of treated wastewater, future Whangārei growth projections, climate change outcomes, demand for recycled water and requirements for stabilised biosolids. This is in addition to a wider range of unknowns associated with societal perspectives, cultural values, reforms and three waters governance, technology, and the economy. In addition, there was a strong desire by the stakeholders for WDC to take a longer-term view of wastewater management and greater consideration given to treated wastewater reuse.

As such, the traditional static options assessment approach initially applied to the Whangārei WWTP was not considered to provide an effective and cost-efficient means of responding to such uncertainty. A different, more adaptive planning approach to assessing options was therefore pursued.

4.1.2 Adaptive Pathways Planning Approach

Adaptive Pathways Planning provides direction on how to develop a future plant that is adaptive and responds to change as the future unfolds, while avoiding redundant infrastructure being built. This approach embeds adaptive responses to changing needs, prescribing short-medium term actions to meet current needs, but leaving decision making on the specific medium-long term direction (pathways) open, with this to be confirmed when there is more certainty on the future needs.

Adaptive Pathways Planning is a practical planning approach that has been developed in recent years in response to the need to plan for long term and potentially uncertain futures, such as climate change effects.

Based on analysis of available data, the adaptive pathway planning approach does the following:

- Defines targeted implementation of future upgrades based on projected requirements. Implementation of future upgrades is in response to triggered needs, not a fixed timeframe. However, to allow for WWTP master planning timeframes are estimated, based on the current understanding of trends, with these regularly reviewed and updated.
- Considers the combined effect of future “disruptors” that could result in the upgrades being brought forward in time, delayed, or the preferred high-level strategic pathway being changed.

The key concepts for developing the pathways for upgrade to the Whangārei WWTP into an adaptive pathway plan are shown in Figure 16. Although presented here as a linear pathway, a series of interconnected pathways have been developed. The Adaptive Pathway Plan is a living document that will require ongoing monitoring of triggers and periodic review of decision/options, resulting in continuous refinement of pathways over time.

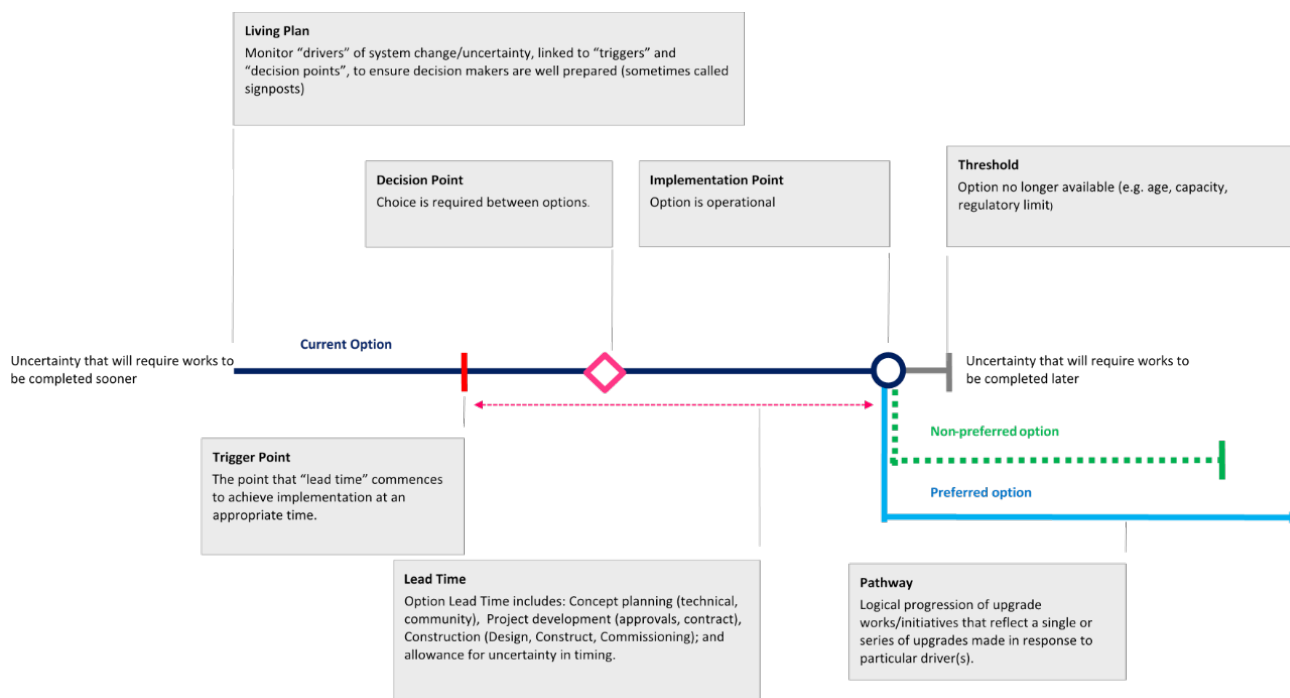


Figure 16 Key concepts for the adaptive pathways planning approach

The drivers¹⁰ for change and uncertainty identified during workshops with WDC and the Wastewater Technical Working Group are summarised in Table 11. At this time some of the drivers are better understood than others, and these have been taken through to inform the Adaptive Pathways Plan. Those more uncertain drivers identified would be considered in more detail in the future as part of ongoing regular review of the Adaptive Pathways Plan as more information regarding these becomes available or as they become more influential on decision making. A proposed set of actions to be undertaken in response to the drivers were identified and are also summarised in Table 11 and were used as the basis for developing the Adaptive Plan of possible upgrade pathways for the plant illustrated below in Figure 17.

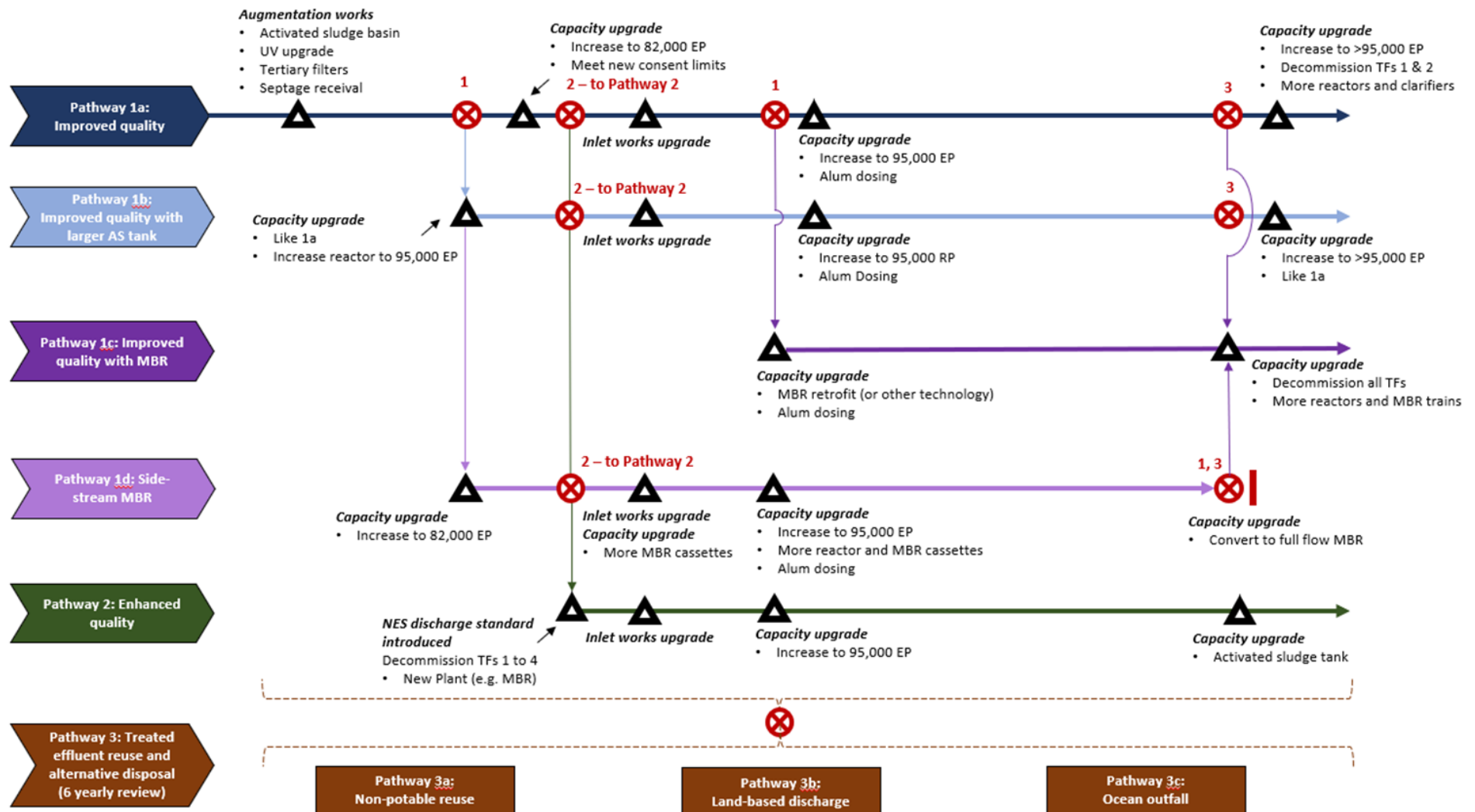
Table 11 Drivers for change

Driver	Details and possible actions	Trigger	Level of certainty / understanding
Current plant capacity and consent compliance.	<ul style="list-style-type: none"> - Pinch-points in the current treatment process and areas of current consent non-compliance identified as part of the Plant Assessment (Appendix H). - Augmentation and optimisation works currently underway to focus on stabilising ammonia concentrations and improve suspended solids and pathogen removal (<5 years). 	<ul style="list-style-type: none"> - Sub-optimal plant performance. - Consent non-compliances. 	High.
Population Growth.	<ul style="list-style-type: none"> - A population growth of 46 % is forecast for Whangarei over the next 35 years, with a corresponding average wastewater flow to be treated by the Whāngarei WWTP increasing from 18 ML/d to 27 ML/d requiring a significant capacity upgrade. 	<ul style="list-style-type: none"> - Growth forecasting. 	Reasonable.

¹⁰ A factor that has a significant influence on the need for WWTP upgrade works e.g. potential future National Environmental Standards introduced for wastewater discharges.

Driver	Details and possible actions	Trigger	Level of certainty / understanding
	<ul style="list-style-type: none"> Refer to Tables 10 and 11 of the Options Report (Appendix H) for current and future wastewater flow and load information used to define future upgrade requirements to maintain current discharge mass loads. 		
Prevention of further degradation to the receiving environment (2 scenarios considered).	<p>PRPN water quality standards and future revisions to address the National Policy Statement for Freshwater core principles of “Te mana o te wai” (discussed further in section 4.2.2):</p> <ul style="list-style-type: none"> Discharge standards based on WWTP's contribution to the state of the Hātea Rivers water quality being maintained thus avoiding further degradation in water quality in line with the intent of the PRPN. Assumes current mass loads of nutrients are maintained with improvements in pathogen and suspended solids removals thus a strong linkage with population growth. Treatment plant capacity upgrade required (5 – 10 years). Refer to Table 12 of the Options Report (Appendix H) for proposed indicative discharge quality targets to meet the intent of the PRPN. 	<ul style="list-style-type: none"> Receiving environment conditions. 	Reasonable.
	<p>Potential National Environmental Standard (NES) for wastewater discharges:</p> <ul style="list-style-type: none"> May stipulate high effluent quality requirements requiring a change in treatment technology (“enhanced treatment”). Treatment plant capacity upgrade timing would depend on the timing requirements prescribed in the proposed legislation. Refer to Table 12 of the Options Report (Appendix H) for proposed indicative discharge quality targets to meet the intent of the PRPN. 	<ul style="list-style-type: none"> Standards being imposed. 	Moderate.
Reuse Opportunities.	<ul style="list-style-type: none"> Land-based irrigation either on Council or 3rd party properties (e.g. expansion of current reuse activities onto Council owned gardens/sportsfields). Industrial reuse. Domestic non-potable reuse (i.e. toilet flushing and gardens). Type of treatment requirements would depend on the end-use. 	<ul style="list-style-type: none"> Water scarcity. Pathogen reduction / industry specific treatment requirements. Community/industry support. 	Low (with exception to current reuse activities).
Offensive odours.	<ul style="list-style-type: none"> Air quality assessment (refer to Appendix F) has recommended several immediate improvements related to odour containment with ongoing monitoring proposed to inform the need for more significant upgrades. Any new infrastructure proposed would be designed with odour control in mind. 	<ul style="list-style-type: none"> Odour surveys and complaints. 	Reasonable.
Climate Change Adaptation	<ul style="list-style-type: none"> Flood risk – NRC coastal and river flood hazard mapping (100 years) indicates the existing wetlands may be affected in future by major flood and severe sea level risk events (not affected at the 50 year predictions). Wet Weather Treatment Capacity – increased frequency and intensity of severe wet weather events could result in higher peak wastewater 	<ul style="list-style-type: none"> Flood/inundation risk. Wastewater Network Strategy and continued network modelling. Carbon emissions. 	Moderate.

Driver	Details and possible actions	Trigger	Level of certainty / understanding
	<p>flows in the network and thus being received by the plant.</p> <ul style="list-style-type: none"> - Greenhouse gas emissions / carbon neutrality targets – the Climate Change Response (Zero Carbon) Amendment Act 2019 sets a national goal to achieve net zero carbon emissions by 2050 (except for biogenic methane) and applies to wastewater treatment. A New Zealand specific emission reporting/estimation guideline is currently being developed. 		
Alternative disposal opportunities	<ul style="list-style-type: none"> - Partial land-based effluent application – focused on summer land application initially. - Ocean outfall – in combination with Ruakaka outfall. 	<ul style="list-style-type: none"> - Land availability. - Ruakaka outfall feasibility reviews. - Community support. - Receiving environment. 	Moderate
Improved solids waste management.	<ul style="list-style-type: none"> - Only primary sludge currently treated by digesters. - In the event an increase in landfill levy or higher biosolids quality requirements are imposed by Puwera landfill upgrades to the solids waste management system would be required. - WDC is considering a solids waste management strategy that could result in increased organic waste being received at the Whangārei WWTP significantly boosting biogas production. - WDC also considering a regional biosolids management approach that could result in Whangārei WWTP becoming a regional biosolids facility and accepting sludge from other facilities. - Additional digesters and/or recuperative thickening, and upgrade to co-generation engines would likely be required. 	<ul style="list-style-type: none"> - Landfill levy. - Landfill biosolids quality requirements. - Solids waste management strategy. - Regional biosolids management strategy. 	Low – Moderate.
Contaminants of Emerging Concern (CEC's).	<ul style="list-style-type: none"> - Limited guidance in New Zealand regarding the management of CEC's in wastewater and no current discharge standards. - To be considered during period review of treatment options and receiving environment monitoring. 	<ul style="list-style-type: none"> - New national environmental standards. - Receiving environment conditions 	Moderate.
Alternative Technology and Innovation	<ul style="list-style-type: none"> - Significant advancement in wastewater treatment has been seen in the past few decades. - Emerging technologies to be considered during period review of treatment options. 	<ul style="list-style-type: none"> - Technology review. 	Moderate
Regulatory and Governance Changes	<ul style="list-style-type: none"> - The water reforms and RMA reforms pose unknowns around ongoing water infrastructure governance and funding priorities for Whangārei WWTP. 	<ul style="list-style-type: none"> - Water Reform outcomes. 	Low.
Growth patterns	<ul style="list-style-type: none"> - Subject to actual population growth and spatial planning of this growth, establishing satellite wastewater scheme could be a viable solution for the future. 	<ul style="list-style-type: none"> - Population growth and spatial planning. 	Low.
Asset Conditions	<ul style="list-style-type: none"> - Some of the assets could reach the end of their asset life in the foreseeable future. 	<ul style="list-style-type: none"> - Asset condition survey 	Low - moderate.



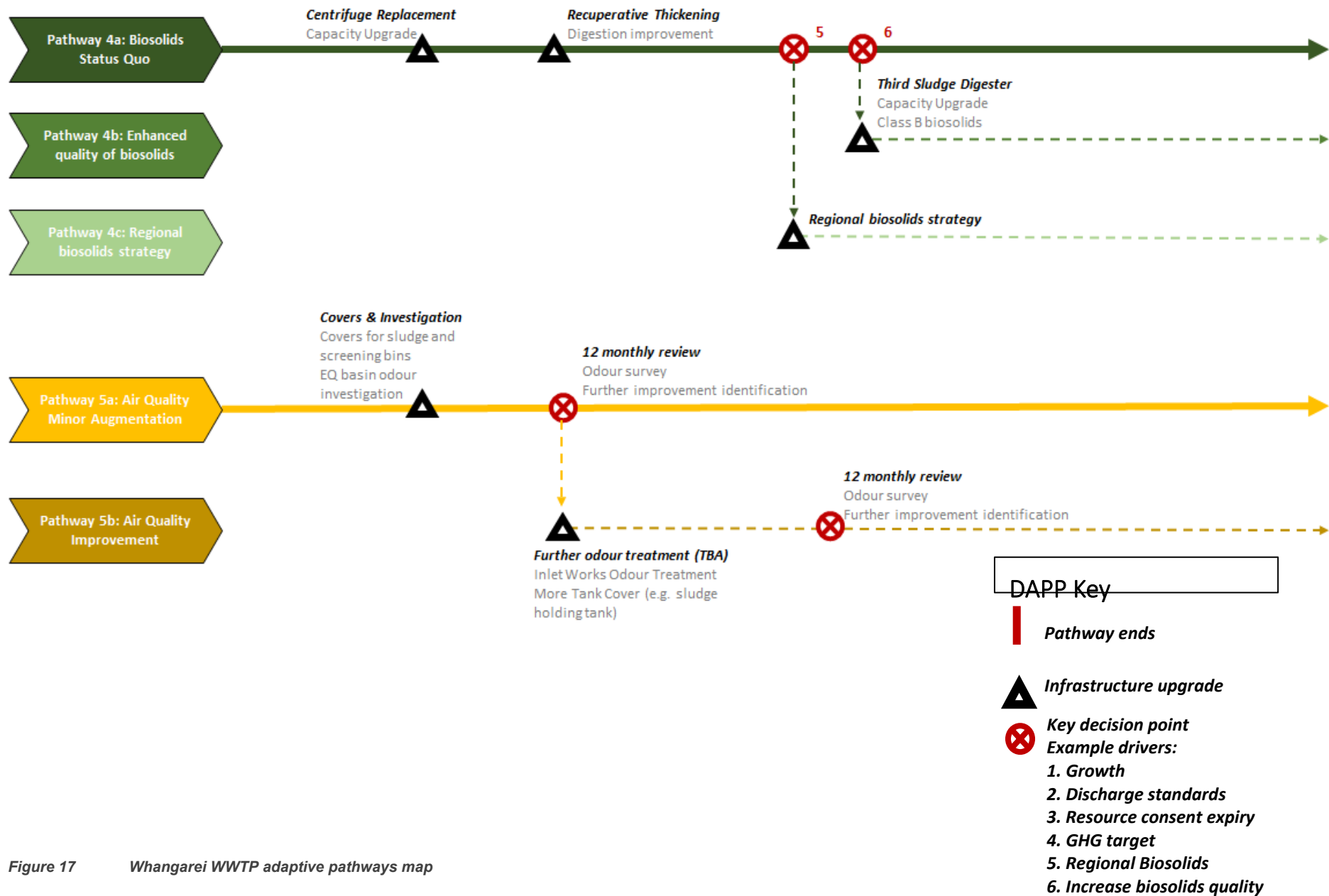


Figure 17 Whangarei WWTP adaptive pathways map

The following provides a summary of the five pathway options considered and presented in Figure 17.

Existing plant augmentation

The existing plant augmentation works are common to all the proposed pathways. These works are required to increase plant capacity for the short term and improve plant resilience to meet existing consent discharge standards. Specifically, these works address intermittent spikes in ammonia, E. coli, and suspended solids..

Key infrastructure includes:

- New septage receiving station specific for septic tank trucked wastes.
- New aerators and re-commissioning of aeration basin #2.
- Tertiary Filters.
- Normal flow UV replacement (for larger capacity).

This work is currently budgeted and planned for in years 2, 3 and 4 of the 2021-31 Long-Term Council Community Plan.

Pathway 1: Improved Quality

Pathway 1 considers the capacity upgrades required to improve effluent quality to prevent further degradation of the receiving environment (refer to Table 12 in the Options report Appendix H for indicative discharge standards). At the same time, the treatment plant would undergo significant capacity upgrade to accommodate the forecasted 2056 population of 95,000 EP. This would be achieved by improving treatment of BOD₅, suspended solids, E coli and a gradual reduction of nitrogen and phosphorous concentrations to maintain the current mass loads discharged to the Limeburners (Hāhā) Creek.

Key infrastructure includes:

- Inlet Works upgrade.
- Modified operation of the existing primary clarifiers.
- Additional secondary and tertiary treatment capacity.
- Biosolids upgrades – e.g. recuperative thickening, third digester tank (refer to pathway 4).

Four sub-pathways under Pathway 1 have been defined, which consider different timing and infrastructure sizing for the activated sludge plant and MBR (or other suitable technology). These sub-pathways are as follows:

- Pathway 1a: Gradual capacity expansion via adding activated sludge tanks in 10 year increments.
- Pathway 1b: Significant increase of plant with a larger activated sludge plant sufficient for 2056 population (95,000 EP).
- Pathway 1c: Retrofit activated sludge tanks with MBR (or other technology) to increase quality of treatment.
- Pathway 1d: Side-stream MBR with existing trickling filter/activated sludge process capped at 15-18ML/d.

Pathway 2: Enhanced Quality

Pathway 2 considers a potential future scenario where the total nitrogen and total phosphorus limits would be reduced beyond those in Pathway 1 through the means of applying an alternative process intensification (a Membrane Bioreactor (MBR) has been selected as a benchmark technology at this time) to address site constraints. Triggers for this pathway could include a future resource consent review or new wastewater discharge regulations.

Key infrastructure required is similar to Pathway 1, except the entire process would be switched to a MBR process. As part of a chemical dosing upgrade for phosphorous removal, a review of the expected solids generation would be required to determine if any solids handling upgrades were required.

Pathway 3: Treated Effluent Reuse and Alternative Disposal

Pathway 3 considers alternative methods of treated effluent reuse and disposal.

Three sub-pathways under Pathway 3 have been defined as follows:

- Pathway 3ai: Effluent reuse for public space irrigation or other restricted access irrigation. This pathway can occur in parallel with other pathways, as the recycled water infrastructure requirements are downstream of the UV reactors and can be installed regardless of the upstream WWTP configuration.
- Pathway 3aii: Industrial reuse opportunities for recycled effluent.
- Pathway 3b: Land-based disposal as a complement to the existing wetland and Limeburners (Hāhā) Creek disposal.
- Pathway 3c: Combined ocean outfall with Ruakaka WWTP.

It is proposed that reuse/alternative disposal options are reviewed every 6 years in line with the Ruakaka ocean outfall feasibility and consent reviews.

Pathway 4: Biosolids Management

Pathway 4 considers future solids handling upgrades, accounting for possible future requirements that all biosolids must be stabilised.

Three sub-pathways under Pathway 4 have been defined and are as follows:

- Pathway 4a: Biosolids status quo, with replacement of existing centrifuges (reaching end of life), addition of recuperative thickening to help increase the sludge retention time of the two digesters resulting in better digestion efficiency and likely deferral of a third digester construction.
- Pathway 4b: Enhanced quality of biosolids requiring all sludge to achieve Class B stabilisation, which requires the addition of a third digester to treat the secondary waste sludge.
- Pathway 4c considers the possibility of Whangārei WWTP being converted to a regional biosolids centre, however the timeframe, the sludge volume and the scope of requirements are unclear at this time.

The upgrade of the biosolids management system can occur in parallel with the other pathways, dependent on other liquid stream processes.

Pathway 5: Odour Mitigation Management

Pathway 5 considers air quality management. Six-monthly independent odour surveys in conjunction with review of odour complaints is proposed to be undertaken to determine at which point further improvements to odour management may be required.

Two sub-pathways under Pathway 5 have been defined as follows:

- Pathway 5a: Air quality minor augmentation, including covers for sludge and screening bins and an EQ basin odour investigation.
- Pathway 5b: Air quality improvement considers further odour treatment (ie inlet works odour treatment, more tank covers, etc).

4.2 Proposed Activity

4.2.1 Adaptive Management Approach Implementation

As part of the adaptive approach, indicators of the key drivers for improvement works are to be monitored to detect at which point operational changes and/or upgrade works need to be initiated, to ensure the proposed discharge objectives set out in Section 4.2.2 are achieved. It is expected that WWTP performance and the receiving environment will be monitored and managed with greater scrutiny than under previous resource consents to ensure that the improvements are made before meaningful degradation or effects on the environment occurs.

The adaptive approach requires the following process to be followed:

1. Identification of relevant drivers for which deviation from current conditions would warrant WWTP improvements.
2. Identification of an appropriate metric or indicator representative of each driver to which the WWTP discharge influence can be benchmarked against.
3. Determination of the trigger, or means of identifying, when deviation from current conditions occurs.

4. Determination of the required actions to be undertaken in response to the confirmed deviation from current conditions.
5. Implementation of monitoring, validation and appropriate analysis to detect when the trigger occurs.
6. Regular review of the above to accommodate additional knowledge and/or change in desired outcomes.

This adaptive approach to managing the receiving environment is proposed to be detailed through a number of interconnecting management plans supported by robust monitoring programs as shown in Figure 18.

- An Adaptive Management Plan – This Plan is considered to be the “how to guide” to implementing the adaptive management approach to ensure compliance with conditions of consent. The Plan is proposed to include:
 - a description of the understood pathways.
 - the response to confirmed triggering of adaptation.
 - the process for reviewing the pathway plan and associated Master Plan and/or operational management plan(s) and engagement on these.
 - decision-making and reporting/notification procedures at key points throughout the adaptive management process.
 - key roles and responsibilities.
 - implementation of adaptation actions.
 - plan reviews.

The means of monitoring the effects of the WWTP and determining when adaptation is needed is proposed to be provided in monitoring sub-plans such as a water receiving environment monitoring plan (referred to currently as the Receiving Environment Management Plan or REMP), odour monitoring plan; and in future monitoring plans for any other criteria that is determined necessary. It is proposed these sub-plans will detail the following (but may not be limited to):

- monitoring procedures to be followed (discussed further in Section 6.8) including location of sampling points, equipment to be used, method of data collection and analysis, and chain of custody procedures.
 - trigger levels for water quality and air quality management.
 - monitoring programme review procedures.
 - reporting and notification requirements.
 - roles and responsibilities.
- Operations Management Plans – These Plans are proposed to include procedures for operations and maintenance for the plant to achieve the desired level of performance. The Operations Management Plan is proposed to comprise sub-plans for the management of specific activities such as an Odour Management and Wastewater Irrigation Management (to address operational procedures relating to the temporary land application of treated wastewater in times of drought). The parent Operation’s Management Plan is also proposed to contain a WWTP monitoring programme describing the methods used to monitor the wastewater treatment plant operation and performance, contingency and emergency planning procedures, reporting and notification requirements, training needs, roles and responsibilities, specific operational checks and procedures for responding to any exceedance of trigger values prescribed in the Adaptive management Plan, and plan review/improvement procedures.
 - The Master Plan – This plan provides an outline of the capital works pathway plan and expenditure providing guidance for plant upgrades. This Plan would ultimately inform the Long-Term Council Community Plan (LTCCP) process and would undergo ongoing monitoring and periodic reviews (in line with the LTCCP process unless adaptation is triggered and an earlier Master Plan review is warranted) to refine the solutions continually as better understanding and change in drivers emerges, with the aim to deliver optimal outcomes to the community (refer to Appendix H for the current Master Plan).

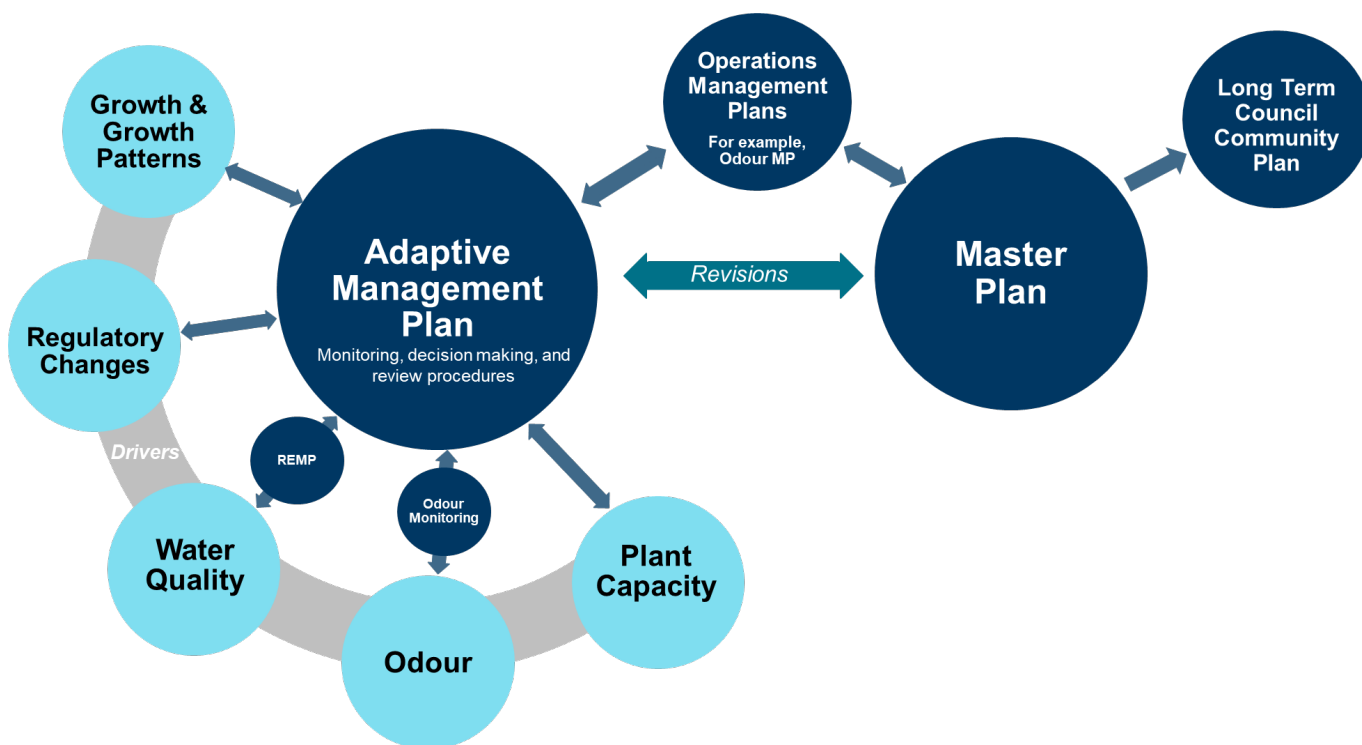


Figure 18 Adaptive Management Planning Documents

4.2.2 Proposed Discharge Objectives

The quality of treated wastewater being discharged to the marine environment and Council gardens / sports fields alongside the management of offensive odours are key performance criteria for the Whangārei WWTP.

Common to all pathways presented in Figure 17 are the augmentation works to the WWTP which are to provide improvements in the short-term to meet current treatment expectations regarding the discharge to Limeburners (Hāhā) Creek and to Council gardens/sportsfields as well as associated odour management as prescribed in the current consents. Subsequent to this, WDC are proposing to implement plant improvements over time and closely monitor key performance criteria to ensure no further degradation of the upper harbour water quality or deterioration of air quality in line with the intent of the PRPN. Although requiring further refinement through a more detailed monitoring campaign proposed to be carried out over the first 1 – 2 years of consent, proposed indicative discharge quality targets to meet the intent of the PRPN have been applied as design criteria for the proposed short-medium term plant upgrades prescribed in the Master Plan (refer to Table 12 of the Options Report) and outlined in section 4.2.3.

To ensure the above discharge objectives are met, the development of triggers for related drivers and robust monitoring programmes of these triggers are to be developed. The following table summarises the ongoing review and monitoring of triggers and drivers proposed. It is noted additional drivers could be added over time.

Table 12 Monitoring of Triggers and review of Drivers

Period	Monitoring of Triggers and Review	Related Drivers
From 2021/2022 onwards	<p>Development and implementation of a Receiving Environment Monitoring Plan that establishes an intensive baseline receiving waters monitoring programme to monitor the proposed activity against preliminary water quality triggers.</p> <p>Following this intensive monitoring period and within 2 years of consent commencement, WDC propose to develop long-term triggers and a long-term monitoring programme (through an update to the REMP) to measure compliance of the proposed activity against for the remaining term of the consent.</p>	<ul style="list-style-type: none"> Prevention of further degradation to the receiving environment. Population growth. Climate change.

Period	Monitoring of Triggers and Review	Related Drivers
	Monitoring will focus on metrics for water quality, ecotoxicity and public health risk with annual reporting of monitoring results proposed. Refer to Section 6.8 Proposed Monitoring, mitigation and adaptation and Appendix E Water Quality assessment (GHD, 2021e) for further detail.	
	Development and implementation of an Odour Monitoring Plan that will establish methodology/procedures for six monthly independent odour surveys followed by annual reporting of results/recommendations Refer to Section 6.8 Proposed monitoring, mitigation and adaptation and Appendix F Air Quality assessment (GHD 2021a) for detail.	Offensive odour.
	Regular review of population growth/forecasts and spatial planning (note to allow 2 to 3 years lead-in time for design and construction).	Population Growth. Alternative technology and innovation.
From 2024 onwards	To align the Master Plan and Adaptive Pathway Planning approach with the LTCCP process and to incorporate the outcomes from the proposed baseline monitoring, a review of the proposed Management Plans and Master Plan documents is proposed to confirm the pathway plan to be followed in the medium term (pathway 1b, 1d or other as noted in Section 4.2.3 below) and where necessary the outcomes of these reviews will be captured in the LTCCP process.	Regulation and Governance Changes. New discharge standards. Industrial reuse opportunities. Regional solids waste and biosolids strategies.
From 2030 onwards	Six yearly review (unless proposed triggers are met at which time a non-scheduled review would be required) of the proposed Management Plans and Master Plan to examine the best practicable option (BPO) with the latest performance, regulations/standards, community aspiration and other factors.	Prevention of further degradation to the receiving environment. New discharge standards. Alternative land treatment/reuse or disposal opportunities. Climate Change. Carbon Neutrality. Contaminants of Emerging Concern. Landfill capacity and restriction. Alternative Technology and innovation.

4.2.3 Proposed treatment and disposal

Main WWTP Discharge activities

To ensure the above discharge objectives are met the following upgrades to the current WWTP over the next 10 years are proposed as outlined in the Master Plan (refer to Appendix H).

The Options report recommended two pathways (1b and 1d) to be taken through to Master Planning and this recommendation received endorsement by WDC and from those present at the June 2021 Wastewater Technical Working Group (representatives from key stakeholders) hui for the following reasons:

- Pathway 1b would require one major expansion within the consent period (unless NES trigger occurs).
- The larger bioreactor in 1b could accommodate the uncertainty around projected population growth better than 1a. Whilst Pathway 1a has lower initial capital expenditure, it would be more disruptive to plant operation as it would require the construction of two reactors 10 years apart.
- Costing for 1b could be easily adapted for 1a, if a lower initial capital expenditure is desired.

- The upfront capital expenditure for 1b is lower than that of Option 1c as Option 1c would require demolition of most existing trickling filters and construction of additional new reactor tanks in their place.
- Pathway 1d provides an alternative pathway to 1a/1b as it allows WDC to continue running its existing trickling filter assets to the end of their useful asset life by gradually replacing the older trickling filters with a more compacted MBR process.

A common starting point for both pathway 1b and 1d as noted earlier are the proposed “augmentation works”, to provide short term capacity increase and improved plant resilience to meet the existing consented discharge standards. This will be followed by several studies and reviews before pursuing Pathway 1b or 1d (or other pathway(s) if determined through review) for future plant expansion to 82,000 EP over a medium-term timeframe (~ next 10 years).

Short-term - Plant Augmentation

The proposed “augmentation works” are based on augmenting the existing process to increase plant capacity in the short-term and improve plant resilience to meet existing consent discharge limits with particular focus on addressing elevated ammonia, E.coli and suspended solids observed at times. No major changes to the process are proposed at this stage of works.

Specific upgrades include:

- New septage receival station to receive trucked septic tank waste for direct loading into the sludge thickeners and continue the existing receiving station for trucked industrial wastes only.
- Converting the idle basin to an activated sludge basin including new aerators, to address ammonia spikes in the final effluent.
- Upgrades to the UV disinfection system to consistently meet current consent conditions.
- Tertiary filters between the secondary clarifiers and UV disinfection to address the elevated suspended solids in the effluent. We understand the WDC operations team is conducting field investigation/troubleshooting to optimise clarifier performance to reduce pin-floc.
- Centrifuge replacement (due to aging asset life).
- Covering of bins and further investigation into the equalization basin operations to better manage potential odour emissions.

The augmentation works are proposed to be implemented by 2024-2025 and initial investigations to support necessary design reporting are currently underway.

Medium -term – Plant upgrade and expansion

Within the medium term (approximately the next 10 years), a more substantial upgrade to meet the population growth drivers and capacity bottlenecks at the existing plant will be needed. The two options currently being considered are Pathways 1b which retains the existing plant configuration with a larger bioreactor, and 1d which involves construction of a side-stream Membrane bioreactor (MBR) process for blending final effluent. Both pathways target a plant expansion to cater to 82,000 EP.

Key components of these upgrades are summarised below:

Pathway 1b specific upgrades include:

- Inlet works upgrade
- A large reactor tank to replace TF# 3 and 4,
- Additional secondary clarifier
- Sludge upgrade

Pathway 1d specific upgrades include:

- Inlet works upgrade
- A reactor tank to replace TF#2
- MBR trains
- Sludge upgrade

The implementation for these upgrades is envisaged to be around the year 2030 but will depend on the results from monitoring of triggers. Further studies will be carried out before pursuing either pathway (or another pathway if determined through review).

Alongside works needed to manage the liquid waste stream, consideration of biosolids and odour management (Pathways 4 and 5) will also be given and constantly reviewed as part of the adaptive pathway planning approach.

Details relating to the lead-in investigations and plant design and implementation are presented in the Master Plan (Appendix H).

Re-use of treated wastewater activity

WDC propose to reuse treated wastewater from the Whangārei WWTP for the purpose of temporary watering of Council trees, annual garden beds and closed sports fields during drought restriction levels (level 1 or above) in order to maintain these facilities whilst relieving pressure on the potable water supply for Whangārei residents and businesses.

WDC have proposed the irrigation of treated wastewater to over 20 sites within the Whangārei district as shown in Table 13. These sites are indicative only as they are likely to change over-time as new sites are planted and upgraded.

Table 13 *Indicative reuse sites*

Tree watering sites	Sport parks (grassed areas)	Annual bedding displays
Whangārei Falls	Ngunguru	Town Basin
Dog Park (Pohe Island)	Hikurangi Sports Park (2 pitches)	Tarewa Park
Bascule Park	Hukerenui Sports Park (2 pitches)	Port Rd Roundabout
Pohe Island carpark	Tikipunga Sports Park (Practice pitch)	Dent and Reyburn traffic islands
Potter Park		Cameron St mall
Town Basin		Cafler Park
Kensington Roundabout		Laurie hall Park
Pocket Park		Cnr Mill and Kamo Roads
Morningside Sports Park		Airport
Nixon St Park		Forum North
Korau Park		Bank St
Lake Waro		Rose St
Tait St Park		Kiripaka Traffic Islands
Kamo shared path		Waipu Toilets

The process for obtaining and applying the treated recycled water is as follows:

1. Water tanker is filled with treated wastewater at the WWTP after the UV treatment system. Wastewater that may have bypassed the 'Normal treatment path' will not be used for irrigation purposes.
2. During tank filling, chlorine is added in the form of 12.5% bleach at a rate of 40 mL per 1000 L to provide additional disinfection to the reuse water.
3. On filling, a water sample is to be taken and tested by the laboratory at the WWTP to check whether the chlorine levels need adjusting for future loads and that Faecal Coliform counts are <1,000 cfu/100 mL.
4. Tanker operator will apply water using the following methods:
 - a. By hose with a trigger nozzle (tree and annual planting) – operator will water individual trees using a hose. Operator will wear the appropriate PPE and following WDC Health and Safety protocols. The watered areas will be very localised around trees, thus closing off of the site will not be necessary. Appropriate signage will be installed during irrigation to inform the public of the operations underway. No watering will be applied within 5 m of any waterway / drainage channel.
 - b. By rear spray bar (grass and sportsfields) – operator will drive the truck in a pattern and speed to water desired area with a suitable amount of water. The site(s) will be either roped off or in the case of sportsfields, closed prior to watering and remain closed until surface is dry with appropriate signage to inform the public of the operations underway. No water will be applied within 20 m of any property boundary (not owned by the WDC), 15 m of the coastal marine area, 15m of a freshwater body (and 100 m from a natural wetland), or 5m of any identified stormwater flow paths.
5. Following use for treated wastewater irrigation, the tankers will be fully disinfected prior to being returned to the tanker supplier.
6. Throughout the above process the operator will wear all appropriate PPE and follow WDC's health and safety procedures including appropriate vaccinations.

5. Matters requiring consent

5.1 Statutory Context

The approvals required for the project are directed by the:

- Resource Management Act 1991 (RMA).
- Resource Management (National Environmental Standards for Freshwater) Regulations 2020 (NES FW).
- Proposed Regional Plan for Northland (Appeals Version) October 2021 (PRPN).

The RMA sets out the circumstances in which resource consents for activities are required.

Section 15 sets out the restrictions on the discharge of contaminants into the environment

“(1) No person may discharge any—

(a) contaminant or water into water; or

(b) contaminant onto or into land in circumstances which may result in that contaminant...entering water;

(c) contaminant from any industrial or trade premises into air;

...unless the discharge is expressly allowed by a rule in a regional plan and in any relevant proposed regional plan, a resource consent, or regulations.”

5.2 Consents Sought

Table 14 summarises the consents required in accordance with the NES FW and the PRPN (Appeals Version) for the re-consenting of the existing Whangārei WWTP and land application of treated wastewater to Council gardens / closed sports fields.

Table 14 *Applicable regional consent triggers*

Section of the RMA	Relevant rule	Appeals / Operative status	Activity
National Environmental Standard for Freshwater			
47	(3) The taking, use, damming, diversion, or discharge of water within, or within a 100m setback from, a natural wetland is a restricted discretionary activity if it – (a) is for the purpose of maintaining or operating specified infrastructure or other infrastructure; and (b) does not comply with any of the conditions in regulation 46(4), but does comply with the conditions in subclause (5) of this regulation.		Restricted discretionary activity For the discharge of treated wastewater from specified infrastructure (Whangārei WWTP) to a natural wetland (coastal mangrove wetland) in Limeburners (Hāhā) Creek.
Proposed Regional Plan for Northland (Appeals version)			
12	Rule C1.1.1 – for the use and occupation by previously authorised existing structures in the common marine and coastal area that is not a permitted, controlled or restricted discretionary activity in section C.1.1. of the plan.	Operative	Discretionary To authorise the use of the existing bypass outlet structure in Limeburners (Hāhā) Creek for emergency purposes only.
15	Rule C.6.2.2 –for the discharge of wastewater to water and land (and associated odour discharges) from a wastewater treatment plant as a Discretionary Activity	Operative	Discretionary For the discharge of treated effluent from Wetlands 1 and 2 to Limeburners (Hāhā) Creek, seepage of treated wastewater from the base of the wetlands, temporary land

Section of the RMA	Relevant rule	Appeals / Operative status	Activity
			application of treated wastewater to Council owned gardens/trees/sportsfields during times of water restrictions, and discharge of odour associated with the WWTP processes and land application of reused wastewater.

The PRPN (Appeals Version) received 23 appeals at the close of 17 June 2019. These appeals have undergone mediation and are now in the process of being heard / resolved. Under section 86F of the RMA, all rules in the PRPN not subject to appeal must now be treated as operative, and the respective operative regional plan rules fall away. As such, following a review of the rules relevant to the activities in question it has been determined that the rules within the Operative Regional Coastal Plan, Operative Regional Water and Soil Plan and Operative Regional Air Plan no longer apply.

Overall, resource consents are required under the NES FW and PRPN (Appeals Version) as a **Discretionary Activity**.

5.3 Other resource consents required.

A full assessment against the relevant planning rules, including those from relevant National Environmental Standards are included in Appendix I and highlights those activities considered to be permitted activities.

Any resource consents required pertaining to any plant upgrades and/or future reuse and/or permanent land application options if progressed through the adaptive management approach, will be sought at that time as separate consents for these activities.

5.4 Whangārei District Plan

The Whangārei WWTP is designated under two designations in the Whangārei District Plan (Figure 19):

- WDC-7 – for Wastewater Treatment and Disposal Facility – applies to the WWTP. The site name is “Whangārei Wastewater Treatment Plant”.
- WDC-8 – for Wastewater Treatment and Disposal Facility– applies to the wetlands. The site name is “Whangārei Wastewater Treatment Plant, Indigenous Wetlands”.



Figure 19 Designations of the Whangārei WWTP under the Whangārei District Plan

No designation conditions are attached. Should any physical works be required as part of the proposed augmentation works and/or future upgrades, an Outline Plan of Works and consents under the National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health (2011) are envisaged. This will need to be revisited should any physical works be required.

6. Assessment of environmental effects

Under Section 104(1)(a) of the RMA, when considering an application for resource consent the consent authority must, subject to Part 2, have regard to any actual or potential effects on the environment. In addition, s107 of the RMA places restrictions on the grant of certain discharge permits to water if specific effects result from a discharge after reasonable mixing. The following section presents an assessment of any actual or potential environmental effects from the proposed continuation of the existing discharge on the coastal receiving waters to Limeburners (Hāhā) Creek and associated environs. A description of the mitigation measures to be undertaken to help prevent or reduce the actual or potential effects is also provided.

In accordance with the Section 88(2) and the Fourth Schedule s7(2) of the RMA the requirement to address a matter in the assessment of environmental effects (AEE) is subject to the provisions of any policy statement or plan, and that the level of detail corresponds to the scale and significance of the effects on the environment. Section 4 of this application has identified that resource consent is required as a discretionary activity pursuant to the provisions of the PRNP.

6.1 Positive effects

The consideration of “effects” associated with the Project includes any positive effect¹¹.

There are obvious benefits to the Whāngarei community of having an operating and efficient wastewater treatment plant. WDC and the urban Whāngarei community rely on the wastewater treatment and disposal system to function sustainably and to maintain public health standards. An inability to continue to operate the wastewater treatment plant would have significant consequences on the wellbeing of the community, and on their health and safety. This is recognised in the Regional Policy Statement with the inclusion of the Plant as “regionally significant infrastructure”.

The proposal is for the continuous improvement to the plant treatment capability through the adaptive pathways planning approach to accommodate population growth and to maintain receiving water quality, whilst also acknowledging other drivers may come into play and require further consideration in future. This includes potential furthering of treated wastewater reuse, alternative disposal options, and/or the need to meet future treatment standards. The inclusion to beneficially reuse treated wastewater onto Council gardens and closed sports fields during periods of water shortage as part of this consent application, strongly signals WDC’s desire to explore future reuse opportunities as they present themselves.

Overall, the project achieves a sustainable balance in enabling the community to provide for its wellbeing into the future while maintaining the environment.

6.2 Potential effects on water quality

Managing the discharge of contaminants to water is important to ensure adverse effects to sensitive environments is avoided. The water quality of an aquatic environment can affect the ability for the water resource to support life, ecosystem processes, provide resources for human activities and uphold social and cultural values. Discharges of wastewater can have an effect on the quality of a water resource if not appropriately managed.

Using the data available for the Limeburners (Hāhā) Creek, collected by 4Sight Consulting, and the Hātea River, collected by NRC as part of the State of the Environment (SOE) monitoring, the potential effects the Whangārei WWTP is having on the water and sediment quality, and the ecology present has been assessed.

6.2.1 Potential effects on coastal water quality and sediment

The water quality assessment of the Limeburners (Hāhā) Creek indicated there is a high degree of variability and often elevation of nutrients and Enterococci, indicative of water quality and public health risk with use, within the

¹¹ RMA: Section 3 – Meaning of Effect.

Creek. The Hātea River water quality assessment also indicated intermittent elevations in the nutrient and Enterococci concentrations.

Concentrations of nutrients and other indicator parameters of treated wastewater accumulate within Limeburners (Hāhā) Creek during the incoming tide, mixing with inflowing marine waters. On the turning tide mixed water flows to the Hātea River where it is rapidly diluted. Intermittently elevated ammoniacal nitrogen concentrations occur within Limeburners (Hāhā) Creek but are not considered to have a meaningful ecotoxicity effect as tidal flushing ensures such periods are short lived and only tolerant species have been identified in areas influenced by the WWTP. As such, effects within Limeburners (Hāhā) Creek are considered to be less than minor.

Elevated nutrient concentrations noted in the Hātea River are evident at the Town Basin, Waiarohia Canal and the confluence with Limeburners (Hāhā) Creek, demonstrating that the Hātea River and its tributary creeks have a notable background nutrient load due to catchment activities. The nutrient results also indicate while periods of high discharge from Limeburners Creek can influence river water quality at the immediate location of mixing, this only has a minor influence on the water quality further downstream.

Monitoring also shows that chlorophyll-a concentrations in the Hātea River are elevated, but relatively constant along the length of the river, indicating that the river is slightly to moderately eutrophic. While the WWTP contributes a notable nutrient load to the river, this nutrient addition is not considered to be exacerbating the trophic state of the river. This is due to the high flushing rates, with both Limeburners (Hāhā) Creek and the Hātea River being highly dynamic tidal environments with significant changes in volume and water quality across the tidal cycle. The high degree of flushing to a great extent mitigates the adverse effects that can result from wastewater discharges, with effects to Hātea River water quality associated with the WWTP discharge considered to be minor.

The sediment assessment of the Limeburners (Hāhā) Creek and the Hātea River highlighted the WWTP influence on sediment quality within the Limeburners (Hāhā) Creek is minor as evidenced by the accumulation of phosphorous in sediment, with contaminant concentrations meeting the sediment quality criteria. The Hātea River sediment monitoring indicated phosphorous and nitrogen bound to sediment is also attributed to catchment sources. There is no indication of the WWTP discharges having a notable adverse effect on sediment quality, with effects to sediment considered to be minor.

Continued management of nutrient mass load from the WWTP, with upgrades as necessary to control the discharge through the adaptive approach, is not anticipated to have a degrading effect on receiving environment water or sediment quality.

In regard to the land application of treated wastewater to Council owned gardens and sports fields, appropriate buffer zones of at least 15 metres are required by the existing consent and proposed to be implemented between the discharge of contaminants to land and the coastal marine area or any watercourse (excluding natural wetlands where greater buffers will be applied in accordance with the National Environmental Standard for Freshwater Management (2020)), and at least 5m from any overland flow paths. Irrigation of garden beds and trees with treated wastewater will be undertaken using a hose with a trigger nozzle that is attended at all times to avoid any accidental discharge of wastewater into nearby stormwater drains or water bodies. Rotating the discharge around various sports fields will assist with reducing the risk of excessive ponding or runoff of contaminants occurring. Given that the treated wastewater will be evenly distributed over a large area and the renovation of the wastewater within the unsaturated soil layers, there is unlikely to be any measurable adverse effects on surface water quality as a result of the discharge

6.2.2 Potential effects on ecology

The ecological surveys of benthic macroinvertebrate communities in the Limeburners (Hāhā) Creek found noticeable differences between the upstream and downstream site (upstream of the Hātea River), with the downstream site being more populated and diverse. The difference in the benthic macroinvertebrate communities found was expected and is reflective of the change in habitat along the Limeburners (Hāhā) Creek. The upstream Limeburners (Hāhā) Creek site is characterised by a cobbled mud substrate and has a large salinity gradient due to the mixing of freshwater. Whereas the downstream site has a smaller salinity gradient and has a soft mud substrate. The downstream communities surveyed were consistent with those found at a reference site and recorded in the NRC Whangārei Harbour Estuary Monitoring Programme.

The Harbour Estuary Monitoring Programme also reported the presence of cockles and wedge shells in the Hātea River and small pockets of cockles, wedge shells and oysters present in the mouth of the Limeburners (Hāhā) Creek.

Fish and bird surveys were not specifically carried out as part of the ecological assessment, however, the 4Sight Marine Ecology Assessment Report (2021b) mentions during previous work eel (*Anguilla sp.*) and bridled goby (*Arenigobius bifrenatus*) have been sighted near the entrance to Limeburners (Hāhā) Creek. In addition, fish species likely to be in the area are yelloweye mullet, grey mullet, flounders, piper, anchovy like fishes, kahawai, koheru, kingfish, snapper, trevally, parore, rays and small wrasses (4Sight, 2021b). A search of the New Zealand freshwater fish database also identified ten records of fish in the upper Limeburners Catchment. The local mudflats and mangrove habitat offer soft shore habitats to a range of birdlife and 4Sight (2021b) noted fifteen different bird species in the vicinity during previous work. The wetlands are also likely to provide a favorable habitat for many bird species.

The results of the ecological surveys and the monitoring programme indicate the WWTP is not having an adverse effect on the macroinvertebrate communities present in the Limeburners (Hāhā) Creek or the Hātea River, with the controlling influence on ecology communities being the salinity gradient, the hydrodynamics of the environment and therefore the substrate composition. The ecology present (including fish species) is considered to comprise species tolerant to the influences of the WWTP, with an equilibrium achieved from decades of continuous discharge into the creek.

6.2.3 Potential effects on groundwater

In regard to the land application of treated wastewater to Council owned gardens and sports fields, the wastewater irrigation will be undertaken during drought conditions during which time there is expected to be sufficient depth of unsaturated soils to provide additional renovation of the wastewater.

There are no known groundwater bores in the immediate vicinity of any of the proposed irrigation areas. In future, if additional sites are to be considered by WDC for irrigation purposes, the proposed Wastewater Land Application Management Plan will be reviewed and those sites identified and a check of groundwater bore locations to those sites undertaken prior to irrigation commencing.

Based on the above, there is unlikely to be any measurable adverse effects on groundwater quality as a result of the temporary reuse of treated wastewater for irrigation of Council facilities during drought conditions.

6.3 Potential effects on public health

6.3.1 Discharge of wastewater to the coastal marine area

The presence of pathogenic micro-organisms in waters used for recreational activities and the collection of shellfish can pose a health hazard for humans, and lead to restriction of access to for recreational purposes. Discharges of wastewater are known to have a residual active pathogen load, and this can potentially effect human health.

As a designated mixing zone, the use of Limeburners (Hāhā) Creek for recreation or shellfish gathering is low and not promoted. Similarly, the Hātea River, as a highly disturbed tidal creek heavily influenced by catchment run-off, is limited to secondary contact recreation activities, such as wading and kayaking. Swimming and shellfish gathering are unlikely to occur and are not promoted. Downstream, the Whangārei Harbour is used extensively for recreational purposes, including both primary contact, and shellfish gathering. The lower harbour also supports commercial pipi and cockle harvesting, although commercial fin-fishing prohibited.

Considering there is no public health monitoring programme in place for microbiological contamination in the Upper Hātea River zone the SoE monitoring data provides the most appropriate measure of public health risk in this environment. Monitoring by NRC public health is carried out at the nearest swimming beach (Onerahi) with these monitoring results and the simplified quantitative microbial risk assessment (QMRA) carried out by NIWA in 2011 used to assess the potential effect on public health associated with the WWTP discharge.

6.3.1.1 Risk from contact recreation

Monitoring indicates that catchment sources dominate the average microbiological concentrations within the Hātea River. This is most evident at the Town basin, Waiarohia Canal and Limeburners (Hāhā) Creek. The lower enterococci and faecal coliform concentrations predominantly occurring at Kissing Point and the Lower Hātea are reflective of the significant dilution and tidal flushing which occurs downstream of Limeburners (Hāhā) Creek.

Periods of significant increases in enterococci concentrations are evident at all locations and reflect the influence of notable rain events. Such events generate catchment run-off and increases in discharge from the WWTP. The Hātea River water quality at such times and until the river is sufficiently flushed of contaminants is considered unsuitable for recreation contact.

The microbiological public health monitoring programme indicates that the lower harbour is predominantly suitable for swimming. Onerahi Beach, the nearest downstream swimming location, has demonstrated low risks of infection during the bathing season, with infrequent exceedance of appropriate bathing water quality criteria. These exceedances have coincided with rainfall events but also periods of no rain; times when elevated microbiological concentrations have not been identified in the Hātea River. This suggests there is likely other sources of microbial contamination closer to Onerahi that are influencing the water quality at this location.

While the WWTP disinfects all wastewater prior to discharge to the wetlands there remains a small residual pathogen load that can increase the risk of infection for users of the receiving water. Disinfection has, at times, not met the desired levels recommended as an outcome of QMRA assessment by NIWA (2011) in the recent past. To address this issue WWTP augmentation works are being undertaken. However, in the context of the background contribution of pathogens during the rain events that generate peak microbiological concentrations in the Hātea River, the WWTP discharges are expected to have only a minor influence on overall public health risk, and only within Limeburners (Hāhā) Creek and the immediate vicinity of its confluence with the Hātea River.

Given the locations and level of contact recreation occurring within the receiving environment the effect of the WWTP discharge on public health is considered to be minor.

6.3.1.2 Risk from shellfish consumption

Limeburners (Hāhā) Creek, in conjunction with the Town Basin, had the greatest range of median average faecal coliform concentrations, as recorded in the SoE monitoring. When compared to the Recreational Shellfish-gathering Bacteriological Guideline Values the results suggest that shellfish gathering should not occur at Limeburners (Hāhā) Creek. In addition, the results suggest that shellfish gathering should only occur, if at all, at the downstream locations of the Hātea River, near Kissing Point and Lower Hātea. Overall, the potential effects of the WWTP discharges on public health relating to shellfish consumption are considered to be no more than minor, as the activity is not recommended in the immediate area (designated as a mixing zone). The observed dilution and flushing dynamics reduce the potential effects risk even further for shellfish gathering in the Lower Whangārei Harbour.

6.3.2 Discharge of treated wastewater to land

As part of the 2020 resource consent application prepared by WDC, the Northland District Health Board (NDHB) was consulted on the potential effects on human health from the use of tertiary treated wastewater in public areas. As a result of this consultation, WDC have proposed that treated wastewater will not be used to irrigate on actively used sports fields; the irrigation areas will be closed during the irrigation activities; appropriate signage will be established to advise the public of the activity; the irrigated areas will remain closed until they are dry; and the minimum wastewater quality and treatment is maintained.

As noted in NRC's section 42A report (NRC, 2020), recommendations from the NDHB relating to staff safety and the sourcing and management of tankers use are not subject to control of the Regional Council, however these matters have been agreed to by the applicant.

Based on the above mitigation measures being in place, the discharge to land should not adversely affect members of the public who may access these areas.

6.4 Potential effect on Air Quality

This section provides a summary of the full assessment of odour and air quality impacts associated with the Whangārei WWTP and which is provided in Appendix F of this report. For further information on potential air quality effects please refer to that assessment. The air assessment utilised a series of odour observations, odour interviews with nearby residential and commercial properties and a FIDOL assessment¹² to assess the potential for off-site odour nuisance associated with the operation of the Whangārei WWTP.

Having assessed the FIDOL factors, GHD considers that the plant is unlikely to cause offensive or objectionable odour effects at either residential receptors or recreational areas. None of the odour observations undertaken in these areas noted odour types associated with the site, and within the residences interviewed only two of the six properties noted odour at their locations; in both cases the odour was determined to be noticeable outside, only once or twice per month. Of these properties one considered the odour was getting better and the other considered the odour was getting worse. The outcome of the odour interviews was generally positive regarding improving conditions in the area, with 26 respondents (92 %) reporting that odour in the area was either “improving” or “that there was no increase in odour”.

This assessment found that intermittent odours are noted in the nearby industrial area. This was also noted in the odour interviews and odour complaints records. In the industrial area the majority of respondents frequently experience a low intensity of odour which is not considered to affect activities, or, infrequently experienced odours which may be considered to be at an intensity to affect daily activities. In this assessment two sites within 400 metres of the WWTP reported odour at an intensity which may be detected indoors more frequently than twice per month. The odour interview results indicate that distinct odour, which is of high intensity or frequency, is limited to within 400 m of the Site. Consequently, mitigation efforts will be put in place at the WWTP to reduce the odour experienced at the industrial sites.

Considering that odours were most commonly experienced on Kioreroa Road directly outside of the site, in an area which is zoned industrial, the locations most likely to experience odour from the plant should be able to tolerate these types of odour. These findings were also reflected in the complaint records and community interviews, which suggest that highly odorous events are infrequent and are usually not at levels considered to be offensive or objectionable for the land use. To reduce odour where it is experienced at the industrial sites and residential properties, GHD has identified onsite odour sources where additional mitigation may be used to reduce the odour potential of the site. Some mitigations to be put in place as part of the proposed site “augmentation works” include the covering of various bins around the site, operational review of the equalisation basin and development of a WWTP odour management plan. The need for further mitigations will be evaluated based on odour monitoring (6 monthly independent odour surveys) and annual reporting of the findings of this monitoring giving regard to any odour complaints received, and providing recommendations for change if necessary, to be implemented following the procedures prescribed in the Adaptive Management Plan outlined in Section 6.8.

In terms of the land application of treated wastewater to Council owned gardens and sports fields, the wastewater is proposed to be treated to a high level with appropriate buffer distances maintained from sensitive areas in accordance with proposed conditions (refer to Section 9) and as such there should be no objectionable odour or spray drift from irrigation activities beyond Council owned property boundaries.

6.5 Potential effects on recreational values

In addition to the public health risks from pathogens in the receiving coastal marine environment, wastewater discharges can also result in a reduction in recreational values by generating odour and visual (aesthetic) effects (discolouration, foaming, scums and growths).

Limeburners (Hāhā) Creek is not promoted for recreational use, similarly the Hātea River which is heavily influenced by catchment run-off is limited to secondary contact activities. Downstream the Whangārei Harbour is used extensively for recreational purposes, including primary and secondary contact recreation activities and shellfish gathering.

¹² An assessment of those factors that contribute to an odour nuisance effect which include the frequency (F) of odour impact, the intensity (I), the duration of exposure (D), the offensiveness (O) and the location (L)

Limeburners (Hāhā) Creek and the Hātea River, at the confluence of the two water bodies, have relatively high turbidity which influences the visual aesthetic of the environment. However, at both locations the concentration of chlorophyll-a (an indicator of algal growth / biomass) is relatively consistent and does not indicate phytoplankton growth (or blooms) as the primary driver of the reduced transparency. As detailed in Section 6.2, both the Limeburners (Hāhā) Creek and the Hātea River at the confluence of the two waters, are characterised by a high portion of mud and fine sediment, which is concluded to be the influencing factor on the visual quality and benthic conditions. The WWTP activities are therefore unlikely to be having an adverse impact on the visual quality of the immediate receiving waters and thus the value of the low use recreational environments.

The land use around the WWTP is primarily heavy industrial and rural production land, with the closest residential area approximately 750 m away. Recreational activities are not anticipated to be common within the industrial and rural land. As detailed in Section 6.4 some odour from the WWTP is intermittently noted at the nearby industrial area with highly odorous events being infrequent and usually not at levels considered to be offensive or objectionable for the land use. The Air Quality Assessment (Appendix F) also identified the plant is unlikely to cause offensive or objectional odour effects at either residential receptors or recreational areas and is therefore unlikely to have an odour effect on recreational activities.

Plant improvements associated with the proposed augmentation work and future upgrades are aimed to maintain quality of the receiving water environment. Although not commonly used for recreational activities, these works will also ensure there is no further degradation of the recreational value and associated visual aesthetics of the Limeburners (Hāhā) Creek and Hātea River associated with the ongoing operation of the WWTP. Similarly, odour mitigation measures associated with the proposed augmentation work to be implemented through the Odour Management Plan, are intended to help reduce odour improving the recreational values in the area.

6.6 Potential effects on cultural values

As noted earlier in Section 3.6, a Cultural Impact Assessment (CIA) is being developed currently which will inform this consent application. It is expected that the CIA will be available to circulate end of February 2022. As such, with exception to considering the relevant objectives and policies of the relevant iwi management plans, we are not in a position to comment on the potential effects of the proposed activity on cultural values, other than to say that representatives of both Te Parawhau and Rewarewa D block contributed greatly to the options evaluation and the later adaptive pathway planning process.

6.7 Potential future effects

There is an unknown potential for wastewater discharges to have additional effects on the receiving environment due to emerging contaminants and climate change. Emerging contaminants can affect the water quality, ecosystems, and social and cultural values of a receiving environment. Similarly, climate change factors can affect many forms of infrastructure and the state of the environment. The wastewater sector is predicted to be influenced by both developing understanding of emerging contaminants and climate change impacts, therefore it is important to consider how wastewater discharges may, in conjunction with these factors, have an effect on the receiving environment.

6.7.1 Emerging contaminants

Emerging contaminants are chemicals, which can be manmade or naturally occurring, that are resilient to degradation and therefore accumulate in environmental areas, and can be toxic to living organisms. Emerging contaminants are not monitored and are often chemicals that already exist, but to date the risk to human health and/or the environment has not been quantified. Emerging contaminants are a concern largely due to the uncertainty of the influence they may have on human and ecological health. Multiple sources of emerging contaminants have been identified, with municipal wastewater systems flagged as a major source of emerging contaminants due to the nature of the waste they receive and the centralisation of contaminants into a single discharge.

The potential effect of emerging contaminants is unknown and difficult to predict, however, it is anticipated that over time criteria for various emerging contaminants will be introduced in New Zealand and / or the wastewater sector. The use of an Adaptive Pathway Planning approach provides the flexibility to respond to the potential

effects of emerging contaminants. New contaminants, limits and monitoring requirements can be adopted through the regular review process built into the Adaptive Management Plan, limiting the overall effect on the receiving environment and associated values.

6.7.2 Climate Change

The wastewater sector in New Zealand is widely vulnerable to the effects of climate change. The potential effects can be described as direct effects and indirect effects. Direct effects have an impact on the physical functionality and operation of wastewater facilities (e.g. potential flood inundation of the wetlands as indicated in the Master Plan reporting in Appendix H), whilst indirect effects influence the wider components of the sector, including quality of influent and effluent, conservation drivers, and influence on environmental and process efficiencies. The effects of climate change are hard to quantify and predict, especially given the rate of change is unknown.

Responses to climate change will need to be location specific, flexible, and adaptive. The application of the Adaptive Pathway Planning approach to identifying and monitoring risks associated with climate change, and progressively building infrastructure and community resilience is actively promoted by the New Zealand Government.

6.8 Proposed monitoring, mitigation and adaptation

In line with the intent of the PRPN, the ongoing operation of the Whangārei WWTP and application of treated wastewater to council gardens / sports fields is to avoid any further degradation of the upper harbour water quality, or deterioration of air quality, over the proposed term of the consent. To ensure this is achieved WDC propose to develop triggers for related WWTP upgrade drivers and robust monitoring programmes to assess change against these triggers. The quality of treated wastewater being discharged to the marine environment and Council gardens / sports fields, alongside the management of offensive odours, are key performance criteria that will be closely monitored, with other performance criteria likely to be identified over the term of the consent as drivers for WWTP upgrades change over time or as new drivers emerge.

The following sections describe the proposed monitoring, mitigation, review and reporting process by which compliance against the proposed discharge objectives defined in Section 4.2.2 is to be assessed and which is also illustrated in Figure 20 and captured within the proposed conditions in Section 9.

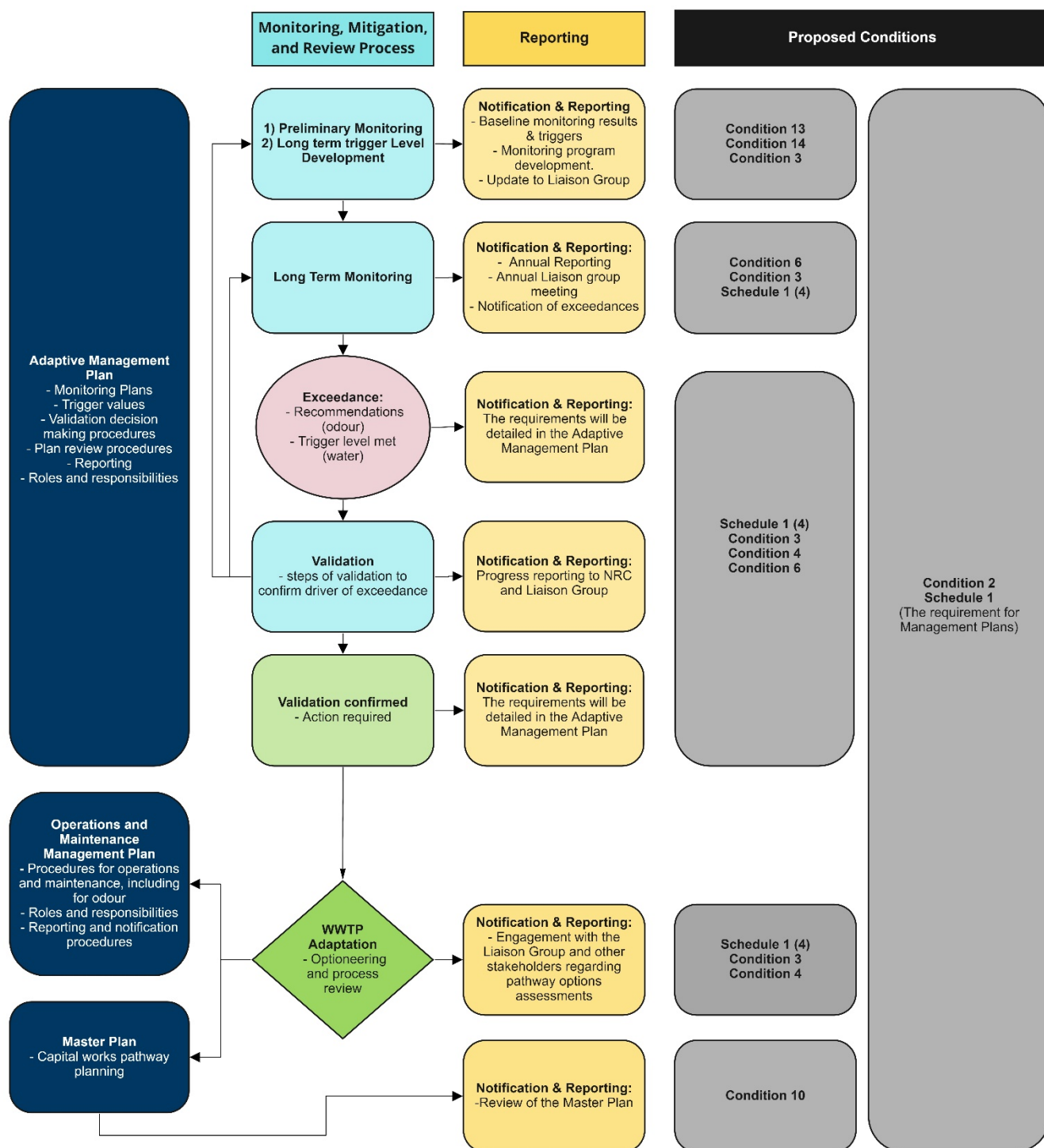


Figure 20 Monitoring and Reporting Process

6.8.1 Monitoring, review and mitigation process

In the context of the receiving environments (water and air) the monitoring, response and mitigation process is proposed to follow these general steps with the procedures associated with each of these steps to sit within the proposed Adaptive Management Plan:

- Preliminary water quality and WWTP mass discharge trigger levels and preliminary/baseline monitoring plan implementation.
- Long term trigger level development and long-term monitoring plan implementation.
- Trigger level or recommendation exceedances.

- Validation of the exceedance(s).
- Confirming the influence of the WWTP.
- Adaptation of the WWTP.
- Undertake periodic review of trigger levels and methodology for development.

Preliminary monitoring and long-term trigger level development helps inform the current conditions in order to understand when improvement of the WWTP is warranted. Each driver for WWTP upgrade requires identification of an appropriate metric or indicator which is used as a measure for WWTP influence on the environment. The preliminary monitoring allows for the development of a comprehensive baseline to confirm the appropriateness of proposed metrics and provide data to set trigger levels that adequately represent current conditions. The preliminary monitoring will also provide a refined understanding of receiving environment processes, other potential influences on the receiving environments and will be used to confirm appropriate monitoring locations, methodology and frequency.

The preliminary trigger values, monitoring locations, and parameters for receiving waters will be developed as part of the Receiving Environment Monitoring Plan (REMP) that shall give effect to the Adaptive Management Plan requirements. The Water Quality and Public Health Assessment (Appendix E, Table 18) has identified the key metrics of the receiving water environment that would be used to represent the influence of WWTP discharges and these have been transposed into the proposed conditions prescribed in Section 9. The Assessment also provides a suite of preliminary water and sediment quality trigger levels based on currently available information that would again sit within the REMP and be used to assess consent compliance over the preliminary two year baseline monitoring period (Appendix E, Table 19).

Similarly, the requirements for monitoring odour effects would be documented in the Odour Monitoring Plan and provide the methodology/procedures for six monthly independent odour surveys followed by annual reporting of results/recommendations. The annual reporting will give consideration to odour complaints logged over that period and meteorological data from the Kioreroa Rd Automated Weather Station.

Both monitoring plans would be developed in the initial months of the consent and implemented within the first six months of consent with the baseline monitoring of water and sediment quality to be undertaken intensively for a minimum of 12 months. The outcome of the preliminary baseline water and sediment quality monitoring and trigger level development would be that the preliminary trigger levels would be confirmed or replaced with long term triggers in the REMP within the first two years of consent. The long-term monitoring plan would thereafter be implemented.

As part of determining the triggers and recommendations, associated actions to validate any exceedances would also be defined. Regular and robust long-term monitoring is paramount to track the drivers, to ensure the associated trigger levels and recommendations remain appropriate, and if the trigger levels or recommendations have been exceeded. In the event a trigger(s) or recommendation(s) is exceeded as detected from the regular long-term monitoring, validation of this exceedance would be required. The steps of validation would be used to confirm the exceedance was a result of the WWTP activities and not an effect of an external factor. The validation steps would include reporting to stakeholders, appropriate actions and assessments to validate the inferred degradation is a result of the WWTP activities, and reporting. Such assessments would include periodic statistical analysis of WWTP discharge and receiving water quality data to detect potential trends of receiving environment degradation.

In the event the validation process determines the deviation from current conditions because of the WWTP activities the WWTP adaptation steps would be initiated. These steps would identify the need for operational changes, feeding into the Operations Management Plan and its sub-plans, and/or if plant upgrades were required, feeding into the Master Plan review process, Figure 20.

6.8.2 Notification, reporting and review

Annual reporting and discussion with NRC of monitoring results and progress against the adaptive pathway plan is proposed throughout the term of consent. If required, notification points will be established to provide NRC a record of issues or triggered actions, updates on the plan review process and any associated actions including changes to the operation or management of the WWTP.

A key component for the successful implementation of the adaptive pathway planning approach to managing effects and ensuring no further degradation of the receiving environment from the proposed activities is through

the development, implementation and regular review of a comprehensive suite of interconnecting management plans, monitoring plans, and the Master Plan that will ultimately inform Council's LTCCP process as shown in Figure 18. Regular review of these plans to accommodate additional knowledge and/or change in desired outcomes will be paramount. It is proposed the suite of plans be developed within the first six months of the consent, with the first review being carried out in the following two years to incorporate the findings of baseline monitoring and to align the plans with the LTCCP process. Future plan reviews are proposed to be carried out on a six yearly basis again to align with the LTCCP process unless particular drivers for change trigger the need for an earlier review (refer to Table 12).

WDC recognises the importance of transparency and ongoing engagement throughout the adaptive management process with not only NRC as the regulator but also its key stakeholders, iwi partners and when necessary the wider community. As such, WDC proposes to facilitate the development and on-going role of a Wastewater Liaison Group, with membership likely to reflect that of the existing Wastewater Technical Working Group but with the ability of membership to vary over the term of consent. The role and functions of the group would be clearly defined in a Liaison Group Terms of Reference to be embedded in the Adaptive Management Plan alongside procedures for notification, reporting and when necessary collaborative input into reviews of the adaptive pathway plan.

It is envisaged the Liaison Group role would include (but may not be limited to):

- Receiving period update on and providing input into the ongoing development and implementation of the suite of Management Plans and associated Monitoring plans that will form the structure for delivering the adaptive management approach to managing effects from the WWTP activities.
- Receiving and discussing annual compliance report, to include progress reporting against the adaptive management plan.
- Receiving notification on any exceedance to trigger levels, validation of these exceedances or recommendations for change.
- Collaborative input into the review of plant changes and/or options for plant upgrades and disposal alternatives through review of the adaptive pathway plan and updates to the Master Plan.

7. Statutory Assessment

The following section provides an evaluation of the proposal against the relevant planning framework. Many of the relevant objectives and policies are substantial and are expanded in Appendix J.

7.1 Resource Management Act

7.1.1 Section 104 Assessment

Section 104(1) of the RMA requires a consent authority, when considering an application for a resource consent, to have regard to:

- Any actual and potential effects on the environment of allowing the activity (s.104(1)(a));
- Any measure proposed or agreed to by the applicant for the purpose of ensuring positive effects on the environment to offset or compensate for any adverse effects on the environment that will or may result from allowing the activity (s.104(1)(ab));
- Relevant national environmental standards, other regulations, and planning and policy documents (section 104(1)(b)); and
- Any other relevant matter (s.104(1)(c)).

The actual and potential effects on the environment of the proposal pursuant to Section 104(1)(a) of the Act are set out in Section 6 of this report.

Pursuant to Section 104(1)(ab) of the RMA, offset mitigation and compensation is not proposed and therefore has not been given regard to here.

Pursuant to Section 104(1)(b) of the RMA, an assessment made against the relevant provisions of the New Zealand Coastal Policy Statement (NZCPS), the National Policy Statement for Freshwater Management (NPS FW), the Resource Management (National Environmental Standards for Freshwater) Regulations (NES FW), Proposed National Policy Statement for Indigenous Biodiversity (PNPSIB), the Regional Policy Statement for Northland (RPS), the Proposed Regional Plan for Northland (PRPN), the operative Northland Regional Coastal Plan (RCP) and the Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations (NES DW) is provided in Sections 7.2.

In terms of any other relevant matters, an assessment of these has been provided in Section 7.3.

7.1.2 Section 105 Assessment

Section 105(1) of the RMA sets out the matters that a consent authority must have regard to when considering a resource consent for a discharge permit. In addition to the matters set out in section 104, NRC must have regard to –

- (a) the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and*
- (b) the applicant's reasons for the proposed choice; and*
- (c) any possible alternative methods of discharge, including discharge into any other receiving environment.*

The nature of the wastewater discharges and the sensitivity of the receiving environment is described in Section 3 of this report. The need to maintain the wastewater treatment facility and continue the discharge to Limeburners (Hāhā) Creek has been discussed throughout this report, while alternative methods of managing the discharge have been identified and discussed in Section 4.1 of this report, including the reuse of treated wastewater for irrigation purposes which has been included into the suite of consents being sought. Other alternative methods of managing the discharge will be continuously considered and reviewed throughout the term of consent as part of the Adaptive Pathway Planning approach being taken.

7.1.3 Section 107 Assessment

Section 107 of the RMA places restrictions on the grant of certain discharge permits to water, if, after reasonable mixing, the contaminant or water discharged (either by itself or in combination with the same, similar, or other contaminants or water), is likely to give rise to all or any of the following effects in the receiving waters –

- (c) The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;*
- (d) Any conspicuous change in the colour or visual clarity;*
- (e) Any emission of objectionable odour;*
- (f) The rendering of fresh water unsuitable for consumption by farm animals;*
- (g) Any significant adverse effects on aquatic life.*

It is expected based on the information presented in Section 3.3 and assessment given in Section 6 that beyond the port road bridge the main WWTP discharge to Limeburners (Hāhā) Creek is unlikely to give rise to any of the effects described in s107(c) - (g).

In regard to the land application of treated wastewater to Council owned gardens and sports fields and the mitigation measures proposed that the activity will not give rise to the effects outlined in Section 107 of the Act after reasonable mixing.

Section 107(3) of the RMA enables conditions to be imposed on a discharge or coastal permit. Proposed consent conditions are provided in Section 9 of this report.

7.1.4 Part 2 Assessment of the RMA – Purpose and principles

Part 2 of the RMA sets out the purpose and principles of the Act. The purpose of the RMA as set out in Section 5 is to promote the sustainable management of natural and physical resources.

Section 6 of the Act sets out a range of matters of national importance that shall be recognised and provided for. The matters of national importance which are relevant to this project are:

- (a) the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development.*
- (c) the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna:*
- (d) the maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers:*
- (e) the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu and other taonga.*
- (h). the management of significant risks from natural hazards.*

The proposed activity is necessary as it provides for appropriate management of the Whangārei urban wastewater. The proposed adaptive management approach for the wastewater treatment plant provides for using a suite of management plans to monitor, review and ensure appropriate procedures are in place to implement operational changes or upgrade to the WWTP in response to greater understanding of the need to do so. The proposed monitoring, mitigation and review process is set out in section 6.8 supported by proposed conditions prescribed in section 9. These measures will mitigate potential adverse effects on the receiving environments of the Whangārei Harbour, Hātea River, Limeburners (Hāhā) Creek and associated coastal wetland and their ecological values, surrounding air shed and third parties.

The constructed wetland 1 associated with the Whangārei WWTP was redesigned in 2014 to provide for public access and as such, access along this section of Limeburners (Hāhā) Creek continues to be maintained as part of this proposal.

The potential adverse effects on Maori cultural values are being addressed through the development of a Cultural Impact Assessment in partnership with Mana Whenua as noted in Section 6.6.

Through the adaptive pathway planning approach being proposed, natural hazards such as those associated with climate change and the risk of these on this regionally significant infrastructure will be monitored and reviewed as part of the Master Plan and Adaptive Management Plan reviews to be carried out on a six yearly basis.

Section 7 sets out the other matters to be considered. Of particular relevance to this project are:

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to—

(a) kaitiakitanga:

(aa) the ethic of stewardship:

(b) the efficient use and development of natural and physical resources:

(c) the maintenance and enhancement of amenity values:

(d) intrinsic values of ecosystems:

(f) maintenance and enhancement of the quality of the environment:

(i) the effects of climate change:

Iwi partners have been collaborated with throughout development of this project and the mapping out of the adaptive management approach. As outlined in section 6.6, a Cultural Impact Assessment is under preparation by iwi partners and it is anticipated that this will be provided to the Regional Council in early 2022.

If monitored and managed appropriately, the Adaptive Pathway Planning approach will achieve current obligations regarding use of the resource (being the receiving waters and air shed), while also accommodating future obligations as they occur. With the opportunity through review to work towards currently aspirational objectives for wastewater disposal, such as greater disposal to land.

Amenity values of neighbouring properties, surrounding rural land, Limeburners (Hāhā) Creek, Hātea River and Whangārei Harbour will be maintained or enhanced as a result of implementing the proposed adaptive pathway plan for the Whangārei WWTP. The reuse of treated wastewater on Council owned sites such as gardens and sports fields will not give rise to adverse amenity effects as appropriate methods of application will be used, signage erected and buffer distances maintained from areas accessible by the public in accordance with proposed conditions of consent (refer to section 9.4). Any potential adverse odour effects will be managed both through the implementation of the proposed Odour Management Plan as well as through ongoing monitoring (6 monthly odour surveys) to ensure any necessary changes/upgrades to the plant are recognised.

Section 6.2 of this AEE has assessed the effect on ecological values within the receiving environment to be less than minor as confirmed through ecological surveys. This is largely due to the salinity gradient, the hydrodynamics, associated substrate composition and the tolerance of the species present given the duration of the discharge from the WWTP indicating a state of equilibrium has been reached in Limeburners (Hāhā) Creek with the species present being tolerant to the current conditions. The long-term implementation of the adaptive management approach supported by robust water and sediment quality monitoring will ensure no further degradation of the environment occurs as a result of the proposed activity and thus the ecological values of the Limeburners (Hāhā) Creek and Hātea River (and associated coastal wetland) will be maintained.

The quality of the receiving environment associated with the WWTP will be maintained because:

- Water quality – monitoring the water quality of the Limeburners (Hāhā) Creek has indicated that nutrients and other indicator parameters of treated wastewater accumulate and mix with inflowing marine waters during the incoming tide. On the turning of the tide these mixed waters flow to the Hātea River where it is rapidly diluted. It has been demonstrated that the Hātea River has a notable existing nutrient and sediment load, and conditions reflective of a slightly to moderately eutrophic state i.e. low water quality. The effects to water and sediment quality associated with the WWTP discharges are interpreted to be only minor. Therefore, continued operation of the WWTP at the current levels of discharge (such as nutrient mass load) is considered unlikely to result in further degrading effects on the water or sediment quality. An intensive monitoring period is

proposed to develop long term triggers which, under the adaptive management strategy, will inform when upgrades to the WWTP are needed.

- Ecological values – Intermittently elevated ammoniacal nitrogen concentrations occur within Limeburners (Hāhā) Creek, but are not considered to have an ecotoxicity effect as tidal flushing ensures such periods are short lived and only tolerant species have been identified in areas influenced by the WWTP. Likewise, the trophic state of the Hātea River is considered to be controlled by tidal flushing, with the relatively short residence time of algae limiting the potential for algal blooms. So while the WWTP contributes a measurable nutrient load to the Hātea River, this is not considered to exacerbate the trophic conditions within the river.
- Public health – it has been determined that at times pathogen concentrations at Limeburners (Hāhā) Creek and Hātea River confluence were greater than background levels, indicating an influence from the WWTP discharge during high flow conditions. However the background load of pathogens from catchment sources dominates the conditions in the Hātea River. The WWTP influence on concentrations is considered to be small in relation to background sources.
- Air quality – the results from the FIDOL assessment and interviews conducted to ascertain the level of odour received as a result of the operation of the existing WWTP found that the plant is unlikely to cause offensive or objectionable odour effects at either residential receptors or recreational areas (sensitive receptors) but odours may be detected in the adjacent industrial area from time to time. However, it was considered that the industrial zoning of locations likely to experience odour should be able to tolerate such odours, particularly due to their infrequent nature. A number of odour sources which can easily be mitigated and reduce odour potential from the plant have been identified, implementation of these measures alongside the development of an odour management plan and ongoing odour surveys to inform the adaptive pathways planning approach will ensure air quality is maintained.
- Amenity values – are discussed above and will be maintained.

The potential effects as a result of climate change are assessed in section 6.7.2. In summary, responses to climate change will need to be location specific, flexible, and adaptive. The proposed Adaptive Pathway Planning approach will build resilience against possible climate change challenges, the effect these will have on the receiving environment and associated values, whilst also building an understanding of the effects through the application of more frequent, robust monitoring.

Section 8 of the RMA requires the principles of the Treaty of Waitangi to be taken into account in resource management decisions. Section 8 of this AEE sets out the consultation and engagement that has been undertaken to date with Mana Whenua. This engagement and consultation has enabled a deeper understanding of issues of significance to Mana Whenua. Mana Whenua are in the process of developing a Cultural Impact Assessment which will be provided to Regional Council in early 2022.

Whilst there are some potential adverse effects associated with the proposed activities, overall the ongoing operation of the WWTP provides for essential key infrastructure that enables people and communities to provide for their social and economic well-being and is consistent with Part 2 of the RMA.

7.2 Relevant National Environmental Standards and Planning and Policy Documents – Section 104(1)(b)

7.2.1 New Zealand Coastal Policy Statement 2010

The New Zealand Coastal Policy Statement (NZCPS) took effect on 3 December 2010 and provides national direction for the management of coastal resources and the coastal environment in New Zealand. The purpose of the NZCPS is set out in section 56 of the Act, which states:

The purpose of a New Zealand coastal policy statement is to state objectives and policies in order to achieve the purpose of this Act in relation to the coastal environment of New Zealand.

The NZCPS is applicable to this application due to the proposed discharge activity being located within the coastal environment, specifically the Coastal Marine Area (CMA).

The objectives and policies relevant to the re-consenting of the Whangārei WWTP discharge include:

- Objective 1: To safeguard the integrity, form, functioning and resilience of the coastal environment and sustain its ecosystems, including marine and intertidal areas, estuaries, dunes and land by [including among others]
 - maintaining coastal water quality, and enhancing it where it has deteriorated from what would otherwise be its natural condition, with significant adverse effects on ecology and habitat, because of discharges associated with human activity.
- Objective 2: To preserve the natural character of the coastal environment and protect natural features and landscape values...
- Objective 3: To take account of the principles of the Treaty of Waitangi, recognise the role of tangata whenua as kaitiaki and provide for tangata whenua involvement in management of the coastal environment...
- Policy 2: The Treaty of Waitangi, tangata whenua and Māori heritage
- Policy 11: Indigenous biological diversity (biodiversity)
- Policy 13: Preservation of natural character
- Policy 14: Restoration of natural character
- Policy 21: Enhancement of water quality
- Policy 23: Discharge of contaminants

These objectives and policies have been tabulated in Appendix J of this report.

Objective 1 and policies 13 and 21 relate to water quality and in particular where the quality of receiving environments have been subject to significant adverse effects as a result of human activity, from a state of what would have otherwise been its natural condition. The Whangārei WWTP has been discharging treated wastewater at this location for several decades. Policy 11 specifically relates to the protection of indigenous biodiversity in coastal environments with the avoidance of significant adverse effects and to avoid remedy or mitigate adverse effects. The immediate receiving environment is a coastal wetland with potential habitat for indigenous species. The water quality and ecological investigations have confirmed that the effects of the current discharge are not significant adverse effects (refer to Section 6.2). The proposed adaptive management approach also includes a robust monitoring programme, as outlined in section 4.2 and 6.8, which will further confirm the condition of the existing environment and determine triggers under which further upgrades to the WWTP (and associated improvements to discharge quality) will be implemented to ensure water quality as a result of the WWTP activity is maintained.

Objective 2 and policies 13 and 14 relate to the preservation and restoration of natural character. The proposed activity is the continued discharge of treated wastewater to the CMA. The receiving environment is an estuarine, coastal wetland - mangrove environment. The proposed discharge activity is not considered to detract from the natural character.

Objectives 3 and policy 2 relate to the treaty of Waitangi and the role of tangata whenua. Iwi partners have been collaborated with throughout development of this project and the mapping out of the adaptive management approach. As outlined in section 6.6, a Cultural Impact Assessment is under preparation by iwi partners and it is anticipated that this will be provided to Regional Council in early 2022. The process undertaken to date is considered to give effect to objective 3 and policy 2 of the NZCPS.

Of note is Policy 23(1)(d) which requires discharges to water in the coastal environment to be managed to avoid significant adverse effects on ecosystems and habitats after reasonable mixing and Policy 23(2) which states -

In managing discharge of human sewage, do not allow:

- a. *discharge of human sewage directly to water in the coastal environment without treatment; and*
- b. *the discharge of treated human sewage to water in the coastal environment, unless:*
 - i. *there has been adequate consideration of alternative methods, sites and routes for undertaking the discharge; and*
 - ii. *informed by an understanding of tangata whenua values and the effects on them.*

Policy 23 highlights when managing discharges to the CMA, the sensitivity and capacity of the receiving environment, the nature of contaminants, the effect on coastal ecosystems and the effects on water quality should

be considered. These matters have been assessed in Section 6 of this report and the effects of the discharge are considered to be no more than minor.

The policy does not support the discharge of untreated human waste directly into the coastal environment. In regard to the continuation of the existing discharge, a high level of treatment is provided for normal flows and preliminary screening, settlement and UV disinfection is provided to high flows before the wastewater enters the CMA. The Adaptive Management Approach outlined in section 4.2 will further ensure that upgrades undertaken throughout the duration of the proposed consent will address any effects on the environment identified through the robust monitoring regime, and to also respond to developing policy and legislative requirements.

Policy 23 also specifies that in managing the discharge of treated human sewage to the coastal environment, this cannot be allowed unless there has been an adequate consideration of alternative methods, sites and routes and the discharge has been informed by an understanding of tangata whenua values and the effects on them. The consideration of alternative methods, sites and routes for this wastewater discharge have been explored in Section 4.2 and Appendix H of this report. The alternatives method consideration concludes that the preferred option is to maintain the existing discharge location in the short to medium term and to have no further degradation on water quality and ultimately maintain water quality in the Upper Whangārei Harbour.

In addition, and as required by Policy 23, the approach outlined in this consent is informed by engagement with Te Parawhau and RewaRewa D Incorporation as mana whenua of the Limeburners (Hāhā) Creek and Upper Whangārei Harbour area and the CIA commissioned as part of this consent application. This engagement is discussed in Section 8. On this basis it is considered the continuation of the discharge meets the intent of Policy 23.

7.2.2 National Policy Statement for Freshwater Management 2020

The National Policy Statement for Freshwater Management 2020 (NPS FW) sets out the objectives and policies for freshwater management under the RMA. The NPS FW does not apply to discharge to the WWTP constructed wetlands, as these are a component of the specified infrastructure (the WWTP) and constructed by artificial means for the particular purpose of contributing to the treatment of wastewater prior to ultimate discharge to the receiving environment. The receiving environment is considered to be a coastal wetland environment falling within the definition of a natural wetland, and under clause 1.5 the NPS Freshwater applies to receiving environments (which may include estuaries and the wider coastal marine area) - to the extent they are affected by freshwater. The Ministry for Environment guidance document outlines that the NPS FW applied only to wetlands located outside of the CMA¹³ (i.e. natural inland wetlands). A recent High Court decision has explicitly overturned the application of the National Environmental Standard for Freshwater (discussed in Section 7.2.3) confirming the coastal wetlands are 'natural wetlands' under the definition in the NPS FW¹⁴. However, the decision was less explicit about any changes in the applicability of the NPS FW to coastal wetlands as 'natural wetlands'. An approach has been adopted whereby the objectives and policies as they relate to natural wetlands have been assessed and excluded those that relate to matters more directly relating to freshwater exclusively, such as natural inland wetlands and freshwater management.

The NPS FW also applies to the portion of the proposal relating to the re-use of treated wastewater being applied to land and has been included in the below assessment.

Objective 1 of the NPS FW seeks to ensure natural and physical resources are managed in a way that prioritises:

- (a) first, the health and well-being of water bodies and freshwater ecosystems*
- (b) second, the health needs of people (such as drinking water)*
- (c) third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future*

Te Mana o Te Wai is the fundamental concept of the NPS FW and recognises that protecting the health of freshwater protects the health and well-being of the wider environment. It is about restoring and preserving the balance between the water, the wider environment, and the community. The hierarchy of obligations outlined in the objective of the NPS FW prioritises this fundamental concept.

¹³ Ministry for the Environment. 2021. Defining 'natural wetlands' and 'natural inland wetlands'.

¹⁴ Minister of Conservation Vrs Mangawhai Harbour Restoration Society Incorporated [2021] NZHC 3113 [18 November 2021]

The proposed adaptive management approach includes provision to tailor the pathways taken to respond to adverse effects on the environment and includes environmental monitoring to determine such triggers.

The following policies of the NPS FW are considered relevant to the proposed activity.

- Policy 9 protects habitats of indigenous freshwater species.
- Policy 12 sets a national target for water quality improvement in relation to primary contact.
- Policy 13 requires that the condition of water bodies and freshwater ecosystems is systematically monitored over time, and action is taken where freshwater is degraded, and to reverse deteriorating trends.
- Policy 15: Communities are enabled to provide for their social, economic, and cultural wellbeing in a way that is consistent with this National Policy Statement.

These objectives and policies have been tabulated in Appendix J of this report.

For the Whangārei WWTP consent objective 1 relates to giving effect to Te Mana o Te Wai – if the natural wetland receiving environment (in this case a coastal wetland) is degraded, the health and wellbeing of this water body is prioritised over other needs. Several policies reinforce this notion further, with Policy 13 requiring that this is monitored and action taken. We understand that treated wastewater has been discharged to Limeburners (Haha) Creek for several decades and the receiving environment has adjusted to this new ‘norm’ and although no specific survey of the mangrove wetlands have been undertaken (with exception to assessing macroinvertebrate), based on general observations there appears to be no signs of mangrove deterioration in the vicinity of the discharge.

A robust monitoring programme of water and sediment quality in the receiving environment is to be developed in the first few months of consent and implemented over the first 18 months of consent with reporting to be provided within 2 years of consent to confirm long-term triggers and ongoing long-term monitoring requirements. The proposed activity is therefore considered to protect habitats of indigenous freshwater species through this robust monitoring programme and aligns with Policy 9.

The improvements relating to Policy 12 has been and will continue to be largely achieved through augmentation works and future upgrades to the disinfection system. One of the key variations sought in 2011 was to disinfect all flows from the plant which was achieved in 2014 and now WDC are proposing to optimise the system to obtain better pathogen removal as part of the augmentation works (as outlined in Section 4.2). The proposed activity is therefore considered to align with Policies 12 and 13.

The proposed activity includes an adaptive management approach during which significant upgrades to the Whangārei WWTP will be undertaken as needed. The form and scale of these upgrades as outlined in section 4.2.3 will be informed in part through the environmental monitoring proposed. Given the level of upgrade and associated discharge quality will be determined through the robust adaptive management framework outlined in section 4.2 it is considered the proposed activity aligns with the relevant policies of the NPS FW outlined above. The provision of a wastewater treatment system, as regionally significant infrastructure is considered to align with Policy 15 – in particular in relation to providing for social and economic wellbeing.

The proposed re-use involves temporary watering of Council trees and annual garden beds drought restriction levels (level 1 or above) in order to maintain these facilities whilst relieving pressure on the potable water supply for Whangārei residents and businesses. This not only reduces water consumption during such periods, it also reduces wastewater being discharged to water (albeit relatively small volumes currently but with scope to increase reuse potential with time thus having a double benefit). Application of treated wastewater would avoid instances where any runoff could get to freshwater locations and would be more than; 20 m from any property boundary (not owned by the WDC), 15 m of the coastal marine area, 15m of a freshwater body (and 100 m of any natural wetland), or 5m of any identified stormwater flow paths. Therefore, it is not considered that the proposed beneficial re-use of treated water in such instances as outlined in this AEE would be contrary to the objectives and policies of the NPS FW.

7.2.3 Resource Management (National Environmental Standards for Freshwater) Regulations 2020

As outlined above in the assessment against the provisions of the NPS FW, the constructed, artificial WWTP wetlands are not applicable under the provisions of the National Environmental Standards for Freshwater (NES

FW). However, a recent High Court ruling overturned an earlier Environment Court ruling in relation to the interpretation of natural wetlands¹⁵. Under that ruling, coastal wetlands are considered natural wetlands.

The Whangārei WWTP is identified as “Regionally Significant Infrastructure” and therefore meets the definition of “specified infrastructure” under the NES FW.

Regulations 46 and 47 of the NES FW relate to the “maintenance and operation of specified infrastructure and other infrastructure”. As the activity would involve discharge to a ‘natural wetland’, the conditions of Regulation 55 cannot be met meaning Regulation 46 does not apply. Therefore, the proposed ongoing operation and associated discharge from Specified Infrastructure in this instance is a restricted discretionary activity pursuant to Regulation 47(3) and consent requirements under the NES FW has been identified in Section 5.

Regulation 47(3) relates to the *taking, use, damming, diversion, or discharge of water within, or within a 100 m setback from, a natural wetland is a restricted discretionary activity if it -*

- a) is for the purpose of maintaining or operating specified infrastructure or other infrastructure; and*
- b) does not comply with any of the conditions in regulation 46(4), but does comply with the conditions in subclause (5) of this regulation.*

The proposed activity is for the purpose of operating the specified infrastructure. The conditions (Regulation 47(5)) associated with this rule appear to relate more to construction or maintenance activities:

- a) the activity must be undertaken only for as long as necessary to achieve its purpose; and*
- b) before the activity starts, a record must be made (for example, by taking photographs) of the original condition of the natural wetland’s bed profile and hydrological regime that is sufficiently detailed to enable compliance with paragraph (c) to be verified; and*
- c) the bed profile and hydrological regime of the natural wetland must be returned to their original condition no later than 30 days after the start of the activity.*

Ongoing operation is considered to include discharges associated with the operation of specified infrastructure, such as those of treated wastewater from the Whangārei WWTP. The discharge associated with the operation of specified infrastructure falls under Regulation 47 and some of the conditions (eg 47(5)(c)) are not applicable to this activity. Regulation 56 outlines the matters to which discretion is restricted. The actual and potential effects of the proposed activity have been outlined in section 6, however, are summarised in relation to the Regulation 56 matters below:

- the extent the activity may have adverse effects on the existing and potential values of the natural wetland and the coastal environment. This relates to the potential of the natural wetland. The monitoring regime proposed will continually assess the level of effects and determine the trigger points at which upgrades will be undertaken to avoid adverse effects on the environment.
- The passage of fish. There are no physical barriers that restrict the passage of fish. The monitoring proposed will also determine if there are potential adverse effects on fish movements throughout the receiving environment as a result of the discharge.
- Practicable alternatives to undertaking the activity that would avoid those effects. The assessment of alternatives undertaken as part of the development of the proposed activity has been outlined in section 4.1 above.
- The extent to which adverse effects will be managed to avoid the loss of the extent of the natural wetland and its values. The values portion of this matter is likely more applicable, as there is no extent of the coastal wetland to be impacted/reduced through the proposed activity. The monitoring regime proposed and the upgrades to be undertaken (and determined) through the adaptive management approach will both address any potential adverse effects or
- Offsetting of effects that are more than minor. No offsetting is currently considered necessary or proposed through the proposed activity.

¹⁵ Minister of Conservation Vrs Mangawhai Harbour Restoration Society Incorporated [2021] NZHC 3113 [18 November 2021]

- The social, economic, environmental, and cultural benefits (if any) that are likely to result from the proposed activity. Continued provision of wastewater treatment facilities is a key social and economic benefit for the region.

The proposed re-use of treated wastewater is also required to be assessed in relation to the NES FW. Due to the proposed separation distance from freshwater bodies (including 100 m from any natural wetland) for any treated wastewater re-use and the rate of discharge it is not considered any provisions of the NES FW.

7.2.4 Proposed National Policy Statement for Indigenous Biodiversity

In 2019 and 2020 public consultation on the proposed National Policy Statement on Indigenous Biodiversity was undertaken. It was recently agreed to extend the timeframe for the delivery of the National Policy Statement for Indigenous Biodiversity to the end of 2021 (the previous timeframe for delivery was April 2021). The Proposed National Policy Statement for Indigenous Biodiversity (PNPSIB) is due for gazettal at the end of 2021. The PNPSIB sets out objectives, policies and implementation requirements to manage natural and physical resources to maintain indigenous biological diversity (indigenous biodiversity) under the RMA. Section 1.6 of the PNPSIB sets out the relationship with the New Zealand Coastal Policy Statement, that is that both the New Zealand Coastal Policy Statement the PNPSIB and the PNPSIB apply in the terrestrial coastal environment. The PNPSIB states if there is a conflict between the provisions of the PNPSIB and the New Zealand Coastal Policy Statement 2010 (or any later New Zealand coastal policy statement issued under the Act), the New Zealand coastal policy statement prevails.

Section 2.1 of the PNPSIB outlines the proposed objectives. Objectives 1 to 6 are all relevant and applicable to this application. In particular they focus on maintaining, restoring and improving indigenous biodiversity with recognition of the roles of tangata whenua, landowners and communities in achieving this. Section 2.2 sets out the proposed policies. Policies 1 to 15 are all relevant with the exception of policy 3, 4, 9 and 14.

- Policy 1 recognises the role of tangata whenua as kaitiaki of indigenous biodiversity;
- Policy 2 requires a precautionary approach is adopted to proposed activities with effects on indigenous biodiversity that are uncertain or unknown;
- Policy 5 requires improvement of information on the effects of proposed use and development on indigenous biodiversity;
- Policy 7 requires that indigenous biodiversity is maintained;
- Policy 8 recognises the locational constraints for development and use;
- Policy 10 provides for existing activities that have already modified indigenous vegetation and habitats of indigenous biodiversity;
- Policy 12 identifies and protects indigenous species and ecosystems that are taonga; and
- Policy 15 requires monitoring and assessment of indigenous biodiversity.

Iwi partners have been collaborated with throughout development of this project and the mapping out of the adaptive management approach aligning with Policy 1. As outlined in section 6.6, a Cultural Impact Assessment is under preparation by iwi partners and it is anticipated that this will be provided to Regional Council in early 2022.

Section 6.2 of this AEE has assessed the effect on ecological values within the receiving environment to be less than minor as confirmed through ecological surveys. This is largely due to the salinity gradient, the hydrodynamics, associated substrate composition and the tolerance of the species present given the duration of the discharge from the WWTP being several decades. The ecological assessment, indicates a state of equilibrium has been reached in Limeburners (Hāhā) Creek with the species present being tolerant to the current conditions as provided for by Policy 10. It is likely any fish species present will also be tolerant to the current conditions.

The long-term implementation of the adaptive management approach will ensure no further degradation of the environment occurs as a result of the proposed activity and is expected to maintain the current biodiversity in line with Policy 7.

The proposed baseline and long-term monitoring of water and sediment quality in the receiving waters will provide valuable information on the health of the waterways and inform of any potential effects of the activity on indigenous vegetation and habitats in line with Policy 15 – from which appropriate actions can then be developed.

7.2.5 Regional Policy Statement for Northland (2016)

The Regional Policy Statement for Northland (RPSN) took effect on the 9th of May 2016 and provides an overview of the regions resource management issues and sets out policies and methods to achieve integrated management of Northlands natural and physical resources.

The objectives and policies relevant to the re-consenting of the Whangārei WWTP cover:

- Objective 3.2 and policies 4.1, 4.4 Water quality – the management of discharges of contaminants to water, including the need to maintain overall water quality.
- Objective 3.3 and 3.4 and policy 4.4 - The safeguarding of ecological integrity in the CMA and freshwater bodies.
- Objectives 3.7 and 3.8 and policy 5.3 - Regionally significant infrastructure and the benefits of this infrastructure, such as the economic benefit to the Northland Region and the local benefits the operation maintenance and development have on the community. Policy 5.3.3 relates to the managing of adverse effects arising from regionally significant infrastructure.
- Objective 3.12 and policy 8.1 - The role of tangata whenua in decision-making, and the need for an assessment of effects of an activity on tangata whenua and their taonga.
- Objective 3.13 and policies 7.1 and 7.2 - The potential effects of climate change on a proposed development.

These have been tabulated in greater detail in Appendix J of this report. In summary, the proposed renewal of the WWTP is consistent with the relevant objectives and policies of the NRPS as:

- the water quality of Limeburners (Hāhā) Creek and the Hātea River will be maintained to its current level, with extensive monitoring being undertaken during the lifetime of the consent against preliminary trigger levels in the first 2 years to be updated to long-term triggers following an intensive baseline monitoring period. This ensures degradation is appropriately managed through upgrades of the plant or alternative disposal locations.
- The effect of the discharge on indigenous ecosystems and biodiversity is less than minor as identified through the survey and monitoring program outlined in Section 6. The health of the receiving waters and sediment will be monitored over the lifetime of the consent as noted above to ensure the integrity of the ecosystem is maintained
- The use and development of infrastructure enables economic wellbeing in the community and has benefits on the local community through the safe and efficient removal and treatment of waste.
- The proposed activity also aligns with the objective of efficient and effective infrastructure, through optimisation of existing infrastructure, ensuring adaptability to meet the foreseeable needs of the community and supports regional economic development and community wellbeing.
- The use of the adaptive pathway planning approach efficiently and effectively uses infrastructure as the existing infrastructure will be used until monitoring indicates upgrades are necessary and will ensure the investment into future redundant infrastructure is avoided.
- Tangata Whenua have been involved in the decision making through the consultation process and a Cultural Impact Assessment is under preparation by iwi partners.
- The use of the adaptive management approach will maintain the water quality overtime and natural character of the area

On this basis it is considered the continuation of the discharge alongside the proposed short-medium term upgrades proposed and any future upgrades adopted through the adaptive pathway planning approach meets the intent of the RPSN.

7.2.6 Proposed Regional Plan for Northland (Appeals Version)

Appeals are underway on the PRPN. The rules for discharges are now operative, as they are not subject to appeal. However, several of the objectives and policies of the PRPN, for the coastal plan portion of the PRPN are subject to appeal. This section summarises the relevant objectives and policies of the PRPN, where those are subject to appeal, further assessment of the equivalent objectives and policies of the Operative Regional Coastal Plan is provided in section 7.2.7. The remaining appeal hearings are anticipated to be run and resolved in 2021 through to 2022. The objectives and policies are also tabulated in Appendix J along with associated commentary and assessment.

The Whangārei WWTP and Limeburners (Hāhā) Creek is subject to the following overlays in the PRPN (Decisions Version)¹⁶.

Table 15 Relevant overlays of the PRPN

Whangārei WWTP	Limeburners (Hāhā) Creek
Whangārei Airsheds	Whangārei Airsheds
Coastal And 'Other' Aquifer Management Units	General Marine Zone
Coastal River – Water Quantity Management Unit	Significant Marine Mammal and Seabird Area
	Marine Pollution Limits Area
	Coastal Aquifer Management Unit
	Coastal River – Water Quantity Management Unit
	Mixing Zone for major discharges – Coastal Water Quality Management Unit

The PRPN prescribes the Coastal Water Quality Management Units for the Whangārei Harbour to which the water quality standards in Table 22 and 23, Policy H.3.3 and H.3.4 of the PRPN (Appeals version) for the Hātea River, Tidal Creeks and Estuary areas of the harbour apply (Figure 21).

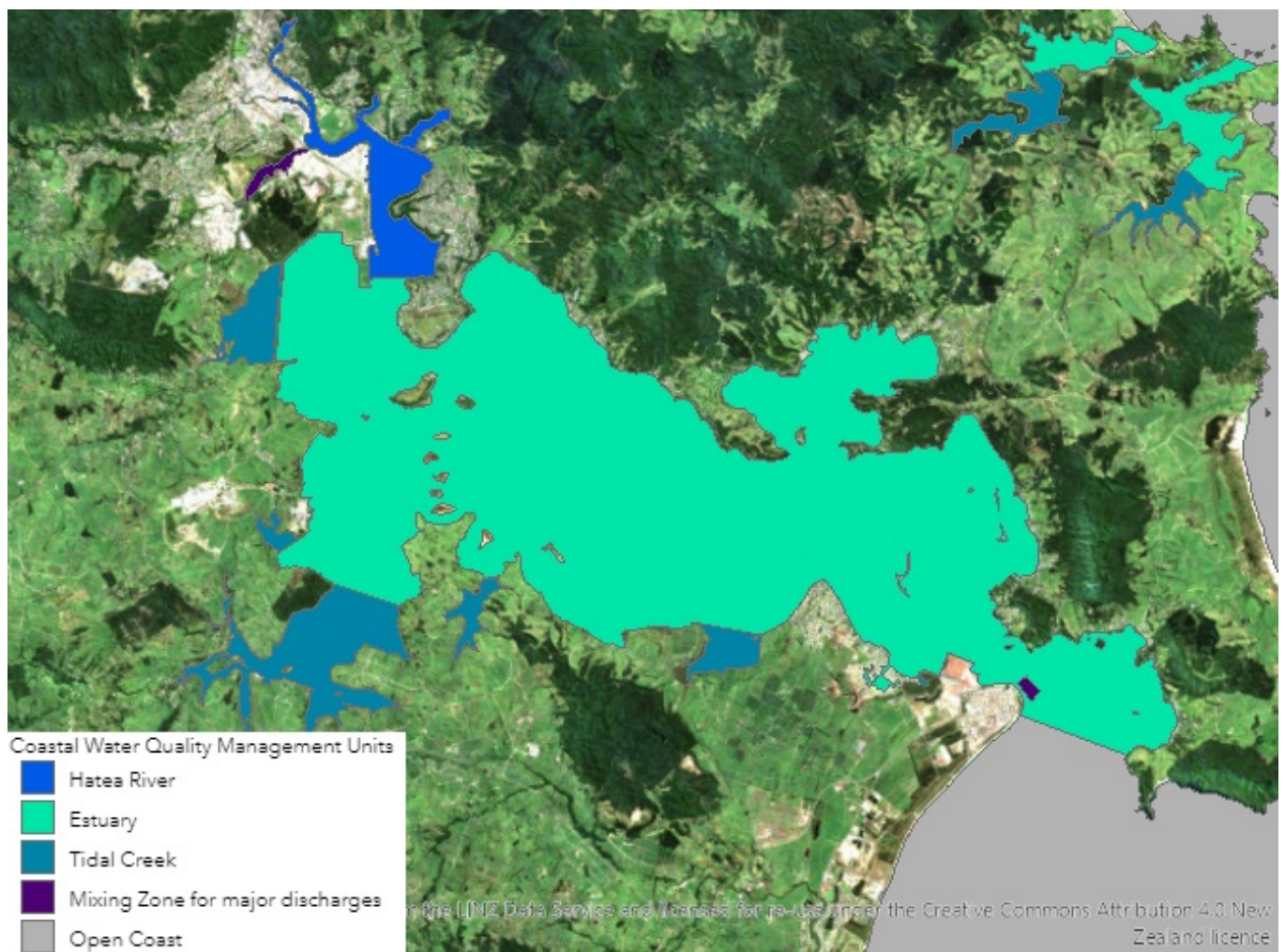


Figure 21 Coastal Water Quality Management Units - PRPN (Decisions version)

The PRPN prescribes within its maps a pre-determined zone of reasonable mixing for major discharges which includes the Whangārei WWTP discharge into Limeburners (Hāhā) Creek.

¹⁶ There is currently no maps available for the PRPN (Appeals Version).

No appeals have been lodged on the mixing zone in Limeburners (Hāhā) Creek or the zone of reasonable mixing definition provided in Policy D.4.4.

Policy D.4.4 states –

When determining what constitutes the zone of reasonable mixing for a discharge of a contaminant into water, or onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of a natural process from that contaminant) entering water, have regard to:

1. *using the smallest zone necessary to achieve the required water quality in the receiving waters as determined under Policy D.4.1, and*
2. *ensuring that within the mixing zone contaminant concentrations and levels of dissolved oxygen will not cause acute toxicity effects on aquatic ecosystems.*

Sections 3.3.1 and 6.2 have assessed based on current data that the discharge within Limeburners (Hāhā) Creek is not having acute toxicity effects on aquatic ecosystems

Furthermore, NRC (2020)¹⁷ have advised there are no direct objectives or policies relating to the mixing zone for major discharges. In the case of the Whangārei WWTP, the Tidal creeks water quality standards in Table 22, Policy H.3.3 of the PRPN (Appeals version), do not apply. Instead, the standards for Hātea River are applicable at the confluence of Limeburners (Hāhā) Creek and the Hātea River.

The objectives and policies relevant to the re-consenting of the Whangārei WWTP cover:

- Water quality – Section F contains the objectives and Section D4 outlines the policies that give effect to them. Objective F.1.2 seeks to manage the use of land and discharges of contaminants to land and water to maintain existing water quality and improve it where it has been degraded as set out in H.3 Water quality standards and guidelines. Amongst other things it also requires that Kai is required to be safe to harvest and eat, and other recreational, amenity and other social cultural values are provided for. Policies D.4.1 (overall water quality), D.4.3 (municipal wastewater discharge requirements), D.4.4 (Zone of reasonable mixing), D.4.5 (transitional policy for NPS freshwater Management 2017), Policies D.4.22, and D.4.24 (manage effects on wetlands). The proposed activity described in Section 4.2 and proposed monitoring and review process described in Section 6.8 respond to the above objectives and policies through implementing initially augmentation upgrade works and a robust environmental monitoring regime that will inform the adaptive pathway planning approach and which in turn will inform long-term upgrades for the WWTP to ensure no further degradation of the upper harbour water quality.
- Air quality – Objective F.1.13 relates to air quality and seeks that Human health, ambient air quality, cultural values, amenity values and the environment are protected from significant adverse effects caused by the discharge of contaminants to air. Policies D.3.1 (general approach to managing air quality), Policy D.3.2 (General approach to managing adverse effects of discharges to air), Policy D.3.4 (Dust and odour generating activities). The actual and potential effects of discharges to air have been discussed in section 6.4. It is considered that these align with the relevant objectives and policies outlined above.
- Adaptive management – Policy D.2.4 which regard should be had to the appropriateness of an adaptive management approach where:
 - 1) there is an inadequate baseline of information on the receiving environment, and
 - 2) the occurrence of potential adverse effects can be effectively monitored, and
 - 3) thresholds can be set to require mitigation action if more than minor adverse effects arise, and
 - 4) potential adverse effects can be remedied before they become irreversible.

The proposed activity seeks to implement an adaptive management approach. It is considered the proposed approach aligns with the criteria of Policy D.2.4 as outlined above.

- Tangata whenua engagement and consultation – with Objective F.1.9 outlining tāngata whenua's kaitiaki role is recognised and provided for in decision-making over natural and physical resources. As noted previously Iwi partners have been collaborated with throughout development of this project and the mapping out of the adaptive management approach and a Cultural Impact Assessment is under preparation by iwi partners and it is anticipated that this will be provided to NRC in early 2022.

¹⁷ Stuart Savill pers comm 8 June 2020

- Indigenous ecosystems and biodiversity Objective F.1.3 seeks to safeguard ecological integrity in the coastal marine area and in fresh waterbodies. This has largely been addressed previously in Sections 7.2.1, 7.2.2 and 7.2.4.
- Economic wellbeing with Objective F.1.5 seeking that Northland's natural and physical resources are managed in a way that is attractive for business and investment that will improve the economic well-being of Northland and its communities. The provision of a wastewater treatment system, as regionally significant infrastructure is considered to provide for the social and economic wellbeing of the Whangārei community.
- Regionally significant infrastructure – Objective F.1.6 seeks to recognise the national, regional and local benefits of regionally significant infrastructure and renewable energy generation and enable their effective development, operation, maintenance, repair, upgrading and removal. Policy D.2.5 - Particular regard must be had to the national, regional and locally significant social, economic, and cultural benefits of regionally significant infrastructure. D 2.7 relates to minor adverse effects arising from the establishment and operation of regionally significant infrastructure. Policy D.2.8 relates to enabling the maintenance and upgrading of established regionally significant infrastructure where it is located by allowing adverse effects.

The proposed augmentation works and eventual larger scale upgrade of the WWTP will align with the objectives and policies of the PRPN. Effects are not anticipated to be the same or better when compared to prior to the upgrade(s) occurring. The robust monitoring regime will further ensure this and establish triggers to be implemented upgrades and to assist in determining appropriate upgrades.

- Use and development - Objective F.1.8 seeks use and development in the CMA to:
 - make efficient use of space occupied in the common marine and coastal area, and
 - be of a scale, density and design compatible with its location, and
 - recognise the need to maintain and enhance public open space and recreational opportunities, and
 - be provided for in appropriate places and forms, and within appropriate limits.

The proposed WWTP makes use of an existing discharge outfall structure, that for a majority of time is not in use and with no changes proposed. The use of the outfall associated with the WWTP is therefore considered to be of a scale, density and design compatible with its location and although public access to the outfall is not available, through the 2014 enhancement works associated with wetland 1 public access adjacent to this area of the CMA has been enhanced.

- Natural character – Objective F.1.12 Natural character, outstanding natural features, historic heritage and places of significance to tāngata whenua are provided from inappropriate use and development. This has largely been addressed previously in Sections 7.1.4 and 7.2.1.

In summary, it is considered that the consenting of the WWTP and associated activities aligns with the objectives and policies of the PRPN, as further outlined in Appendix J. Further assessment has been provided on Policy D.2.3 and D.2.14 which are outlined below.

Policy D.2.3 relates to climate change and development. At this stage of the project, it is unclear what effect climate change will have on WWTP processes. As such, climate change is one of the drivers that will be assessed as through regular reviews to the adaptive pathway plan and associated management plans. This allows for the plant to be upgraded to address specific climate change issues as they present themselves or are better understood.

When determining the duration of resource consent, the PRPN prescribes in Policy D.2.14¹⁸ that particular regard should be given to:

1. *security of tenure for investment (the larger the investment, then generally the longer the consent duration), and*
2. *the administrative benefits of aligning the expiry date with other resource consents for the same activity in the surrounding area or catchment, and*
3. *certainty of effects (the less certain the effects, the shorter the consent duration), and*
4. *whether the activity is associated with regionally significant infrastructure (generally longer consent durations for regionally significant infrastructure), and*

¹⁸ Appeal to Environment Court by i) Mataka Residents Association Inc ENV-2019-AKL-000112 ii) Robinia Investments Ltd ENV-2019-AKL-000115 iii) Paroa Bay Station Ltd ENV-2019-AKL-000112 iv) Royal Forest & Bird Protection Society NZ ENV-2019-AKL-000127

5. *the following additional matters where the resource consent application is to re-consent an activity:*
- the applicant's past compliance with the conditions of any previous resource consent or relevant industry guidelines or codes of practice (significant previous non-compliance should generally result in a shorter duration), and*
 - the applicant's voluntary adoption of good management practice (the adoption of good management practices that minimise adverse environmental effects could result in a longer consent duration).*

The implementation of the Adaptive Pathway Planning approach relies upon a level of certainty which can best be provided by a long-term consent. Rigorous and robust long-term monitoring of the WWTP performance and other metrics to track drivers will ensure improvements to plant operations and/or upgrades to treatment and disposal are made before meaningful degradation or adverse effects occur on the receiving environment. The adaptive pathway planning approach relies on the implementation of a suite of comprehensive management plans, which will be subject to regular review and update, with progress reporting against these plans provided regularly to the NRC and key stakeholders (Liaison Group). In the event significant upgrades to the plant are validated as necessary, collaboration with key stakeholders through review and update of the Master Plan and Long-term planning processes will be undertaken. The activity is associated with regional significant infrastructure, and the Master Plan currently indicates substantial investment is likely to be required over the short-medium term providing further cause for a longer-term consent to ensure security of Council's investment. A shorter term of consent will not achieve any significant additional benefits or provide any additional safeguard against potential environmental effects. On this basis, the term of consent requested for all consents required for the Whangārei WWTP of 35 years is considered reasonable.

7.2.7 Operative Northland Regional Coastal Plan

The Operative Regional Coastal Plan (RCP) for Northland is applicable where equivalent matters of the Proposed Regional Plan for Northland are under appeal. As such, a high level overview of the RCP has been undertaken below, with specific overlap shown in Appendix J.

- Structures within the coastal marine area – Objective 17.3 - The provision for appropriate structures within the coastal marine area while avoiding, remedying or mitigating the adverse effects of such structures.
- Discharges to water – Objective 19.3 The avoidance of the effects of discharges of contaminants to Northland's coastal water and the remediation or mitigation of any adverse effects of those discharges of contaminants to coastal waters, which are unavoidable.
- Network utilities (including wastewater treatment) – Objective 24.3 and policies 24.4(2) and 24.4(2) Provision for network utilities and services within Northland's coastal marine area while avoiding, remedying or mitigating the adverse effects of such activity. Policy 24.4 (1) To identify within this Plan, the type and location of existing authorised network utilities and services currently within the coastal marine area and provide for their operation and maintenance subject to specified criteria. Policy 24.4 (2) To ensure that existing authorised network utilities and services in the coastal marine area are managed so as to, avoid, remedy or mitigate adverse environmental effects.

The proposed activity being the continued use of a structure in the coastal marine area, discharge to water and the continued operation (and upgrades) of a network utility operation is considered to be in alignment with the above objectives and policies of the operative RCP – whereby equivalent policies in the PRPN are subject to appeal.

7.2.8 Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations (2007)

The National Environmental Standard for Sources of Human Drinking Water (NES DW) commenced on 20 June 2008. This standard is a regulation enacted by an Order in Council, under section 43 of the RMA. The regulation requires that a regional council must not grant a water or discharge permit for an activity that will occur upstream of a drinking water abstraction point if specific criteria at the point of abstraction are exceeded. The matters to be considered as part of an assessment are dependent on the permit being sought and the level of effects on any drinking water supplier located downstream or down gradient of the activity. There are no drinking water abstraction points which are impacted by the proposed WWTP discharge to the CMA or land discharges to Council gardens/sports fields.

7.3 Other Matters – Section 104(c)

7.3.1 Marine and Coastal Area (Takutai Moana) Act 2011

The purpose of the Marine and Coastal Area (Takutai Moana) Act (MCAA) is to establish:

- A durable scheme to protect the legitimate interests of all New Zealanders in the marine and coastal area of New Zealand;
- Recognise the mana tuku iho exercised in the marine and coastal area by iwi, hapū, and whānau as tangata whenua;
- Provide for the exercise of customary interests in the common marine and coastal area; and
- Acknowledge the Treaty of Waitangi.

The MCAA replaced the Foreshore and Seabed Act 2004 and establishes an opportunity for groups to apply for Customary Marine Rights or Customary Marine Title (CMT) over the CMA.

Customary Marine Title recognises the relationship of an iwi, hapū or whānau with a part of the Common Marine and Coastal Area, and establishes various rights over this area.

The CMA within which the Whangārei WWTP discharges into via the wetland, is identified within the Statutory Acknowledgement Area of¹⁹ –

- Collier on behalf of Ngāti Kawau & Te Waiariki Kororā
- Dargaville on behalf of Ngaitawake
- Hotere & Wikaira on behalf of Te Hikutū Hapū
- Kingi on behalf of Ngā Hapū o Tangaroa ki Te Ihu o Manaia tae atu ki Mangawhai
- Kingi on behalf of Ngā Puhi nui tonu, Ngāti Rāhiri, Ngāti Awa, Ngā Tahuhu and Ngaitawake
- Korokota Marae for Te Parawhau Hapū
- Mahinepua Reserve Ririwha Trust
- Māhanga on behalf of Te Waiariki, Ngāti Kororo, Ngāti Takapari Hapū/Iwi of Niu Tirenī
- Mita Pōmana & Takutai Moana Heke Pōmana Whānua
- Nathan on behalf of Rōpū o Rangirir
- Ngā Hapū o Ngāi Tāhuhu
- Ngā Hapū o Tangaroa ki Te Ihu o Manaia tai atu ki Mangawhai
- Ngā Hapū o Ngāti Wai Iwi
- Ngāpuhi Nui Tonu (Awataha Marae)
- Ngāpuhi Nui Tonu (Te Kotahitanga Marae)
- Ngāpuhi Nui Tonu-Kota-toka-tutaha-moana o Whāingaroa
- Ngāti Hau
- Ngāti Kawau te Kōtuku, Te Uri o Te Aho, Ngāti Kurī, Te Waiariki Kororā ngā Hapū o Ngāpuhi-Nui-Tonu
- Ngāti Pūkenga
- Ngāti Pūkenga represented by Te Tāwharau o Ngāti Pūkenga
- Ngāti Wai – Whairepo Trust
- Ngātiwai Trust Board
- Nova on behalf of Ngāi Tāhuhu, Ngāti Tuu, Ngāti Kukutea
- Panoho on behalf of Te Rae Ahu Whenua Trust
- Rata on behalf of Kāre Rata Me Ngā Hapū o Ngāti Wai
- Reti Whānau

¹⁹ <https://tearawhiti.govt.nz/te-kahui-takutai-moana-marine-and-coastal-area/applications-made-under-the-marine-and-coastal-area-act/northland-region/> accessed 20 May 2020

- Te Iwi, Whānau and Hapū of Ngatiwai
- Te Kaunihera Māori o Te Tai Tokerau
- Te Parawhau ki Tai
- Te Rūnanga o Ngāti Hine
- Te Uri o Tautohe
- Te Whanau Whero

Under section 62(3) of the MCAA, an obligation exists for every resource consent applicant making an application for a discharge permit under the RMA to notify and seek the views of a CMT applicant, where the consent application relates to a part of the common marine and coastal area for that applicant. As such, letters have been sent to each of the relevant CMT applicants notifying them of the application and seeking their views on the application. A copy of the letter is provided in Appendix K. To date, WDC has not received any views from the CMT applicants.

It is also understood that there are no identified customary activities which would be put at risk by the implementation of the proposed land application of treated wastewater onto Council owned gardens/sports-fields. However, this will be further confirmed through the Cultural Impact Assessment being undertaken.

7.3.2 Iwi/Hapu management plans

WDC acknowledge the following Iwi/Hapu management plans with relevance to the location of the discharge activities relating to the Whangārei WWTP and re-use of treated wastewater to Council gardens/sports fields.

- Te Iwi o Ngatiwai Iwi Environmental Policy document 2007. The rohe covered by this Policy document extends over Whangarei, but the Hapu Te Parawhau are the affected tangata whenua for this area. Within the document in section 9.1.3 Water Issues, water objectives, water policies and methods are outlined. The objectives include (amongst others) that the mauri of water and soil is protected and enhanced in ways which enable tangata whenua to provide for their social, economic and cultural wellbeing, and that of generations as yet unborn; that life supporting capacity of water enables optimum health; sustainable management; and the relationship between tangata whenua and waters. Under the water methods for Ngati wai rohe, that; (7) consent conditions which allow any possible emergency discharge (if the discharge is unforeseen, intermittent, infrequent, or from a technical failure) of untreated sewage from sewage pumping stations into creeks, streams, water bodies, wetlands, waters, estuarine waters and coastal waters are prohibited, unless decided otherwise by Tangata Whenua (pg 25). The Policy document also states in section 9.1.3, method (8) that ‘no liquid waste will be discharged directly, or indirectly (through stormwater drains, artificial watercourses, subsurface field drainage or open drains), to creeks, streams, water bodies, springs, thermal waters, estuarine waters or coastal waters. Instead it will be diverted back onto land for treatment that removes all bacteria, viruses and protozoa dangerous to health. Only then will it be permitted to enter receiving waters. This includes stormwater, sewage, farm dairy waste, effluent, contaminants, animal effluent and non-point source discharges’ (pg 26). Finally, the method 39 states that “all resource consent applications concerning or potentially affecting water use, allocation, flow, level, or quantity must be lodged with a Tangata Whenua Impact Assessment written by the relevant Tangata Whenua. Suggested consent conditions will be included in the assessment.
- Ngati Hine Iwi Environmental Management Plan 2008 - The rohe covered by this Policy document extends over Whangarei, but the Hapu Te Parawhau are understood to be the affected tangata whenua for this area. Objective 1 of Section 15 relates to the mauri of water being protected and enhanced. Policy 4 outlined that *“to discharge human effluent, treated or untreated directly to water is culturally repugnant to Ngati Hine...”*. *Further pollution of our oceans through unsustainable management is unacceptable*. Within the document, Section 15, the relevant methods prescribe; 4(e) consent conditions which allow any possible emergency discharge (if the discharge is unforeseen, intermittent, infrequent, or results from a technical failure) of untreated sewage from sewage pumping stations into any water body are prohibited, unless decided otherwise by Ngati Hine, and (f) no liquid waste will be discharged directly or indirectly to any water body. Instead it will be diverted back onto land for treatment that removes all bacteria, viruses and protozoa dangerous to health. Only then will it be permitted to enter receiving waters. This includes storm water, sewage, farm effluent, contaminants and non-point source discharges”.

- Patuharakeke Environmental Management Plan 2014 – relates to the Southern area of Whangārei District. The site of the proposed discharge into the Hāhā Creek is not within the whenua covered by this Plan, but as modelling shows dispersion of the discharge occurs within the wider Whangarei Harbour then this plan must be given regard to. Council also hold a Memorandum of Understanding with Patuharakeke Trust Board (2004). Both documents recognise Patuharakeke as an affected party to all plan and policy development and all resource consent applications that impact or affect their resources, culture and/or heritage. Section 9 relates to coastal water quality with objectives including (9.1.2(a)) : ... *the mauri and cultural health of the harbour, Bream Bay and out estuaries is protected and enhanced in ways that enable Patuharakeke to provide for our physical, social, economic and cultural wellbeing*. Policy 9.1.3 (d) the discharge of human effluent, treated or untreated, directly to coastal waters is culturally repugnant. All direct discharges of pollutants or contaminants (wastewater, industrial, storm water and agricultural) to coastal waters should be avoided and existing discharges ultimately eliminated. Policy 9.1.3(e) outlines Patuharakeke's position on new discharge consents where they will "*oppose any new consent applications seeking the direct discharge of contaminants to coastal water, or where contaminants may enter coastal waters*".

In summary, in terms of the treatment plant discharge to Limeburners (Haha) Creek the proposed activity is not a discharge of untreated wastewater and receives high levels of treatment including UV disinfection to remove pathogens and further polishing through the engineered wetlands prior to discharge to the Limeburners (Hāhā) Creek. As such, it is considered the activity goes some way to meeting the intent of the policies set out in the relevant EMP's. However, those objectives and policies of the iwi management plans outlined above which oppose discharge of treated human effluent to water will be unable to be met. In this instance, it is appropriate that this be explored further through the Cultural Impact Assessment being undertaken (which is anticipated to be complete in early 2022). Within the adaptive management approach, there will be continuous reviews of drivers/triggers throughout the term of the consent to re-evaluate potential reuse and land application options with the objective of reducing discharge volumes to the harbour.

In terms of the land application of recycled wastewater, a wastewater discharge to land which does not adversely affect groundwater or surface water quality is not contrary to the objectives and policies contained within these plans.

The objectives and policies contained within the relevant iwi/hapū Environmental Management Plans have been considered along with the objectives and policies of the relevant planning documents, however, full assessment of these will be included as part of the Cultural Impact Assessment currently underway.

7.4 Value of investment – Section 104(2A)

Section 104(2A) of the RMA requires the consent authority when considering a renewal of an existing consent to "*have regard to the value of the investment of the existing consent holder*."

This application is being made to replace an existing resource consent due to expire on 30 April 2022.

The monetary replacement value of the Whangārei WWTP is assessed as at 2019 revaluation as being \$37m. The Whangārei WWTP plays an important part of the existing Whangārei district wastewater infrastructure, valued at approximately \$445.6m.

The non-monetary value of the investment to WDC as the consent holder is the value to the community of retaining the existing asset. This community wastewater treatment and disposal system provides for the well-being and health of the current and future businesses and residents of the Whangārei City reticulated area.

The economic and social value of the asset is significant in that it provides critical infrastructure associated with the continued safe uninterrupted operation for both businesses and households.

As discussed in Section 4.2, a number of alternatives to the current treatment and discharge have been considered. At this time, continuing with the existing treatment system is considered the only cost effective option, however this will be reviewed as part of the first Master Plan review proposed within 2 years of the consent being granted.

7.5 Statutory assessment conclusion

The relevant provisions of the NZCPS, NPS FW, NES FW, PNPSIB, RPS for Northland, PRPN, Operative RCP and NES DW have been considered above. Iwi Environmental Management Plans have also been considered, however, full assessment of these will be included as part of the Cultural Impact Assessment underway. In conclusion the continued discharge activities associated with the Whangārei WWTP, including proposed irrigation to Council gardens/sports-fields of treated wastewater is consistent with the purpose and principles of the RMA, and the objectives and policies embodied in the relevant planning and policy documents.

8. Consultation

8.1 Consultation and Engagement undertaken

Consultation and engagement for the renewal of consent for the Whangārei WWTP commenced in early 2020 to 2021 (present), to inform the community and stakeholders about the proposal and seek their feedback.

Engagement has been carried out with a range of stakeholders, from the wider community to key stakeholders including representative groups from the community and Mana Whenua.

A Wastewater Technical Working Group was established early in the process, comprising of representatives from key stakeholders including Northland District Health Board, Fish and Game, Forest and Bird, Department of Conservation, Te Parawhau and Rewarewa D, and Northland Regional Council. WDC held a series of workshops with the Wastewater Technical Working Group to discuss initially the Best Practicable Option via a traditional multicriteria analysis process and later exploring with the group the Adaptive Pathway Planning Approach which has been adopted.

Community interviews with adjacent Land owners/occupiers as well as wider public engagement through social media and drop-in sessions have been carried out.

More recently, WDC has commenced working with Tangata Whenua and their nominated consultant to prepare a Cultural Impact Assessment. This work is progressing and will be provided as an addendum to the Assessment of Environmental Effects following consent lodgement.

A summary of the consultation and engagement undertaken to date and the feedback received is provided in Table 16 below. Relevant meeting minutes, consultation material is also provided in Appendix K.

Table 16 Consultation and engagement summary

Stakeholder Group	Organisation	Engagement undertaken	Key Messages	Comments / Feedback received
Council / Elected Representatives	<ul style="list-style-type: none"> • Councilors • WDC Senior Leadership Team 	Council Briefings were given on 13 August 2020 and 8 April 2021.	Overview of consultation and adaptive management approach to the WWTP consent.	Council supportive of adaptive approach and options presented.
Wastewater Technical Working Group	<ul style="list-style-type: none"> • Northland Regional Health Board (Johanna Dones) • Fish & Game Northland Region (Rudi Hoetjes) • Forest & Bird Northland Region (Shane Herare) • Department of Conservation (Dave West and Aurelia Robertson, Erica Wade, Laura Wakelin) • Te Parawhau (Mira Norris) • Rewarewa D (Nicki Wakefield) 	A series of Wastewater Working Group hui were held over 2020 and 2021. Copies of workshop minutes are provided in Appendix K		<p>NRC (Stuart Savill) declined invite to participate in WWG due to perceived conflicts of interest.</p> <p>Forest and Bird were invited and provided all information but did not attend the working party meetings.</p>
		WWG Hui #1 – 22 October 2020	<ul style="list-style-type: none"> • Background to plant, population growth and consent process. • Long-list options and preliminary discussion on these options and fatal flaws. • An output of the workshop was an evaluation matrix of the Long-list Options (Long list Options – Summary Report 10/11/2020 – Appendix K). 	<ul style="list-style-type: none"> • Consent term of 35 years too long. • Longer view to wastewater infrastructure planning wanted. • Limeburners (Hāhā) Creek and wider Harbour historically a major food basket – aspiration to improve water quality in the Harbour. • Concern that water quality standards aren't being improved enough. • Concerns regarding emerging contaminants. • General support for wastewater reuse/recycling. • Source control initiatives needed. • No-go for lower harbour discharges or deep bore injection options. • Iwi's abhorrence to the ocean outfall proposed for Ruakaka noted. • Focus more on the objectives and vision of the plant and understand what the plant can effectively achieve to then inform future options. • No feedback received on the evaluation matrix weightings.

		WWG Hui #2 – 26 November 2020	<ul style="list-style-type: none"> • Summary of Long-list MCA findings and recommendations – long-list not mutually exclusive. • Status of current environmental data • Introduce and confirm Adaptive Pathways Planning approach to managing options for the WWTP (alternative to traditional MCA approach), desired outcome of workshop - to align on drivers for wastewater treatment plant improvements and triggers for action. • Skeleton pathway map. 	<ul style="list-style-type: none"> • A need for cultural aspirations/values to be incorporated into the Adaptive pathways plan. • Support no net loss of biodiversity, improve swimmability / mahinga kai. • Make best use of biosolids. • Improve UV disinfection = reduce downstream risks and increase reuse opportunities. • Continue use of wetlands and potentially expand.
		WWG Hui #3 – 1 June 2021	<ul style="list-style-type: none"> • Update on environmental investigations and baseline monitoring results including water quality, public health and air quality assessments. • Seek endorsement for pursuing Adaptive pathway #1. 	<ul style="list-style-type: none"> • WWTP odour noted at port rd bridge and beyond on still evenings particularly when sea mist present. • Those present generally endorsed Adaptive pathway plan approach being taken. • Agreement made to cost pathways 1b and 1d as part of master planning.
		WWG Hui #4 – 2 August 2021	<ul style="list-style-type: none"> • Update on Master Plan and Technical Assessments for air quality and water quality. • Confirm final steps, seek final feedback. 	<ul style="list-style-type: none"> • Desire for mana whenua to participate in catchment scale monitoring – Mātauranga Māori monitoring plan/framework – CIA to confirm. • Request for Papakainga land to be included in any future odour surveys. • DoC declined attendance at final WWG workshop as felt they no longer needed to input into the process.

Mana Whenua Hapu, Marae	<ul style="list-style-type: none"> Te Parawhau Patuharakeke / Rewa Rewa D 	WDC (Sarah Irwin) met with Te Parawhau ki tai and Rewa Rewa D representatives (Mira Norris, Mike Kake, Pari Walker and Nicki Wakefield) on 6 September 2019	Introduce WWTP resource consent renewal process and to nominate Working party representatives and contact points at the September hui.	Mira Norris and Nicki Wakefield were nominated as Wastewater Technical Working Group representatives.
		WDC (Simon Charles) met with Te Parawhau representatives (Mira Norris, Mike Kake, and Pari Walker) on 5 May 2021.	Draft Options report and Adaptive Planning Pathways approach was introduced at the May hui.	Proposed Landform Consulting to undertake the CIA on behalf of Te Parawhau and Georgina Olsen to be invited to any further technical meetings.
		WDC (Simon Charles/Sarah Brownie) met with Te Parawhau representatives (Mira Norris, Mike Kake, Nicki Wakefield and Pari Walker) on 19 October 2021.	Discussion regarding the preparation of a CIA at the October hui. Notes from the hui are provided in Appendix K.	Discussion largely focused on the timing of the CIA development in relation to the lodgment date for the application. Concern was also raised around the lateness of engagement with mana whenua and CIA development.
		Three future hui planned for 10 November, 24 November and 8 December 2021. The hui panui has been circulated to the wider iwi/hapu community.	Focus for hui's is to clarify cultural values and feedback on proposal to inform the development of a CIA.	Feedback to be incorporated into the CIA.
	Refer to Section 7.3.1 for a list of Customary Marine Title applicants in relation to the Marine and Coastal Area Act (Takutai Moana).	Formal notification under MCAA has been provided to all iwi with registered customary interests in the area.	The notification included a request for feedback (refer to Appendix K).	No specific concerns have been raised and ongoing consultation has been and continues to be undertaken as part of the work being undertaken to prepare the CIA.
Interest Groups	Whangarei Harbour Catchment Advisory Group	19 October 2020 and 19 October 2021, minutes of meetings are provided in Appendix K.	Presentation to Whangārei Harbour Catchment Advisory Group on Resource Consent renewal. Reporting given at each meeting on progress with WWTP consent.	Supportive of adaptive approach.
Adjacent Land owners/occupiers	Refer to Appendix F, Figure 8.3 for locations of those who participated in community interviews.	Interview questions are presented in Table 8.3 of Appendix F, and the interviews were carried out over 2 days in July 2021 and included a collection of industrial, commercial and residential sites.	A series of questions pertaining to experiences by neighbouring land/owners occupiers of odours in the area that may be from abnormal operation of the plant, seasonal effects, specific meteorological conditions not captured in the odour surveys undertaken.	Responses to the Community Odour Interview are presented in Appendix E of the Air Quality Assessment Report provided in Appendix F to this AEE, graphically presented in Figure 8.4 of Appendix F, and summarised in Section 8.3 of the Appendix F.

		In addition to the Community Odour Interview, a letter drop with brochures (same as those on the WDC website) was undertaken to neighbouring properties (brochures provided in Appendix K).		
Local Community	Local residents / businesses	Council News/Facebook posts informing people of the consent process and how to find more information.		
		New webpage for Consent on WDC website including online feedback form (Whangārei Wastewater Discharge Consent Renewal - Whangarei District Council (wdc.govt.nz)).		
		Online WWTP community survey undertaken between 6 April and 5 May.	<ul style="list-style-type: none"> • Approach to re-consenting of WWTP explained. • Clarification on which issues are considered most important. • Steps WDC should be taking to improve harbour water quality • Opportunity to receive updates. 	<ul style="list-style-type: none"> • 13 responses received. • Issue of most importance related to discharge quality of water to harbour and improving the health of the harbour. Sustainability (encouraging reuse), odour and plant location also identified. • Focus of responses appeared to be in relation to stormwater management, reducing stormwater inflow into the wastewater network. • Maintain or improve odour emissions from the plant.
		Flyer for local residents/businesses available at the library and community hubs.		
		Have your say feedback drop-in sessions held at the Whangarei Public Library on 29 October, 5 November, 12 November, 19 November, 26 November 2020.	Between 60 – 80 people attended these.	No formal feedback notes were taken.

In addition to the above, WDC request public notification of the application to ensure that any other potentially affected party can participate in the process.

8.2 Issues raised and WDC response

In response to feedback received, WDC propose to:

- Continue working with Mana Whenua to understand and give effect to their cultural values and aspirations through working in partnership to develop a CIA and broader catchment Mātauranga Māori monitoring. Due to timing of its development the CIA will be provided as supplementary information to this consent application and inform future reviews of the Adaptive Management Plan and related documentation.
- Continue to engage with Mana Whenua and other key stakeholders (including the wider public when necessary) throughout the term of the consent as part of the adaptive pathway planning approach being proposed. WDC propose to establish a liaison group, comprising of key stakeholder representatives and mana whenua whom will be regularly informed of progress against the consent (including reporting of monitoring undertaken) and the Adaptive Management Plan. Any significant upgrades or alternative disposal options required in future are envisaged to trigger wider consultation needs which would likely to be carried out in line with Councils LTP processes.
- Legislation requirements pertaining to Emerging Contaminants will be monitored over the term of the consent. The use of an Adaptive Pathway Planning approach provides the flexibility to manage emerging contaminants as improved knowledge of their impacts is gained through adoption of new limits and monitoring requirements as part of the proposed Adaptive Management Plan review process.
- Based on the findings of the Air quality assessment (refer to Appendix F) and in response to feedback received through the community interview and other consultation initiatives, some minor operational improvements have been proposed on-site alongside a review to be undertaken on the operations of the equalization basin in conjunction with six monthly independent odour surveys. The results of the odour surveys, incidents and complaints reported will be reviewed on an annual basis to inform recommendations for odour management. As part of developing the procedures for the odour surveys, WDC propose to include the Papakainga land into the survey area.

9. Proposed consent conditions

The proposed consent conditions have been developed to provide flexibility and adaptability for effective management of the WWTP in the future, and to ultimately monitor and control the effects the WWTP may have in an efficient manner.

9.1 General Conditions

1. The Whangārei wastewater treatment and disposal system shall be generally designed, built, operated and maintained in accordance with the documents submitted in support of the application, including;
 - a. the document titled “*Whangārei Wastewater Treatment Plant Discharges - Resource Consent Applications and Assessment of Effects on the Environment*”, dated December 2021 and its appendices.
 - b. the document titled “*Whangārei WWTP Consenting – Master Plan Report*”, Revision 1 final draft dated October 2021 (hereafter referred to as “the Master Plan”) and any future revisions as required by Condition 10.

and subject to the conditions of this resource consent. If there are any differences or apparent conflict between these documents and any conditions of this consent, then the conditions of consent shall prevail.

NOTE: We have specifically listed the ‘Master Plan’ here as it does not sit within the suite of Management Plans prescribed in Table 1 but will be informed by the Adaptive Management Plan and will require continuous review as prescribed in Condition 13.

Management Plans

2. Within six months of the granting of consent the Consent Holder shall have prepared the Management Plans listed in Table 1. The Management Plans shall give effect to **Schedule 1 (attached)**. All Management Plans listed in Table 1 are to be prepared by a suitably qualified and experienced person with expertise in the matters that the individual Management Plan is to address. The Management Plans, and any subsequent reviews, shall be provided to the Northland Regional Council’s Consents Manager or their successor or nominee (hereafter referred to as “the Manager”) within 1 month of finalisation. The consents shall thereafter be exercised in conformance with the approved Management Plans.

Table 1 Management Plans

Management Plan
Operations and Maintenance Management Plan
Odour Management Plan
Wastewater Irrigation Management Plan
Adaptive Management Plan

NOTE: It is envisaged at this time that the Odour Management Plan and Wastewater Irrigation Management Plan will form sub-plans to the Operations and Maintenance Management Plan, whilst the Adaptive Management Plan will remain a stand-alone Plan to the Operations and Maintenance Management Plan.

Liaison Group

3. The Consent Holder shall, by providing reasonable organisational and administrative support for the duration of these consents, facilitate the development and on-going role of a Wastewater Liaison Group (hereafter referred to as the “Liaison Group”). The membership of the Liaison Group shall comprise a representative (subject to their agreement) of:
 - Tangata whenua representatives.
 - Northland District Health Board.
 - Department of Conservation, Whangārei.

- Royal Forest and Bird Protection Society of NZ.
- Fish and Game.

The membership of this Group may be varied over the term of the consents, as agreed by the Consent Holder, the Liaison Group and the Manager.

The role and functions of this Group shall be defined in a Liaison Group Terms of Reference developed by the Consent Holder and agreed to by the Liaison Group Members at least six months following the granting of consent. The role of the group shall include, but not be limited to:

- Receiving and discussing with the Consent Holder, the results of the annual compliance reporting required by Condition 6.
 - Receiving from the Consent Holder periodic updates on, and providing input into, the on-going development and implementation of the Adaptive Management Plan including associated Monitoring Plans, the Operations and Maintenance Management Plan, and the Master Plan review required by Condition 2, Schedule 1 and Condition 10.
- The Consent Holder shall update the Liaison Group via a meeting or other means at least annually, and on other occasions when significant milestones associated with the implementation of the Whangarei Wastewater Scheme are reached. The meeting shall be held at a time convenient for the majority of members of the Liaison Group and minutes prepared documenting outcomes and/or actions from the meeting.

NOTE: It is envisaged that the Liaison Group will where necessary be required to input into any future reviews of the Master Plan and thus pathway planning options. Wider community engagement on the Master Plan pathway plans will be undertaken as part of the LTCCP process and therefore the Master Plan review frequency has been proposed to align with this process as prescribed in Condition 10.

Monitoring and Reporting

- The Consent Holder shall monitor these consents in accordance with the requirements set out in the Management Plans required by Condition 2 and Schedule 1 and implement such monitoring within six months of the granting of this consent.

Note – The monitoring to be prescribed in the Management Plans is to include monitoring of the flows and quality from the wastewater treatment plant both pre and post wetlands, monitoring of the receiving water environment, odour monitoring, monitoring of population projections, general monitoring of general operational and maintenance procedures where necessary to ensure the intent of these consents is met.

- The Consent Holder shall report in writing to the Manager annually, and present via a meeting or other means at least annually, and on other occasions when significant milestones associated with the implementation of the Whangarei Wastewater Scheme are reached, the results of the following:
 - Monitoring and records required by the suite of Management Plans prescribed in Condition 2, Schedule 1 assessing compliance with these consents.
 - Incidents and complaints logged as required by condition 9,
 - Reporting of any monitoring recommendations or trigger exceedances that warrant validation and a description of the actions to be taken including timeframes.
 - Progress reporting of the adaptive management plan implementation to show the intent of the adaptive management approach is being achieved.

The first annual report shall be provided to the Manager 20 months following consent commencement and every year thereafter on the same month.

Note – The initial 20 month reporting timeframe allows for 6 months of management and monitoring plan development and implementation of the baseline monitoring followed by 12 months of intensive monitoring followed by a further two months of annual report preparation.

- The records required by Conditions 6 and 33 shall be in an electronic format that has been agreed to by the Manager. In addition, a copy of the records shall be forwarded immediately to the Manager on written request.
- The Consent Holder shall, for the purposes of adequately monitoring these consents, as required under Section 35 of the Resource Management Act 1991, on becoming aware of any incident or situation that does not comply with this consent:

- a. Immediately take such action, or execute such work as may be necessary, to stop and/or remedy the situation;
- b. Immediately notify the Northland Regional Council, by telephone of the incident or situation;
- c. Take all reasonable steps to remedy or mitigate any adverse effects on the environment resulting from the incident or situation; and
- d. Report to the Northland Regional Council in writing within one week detailing the nature of the non-compliance and the steps taken or being taken to effectively mitigate the effects on the environment and public health, and control or prevent similar non-compliances in future.

Advice Note: With regard to telephone notification, during the Northland Regional Council's opening hours, the assigned monitoring officer for these consents should be contacted. If that person cannot be spoken to directly, or it is outside of the Northland Regional Council's opening hours, then the Environmental Hotline should be contacted on 0800 504 639.

Complaints Register

9. The Consent Holder shall maintain records of all complaints relating to the exercise of these consents received by the Consent Holder as detailed below:
 - a. The name and address of the complainant, if provided;
 - b. The date and time the complaint is received;
 - c. The duration of the alleged event that gave rise to the complaint;
 - d. The location from which the complaint arose, if provided by the complainant;
 - e. The weather conditions prevailing at the time;
 - f. Any events in the management of any processes that may have given rise to the complaint;
 - g. In relation to (f), any actions taken by the Consent Holder to minimise any possible cause of the complaint.

Review

10. The Consent Holder shall submit to the Manager, a review of the Master Plan referred to in Condition 1, within two years of the granting of consent and thereafter at six yearly intervals, for the duration of the consents, or in the event particular drivers for change trigger the need for a Master Plan review. The revised Master Plan shall be made available to all members of the Liaison Group within one month of it being submitted to the Manager. The scope of the Review shall address those matters set out in the Adaptive Management Plan prescribed in Schedule 1(4).

Note – the intent here is to ensure the Master Plan is updated and the outputs from it are captured in the next LTCCP process commencing 2023/2024, and future review is then aligned with future LTCCP reviews as well as the Ruakaka WWTP consent review conditions.

11. The Northland Regional Council may, in accordance with Section 128 of the Resource Management Act 1991, serve notice on the Consent Holder of its intention to review the conditions of these consents annually during the month of June, for the following purposes:
 - a. To provide for compliance with rules relating to minimum standards of water quality or air quality in any regional plan and/or any relevant environmental standards that has been made operative since the commencement of the consent; or
 - b. To deal with any inadequacies or inconsistencies the Northland Regional Council considers there to be in the conditions of consent following the establishment of the activity the subject of the consent.
 - c. To deal with any inaccuracies in the information made available with the application that materially influenced the decision on the application and where the effects of the exercise of consent are such that it is necessary to apply more appropriate conditions.
 - d. To deal with any adverse effects on the environment that may arise from the exercise of the consent following assessment of the results of the monitoring of the consent and/or as a result of the Northland Regional Council's monitoring of the state of the environment in the area.
 - e. To require the adoption of the best practicable option to remove or reduce any adverse effect on the environment.

9.2 Wastewater discharge to land (via wetland seepage) and the coastal marine area (Limeburners (Hāhā) Creek) and associated discharge of contaminants (odour) to air

Wastewater Discharge Standards

12. The treated wastewater discharge to Limeburners (Hāhā) Creek shall not exceed a maximum wet weather volume of 140,000 cubic metres per day. Compliance with this condition shall be determined in accordance with the monitoring requirements prescribed in the Operations and Maintenance Plan in Schedule 1.

Ongoing efforts by WDC in network renewal and capacity of pump stations informed through continuous network monitoring and modelling is expected to result in peak wet weather flows being discharged from the plant not exceeding 140,000 m³/d. Any reporting on network improvements and subsequent inflow and infiltration flow reductions will be addressed through WDC's forthcoming wastewater network consent.

13. Within six months of the granting of the consent and for a minimum period of 12 months and a maximum period of 18 months, the quality of the treated wastewater, receiving water and sediment environment shall be monitored for the parameters and at the locations prescribed in Table 2 and shall be monitored against those trigger values prescribed in the Receiving Environment Monitoring Plan required by Condition 2 and Schedule 1(4)(b)(i).

Table 2 Baseline Monitoring Locations and Metrics

Driver	Location	Medium (compliance metric)	Metric
Water quality	Hātea River (appropriate location to be defined)	Water (maximum concentration)	Total Nitrogen
			Inorganic Nitrogen
			Total Phosphorous
			TSS
			Chlorophyll-a
	WWTP Wetland discharge	Water (upper quartile mass or upper quartile concentration)	Total nitrogen
Ecotoxicity	Limeburners (Hāhā) Creek	Water (maximum concentration)	Ammonia
		Sediment (maximum concentration)	Heavy metals (maximum concentration)
	Hātea River	Water (max concentration)	Ammonia
		Sediment (maximum concentration)	Heavy metals (maximum concentration)
Public health risk	Hātea River	Water	Enterococci (annual 95 th percentile)
	Upper Harbour	Water	Enterococci (95 th percentile during swimming season)
			Faecal Coliform (median and no more than 10%)

14. Within two years of the granting of the consent and based on the results of the baseline monitoring to be carried out in accordance with Condition 13, a long-term monitoring program and long-term trigger values shall be developed and incorporated into the Receiving Environment Monitoring Plan and implemented.

Note: - the logic for the above baseline monitoring locations and parameters in Table 2 is given in the Water Quality and Public Health assessment provided in Appendix E to this AEE. The baseline

monitoring is proposed to be carried out for a minimum of 12 months, but is authorized to continue for a further 6 months to allow sufficient time for the development of long-term triggers and a long-term monitoring program that will then be implemented within 2 years of the granting of consent to assess future compliance (in which the monitoring locations and parameters to monitor may differ to those prescribed above). The triggers and monitoring program methodology will sit within the Receiving Environment Management Plan, a sub-plan to the Adaptive Management Plan as detailed in Schedule 1.

15. The discharge of treated wastewater authorised by this consent (including seepage from the wetlands to ground) shall not cause any of the following effects beyond the Limeburners (Hāhā) Creek designated mixing zone for major discharges:
 - a. The production of conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - b. Any conspicuous changes in colour or visual clarity;
 - c. Any emission of objectionable odour as identified by a suitably trained and experienced Enforcement officer of the Northland Regional Council, or its agent; or
 - d. Any significant adverse effects on aquatic life.
16. The Consent Holder shall notify the Northland District Health Board, of any disruption to the disinfection system that results in the performance of the system required in the Operations and Maintenance Plan not being achieved for a period greater than 30 minutes.

Emergency Bypass Discharge to the Coastal Marine Area

17. The Consent Holder shall discharge treated wastewater directly to the Coastal Marine Area (Limeburners (Hāhā) Creek) via the existing Emergency Bypass Outlet only in events where flows to the wetland system are not practical.
18. An Emergency Bypass Discharge into Limeburners (Hāhā) Creek shall not give rise to all or any of the effects in the receiving waters at the Northland Regional Council Sampling Site Number 100207 prescribed in Condition 15.
19. The Consent Holder shall immediately notify the Northland Regional Council of all Emergency Bypass Discharges from the treatment plant directly into Limeburners (Hāhā) Creek. Such advice shall also be confirmed in writing as soon as practicable and no later than 48 hours after the event.
20. The Consent Holder shall record the date, start and finish times, the volume of wastewater discharged, for all Emergency Bypass Discharge events. This information shall be forwarded to the Northland Regional Council and Northland District Health Board within 24 hours of the discharge ceasing.

Note – As discussed in Section 2.3 of the AEE, conditions 17 – 20 have been proposed to cover off those events where discharge to the wetlands is not able to occur and thus a manual opening of the bypass valve will be required. To date since the bypass valve was installed, this outlet has not been used.

Discharge of contaminants to air

21. The Consent Holder's operation shall not give rise to any discharge of contaminants at or beyond the property boundary which is deemed by a suitably trained and experienced Enforcement Officer of the Northland Regional Council to be noxious, dangerous, offensive or objectionable to such an extent that it has, or is likely to have, a more than minor adverse effect on the environment.

For the purposes of this condition, contaminants include but are not limited to, dust, and odour. In addition, for the purposes of this condition, the "property boundary" shall be drawn at the boundary of:

- a. The treatment plant property, this being Pt Lot 1 DP50540, Lot 1 DP96770, Lots 3 and 5 DP96772 and Pt Lot 1 and Lot 2 DP65087; and/or
- b. Any other properties, or parts thereof, in the vicinity of the treatment plant property which are either owned by, or under the control of, the Consent Holder; and/or
- c. Any other properties over which the Consent Holder has obtained legal rights to emit or discharge contaminants to air by the grant of either an easement, covenant, or other legal instrument either currently registered, or at some future date registered, against the title of such other properties.

The Consent Holder shall forward copies of any easements, covenants or other legal instruments referred to in sub-clause (c) above, when they are legally established to the Northland Regional Council with 20 working days of their establishment.

Note – Figure 9 of this AEE illustrates the current “property boundary”.

22. Independent odour surveys shall be undertaken on a six monthly basis ensuring that one of these surveys is conducted in the summer months, with the first of such surveys to be undertaken six months from the granting of the consent. The odour surveys are to be undertaken in accordance with the procedures prescribed in the Adaptive Management Plan required by Condition 2 and Schedule 1(4)(b)(ii).

9.3 Occupation and Use of Coastal Space by the Emergency Bypass Outfall

23. The occupation of the Coastal Marine Area of Limeburners (Hāhā) Creek shall be limited to the physical space of the emergency bypass outfall structure.
24. The use of the outfall structure shall be limited to the discharge of treated wastewater from the Whangārei Wastewater Treatment Plant in accordance with Condition 17.
25. The outlet structure shall effectively dissipate the energy of the discharge to prevent scouring of the downstream channel or watercourse. The Consent Holder shall maintain the outlet structure in good order.

9.4 Discharge of tertiary treated wastewater to land and associated discharge of contaminants (odour) to air

26. The Consent Holder shall only use tertiary treated wastewater from the Whangārei Wastewater Treatment Plant for the irrigation of Council owned garden beds, trees and closed sports fields for the purpose of re-establishing vegetation on the fields during periods when water restrictions are implemented by Whangārei District Council.
27. The Consent Holder shall advise the Manager in writing of the proposed date that these consents will be exercised for the first time each year at least 24 hours beforehand.
28. The concentration of faecal coliforms in the treated wastewater, as measured in any sample collected prior to it being used for irrigation purposes, shall not exceed 1000 cfu per 100 millilitres.
29. The Consent Holder shall ensure the public is restricted access from sports fields during irrigation activities and the fields shall remain closed until the surface of the irrigated area is dry. As a minimum, prominent signage shall be placed prior to the commencement of irrigation.
30. No treated wastewater shall be discharged to land within:
 - a. 20 metres of any property boundary (not owned by the Consent Holder); or
 - b. 15 metres of the coastal marine area (excluding natural wetlands); or
 - c. 15 metres of a river, lake, stream, or pond (excluding natural wetlands); or
 - d. 5 metres of any identified stormwater flow paths.
31. The method of application of treated wastewater to garden beds, trees and closed sports fields shall be managed in accordance with those procedures prescribed in the Wastewater Irrigation Management Plan prescribed in Condition 2 and Schedule 1(3).
32. The Consent Holder's operations shall not give rise to any contaminants including spray drift from irrigation of treated wastewater beyond the Consent Holder's property boundaries that are deemed by the Manager to be noxious, dangerous, offensive or objectionable.
33. The Consent Holder shall report to the Manager, monthly by the 15th of the following month, the results of the monitoring required by the Wastewater Irrigation Management Plan, or within 24 hours of receipt of results indicating non-compliance with a condition of consent.
34. The Consent Holder shall notify the Manager in writing of any proposed change(s) to the operation or processes that may change the nature or quantity of contaminants discharged at least 72 hours prior to the proposed change(s) occurring.

Advice Note: If the proposed alteration may result in adverse effects that are greater than those authorised by this consent, or the change is outside the scope of what was applied for, then either a change to the conditions of this consent under Section 127 of the Resource Management Act, or a new consent would need to be obtained.

9.5 Schedule 1 – Management Plans

Operations and Maintenance Management Plan

1. The Consent Holder shall prepare an Operations and Maintenance Management Plan which shall meet the following outcomes:
 - a. Demonstrate how the wastewater treatment system is to be operated and maintained to ensure compliance with the conditions of these consents.
 - b. The Operations and Maintenance Management Plan shall include (but is not limited to) the following details:
 - i. A description of the entire wastewater treatment plant and sampling points;
 - ii. A monitoring programme describing the methods used to monitor the wastewater treatment plant operation and performance, including (but not limited to):
 - A. inflow and outflow daily volumes.
 - B. influent and effluent monitoring.
 - C. performance of the disinfection treatment system and monitoring of the discharge.
 - D. Sampling and analytical methods to be used.
 - E. Meter accuracy and calibration requirements including record keeping.
 - iii. Specific management procedures for ensuring the efficient functioning of the wastewater treatment system.
 - iv. A description of routine maintenance procedures to be undertaken to ensure compliance with these consents.
 - v. Procedures for recording routine maintenance and all repairs undertaken.
 - vi. Contingency and emergency planning procedures including identification of risks and incidences and any remedial actions necessary.
 - vii. The details of the system upset/failure and complaints procedure, record keeping, response procedure and notification procedure to the Manager.
 - viii. Specific operational checks and procedures for responding to any exceedance of the trigger values prescribed in the Adaptive Management Plan.
 - ix. Identification of key personnel and their responsibilities for the implementation of the Operations and Management Plan.
 - x. The details of employee training in relation to the wastewater treatment system operation and maintenance procedures.
 - xi. Other actions necessary to comply with the conditions of this resource consent.
 - xii. Procedures for improving and/or reviewing the Operations and Management Plan.
 - c. The Plan shall be reviewed by the Consent Holder and submitted to the Manager within two years of the granting of consent and thereafter at six yearly intervals for the duration of the consents. The Consent Holder may also amend the Plan at any time a particular driver(s) for change trigger the need for a Operations and Management Plan review and/or prior to commissioning any upgrades to the wastewater treatment and disposal scheme. If any changes are made to the Plan, then a copy of the amended plan shall be forwarded to the Manager, prior to it being made operative.

Odour Management Plan

2. The Consent Holder shall prepare an Odour Management Plan which shall meet the following outcomes:

- a. Demonstrate how the wastewater treatment system is to be operated and maintained to avoid, remedy or mitigate potential odours arising from the wastewater treatment system and to ensure compliance with the conditions of these consents.
- b. The Odour Management Plan shall include (but is not limited to) the following details:
 - i. The details of the operating and maintenance regimes and controls required to control odour including inspection, monitoring, maintenance and housekeeping procedures.
 - ii. Contingency and emergency planning procedures including identification of risks and incidences and any remedial actions necessary.
 - iii. The details of the odour upset and odour complaints procedure, record keeping, response procedure and notification procedure to the Manager.
 - iv. Identification of key personnel and their responsibilities for the implementation of the Odour Management Plan.
 - v. The details of employee training in relation to odour remediation or mitigation procedures.
 - vi. Procedures for improving and/or reviewing the Odour Management Plan.
- c. The Plan shall be reviewed by the Consent Holder and submitted to the Manager within two years of the granting of consent and thereafter at six yearly intervals for the duration of the consents. The Consent Holder may also amend the Plan at any time a particular driver(s) for change trigger the need for operational odour management review and/or prior to commissioning any upgrades to the wastewater treatment and disposal scheme. If any changes are made to the Plan, then a copy of the amended plan shall be forwarded to the Manager prior to it being made operative.

Wastewater Irrigation Management Plan

3. The Consent Holder shall prepare a Wastewater Irrigation Management Plan which shall meet the following outcomes:
 - a. Demonstrate how the reuse of treated wastewater to land is to be managed to avoid, remedy or mitigate potential environmental effects, public health risk and odours arising and to ensure compliance with the conditions of these consents.
 - b. The Wastewater Irrigation Management Plan shall include (but is not limited to) the following details:
 - i. The proposed irrigation schedule including proposed dates and locations.
 - ii. Staff responsibilities for managing the application of wastewater to land.
 - iii. A map of each irrigation area including exclusion zones required by Condition 30.
 - iv. A monitoring programme describing the methods used to monitor the land application of treated wastewater, including (but not limited to):
 - A. discharge daily volumes, area and location of irrigation, and estimated volume of wastewater irrigated to each area.
 - B. Monitoring of the treated wastewater.
 - C. Sampling and analytical methods to be used to ensure that the specified accuracy is maintained and records kept to ensure quality assurance measures are met.
 - v. The operational irrigation management processes and procedures to be used to meet the requirements of this consent, including:
 - A. the level of treatment required.
 - B. methods and procedures of application to be used.
 - C. monitoring.
 - vi. Procedures on record keeping and reporting non-compliance; and
 - vii. Procedures to prevent the emission of objectionable odours.
 - viii. Procedures for improving and/or reviewing the Wastewater Irrigation Management Plan.
 - c. The Plan shall be reviewed by the Consent Holder and submitted to the Manager annually prior to commencing the discharge of treated wastewater to land. If any changes are made to the Plan, then a copy of the amended plan shall be forwarded to the Manager, prior to it being made operative.

Adaptive Management Plan

4. The Consent Holder shall prepare an Adaptive Management Plan which shall meet the following outcomes:
 - a. Demonstrate how the adaptive pathway planning approach is to be implemented to ensure no further degradation of the receiving environments results from the operation of the wastewater treatment system and to ensure compliance with the conditions of these consents.
 - b. The Adaptive Management Plan shall include (but is not limited to) the following details:
 - i. A Receiving Water Environment Monitoring Plan which shall include (but is not limited to) the following details:
 - A. Sampling and analytical methods to be applied including location of sampling points, equipment to be used, method of data collection and analysis, and chain of custody procedures;
 - B. Trigger values for parameters to be monitored in accordance with Condition 13 or other parameters identified as necessary through review;
 - C. Decision making procedures on the actions required to address trigger value exceedances or recommendations made in the annual receiving water environment monitoring reporting.
 - D. Roles and responsibilities of key personnel required to implement the Receiving Water Environment Monitoring Plan; and,
 - E. Procedure for review of the Receiving Water Environment Monitoring Plan.
 - ii. An Odour Monitoring Plan that shall include (but is not limited to) the following details:
 - A. A procedure for 6 monthly independent odour surveys and associated annual reporting in line with a review of the complaints log and using supporting meteorological data from the closest Automated Weather Station to the site (Kioreroa Road Met Station).
 - B. Decision making procedures on the actions required to address recommendations made in the annual independent odour monitoring reporting.
 - C. Roles and responsibilities of key personnel required to implement the Odour Monitoring Plan; and,
 - D. Procedure for review of the Odour Monitoring Plan.
 - iii. Procedure and scope for review of the Master Plan that shall include (but is not limited to) the following considerations:
 - A. A review of the rate and extent of land use development and wastewater flows (volumes) and key contaminant loads over the period since either lodgement of the AEE (December 2021) or the previous review, and the future projections at that review time through to the end of the most distant expiry date of the consents.
 - B. An update on the on-going development and implementation of the Whangarei Wastewater Strategy ("Adaptive Pathways Plan, Adaptive Management Plan and Master Plan").
 - C. Assessment of the need, justification and cost effectiveness for major components of future upgrades of the Whangārei Wastewater Treatment Plant.
 - D. Summary of ongoing compliance with the requirements of these resource consents (based on the annual reporting) and any reported non-compliance with consent conditions (this would include an assessment of compliance/consistency with any relevant national, or regional water quality policies, standards or guidelines in effect at the time).
 - E. A summary of any major upgrades made to the wastewater reticulation, treatment or discharge system since the commencement of consent that are likely to have an effect on the exercise of the consents.
 - F. A summary of current technological knowledge in relation to wastewater management, treatment, disposal and beneficial re-use technologies that are relevant to the Whangarei Wastewater Scheme.
 - G. A summary of known advancements in the knowledge regarding the presence, monitoring, treatment and environmental effects of contaminants of emerging concern that are relevant to the Whangārei Wastewater Treatment Plant.

- H. An evaluation of opportunities for land discharge, reuse and recycling of treated wastewater, and shall implement these opportunities if they are reasonably practicable and affordable in the opinion of the Consent Holder.
- iv. Procedure for notifying the Manager of an upgrade to the treatment and/or discharge system and regular progress reporting of the construction and commissioning.
- v. Description of the role and function of the Liaison Group and procedures for notification, reporting and engagement with the Group as part of Adaptive Management process.
- vi. Identification of key personnel and their responsibilities for the implementation of the Adaptive Management Plan.
- vii. Procedures for improving and/or reviewing the Adaptive Management Plan.
- c. The Plan shall be reviewed by the Consent Holder and submitted to the Manager within two years of the granting of consent and thereafter at six yearly intervals for the duration of the consents. The Consent Holder may also amend the Plan at any time a particular driver(s) for change trigger the need for an Adaptive Management Plan review. If any changes are made to the Plan, then a copy of the amended plan shall be forwarded to the Manager, prior to it being made operative.

Note – It is intended that the initial version of the Receiving Environment Monitoring Plan will contain those preliminary trigger values as prescribed in the Water Quality and Public Health Risk Assessment report provided in Appendix E of this AEE and that following a minimum of 12 months of baseline monitoring, these trigger values will be reviewed and long-term trigger values proposed to replace the preliminary trigger values if necessary. It is also proposed to align the review of the O&M Plan and AMP with the Master Plan as the documents should talk to each other and which are to align with the LTCCP process.

10. Conclusion

Pursuant to Section 88 of the RMA (1991), WDC is seeking discharge consents to land, air and the coastal marine area, including to natural wetlands, and the use and occupation of a structure within the coastal marine area, in relation to the activities carried out at the Whangārei WWTP and the reuse of treated wastewater onto Council owned gardens, trees and closed sports fields in accordance with sections 12 (2) and (3), and 15 (1) of the RMA.

To accommodate for uncertainty over the Whangārei WWTP's planning horizon, with regards to changing regulations, future growth, climate change outcomes, and future community demands/desires, WDC have taken an Adaptive Pathway Planning approach to decision making of upgrade options. Managing risk and the need to accommodate change over time is proposed to be managed via a robust system and environmental monitoring, and a more comprehensive review and engagement process than previously adopted.

The Adaptive Pathway Planning approach proposes over the short-medium term to:

- Undertake “augmentation works” (the planning phase of which is underway) based on augmenting the existing process to increase plant capacity in the short-term, improve plant performance and resilience to meet existing consent discharge limits with particular focus on addressing elevated ammonia, E.coli and suspended solids observed at times and improved management of odour. No major changes to the process are proposed at this stage of works.
- Several studies and Master Plan review(s) before pursuing Pathway 1b (retains the existing plant configuration with a larger bioreactor) or 1d (involves construction of a side-stream Membrane bioreactor (MBR) process for blending final effluent), or other pathway(s), if determined appropriate through review for future plant expansion. .
- Implementation of a 12 month comprehensive baseline monitoring programme of the WWTP discharges and receiving water environment to support the development of long-term trigger values and a long-term monitoring programme, to ensure no further degradation of the upper harbour water quality occurs as a result of the WWTP operations, in line with the intent of the PRPN.
- Implementation of six monthly odour surveys and annual recommendation reporting to ensure no deterioration of air quality occurs as a result of the WWTP operations in line with the intent of the PRPN
- Development of a suite of Management Plans and supporting Monitoring Plans in line with the proposed conditions of consent, to give effect to the Adaptive Pathway Planning approach to managing the receiving environment with regular review of such plans over the term of consent.

This application has considered all relevant statutory and planning provisions. In addition, a detailed assessment of environmental effects based on monitoring data collected over the past two years by 4sight Consulting and 10 years of NRC's State of the Environment Monitoring, and a number of other supporting investigations has been prepared. The effects assessment has informed the Adaptive Pathway Planning approach and development of a suite of proposed consent conditions to ensure any potential effects on the receiving environment are appropriately mitigated and no further degradation of the receiving environment results from the proposed activity. Overall, the proposal to continue to discharge treated wastewater to land, water and air, and occupation of the coastal marine area with the bypass outfall is considered consistent with the objectives and policies of the NZCPS, NPS FW, NES FW, RPS and PRPN.

WDC requests that consents be granted for a 35 year duration, to enable WDC the certainty and security to protect its investment and which will include significant future planned upgrades within this proposed term of consent, and to ensure the successful implementation and outcomes of the Adaptive Pathway Planning approach which relies upon monitoring and responding to change over the long term.

As part of this application, WDC has undertaken extensive consultation with iwi (which continues as part of the CIA development), key stakeholders and the wider community. WDC acknowledges there is likely to be interest in the proposed activity and therefore has requested the application be publicly notified.

11. References

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- GHD (2021e) *Whangārei WWTP Consenting – Water quality and public health assessment*, Revision 2, Final, prepared for Whangārei District Council, October 2021.
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