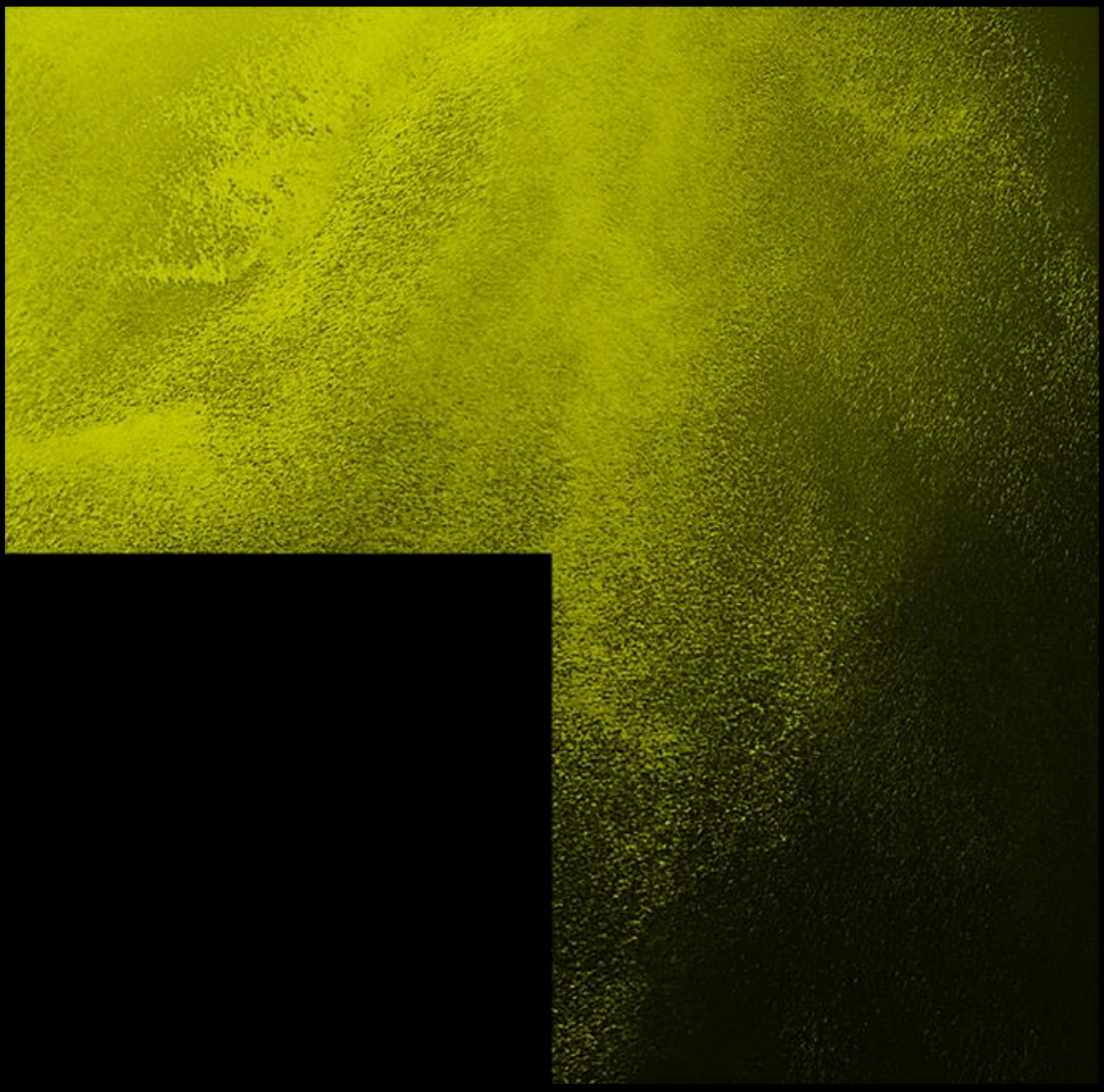
PLAN CHANGE 14 TO THE WAIPĀ DISTRICT PLAN - MANGAONE PRECINCT

C10 Industrial Growth Cell, Hautapu

Civil Infrastructure Assessment

Fonterra Limited



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APPENDICES

1.0 INTRODUCTION

1.1 PLAN CHANGE AREA LOCATION

This civil infrastructure assessment has been prepared to support proposed Plan Change 14 (PC14) to the operative Waipā District Plan to rezone a portion of the C10 Growth Cell at Hautapu from Rural to Industrial.

The total area being applied under PC14 is approximately 79.2 hectares (ha) within the Mangaone Precinct (hereafter referred to as the "PC14 area" in this report), comprising the following properties: Fonterra owned land (Lot 2 DP 529042) and the 'Kiwifruit Block' (made up of three lots: Section 1 SO 499872, Section 4 SO 499872 and Section 7 SO 499872) as shown in **Figure 1** below.

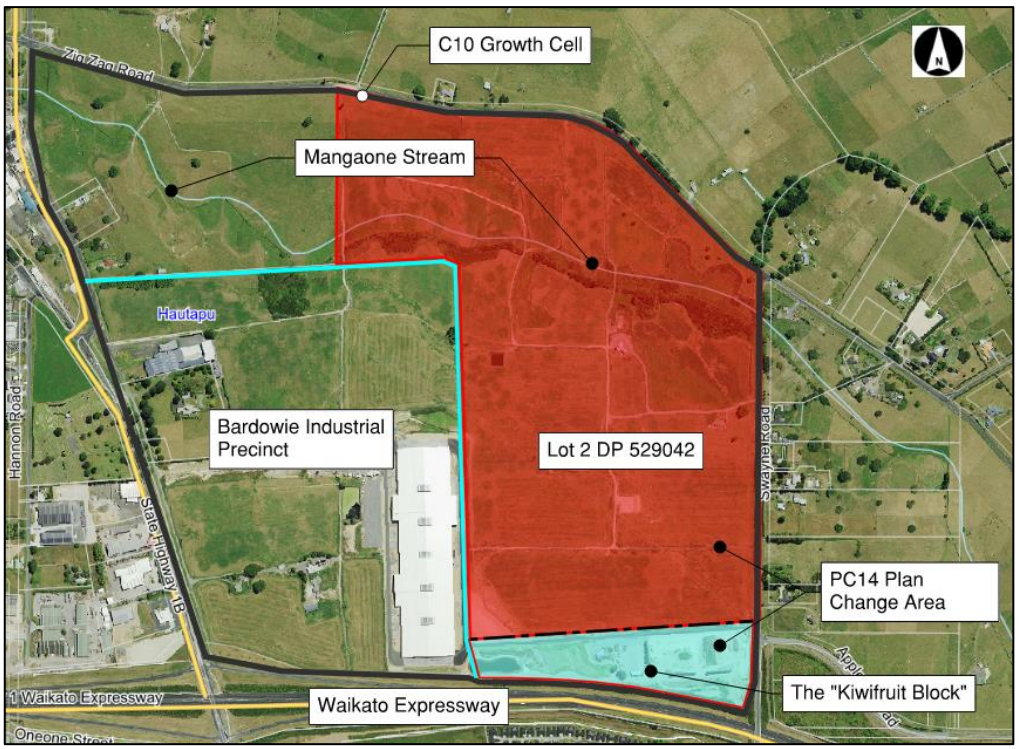

FIGURE 1 – MANGAONE PRECINCT (THE PC14 PLAN CHANGE AREA) INCLUDING THE "KIWIFRUIT BLOCK"

The PC14 area borders the Bardowie Industrial Precinct (BIP) to the west, Swayne Road to the east and Zig Zag Road to the north. The Mangaone Stream runs through the northern part of the site flowing east to west.

This Civil Infrastructure Assessment report only covers the servicing of Lot 2 DP 529042 shown in red in **Figure 1**, which has an area of 71.4ha and comprises the Mangaone Precinct Structure Plan area (hereafter referred to in this report as the "PC14 Structure Plan Area"). This assessment does not cover servicing of the Kiwifruit Block as identified in blue in **Figure 1** because this land is the subject of separate resource consents granted by Waipā District Council and it is being developed as an extension of the Bardowie Industrial Precinct to the west.

Figure 2 below shows the wider context of the PC14 area, which is located at Hautapu to the north of Cambridge. The Waikato Expressway borders the PC14 area along its southern boundary and Stage Highway 1B (Victoria Road) borders the C10 Growth Cell to the west.

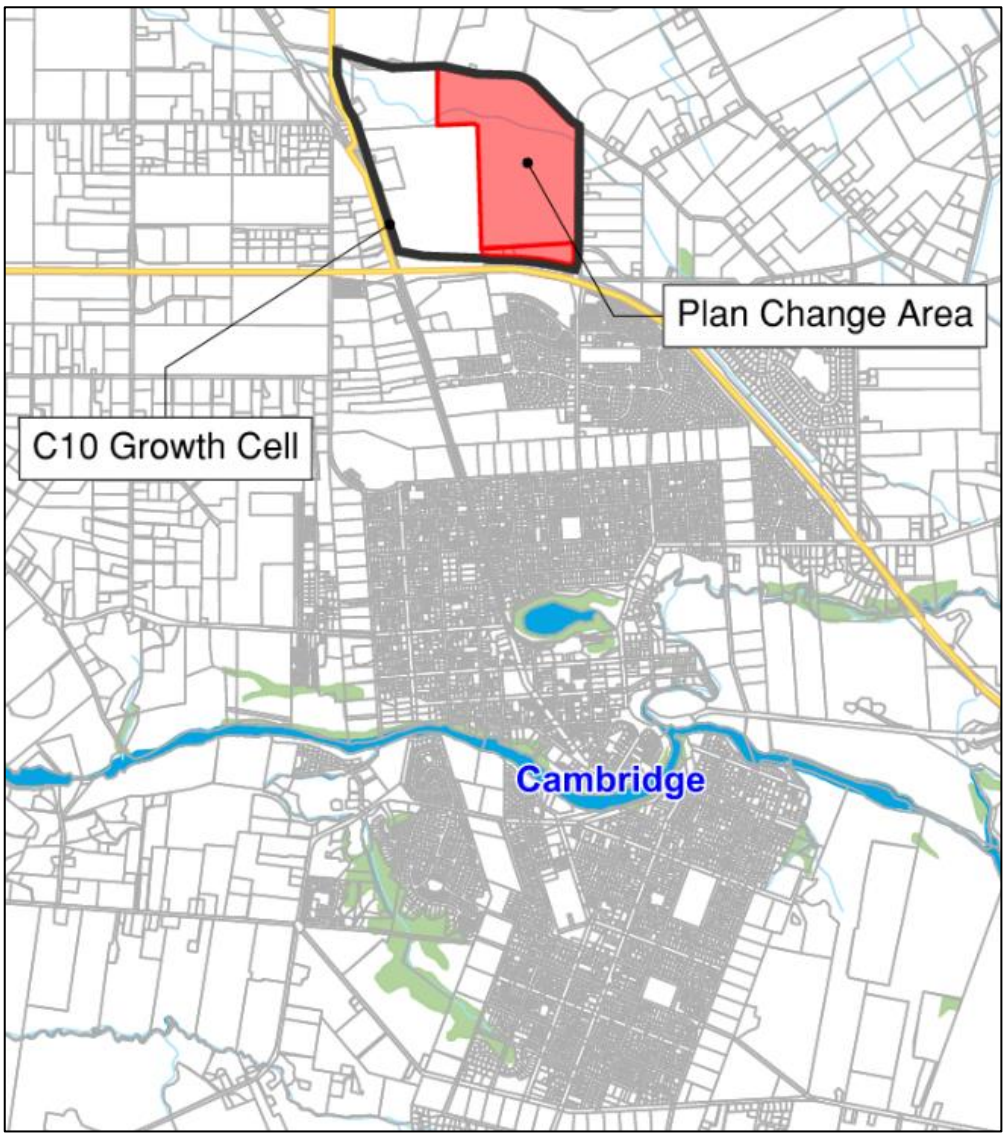

FIGURE 2 - PLAN CHANGE 14 AREA LOCATION

This assessment is based on a review of the available information on the PC14 Structure Plan Area, consultation with Waipā District Council, service providers and information commissioned and provided by the Fonterra Limited ("Fonterra", the Applicant).

The information has been obtained from the following sources:

- Waipā District Council (WDC) – website and GIS maps.
- Waikato Regional Council (WRC) – online GIS hazard maps.
- Review of Plan Change 11 design work carried out within the BIP.
- Waikato Local Shared Services Regional Infrastructure Technical Specifications (RITS).
- WRC Stormwater Management Guideline (TR2020/07).

- Information provided by the Applicant.
- Information provided from meetings with WDC staff.
- Information provided from McCaffrey and Cable Consultants, principal consultant for the BIP.
- Information provided in meeting with Sunjeet Singh, Waipā Networks (refer section 5.0 of this report).

This assessment covers stormwater reticulation, water supply, wastewater and power. It also highlights available infrastructure, constraints and possible solutions for the development of the PC14 Structure Plan Area as a primarily industrial development area.

Flood assessments and general stormwater management are addressed in a separate report[1].

1.2 PC14 STRUCTURE PLAN AREA OVERVIEW

The PC14 Structure Plan Area consists largely of grass paddocks with a few farm buildings. The portion to the south of the Mangaone Stream is relatively flat falling towards the stream with localised diagonal depressions. The stream is approximately 4m lower than the adjacent paddocks with a narrow stream bed and a wide floodplain with inland wetlands.

The northern portion of the PC14 Structure Plan Area is also generally flat falling towards the stream. There are large electricity pylons crossing the northeast corner of the PC14 Structure Plan Area.

The underlying soils within the southern portion are Hinuera Formation alluvial deposits comprising intermixed loose to medium-dense sands. From a review of the Geotechnical Report[2], the soils underlying the PC14 Structure Plan Area offer variable rates of soakage, ranging from zero to over 300 cm/hr. The two test sites in the northern portion of the property had zero drainage. The southern portion had numerous test results with good infiltration rates.

The Geotechnical Report also identified relatively shallow groundwater within the upper plateaus between 0.1m and 3.2m and expected an average of 1.2m below existing ground level.

2.0 STORMWATER MANAGEMENT

2.1 STORMWATER MANAGEMENT PROVISIONS (PERFORMANCE CRITERIA)

The RITS Table 4-5 categorises industrial zones as high contaminant load profile with downstream discharge to a natural stream.

Based on this, the following provisions in **Table 1** are drawn (including a revised rainfall runoff approach for estimating 100yr flows) and relate to the criteria that must be met to satisfy the relevant compliance documents.

[1] Hautapu PC14 – Growth Cell 10, Stormwater Management Plan (April 2024) prepared by Harrison Grierson
[2] Geotechnical Investigation for Proposed Private Plan Change at Fonterra Hautapu, 195 Swayne Road, Cambridge – Soil & Rock Consultants. Rev A, 1 September 2023

TABLE 1: STORMWATER MANAGEMENT PROVISIONS

STORM EVENT (ARI)	PROVISION	GUIDANCE
All events	First flush – pre-treatment.	Waikato Regional Stormwater Management Guideline (Technical Report 2020/07)
1/3 2yr	Water quality treatment.	RITS, Stormwater Management Devices: Design Guidelines Manual Auckland Regional Council, May 2003 (TP 10) and Waikato Regional Stormwater Management Guideline (Technical Report 2020/07)
2yr	Soakage Disposal up to 72hrs.	RITS
10yr	Primary drainage conveyance through the PC14 Structure Plan Area.	RITS
100yr	Secondary conveyance through the PC4 area – no people or property at risk.	RITS and Waikato Regional Stormwater Management Guideline (Technical Report 2020/07)
100yr	Attenuate to 80% of pre-development peak flow to the Mangaone Stream.	RITS and Waikato Regional Stormwater Management Guideline (Technical Report 2020/07)

2.2 STORMWATER DESIGN CONCEPT

A summary of the PC14 Structure Plan Area stormwater concept design follows, in accordance with the provisions in **Table 1**.

First flush events will be managed at the source via a series of pre-treatment devices prior to discharge to the secondary treatment device. Pre-treatment will improve the long-term performance of the secondary treatment devices by removing the coarse grain fragments and any large litter items. Examples of the pre-treatment devices expected to be utilised include catch pit inserts, grass filter strips, swales, raingardens, rainwater harvesting and basin forebays.

Water quality treatment (1/3 of 2yr rain event) will be required for developed industrial zones, carparks and road(s). Treatment can be provided by a range of options such as bio-retention, proprietary stormwater treatment devices or swale systems.

Stormwater flows up to the 10-year events will be piped from the lots to streetside grass or planted swales. These swales will provide pre-treatment of water quality flows from the roads and convey road and lot stormwater to end of line communal constructed wetland devices located along the banks of the Mangaone Stream floodplain.

The proposed constructed wetlands will be designed to treat the water quality flows from the full development. The devices will also be sized to provide extended detention to attenuate the peak flows to pre-development flows.

Total runoff volume from the 10yr Annual Recurrence Interval (ARI) event must be managed and accommodated within the plan change area so as to not impact on the WRC rural drainage scheme. This scheme has its own primary performance standard of

alleviating flooding of farmland in no more than 3 days from a 10yr storm event (Land Drainage Management Plan, Waikato Regional Council Policy Series 2019/14). Discharge from the PC14 Structure Plan Area may not adversely impact that objective.

Secondary flows up to the 100yr ARI event, including increased rainfall to account for climate change must be managed and conveyed within the PC14 Structure Plan Area so as to not put pedestrians, road users and property floor levels (meeting freeboard requirements of 300mm for industrial buildings as per NZS 4404) at risk. This requirement also covers New Zealand Building Code, E1 Surface Water, 50yr ARI design standard to protect buildings from flood inundation.

The 100-year stormwater runoff (increased to account of climate change) will be conveyed overland within road corridors and roadside swales to the constructed wetland devices.

100yr ARI peak flows (increased to account of climate change) must not exceed 80% of the existing 100yr peak flows to the Mangaone Stream unless the increased flood risk downstream can be managed to acceptable levels. Analysis will consider the existing environment along with the effect of the development downstream of the PC14 Structure Plan Area (this has been addressed in a separate report - Hautapu PC14 – Growth Cell 10, Stormwater Management Plan (April 2024) prepared by Harrison Grierson).

Development of the final stormwater solution will focus on the requirements of the PC14 Structure Plan Area and identify any opportunities to integrate stormwater assets with future development where practical. The preferred systems will be developed as the project progresses to resource consent stage and will likely include a “tool-box” approach for individual lot developers with systems that integrate into the greater development.

The stormwater management has been addressed in greater detail in the Hautapu PC14 – Growth Cell 10, Stormwater Management Plan (April 2024) prepared by Harrison Grierson Consultants Limited.

2.3 STORMWATER CONSTRAINTS

We have identified the following stormwater constraints that will require further investigation as part of the resource consent / building consent process for the PC14 Structure Plan Area:

- The lots, roads and swales will need to be designed to ensure overland flows are conveyed from the lots to the attenuation devices and ultimately the Mangaone Stream.
- Based on our preliminary landform design we believe the stormwater conveyance to the constructed wetlands can be achieved. The final size and location of the wetlands will be determined during the detailed design stage of the project.

3.0 WATER SUPPLY

3.1 EXISTING WATER NETWORK

The PC14 Structure Plan Area currently does not have any public water supply. The intention is that water will be supplied through the BIP water supply network.

Figure 3 below shows the existing water supply network. The bulk supply to the Hautapu reservoir is through the new 450mm diameter PE main along Victoria Road (SH1B). The reservoir, properties, and BIP are supplied by the 200mm diameter PVC pipes.

The BIP has a 150mm diameter connection to each of the 200mm diameter pipes in Victoria Road with a single 150mm diameter pipe on the southern side of the BIP access road suppling the Architectural Glass Products (AGP) Building within the BIP. This was installed as Stage 1 of the development. The AGP access road (Road 1, **Figure 3**) is currently under construction and includes extending the northern 150mm diameter pipe to the east. These pipes will service the properties on either side of Road 1.

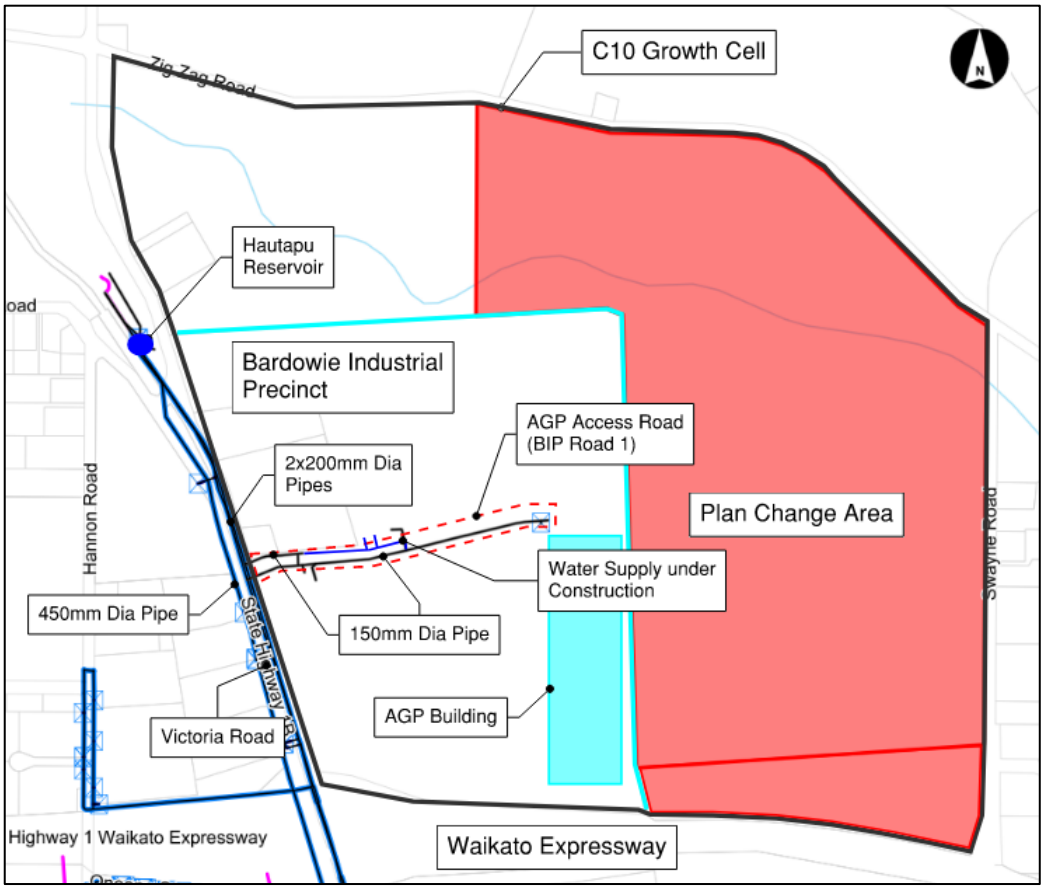

FIGURE 3 - EXISTING WATER SUPPLY NETWORK

The 450mm diameter bulk main on the western side of Victoria Road was installed in 2020 to meet the future demands of the C10 Growth Cell and northern Cambridge. There will be no bulk water supply issues for the PC14 Structure Plan Area.

The masterplan modelling carried out by HG for the BIP project included an allowance to supply 45.8ha of the PC14 Structure Plan Area (Area C in **Figure 4**). This allowance was for 62.4 l/s which includes peak flows (refer to **Figure 5**) and firefighting supply to FW3 (Fire water classification number 3, as per Table 2 of the Standards New Zealand Publicly Available Specification 4509:2008) level of service.

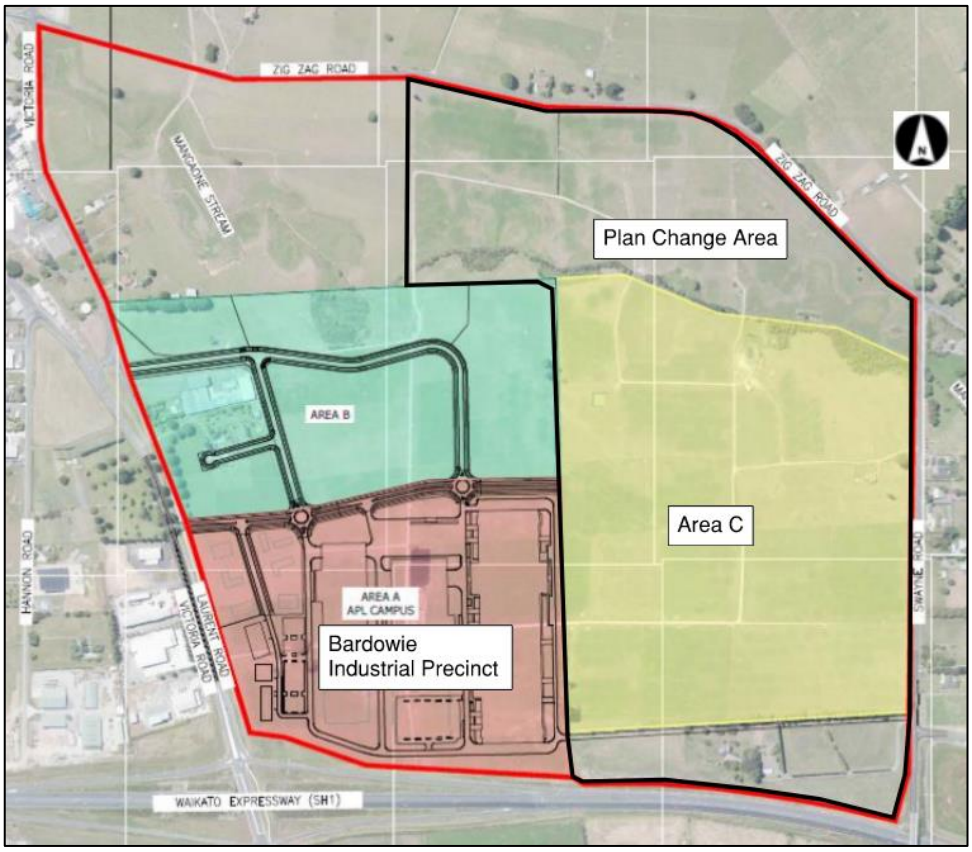

FIGURE 4 - PLAN CHANGE 11 MASTERPLAN ZONES

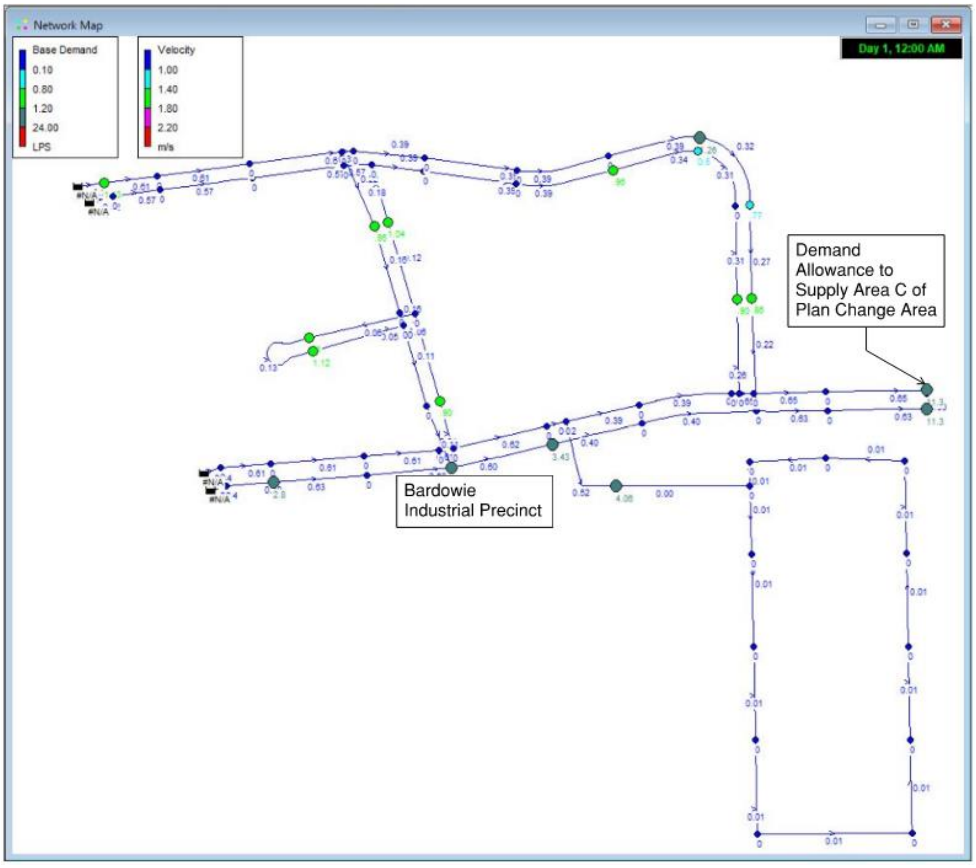

FIGURE 5 - PLAN CHANGE 11 EPANET MODELLING (BIP ZONE ONLY)

3.2 DESIGN FLOWS

The design flows have been calculated using the RITS requirements for Industrial zones with one amendment. The population density has been reduced to 30 people/ha to align with Beca Hautapu Industrial Structure Plan (2017) document.

In essence the following parameters have been applied:

- 260 litres per person per day.
- 30 people per hectare.[3]
- A peaking factor of five is applied over the total area for On Demand Supply.
- FW3 fire supply for the public domain development. The fire flow is applied on top of 60% of the peak day peak flowrate as recommended in New Zealand Fire Service Firefighting Water Supplies Code of Practice SNZ, PAS 4509:2008.

The PC14 Structure Plan Area has been split into three zones based on developable land (refer to **Figure 6** below), Plan Change Area (PCA) North (16.8ha), PCA South (38.2ha) and the Mangaone Stream zone that includes stormwater devices and setbacks (16.4ha).

Developable land includes industrial lots (47.6ha), the Central Focal Area (0.3ha) and roads and swales (7.1ha outside of the Mangaone Stream Zone).

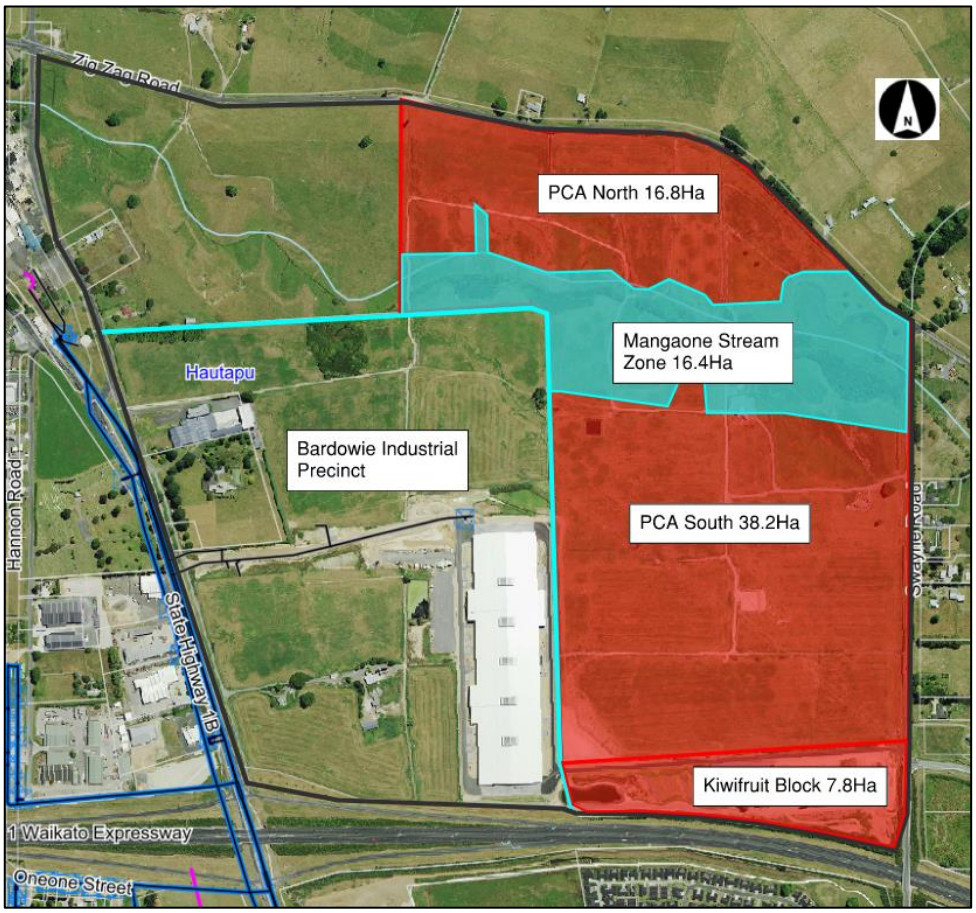

FIGURE 6 - PC14 STRUCTURE PLAN AREA ZONES

[3] *As confirmed with WDC in alignment with the Beca Hautapu Industrial Structure Plan document 2017. This is based on gross area.*

Fire flows have been calculated based on FW3 level of service. FW3 level of service requires a flow rate of 50l/s through three fire hydrants. For demand and modelling calculations these are carried out at 60% of peak demand flows.

The water demand for the developable portion of the PC14 Structure Plan Area is shown in **Table 2** below:

TABLE 2: WATER DEMAND AND USAGE

PCAZONE	AREA (HA)	POPULATION EQUIVALENT	AVERAGE DAILY DEMAND (m^3/D)	PEAK FLOW (l/s)	FIRE FLOW (l/s)
PCA North	16.8	504	131.0	7.58	54.6
PCA South	38.2	1146	298.0	17.2	60.4
TOTAL Developable PCA	**55.0**	**1650**	**429.0**	**24.83**	**64.9**

The water supply modelling carried out as part of the BIP consent and master plan stages only allowed for fire flows of 62.4l/s. **Figure 7** (below) shows the maximum flows to the PC14 Structure Plan Area (referred to as C10 East in the model) as 63.6l/s. This is marginally lower than the 60.4l/s maximum demand calculated for the 55.0ha of developable land within the PC14 Structure Plan Area, however, the originally proposed pipe sizes would be able to meet the revised flow demand while retaining flow velocities under 2m/s.

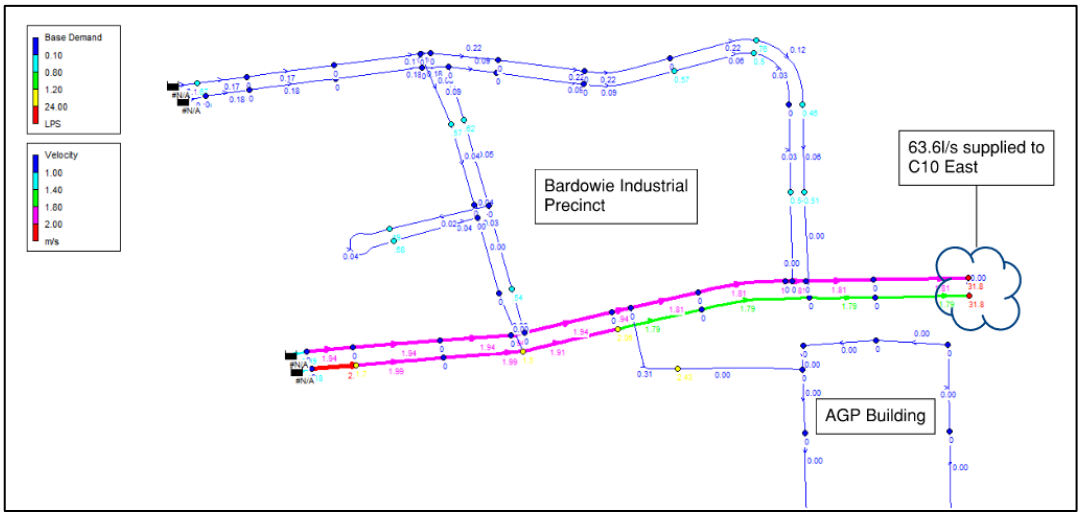

FIGURE 7 - BIP MASTERPLAN – PEAK FLOW MODEL (WATER MASTERPLAN ASSESSMENT – TECHNICAL MEMO HG DECVEMBER 2018)

It is understood that the collector road access to the PC14 Structure Plan Area has been changed from the centre of the BIP as modelled in the masterplan (**Figure 7**), to a northern access route as shown in the Mangaone Precinct Structure Plan in **Figure 8**. The water will now be supplied to the PC14 Structure Plan Area along the proposed northern collector road and not through the centre of the BIP as initially intended. This will allow the possibility of having slightly larger connections off the water mains on Laurent Road if required.

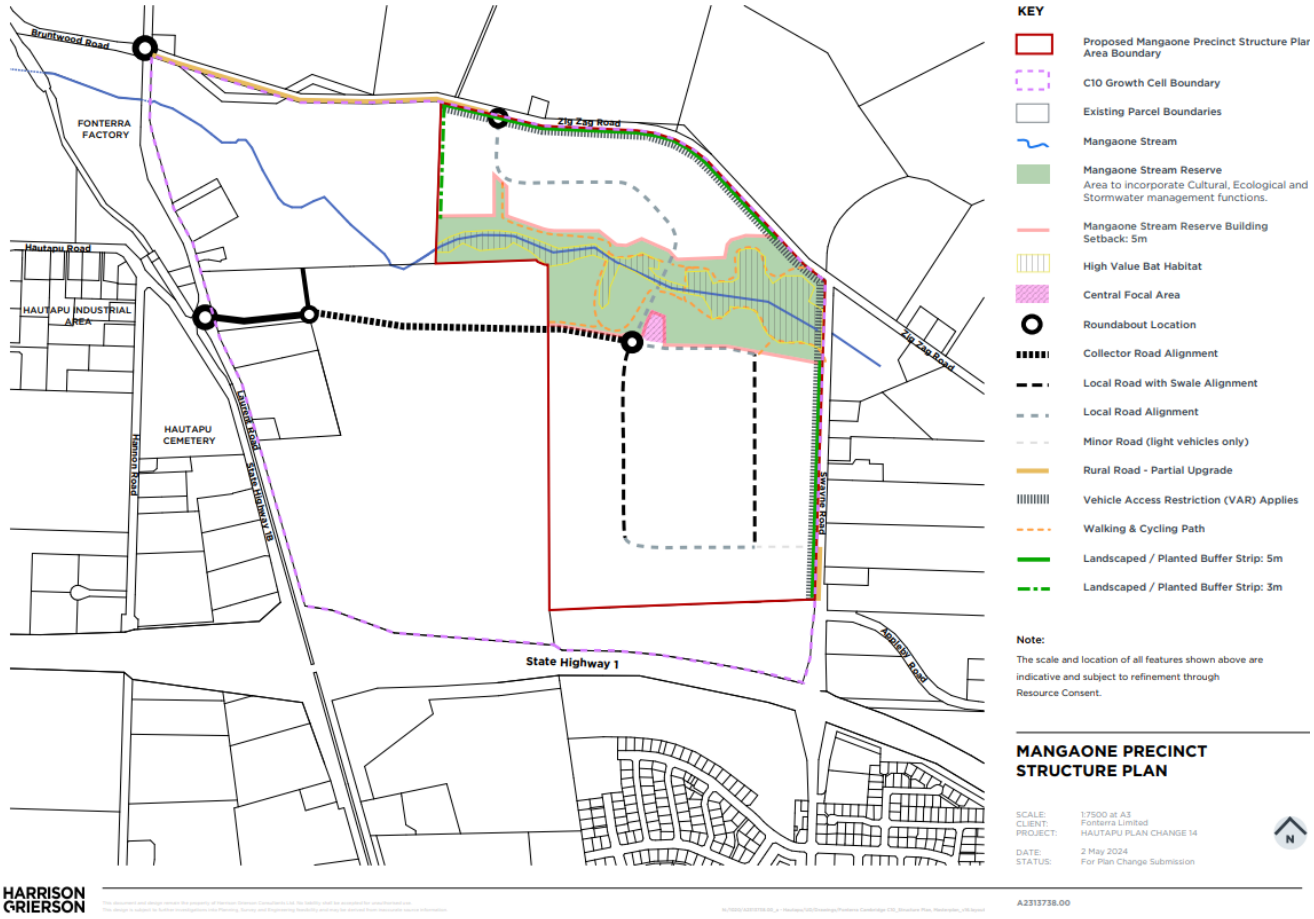

FIGURE 8 – MANGAONE PRECINCT STRUCTURE PLAN

At the time of modelling the BIP, it was anticipated that the C10 Growth Cell area north of the Mangaone Stream would be supplied from a northern connection, possibly off Zig Zag Road. It is anticipated that this will now be supplied through the collector road water supply connection. The 450mm diameter trunk main upgrade carried out by WDC was sized to include demands for the whole of the C10 Growth Cell so we do not foresee any capacity issues for the PC14 Structure Plan Area. The final delivery pipe sizes will be confirmed at the detailed design stage, once the internal reticulation has been confirmed and flows can be accurately modelled.

4.0 WASTEWATER

4.1 EXISTING WASTEWATER NETWORK

The PC14 Structure Plan Area currently does not have any connections to the public wastewater network. The adjacent BIP property includes the Bardowie Wastewater Pumpstation with a 280mm diameter PE rising main discharging to the Taylor Street Wastewater Pumpstation, approximately 2.2km to the south, and ultimately to the Cambridge Wastewater Treatment Plant on Matos Segadin Drive. This Bardowie Wastewater Pumpstation was completed in 2020 as part of the BIP Stage 1 works and will be vested with WDC after completion of the Victoria Road upgrade project currently under construction.

The Bardowie Wastewater Pumpstation and network was designed as a terminal pumpstation servicing flows from the entire C10 Growth Cell. There will be multiple pumpstations discharging into the Bardowie Wastewater Pumpstation gravity reticulation as indicated in **Figure 9** below.

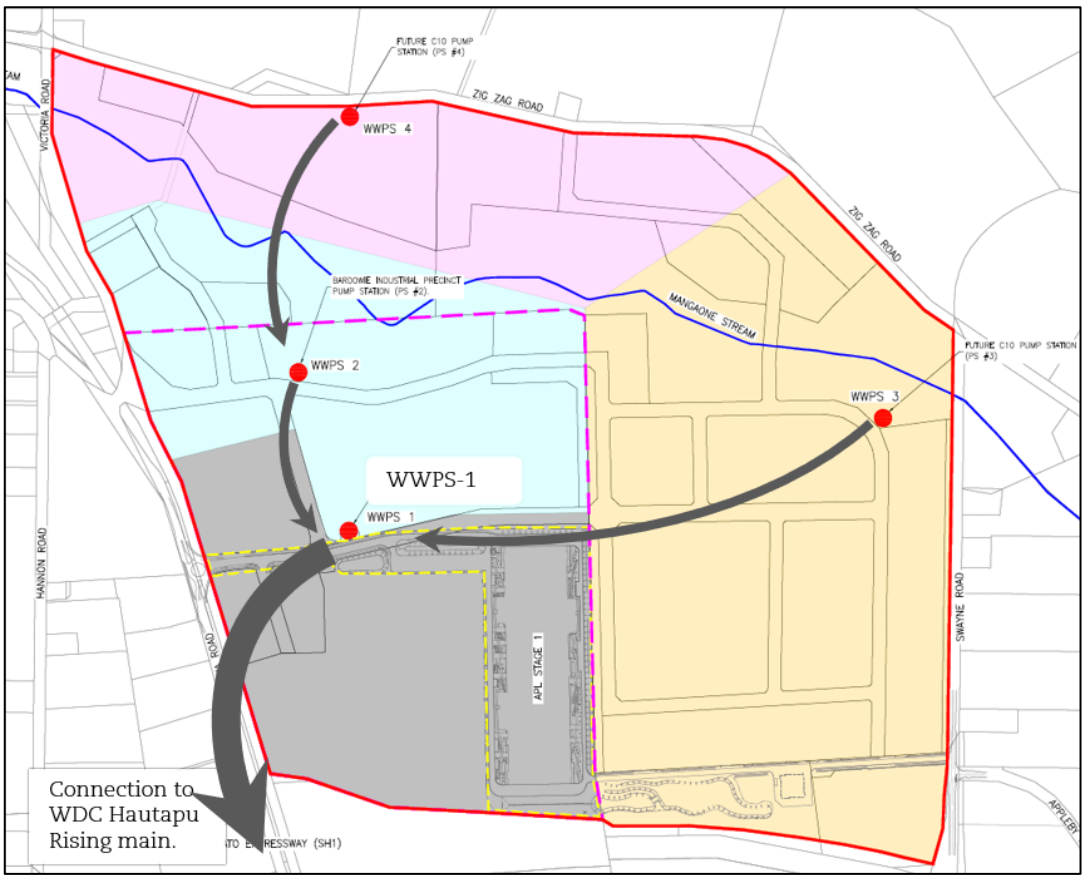

FIGURE 9 - C10 GROWTH CELL PUMPSTATION SKETCH (BARDOWIE WASTEWATER PUMPSTATION DESIGN REPORT, HG 2019)

The Bardowie Wastewater Pumpstation was designed to meet an ultimate peak flow requirement of 55.76l/s, which was based on servicing a total catchment area of 161.38Ha (the entire C10 Growth Cell).

As a terminal pumpstation, the Bardowie Wastewater Pumpstation was designed to ultimately hold nine-hours of Average Daily Flow as emergency storage based on the Bardowie Wastewater Pumpstation's gravity network catchment. In addition, it needs to allow for one-hour of Average Daily Flow from each of the wastewater pumpstations that discharge into the Bardowie Wastewater Pumpstation's gravity network. The total emergency storage requirement for the Bardowie Wastewater Pumpstation (as a terminal wastewater pumpstation for the C10 Growth Cell) is 147.6m^3.

The emergency storage provision is calculated from the volume stored within the gravity network of pipes and manholes and the balance within storage tanks adjacent to a wastewater pumpstation. For the BIP Stage 1 works, the emergency storage is held within the constructed gravity network and the emergency storage tanks will be installed as a future stage. Land within the Bardowie Wastewater Pumpstation site has been allocated to allow for the installation of the emergency storage tanks (**Figure 10**). When future stages come online, this will trigger the construction of the emergency storage tanks.

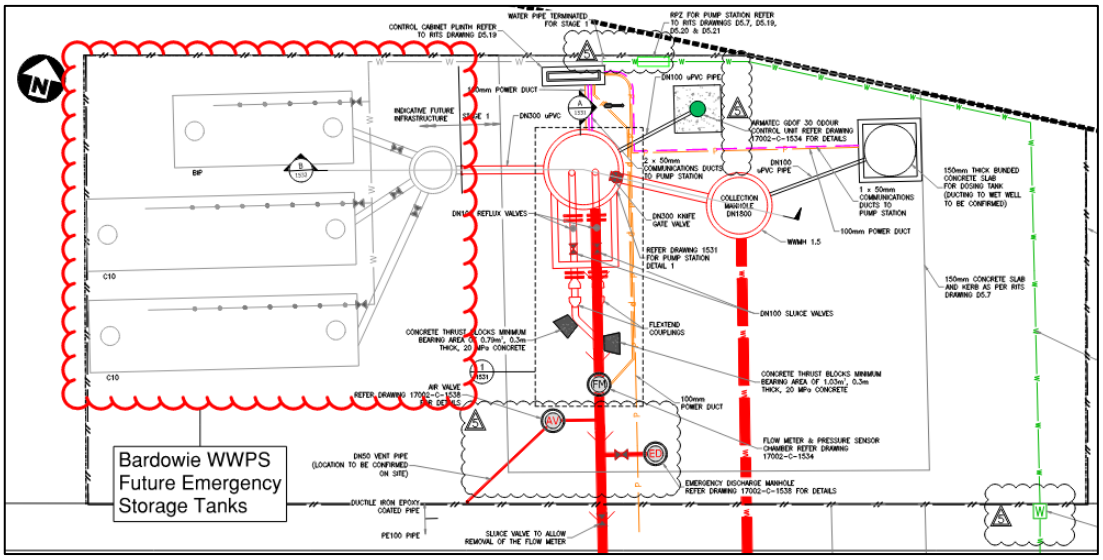

FIGURE 10 - BARDOWIE WASTEWATER PUMPSTATION LAYOUT

The emergency storage volume required for BIP Stage 1 is 39.1m^3. The available storage within the Stage 1 network is 54.9m^3. Additional emergency storage will be required once the PC14 Structure Plan Area discharges wastewater to the Bardowie Wastewater Pumpstation.

4.2 WASTEWATER FLOW

The base wastewater demand for the PC14 Structure Plan Area has been based on the requirements of the RITS, amended to a population density of 30 people/ha as set out in the Beca Hautapu Industrial Structure Plan (2017) document. The design parameters are listed in **Table 3**, below are based on gross developable area and include industrial lots, roads and swales outside of the Mangaone Stream zone.

TABLE 3: SUMMARY OF DESIGN ASSUMPTIONS MADE

HAUTAPU INDUSTRIAL GRAVITY SEWER ZONES		
Population per Ha	30[4]	people/Ha
Wastewater Generation	200	l/p/day
Infiltration allowance	2250	l/Ha/day
Surface Water Ingress	16500	l/Ha/day
Peaking Factor	see Table 5-2 of RITS	

[4] *As confirmed with WDC in alignment with the Beca Hautapu Industrial Structure Plan document*

The expected wastewater flows are shown in **Table 4** based on the developable area and split between the PCA North and PCA South.

TABLE 4: WASTEWATER DESIGN FLOWS

GROWTH CELL PORTION	AREA (HA)	EQUIVALENT POPULATION	AVERAGE DAILY FLOW (M3/DAY)	PEAK WET WEATHER FLOW (L/S)	EMERGENCY STORAGE VOLUME (M3)
PCA North	16.8	504	138.6	6.9	52.0
PCA South	38.2	1146	315.2	14.7	118.2
Combined Flow to the Bardowie Wastewater Pumpstation[5]	**55.0**	**1650**	**453.8**	**20.3**	**18.9***

** This is only the PC14 Structure Plan Area emergency storage requirement at the Bardowie Wastewater Pumpstation*

4.3 BARDOWIE WASTEWATER PUMPSTATION EMERGENCY STORAGE

As mentioned in Section 4.1, there is a requirement for the Bardowie Wastewater Pumpstation to include emergency storage for one hour of ADF flow from the external catchments discharging into its network. The Bardowie Wastewater Pumpstation would need to provide a total of 147.6m^3 of emergency storage for the C10 Growth Cell, of which, 18.9m^3 would be for the PC14 Structure Plan Area wastewater flow. The future BIP stages will increase the Bardowie Wastewater Pumpstation network storage to 84.5m^3, however at that stage the emergency storage requirement will be 105.8m^3, requiring installation of auxiliary emergency storage tanks.

The development of the PC14 Structure Plan Area or Stage 2 of the BIP will likely trigger the installation of all the emergency storage tanks at the Bardowie Wastewater Pumpstation.

4.4 WASTEWATER NETWORK

Conveyance is largely dependent on the topography. The preferred method of wastewater collection for development sites is by gravity flow through small diameter pipes, which are connected to bulk collector pipes and ultimately drain via gravity to a wastewater treatment plant.

Where the terrain is relatively flat these gravity lines tend to become very deep. In these situations, the costs and safety risks associated with constructing deep gravity lines makes them unfeasible and wastewater pumpstations are used to collect and lift effluent to a point where it can join a gravity main and flow to the next wastewater pumpstation or treatment plant.

The topography and expected landform levels will likely make it difficult for a gravity network to cross the Mangaone Stream without excessively deep pipelines and pumpstation wet well depth. We expect that there will be at least two Wastewater Pumpstations within the PC14 Structure Plan Area, one for the northern zone and one in the southern zone. The final landform designs and road network will dictate the extent of each pumpstation's gravity catchment and the final number and location of the pumpstations.

[5] Note: The total peak flows shown above are for the combined flows from both zones where the peaking factor is reduced as per Table 5-2 of the RITS.

The PC14 Structure Plan Area wastewater pumpstation(s) will discharge directly into the BIP wastewater gravity network or pump directly to the Bardowie Wastewater Pumpstation.

The BIP Masterplan made allowance in the gravity network to the Bardowie Wastewater Pumpstation to accommodate flows from the entire C10 Growth Cell. The flows from the external pumpstations were split with some of the flows directed through the northern network and some from the east, as shown in **Figure 9**.

The flows from the C10 East (PCA South) were intended to flow into the BIP on the original collector road just to the north of the AGP Building (wastewater connection corridor on **Figure 11**). With the collector road now located to the north of the BIP, the existing gravity network to the Bardowie Wastewater Pumpstation from the north may not have adequate capacity to service all flows from the northern portion of the BIP and all of the PC14 Structure Plan Area. Some of the flows would still need to be delivered through the original wastewater connection corridor as shown as the Alternative Rising Main Discharge Route in **Figure 11**.

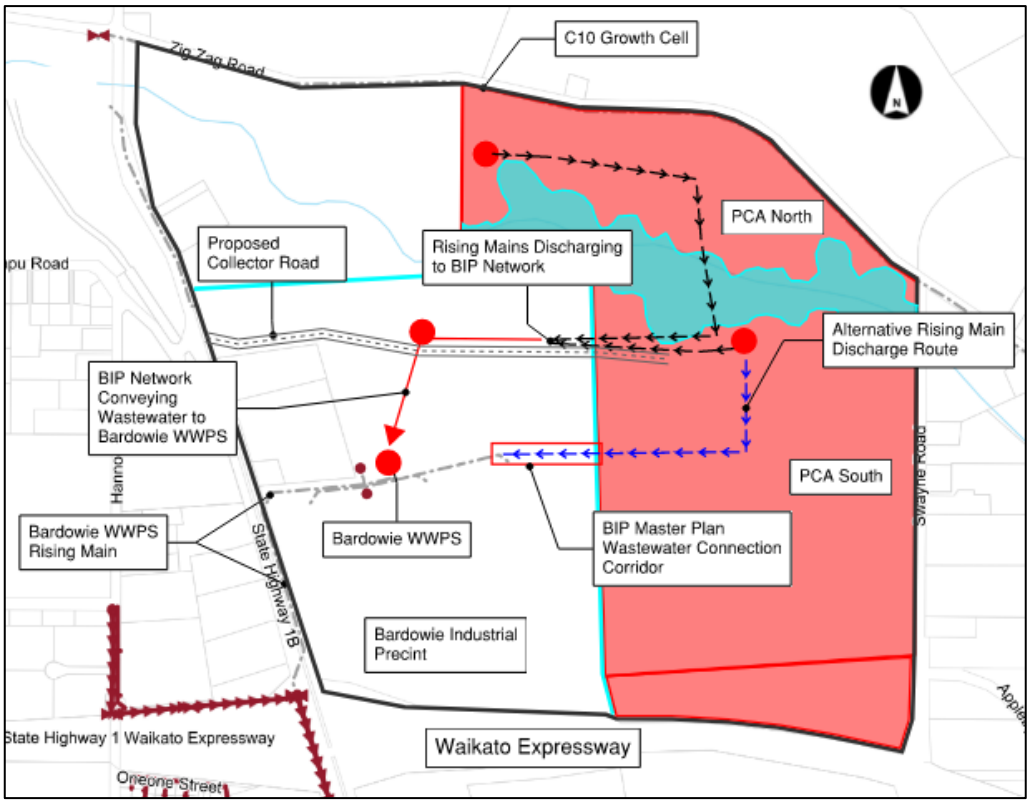

FIGURE 11 - WASTEWATER NETWORK USING BIP GRAVITY NETWORKS

The preferred option is to pump from the PC14 Structure Plan Area directly to the Bardowie Wastewater Pumpstation (**Figure 12**). This will remove any reliance on the extent of development within the BIP and will not require upsizing of any of the existing wastewater network.

Under the preferred option, the proposed Bardowie Wastewater Pumpstation lot boundaries will need to be revised as part of the final vesting of the pumpstation to enable the layout to include a new access to the Bardowie Wastewater Pumpstation on the northern side of the pumpstation. This will allow for a new connection to the pumpstation, sized to receive the pumped flow from the entire PC14 Structure Plan Area.

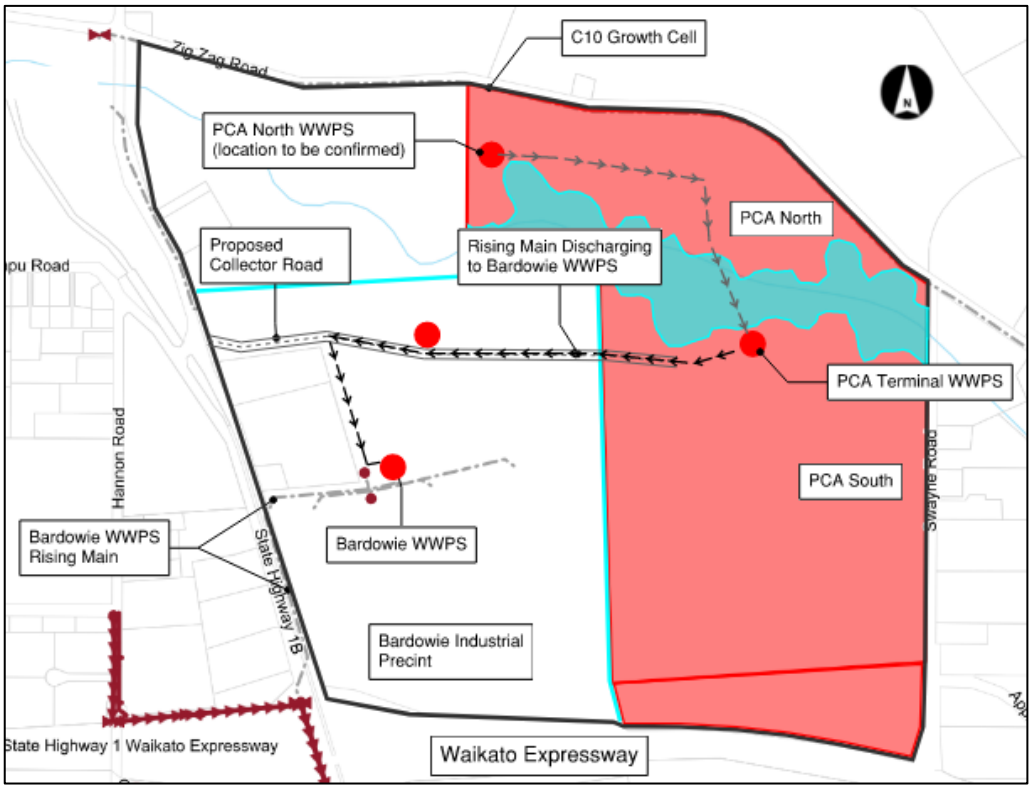

FIGURE 12 - WASTEWATER NETWORK PUMPING FROM THE PC14 STRUCTURE PLAN AREA TO THE BARDOWIE WASTEWATER PUMPSTATION

5.0 ELECTRICAL SUPPLY

Waipā Networks manage the power distribution in Cambridge. Waipā Networks have been consulted and have confirmed that they are aware of developments within the BIP and are currently starting to plan upgrades around these developments.

In a meeting held on 6 November 2023 with Matthew Farrell (HG), Mikaere Ngarimu (Engineering Manager), Sunjeet Singh (Network Design Manager) and Hannah Connolly (Electrical Engineer) advised that the network in the area is currently operating near capacity and would not be able to supply the C10 Growth Cell area without implementing their upgrades.

Waipā Networks are currently in discussions with BIP regarding the construction of a new substation to service the area. Waipā Networks has advised that this substation is programmed to be constructed in 2027 once the new Forrest Road substation becomes operational, expected in 2025. The PC14 Structure Plan Area would be supplied by this substation. Waipā Networks is aware of the Fonterra proposal to rezone the PC14 area and discussions are underway to ensure that the substation is designed to service the PC14 Structure Plan Area based on expected demand.

Waipā Networks also confirmed that the existing 11kV overhead lines running diagonally across the PC14 Structure Plan Area can be relocated and run underground within the road service trenches.

6.0 CONCLUSION

Our assessment has demonstrated that there are adequate and appropriate options to service the development of the PC14 Structure Plan Area. These options will be refined as part of the resource consent/detailed design process.

Our assessment concludes that:

1. Stormwater can be managed with a combination of road swales and constructed wetlands. Larger events up to the 100-year storm will be conveyed overland and be attenuated within communal wetlands with controlled discharge to the Mangaone Stream network.

2. Potable water supply and firefighting can be provided from the existing water supply network.

3. Wastewater can be reticulated and pumped from the PC14 Structure Plan Area to the Bardowie Wastewater Pumpstation and ultimately to the Cambridge Wastewater Treatment Plant. The emergency storage at the Bardowie Wastewater Pumpstation will need to be installed to include the PC14 Structure Plan Area.

4. Waipā Networks have confirmed that there is a programme in place to upgrade the existing power supply for the C10 Growth Cell. The specific demands of the PC14 Structure Plan Area will need to be confirmed and discussed with Waipā Networks to ensure the stages of the upgrades align with the PC14 Structure Plan Area implementation programme.

7.0 LIMITATIONS

7.1 GENERAL

This report is for the use by Fonterra Limited only and should not be used or relied upon by any other person or entity or for any other project.

This report has been prepared for the particular project described to us and its extent is limited to the scope of work agreed between the client and Harrison Grierson Consultants Limited. No responsibility is accepted by Harrison Grierson Consultants Limited or its directors, servants, agents, staff or employees for the accuracy of information provided by third parties and/or the use of any part of this report in any other context or for any other purposes.

APPENDIX 1
TABLE OF ENGINEERING ABBREVIATIONS

ENGINEERING ABBREVIATIONS

Abbreviation	Abbreviation in Full
AC	Alternating Current
AEP	Annual exceedance probability
AGP	Architectural Glass Products
ARI	Average Recurrence Interval
AS	Australian Standard
AS/NZS	Australian New Zealand Standard
BIP	Bardowie Industrial Precinct
BPD	Backflow Protection Device
BPO	Best Practicable Option
BS	British Standard
BSP	Bulk Supply Point
CAR	Corridor Access Request. An authorisation for working in the road corridor, administered by NZTA local authority.
CBD	Central business district
CCO	Council Controlled Organisation
CCTV	Closed Circuit Television. Used to inspect pipelines in order to determine the interior condition of the pipe.
CLS	Concrete lined steel (pipe)
CoP	Code of Practice. Also historically known as: 'Connection Standards', 'Quality Standards', 'Design Standards', 'Engineering Standards' 'Environmental Standards', 'Development Code' or similar.
DN	Nominal diameter
DOL	Direct On Line (motor starter)
DWSNZ	Drinking Water Standards for New Zealand
ELV	Extra-Low Voltage
ESF	Engineering Standards framework
FAC	Free Available Chlorine or Chlorine Residual
FW	Fire water classification number
GD	Guideline Document. A publication which provides technical and/or design guidance.
GPO	General Purpose Outlet

ENGINEERING ABBREVIATIONS

Abbreviation	Abbreviation in Full
H2S	Hydrogen Sulphide
Ha or ha	Hectare
HG	Harrison Grierson
HGL	Hydraulic grade level
Hz	Hertz
IEC	International Electrotechnical Commission
IQP	Independent qualified person
kPa	Kilo Pascal
kV	Kilovolts
kVA	Kilovolt-Amperes
kW	Kilowatts
L or l	Litre
L/d	Litres per day
L/p/d	Litres per person per day
L/m²/d	Litres per square metre area per day
L/s	Litres per second
LV	Low-Voltage
m	metre
m²	square metre (area)
mA	Milliampere
MEN	Multiple-earthed Neutral (system)
mg/L	Milligrams per litre (equivalent to ppm)
mL	Millilitres
mm	millimetres
MPa	megapascal
MPN	Most Probable Number
m/s	metres per second
NEDS	National Engineering Design Standards

ENGINEERING ABBREVIATIONS

Abbreviation	Abbreviation in Full
NB	Nominal bore. The inside diameter of a pipe
O/L	Overload
PE	Polyethylene
PF	Peaking factor
PN	Pressure nominal. Maximum rated operating pressure
PPE	Personal Protective Equipment
ppm	Parts per million (equivalent to mg/L)
PVC	Polyvinylchloride
RITS	Waikato Local Authority Shared Services Regional Infrastructure Technical Specifications
RTU	Remote Telemetry Unit
SCADA	Supervisory control and data acquisition
SDS	Safety Data Sheet
WDC	Waipā District Council
WRC	Waikato Regional Council
WTPs	Water Treatment Plants