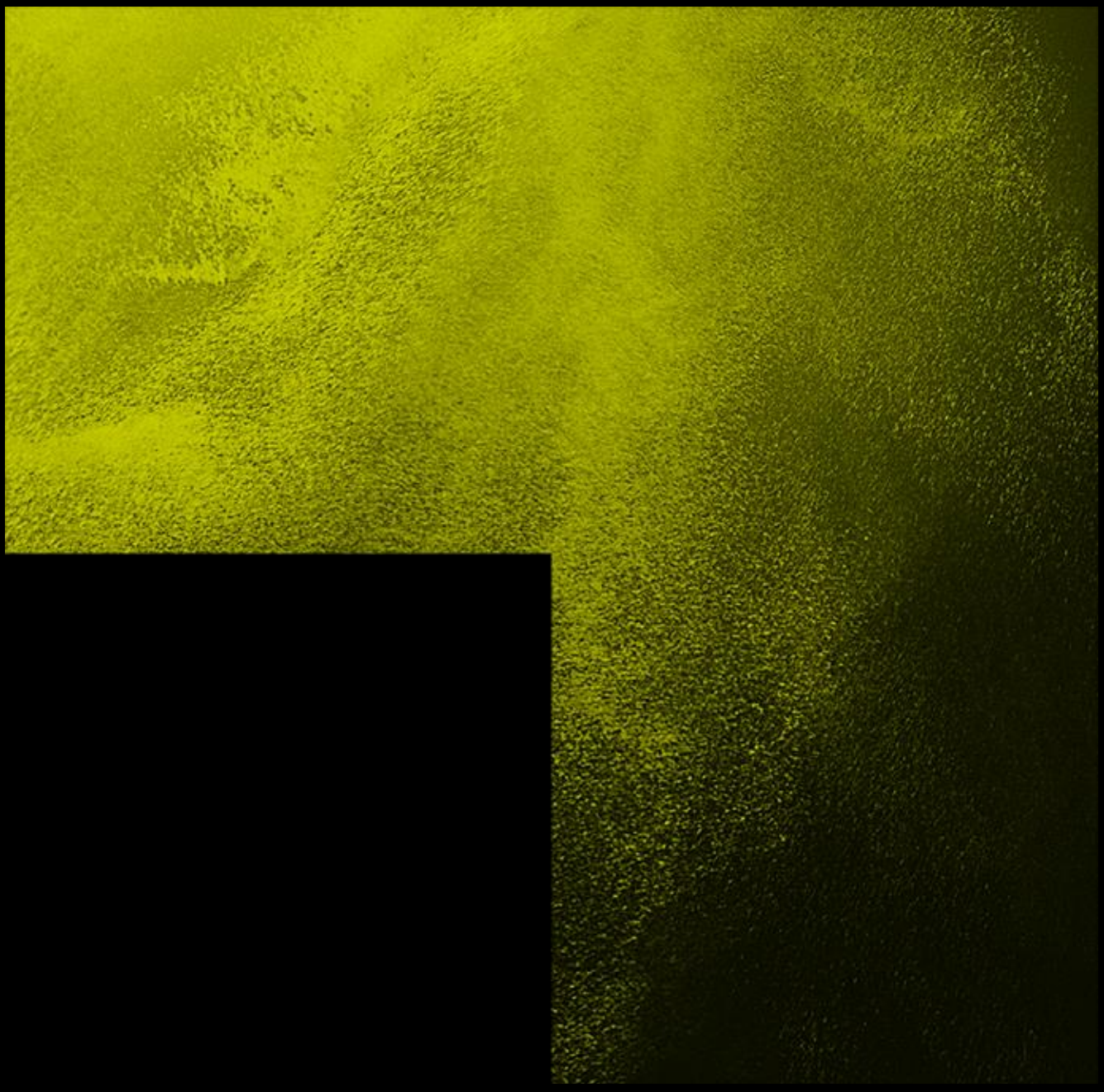
TE RAPA PRIVATE PLAN CHANGE

Infrastructure Assessment

Fonterra Limited



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1.0 INTRODUCTION

This infrastructure assessment has been prepared on behalf of Fonterra Limited ('Fonterra') to inform and support its Private Plan Change (Plan Change 17 ('PC17')) request at Te Rapa, Hamilton. The purpose of PC17 is to rezone approximately 91ha of land (the 'Plan Change Area') surrounding the Te Rapa Dairy Manufacturing site at 1344 Te Rapa Road ('Te Rapa Dairy Manufacturing Site / 'Manufacturing Site'). PC17 does not seek to change any of the land within Te Rapa Dairy Manufacturing Site or planning provisions relating to the Manufacturing Site.

The relative locations and topography of the Plan Change Area splits the Plan Change Area into three parcels. Legally described and referred to as follows:

West Block:

- Section 3 SO 456626;
- Section 1 SO 456626;
- Lot 1 – 6 DPS 11087;
- Part Lot 2 DPS 10804;
- Lot 1 DPS 34481;
- Part Lot 1 DPS 10804;

North Block:

- Lot 1 DP 551065; and
- Lot 1 DPS 8230.

South-East Block:

- Lot 5 DPS 18043;
- Lot 1 DPS 85687; and
- Lot 1-3 DPS 61136.

Te Rapa Road runs along a ridge separating the West Block from the North Block, the Te Rapa Dairy Manufacturing Site and South-East Block. The Te Rapa Dairy Manufacturing Site sits between the North Block to the north and the South-East Block to the south. The Plan Change Area is bound by Te Rapa Road to the west and the Waikato River to the east. The North Block has a panhandle connection to Hutchinson Road to the north allowing for possible future access north.

The Plan Change Area has access to Te Rapa Road. Onion Road runs along the western boundary of the West Block, but as the North Island Main Trunk ('NIMT') railway separates this from the West Block, there is currently no direct access. There is also no direct access to State Highway 1C ('Waikato Expressway') that borders the north-western portion of the West Block. The NIMT railway runs parallel to Onion Road to the east, but there are currently no sidings into the West Block.

Figure 1 shows the Plan Change Area.

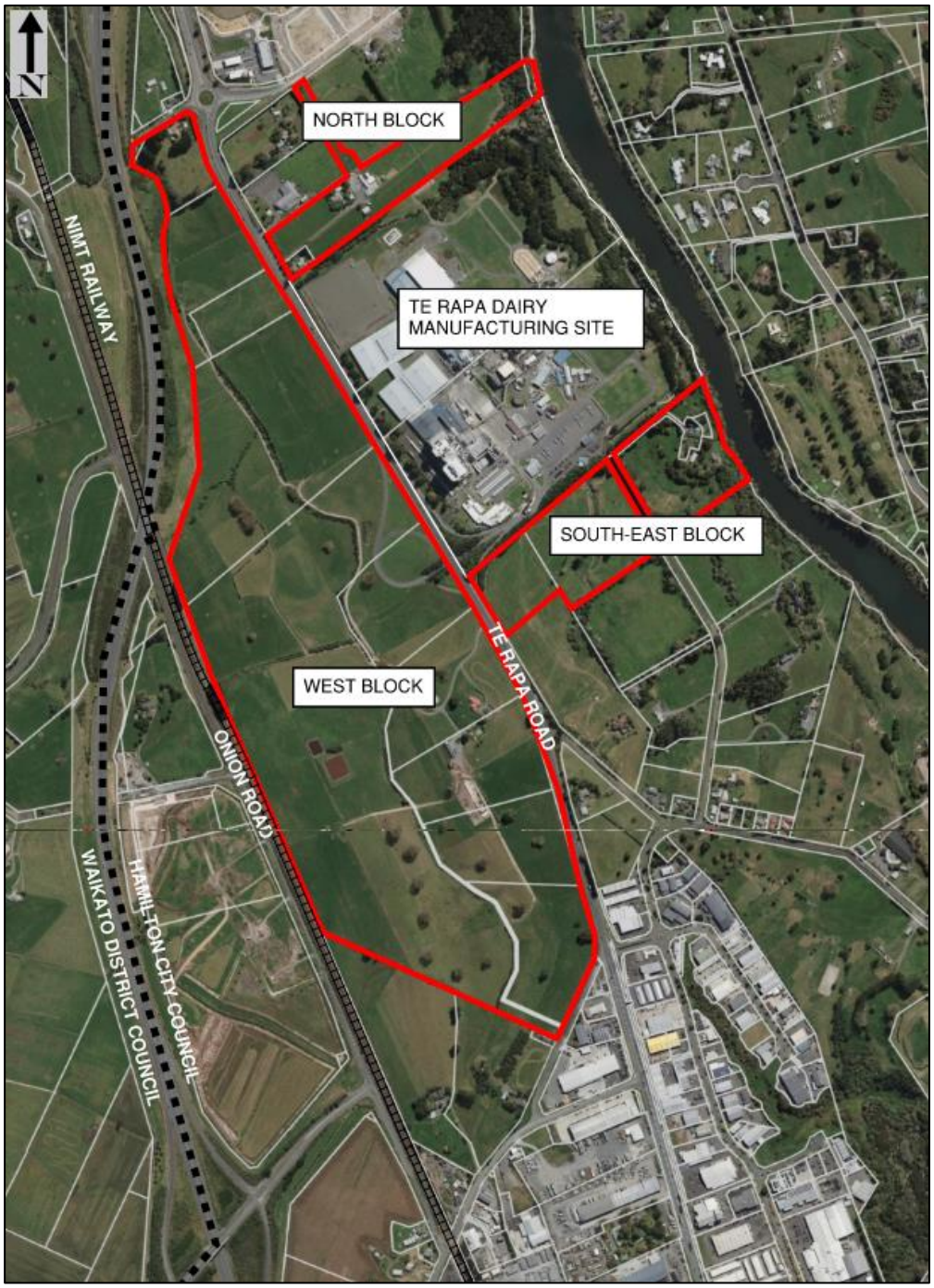

FIGURE 1 EXTENT OF PLAN CHANGE AREA SHOWN IN RED OUTLINE

The information used and reviewed as part of this assessment has largely been obtained from the following sources:

- Waikato Regional Council ('WRC') – online GIS hazard maps.
- Hamilton City Council ('HCC') – online 3Waters Viewer and Flood Viewer.
- HCC's Draft Integrated Catchment Management Plan ('ICMP') prepared by Beca, Rev F, dated 13 March 2024.
- The Plan Change Area survey information.

- Information provided by Fonterra.

This infrastructure assessment will highlight constraints and possible solutions to identify the direction to be adopted for a more in-depth assessment for future subdivision and development of the Plan Change Area (i.e. once PC17 has been processed).

We note there are capacity constraints in both the public water and wastewater networks. The preference is to overcome these constraints by undertaking upgrades to enable sufficient water supply and wastewater capacity in line with the staged development of the Plan Change Area which would involve a co-ordinated approach with Hamilton City Council (as the asset owner). We have also identified potential interim and short-term solutions to provide the necessary infrastructure solutions should the public upgrades not be able to be achieved in line with the anticipated development staging.

2.0 STORMWATER

2.1 TERRAIN AND EXISITING DRAINAGE

The West Block largely comprises greenfield paddocks that generally slope from the east and west boundaries to the existing Te Rapa Stream that runs south to north through the middle of the West Block. The West Block is generally of moderate gradient, with the exception of a small, isolated hill that is approximately 6m high and central to the West Block, and two steeper banks. One of the steeper banks runs the length of the eastern boundary against Te Rapa Road, and one runs from the middle of the southern boundary to the north, then moves to the western boundary and tapers back to a more moderate slope to the north (shown on Figure 2 below). These banks create a lower flood plain terrace along the Te Rapa Stream.

The main south-north Te Rapa Stream has a length of approximately 1900m within the Plan Change Area and an average grade of approximately 0.26%. The Te Rapa Stream catchment originates within the developed Te Rapa North area (located south of the West Block) and includes approximately 67.2Ha of developed industrial properties and 11.6Ha of rural and farm properties. The catchment is the Plan Change Area bound by Te Rapa Road to the east, Te Kowhai Road to the south, and the NIMT railway to the west (shown in Figure 3), as External Catchment South.

There are also two smaller farm drains connecting to the Te Rapa Stream, one is central and the other in the north within the West Block.

The northern drain appears to originate within the West Block boundary.

The central drain originates to the west of the West Block, this external catchment is approximately 23Ha and is between the NIMT railway and the Waikato Expressway.

The drains are shown in Figure 2 and the external catchment shown as External Catchment West in Figure 3.

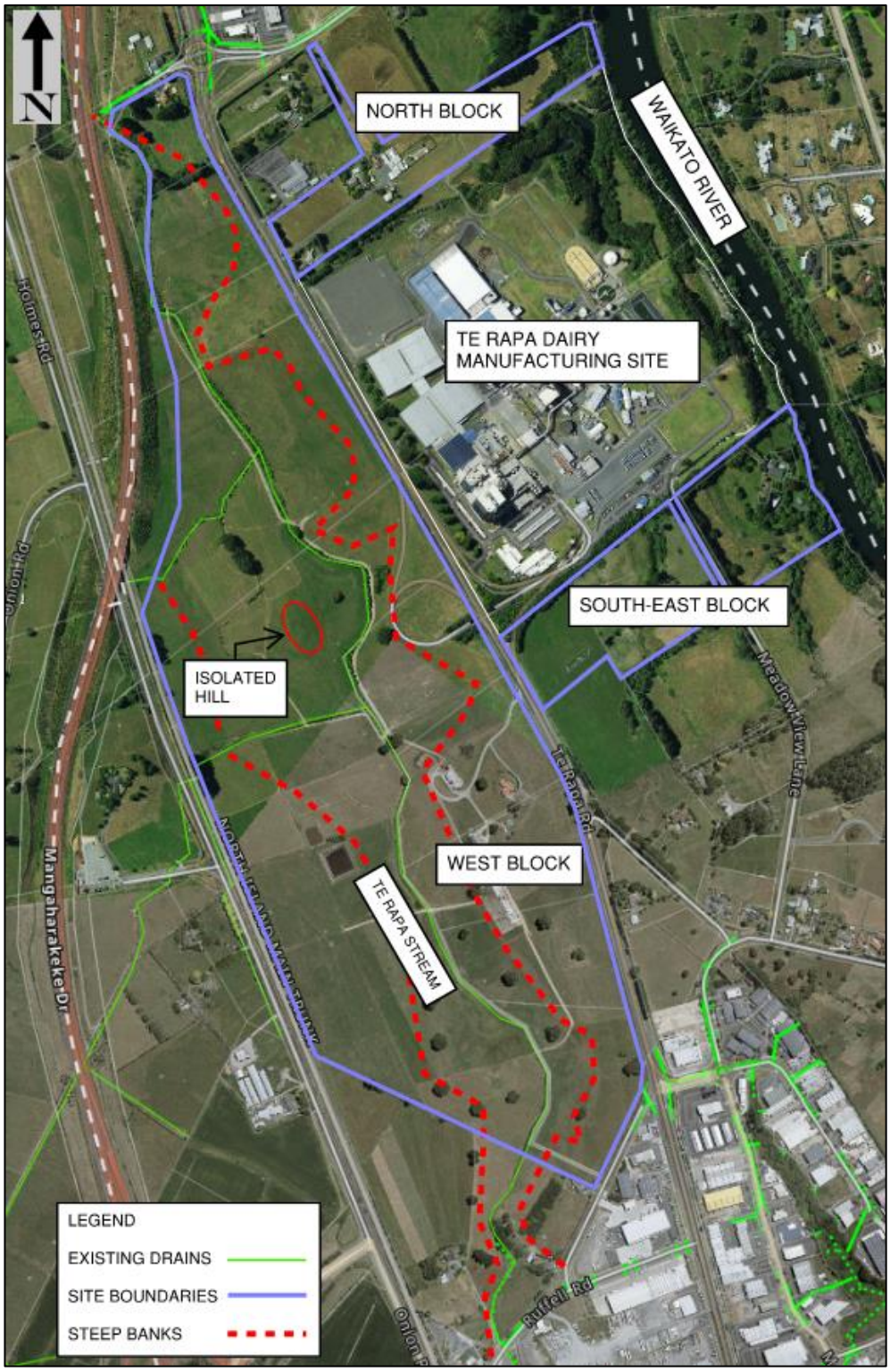

FIGURE 2 EXISTING FARM DRAINS AND SLOPES (COLAB WAIKATO ONE VIEW GIS PORTAL)

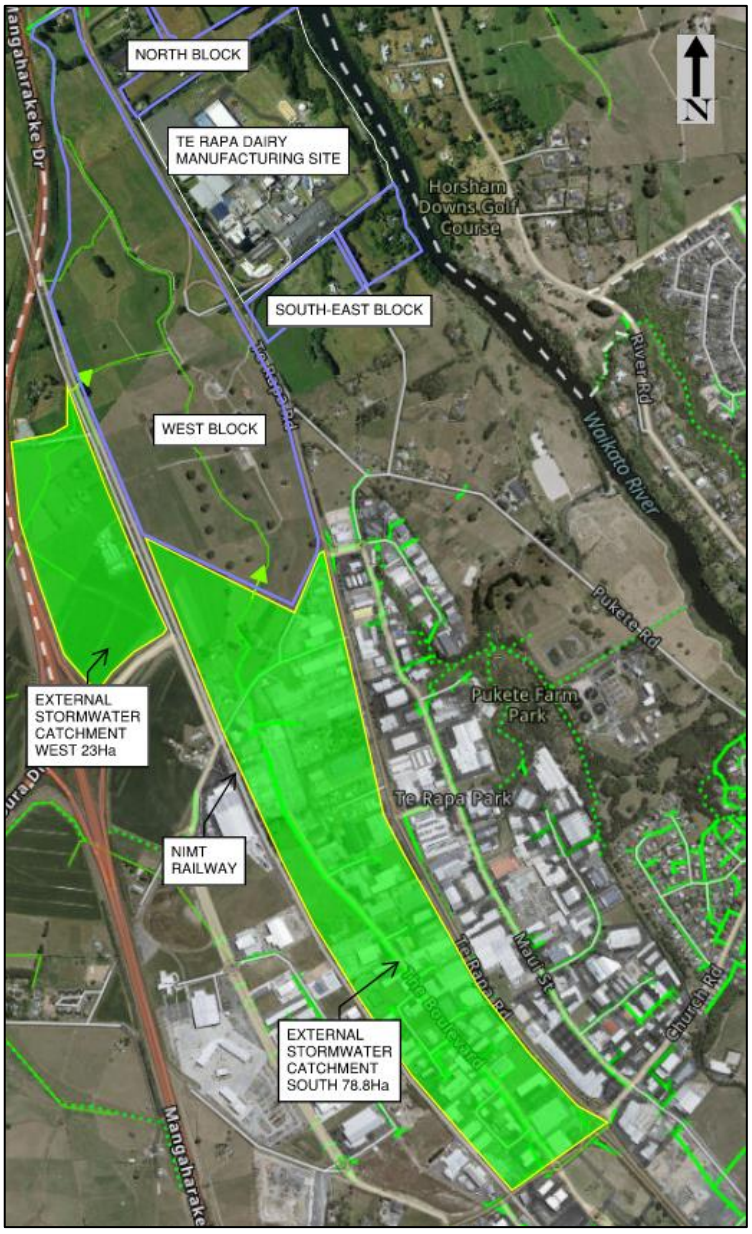

FIGURE 3 TE RAPA STREAM CATCHMENTS

The South-East Block and North Block are both of a moderate grade sloping towards the Waikato River. There is a small overland flow path running south to north through the South Block connecting to another overland flow path running west to east along the Te Rapa Dairy Manufacturing Site's southern boundary towards the Waikato River. Both blocks have no identified watercourses present.

2.2 FLOOD HAZARDS

As shown in Figure 4, sourced from the HCC online Flood Viewer, a 100-year flood hazard strip runs south to north through the entire West Block and a smaller section runs from the western boundary to the centre of the West Block.

The extent of the 100-year flood through the West Block is generally constrained within the lower terraces bound by the steeper banks shown in Figure 4. A large portion of the flood extent is less than 100mm deep as a result of the flat terrain.

The South-East Block has a strip of flooding during a 100-year storm event north through the eastern side of the South-East block, as shown in Figure 4.

No information is available for the North Block as this area falls outside the extents of the HCC flood model. The HCC flood model does provide overland flow paths for the North Block (Figure 5) that would be indicative of possible flood locations.

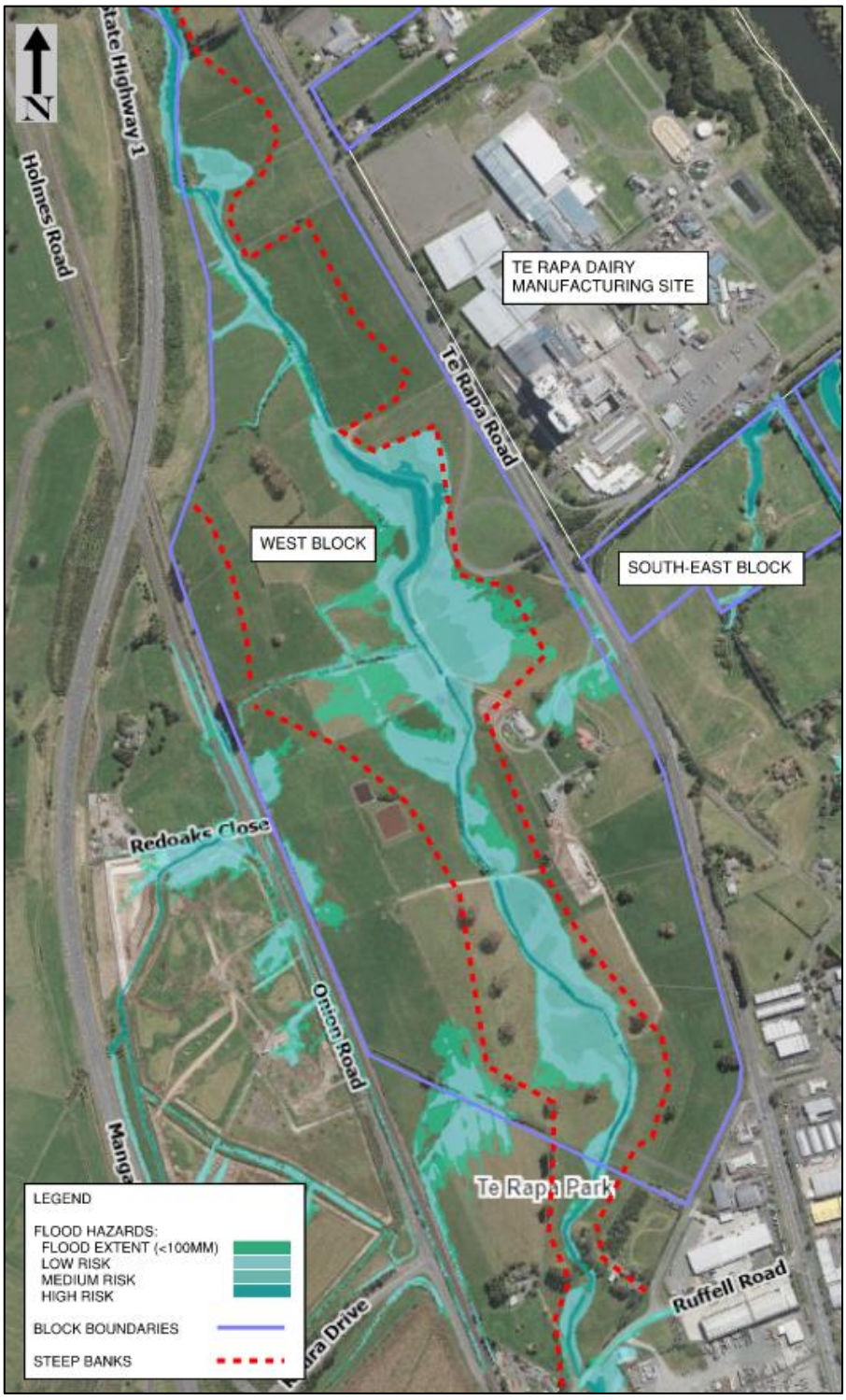

FIGURE 4 100-YEAR FLOOD HAZARD AREAS (HCC FLOOD VIEWER)

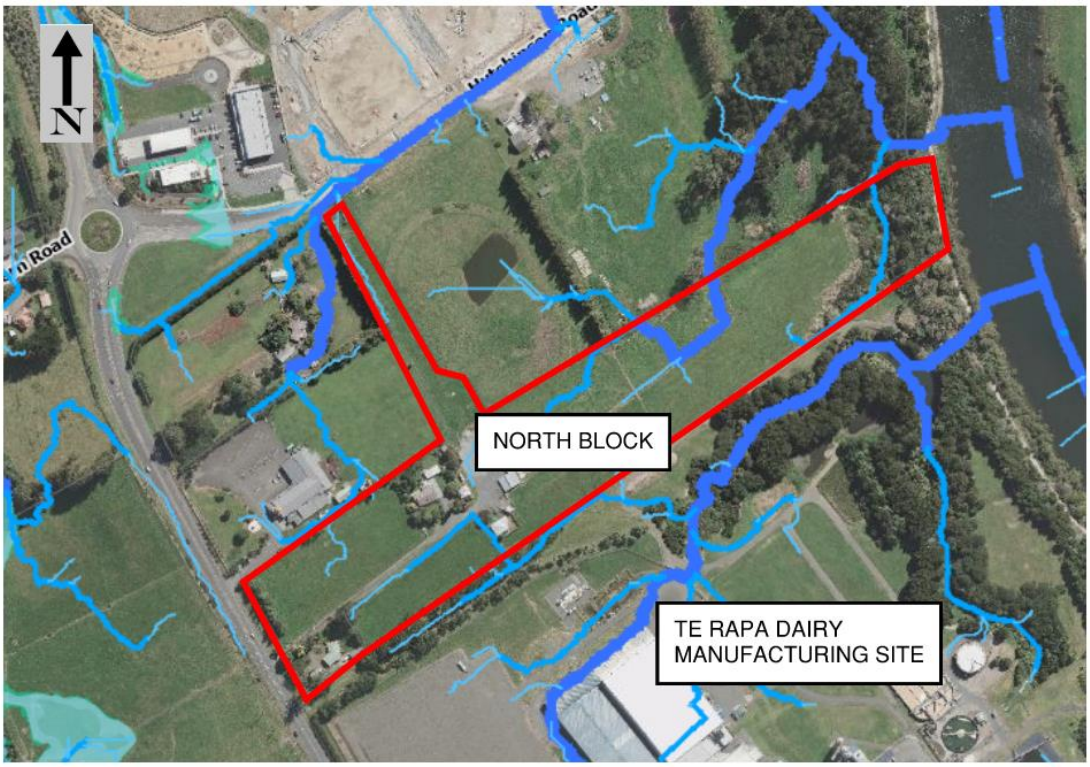

FIGURE 5 NORTH BLOCK OVERLAND FLOW PATH (HCC FLOOD VIEWER)

2.3 STORMWATER MANAGEMENT REQUIREMENTS

As per the WRC's 'Waikato Regional Stormwater Management Guideline' (Technical Report 2020/07) stormwater runoff from any development will need to be treated before being discharged from the Plan Change Area.

The Waikato Regional Stormwater Management Guideline also requires that post-development stormwater flows are managed within the Plan Change Area to ensure that there is no peak flow increase downstream of the Plan Change Area. The exception to this is if the stormwater network discharges to the Waikato River. On this basis, the West Block would require treatment and attenuation of peak flows, while the properties to the east (the North Block and South-East Block) would only require treatment, as the stormwater from these blocks can be discharged directly to the Waikato River (as discussed further below).

Any increase to current peak flows from the West Block post-future development will need to be detained on the West Block to avoid any impact to the drains downstream of the future developed Plan Change Area.

Stormwater management outcomes will need to comply with the requirements of the ICMP for the catchment area. The ICMP for this catchment (the Te Rapa North catchment) is currently being produced by HCC and is in draft stage at present. However, as the ICMP is guided by the same principles as the Waikato Regional Stormwater Management Guideline, the requirements should not differ substantially.

2.3.1 STORMWATER SOAKAGE CONSTRAINTS

A Geotechnical Investigation Report for the Plan Change Area was undertaken by Soil & Rock Consultants (Rev A, dated 29 November 2023), which established that the Plan Change Area consists mainly of Hinuera soils (sands, gravels and silts) with moderate soakage results obtained.

Due to the soil conditions (alluvial deposits) and moderate soakage rates obtained (an average soakage test result of 1.37×10^{-8}m/sec) across the Plan Change Area, soakage as a primary method of stormwater management for the Plan Change Area (future roading etc) has been precluded at this stage.

Although soakage is precluded for stormwater management of the Plan Change Area, for the future subdivision development of the Plan Change Area the use of low-level soakage on individual lots is considered feasible as part of the Hamilton City Operative District Plan (ODP). The ODP has a requirement for new lots to provide on-lot retention/reuse or soakage (with pre-treatment) for the first 10mm of stormwater runoff from each lot.

2.3.2 RECOMMENDED STORMWATER MANAGEMENT APPROACHES

Considering the varying stormwater management requirements for each of the Plan Change Area parcels (i.e. the West Block, the North Block and the South-East Block) separate stormwater management recommendations have been provided for the different parcels, as detailed below:

<u>West Block</u>

From a review of the Waikato Regional Stormwater Management Guideline, and the content of the ICMP at the time of writing this assessment, it has been determined that stormwater quality treatment, extended detention and attenuation of the post development flows (up to and including the 100-year storm event) will be required across the West Block.

With groundwater soakage excluded as the primary means of stormwater management for the West Block, the alternative low impact option to treat and attenuate stormwater runoff from across the West Block would be via the use of artificial wetlands.

The availability of flat land alongside the stream corridor, with the land to the west and east naturally sloping down towards the stream corridor, is ideal for wetland placement.

Initial sizing of the wetlands has been determined using 4% of each contributing sub-catchment area to size the permanent water surface area of the wetlands. Hydrologic Engineering Centre Hydrologic Modelling System ('HEC HMS') stormwater modelling has then been undertaken for each sub-catchment to determine the required wetland depth, volume, and hence surface level footprint so as to provide the required extended detention, and two-year, 10-year and 100-year flow attenuation prior to discharge to the Te Rapa Stream. The West Block sub-catchments are identified in Figure 6.

The outcome of the modelling established that, in general, a total wetland depth of 1.5m is sufficient to provide all the required stormwater management attributes. Calculations were undertaken using the recommended expected impervious area of 85%, and accounting for future climate change.

A summary of the wetland sizes and catchments is shown in Table 1 and Figure 6, and in drawings A2212331.01-HG-ZZ-DR-Z-027 to 030 in the appendices.

TABLE 1: WETLAND SUMMARY

WETLAND	CATCHMENT AREA (HA)	REQUIRED WETLAND PERMANENT WATER AREA (M2)	ESTIMATED WETLAND TOP FOOTPRINT AREA (M2)
A	10.0	4,000	7,300
B	21.5	8,600	13,400
C	10.0	4,000	7,200
D	9.4	3,800	7,400
E	10.0	4,000	7,000

** Note: For external catchments that drain into the West Block (i.e. the Western and Southern catchments identified on Figure 3) it is assumed that any necessary treatment, extended detention and attenuation has been provided on those sites prior to discharge into the West Block stormwater network.*

Initial placement of the wetlands across the West Block has been to place them off-line, along the central Te Rapa Stream, as this is the natural low point for drainage, and the wetlands will have controlled discharge into the Te Rapa Stream. The preliminary urban design has also identified the Te Rapa Stream as having future amenity potential, with future footpaths and cycleways. The artificial wetlands will add ecological value to the Plan Change Area and attract aquatic fauna.

Stormwater flows from future development within the West Block, for up to and including a 10-year storm event, would be conveyed within a gravity piped network within the future road reserves and discharge into the wetlands. Storm event runoff from up to and including a 100-year event would be conveyed overland, within the future road reserves, to the wetlands where they would be detained with controlled outlets to ensure the post-development peak flows do not exceed the pre-development peak flows (for up to and including a 100-year storm event), before discharging into the Te Rapa Stream.

Due to the industrial nature of any likely future development of the West Block, a treatment-train approach would likely be required to pre-treat runoff from any future road carriageways prior to discharging flows to end-of-line wetlands (for additional treatment and attenuation). Such pre-treatment could be provided within the road corridors, either by adopting sediment filtration inserts into each future roadside catchpit (which comes with an ongoing maintenance burden) or by incorporating either raingardens or grassed treatment swales along the road corridors to treat runoff prior to discharge into a gravity reticulation system that would drain to end-of line wetlands.

To ensure adequate grades for the gravity network, the West Block will require some earthwork contouring towards the Te Rapa Stream, to remove the existing steep banks and provide terraces. This earth work may, in places, extend into some of the existing flood areas. Additional flood modelling will be required as the design develops, to ensure the Te Rapa Stream retains adequate flood volume.

FIGURE 6 INDICATIVE WEST BLOCK WETLAND LOCATIONS AND SIZES

As the designs progress, the possibility of converting some of the larger wetlands into a series of multiple smaller wetlands could be investigated. Wetland locations can also be adjusted to suit required locations of future building platforms or road corridors; to be determined at future subdivision stages.

As noted above, in addition to the provision of wetlands, the use of low-level soakage on individual lots is considered feasible as part of the ODP requirement for new lots to provide on-lot retention/reuse or soakage (with pre-treatment) for the first 10mm of stormwater runoff from each future lot. Roof water collection and reuse would also be feasible for any building constructed on a lot.

North Block and South-East Block

As the North Block and South-East Block parcels are able to discharge directly to the Waikato River they will not require extended detention or attenuation (as there are no intervening watercourses that will require protection for erosion).

As such, it is proposed that stormwater treatment swale drains (incorporated into any future roading network) are provided for each of these parcels to collect and treat stormwater runoff from any new roading or hardstand areas prior to discharge to the existing overland flowpaths that currently drain any stormwater runoff from these areas to the adjacent Waikato River (refer to Figures 4 and 5 for flowpath locations).

The provision of stormwater treatment swales is considered optimum for these parcels as they best mimic the existing overland flow characteristics of the land, thus offering the lowest impact design option available.

Due to the gently sloping nature of the North and South-East Blocks, the use of soakage (with suitable pre-treatment) on future individual lots is again considered feasible as part of the ODP requirement for new lots to provide on-lot retention/reuse or soakage (with pre-treatment) for the first 10mm of stormwater runoff from each future lot. Roof water collection and reuse would also be feasible for any building constructed on a lot. Excess runoff from future lots would need to be directed to the swale drain system for discharge to the Waikato River.

2.4 STORMWATER CONSTRAINTS

Stormwater constraints, that will need to be considered at any future development or subdivision stage, include:

- The design landform will need to ensure overland flows travel from lots to roads, and then along the roads to the wetlands.
- Allowance in road corridors will be required to provide space for raingardens or treatment swales.
- Flood modelling will be required to ensure the landform design does not negatively impact the downstream or upstream flood risks, and to help determine final levels for off-line wetlands and building platforms.
- Building platforms will need to provide the required freeboard above the flood levels.
- Ongoing co-ordination with HCC's ICMP team will be required to make sure the requirements of the ICMP align with the design approach taken for the Plan Change Area.

3.0 WASTEWATER

3.1 WASTEWATER DESIGN FLOWS

Section 5.2.4.2 of the RITS sets out the following criteria for the calculation of wastewater flows:

- Domestic average daily flow is 200 litres per person per day.
- Infiltration allowance is 2,250 litres per hectare per day.
- Surface water ingress allowance is 16,500 litres per hectare per day.
- Peaking factor based on RITS Table 5.2.

Population equivalent as per RITS Table 5.3. For General Residential this is 45 people per hectare for all industrial zones, city centre zone, major facilities zone.

Calculation of flows is as per the following formulae set out in the RITS:

Average daily flow (ADF)

ADF = (infiltration allowance x catchment area) + (water consumption x population equivalent)

Peak Daily Flow (PDF)

PDF (l/s) = ((infiltration allowance x catchment area) + (peaking factor x water consumption x population equivalent))/86400

Peak wet weather flow (PWWF)

PWWF (l/s) = ((infiltration allowance x catchment area) + (surface water ingress x catchment area) + (peaking factor x water consumption x population equivalent))/86400

RITS section 5.2.4.3, Commercial and Industrial Flows, states "Where the industrial domestic waste and trade waste flows from a particular industry are known, these shall be used as the basis of the wastewater design. Where this information is not available, flows shall be calculated using the relevant peaking and population densities defined in (RITS) Table 5-3"

There is expected to be a moratorium on wet industries within the Plan Change Area that would result in significantly lower demand than the RITS specification. HG have carried out numerous studies on existing, occupied, non-wet industrial sites in Hamilton, Waipa and Horotiu and have found actual water usage based on meter readings to be in the range of 30 to 70 l/person/day. This would equate to wastewater flows of between 23 to 53 l/person/day based on wastewater demand being 75% of the water supply.

AS/NZS 1547:2012 On-site Domestic Wastewater Management, Table H4, lists proposed wastewater flows for rural factories as 50l/person/day for reticulated, community or bore-water supply.

Table 2, below, compares the wastewater demand based on the RITS and on AS/NZS 1547:2012 rates with RITS infiltration and ingress allowances applied to both.

We believe the AS/NZS 1547:2012 rates are closer to the expected flows based on the intended industrial usage and propose these are adopted for the detailed design of the Plan Change Area.

TABLE 2: WASTEWATER DESIGN FLOWS

DEVELOPMENT STAGE	AREA (Ha)	POPULATION	AVERAGE DAILY FLOW (M3/DAY)	PEAK DAILY FLOW (l/s)	PEAK WET WEATHER FLOW (l/s)
RITS WASTEWATER FLOWS					
West Block	74	3338	834	16.6	30.8
South-East Block	11	483	121	3.5	5.6
North Block	6	280	70	2.4	3.6
Total (RITS)	**91**	**4100**	**1025**	**20.4**	**37.8**
AS/NZS1547:2012 WASTEWATER FLOWS					
West Block	74	3338	334	3.9	19.8
South-East Block	11	483	48	0.6	3.1
North Block	6	280	28	0.3	1.9
Total (AS/NZS1547)	**91**	**4100**	**410**	**6.9**	**24.3**

We believe the AS/NZS 1547:2012 rates are closer to the expected flows based on the intended industrial usage. Based on this, the total wastewater flow from the fully developed Plan Change Area would be 410m^3/day.

3.2 EXISTING WASTEWATER SERVICES

The HCC 3Waters Viewer shows there is an existing 110mm diameter wastewater rising main running from Te Awa Lakes development north of the North Block. The rising main runs southwest along Hutchinson Road then south along Te Rapa Road, typically within the western side; terminating at a manhole on Maui Street about 700m southeast of the Plan Change Area (Figure 7) where the existing wastewater network increases to 300mm diameter pipes.

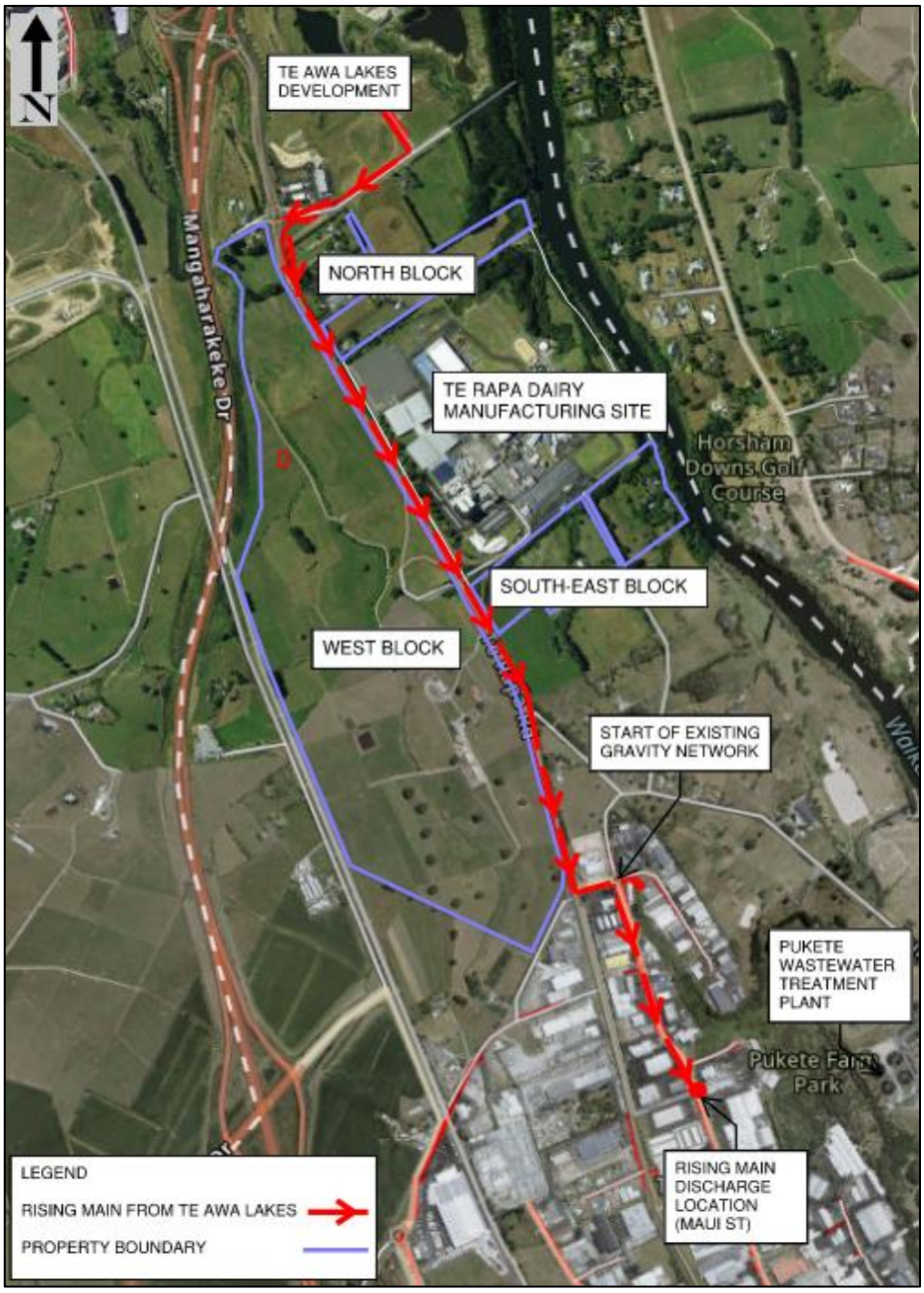

FIGURE 7 EXISTING WASTEWATER SERVICES

The closest wastewater gravity network connection is 150m to the southeast of the West Block at the roundabout intersection of Maui Street and McKee Street. The existing network is 150mm diameter pipes at this point and approximately 3m below ground.

The existing wastewater system for the Te Rapa Dairy Manufacturing Site is entirely self-managed treatment and discharges all occur on the factory site. This will not change as part of PC17.

The Plan Change Area is approximately 1.5km northwest of HCC's Pukete Wastewater Treatment Plant ('PWWTP').

3.2.1 PIPE NETWORK CAPACITY

Consultation with HCC has indicated that to date the Plan Change Area has not been included in the Hamilton City Council 2024-34 Long-Term Plan ('LTP'), and no funding has been allocated within the HCC budget to develop the infrastructure in this portion of Hamilton (including the pipe network).

There is no available capacity to receive additional flows within the existing pipe network in Te Rapa North and the Plan Change Area.

There are planned capacity upgrades to the PWWTP. However, these are not specifically for the Plan Change Area. The Plan Change Area is within the city limits and ultimately will be treated at the PWWTP.

HCC have indicated that the upgrades to the PWWTP are likely to only take place in 10 to 15 years' time and there is no available capacity to treat wastewater from the Plan Change Area in the interim.

This report therefore identifies and explores a range of options to treat and discharge wastewater from the Plan Change Area before the upgrades are undertaken at the PWWTP.

3.3 WASTEWATER INVESTIGATION FOCUS

Our investigations into the wastewater for the Plan Change Area will look at both long-term and interim conveyance and treatment options.

3.3.1 CONVEYANCE

Conveyance is largely dependent on topography. The preferred method of conveyance consists of piped gravity networks flowing to a low point. This low point would be either a manhole on the existing wastewater network or a wastewater pump station that would collect and pump the wastewater to a suitable location within the existing gravity network.

LONG-TERM SOLUTION

Based on the depth of the existing HCC gravity network near the Plan Change Area, only a small portion of the West Block (approximately 6ha) would be able to connect to the HCC network by gravity. The remaining Plan Change Area would require wastewater pumpstations.

The West Block slopes from south to north with a total drop of approximately 5m elevation. Initial investigations using a conservative pipe gradient of 1:100 and a maximum manhole depth of 5m suggests that the West Block would require at least two wastewater pumpstations to service the balance of the West Block (i.e. the area unable to connect directly into the HCC gravity network). Figure 8 shows the possible locations of the wastewater pumpstations for the West Block. However, with the Te Rapa Stream splitting the West Block in half, and with two lower lying areas in the south, a third minor pump station may be required if the gravity network is unable to cross under the stream. Additional investigation and design are required to understand how wastewater within these low areas will be collected, and how the Te Rapa Stream crossing will be managed in relation to the proposed earthworks of the West Block.

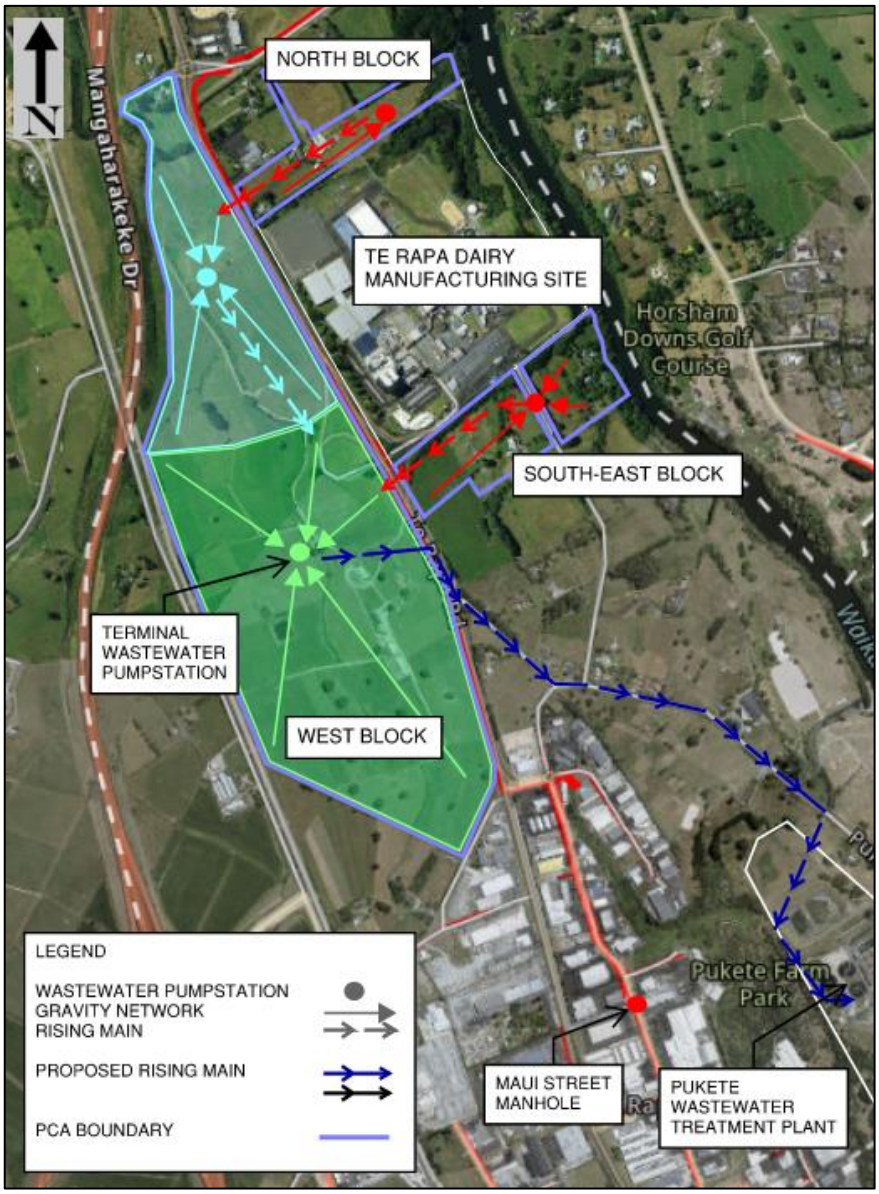

FIGURE 8 PROPOSED LONG TERM WASTEWATER PUMPSTATION CONVEYANCE

The terminal pumpstation for the development is expected to be the one located in the southern portion of the West Block. Having the terminal pumpstation at the northern end of the West Block would not be suitable if the development is carried out in phases with initial phases starting from the southern end.

The North Block and South-East Block both slope gradually from west to east with a total drop of approximately 2.5m elevation. Initial investigations suggest a single pump station in the east of each parcel (as shown on Figure 8) will be sufficient to manage the wastewater flows. The wastewater from both parcels would likely be pumped to the west, over Te Rapa Road and into the West Block's wastewater system.

An alternative wastewater conveyance option is to use the gravity network within the Plan Change Area as a low-pressure sewer system (Figure 9).

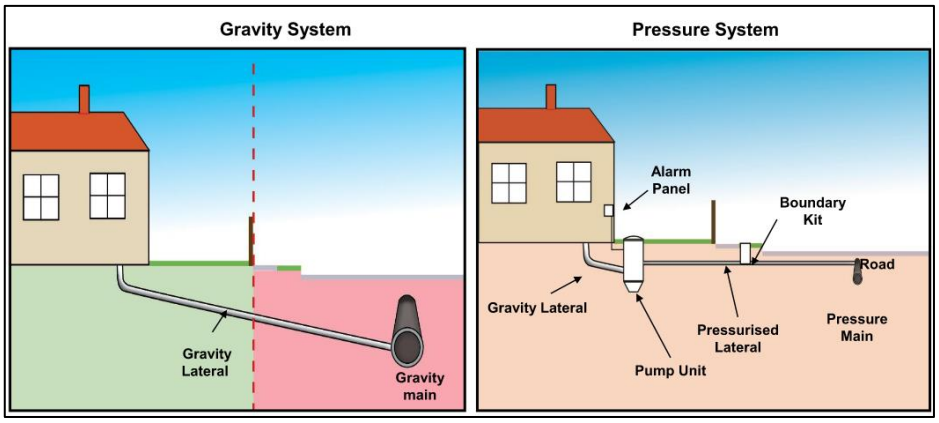

FIGURE 9 COMPARISON OF GRAVITY SEWER (LEFT SIDE) AND LOW-PRESSURE SEWER SYSTEMS (RIGHT SIDE) (E-ONE)

In a low-pressure sewer system, each lot has a dedicated pump that macerate and pump wastewater from the lot. Each lot is connected to a common rising main within the road reserve using the collective pumping effort from all the lots to convey wastewater to a common location – either a gravity network manhole, a central/council wastewater pumpstation or a wastewater treatment plant. In this instance, the low-pressure sewer would then discharge to a central/council wastewater pumpstation.

It is worth noting that the number of wastewater pumpstations may be less than shown in Figure 8 if low-pressure systems are used as the location will not be dependent on the depth of gravity pipes, but more likely dependent on development staging.

INTERIM WASTEWATER CONVEYANCE

Having received confirmation from HCC that there is no immediate capacity at the PWWTP to accommodate development within the Plan Change Area, it is important to identify what an interim solution could be before the PWWTP receives the necessary upgrades to accommodate flows from the Plan Change Area. This has implications for both the conveyance and treatment of wastewater.

The interim wastewater conveyance will ultimately be dependent on the final wastewater solution discussed in Section 3.3.3 Wastewater Treatment and Disposal. Essentially, the method of conveyance will be the same as the long-term conveyance with the key difference being that there will be no direct connection to the HCC network or the PWWTP.

The interim solution will need to be designed so that it can still be connected to the PWWTP once the upgrades have been completed and there is capacity to treat wastewater from the Plan Change Area.

3.3.2 WASTEWATER PUMPSTATION ENVIRONMENTAL RISK MITIGATION

Wastewater pumpstations are reliant on multiple factors to operate effectively. The pumps need to turn on when sufficient wastewater has collected in the wetwell and the pumps need to be able to pump at a rate that exceeds the wastewater flow into the pumpstation. If the pumps fail to turn on or pump at a slower rate than the wastewater inflow, wastewater will start to accumulate within the pump station, then backup the gravity network before eventually overflowing into lots or roads, stormwater network and likely reach a watercourse (that would ultimately flow into the Waikato River). To avoid this occurrence wastewater pumpstations have several measures built in.

The first measure is to design the pumps to discharge at a minimum of 10% more flow than is expected to flow to the pumpstation under peak wet weather flows.

The pumpstations are then constructed with a minimum of two pumps: a duty pump and a standby pump. Should the duty pump fail to turn on when the wetwell fills up to a predetermined level, the duty pump will then turn on. In addition, the Council maintenance teams will receive an alert that there is a fault at the pumpstation, and they will then be able to repair or replace the faulty pump (while the standby pump continues to discharge the inflows).

Should the standby pump also fail to turn on, the Council will receive a second notification that the standby pump has not started (this could be the result of a power failure to the wastewater pumpstation site). The Council will then utilise their sucker trucks to remove wastewater from the pumpstation, drive to the wastewater treatment plant and discharge the wastewater; all while the faulty pumps are repaired/replaced or until power is restored to the site.

As a last line of protection, if multiple wastewater pumpstations are out of operation (a regional power failure for example) and the Council is unable to manage the flows using sucker trucks the wastewater pumpstations are designed to hold a minimum of 9 hours emergency storage based on Average Daily Flow (ADF) before the system overflows. This storage is normally below ground storage tanks connected to the pumpstation.

Based on the proximity of the Plan Change Area to the Waikato River and the impacts of wastewater discharging to any river, we recommend increasing the storage at the wastewater pumpstation to 16 or 24 hours of Average Daily Flow.

It is worth noting that should the development utilise a low-pressure sewer network instead of a conventional gravity system, each on-lot pump system will hold 24-hours of the lot's average daily flow. In this instance the receiving wastewater pumpstation would not need to increase their emergency storage capacity above 9-hours of average daily flow. Collectively the wastewater catchment would be providing 33-hours (24-hours on-lots + 9-hours at the central/council's wastewater pumpstation) of emergency storage.

The individual on-lot pumps are also fitted with failure alarms; however, these are normally managed and maintained by the lot owners, but councils may have the ability to override the function of the on-lot pumps and prevent them pumping when the council wastewater pumpstation is not operating. This feature reduces the risk of the central wastewater pumpstations from overflowing by utilising the on-lot pumpstations' emergency storage (normally 24 hours of storage).

3.3.3 WASTEWATER TREATMENT AND DISPOSAL

As discussed previously the HCC have a long-term plan to upgrade the PWWTP to treat the expected wastewater flows for the Plan Change Area.

LONG-TERM SOLUTION

The long-term solution for the disposal of the wastewater from the Plan Change Area is to discharge to the PWWTP. The current rising main along Te Rapa Road has been sized specifically for the Te Awa Lakes development and does not have capacity to convey any additional flow from the Plan Change Area. A new rising main, at least 150mm diameter, would be required to dispose of PC17's future development flows.

Based on discussions with HCC their preferred alignment of this rising main would be to install it along Te Rapa Road and Pukete Road, discharging to a new gravity network from the high-point on Pukete road. This proposed gravity network would extend southeast along Pukete Road and discharge to the PWWTP. This option does not rely on the use of any existing gravity networks.

We note that there also alternative alignments that could be investigated during the detailed design stage.

INTERIM WASTEWATER TREATMENT

Onsite treatment and disposal is a potential solution until the PWWTP has capacity to treat the wastewater from the Plan Change Area. There are two options that could be considered for the Plan Change Area.

Option 1

The first would be for each lot to have a wastewater treatment system within the lot. This would only treat the wastewater generated from the lot. The treated effluent would then be disposed into the land via subsurface dripline, or depending on soil characteristics, a trench system, this is known as a disposal field. The lot developer would be required to design the treatment plant and disposal field as part of their building design. They would need to account for ASNZS 1547:2012 requirement of an area equal to the disposal field needs to be reserved within the lot as backup for failure of the initial disposal area.

There are numerous commercially available package-type wastewater treatment plants. These plants treat the raw wastewater to a standard suitable for disposal to ground. Some of the systems are made up of multiple modular units, making the system suitable for sites under development and also can be easily tailored to the demands of the site. Treatment modules are added to the system to match the wastewater demands.

The on-lot wastewater treatment could be retained as a permanent solution. There would be no requirement for the lot to connect to the HCC wastewater infrastructure and no requirement for wastewater reticulation within the portions of Plan Change Area to be developed with on-lot wastewater systems.

Alternatively, the on-lot system could be an interim solution that is made redundant when the PWWTP has capacity to treat wastewater from the Plan Change Area. At that stage the wastewater from the lot would be diverted from the on-lot system into the Plan Change Area public reticulation system flowing to the Terminal WWPS and on to the PWWTP.

Option 2

The second option would be to have larger package-type wastewater treatment systems located adjacent to the Plan Change Area WWPS's. These treatment plants and disposal fields would be placed on future lot sites adjacent to the WWPS and sized to treat the WWPS' catchment.

As the remaining industrial lots are developed, they would connect to the wastewater reticulation within the road reserves and wastewater would flow to the WWPS wetwell chamber. The wastewater would then be pumped from the WWPS to the adjacent, interim, wastewater treatment system for treatment. The treated effluent would then be discharged to the disposal field. As more lots are developed and the wastewater flows increase additional modules would be added to the system to treat the increased flow.

When the PWWTP has been upgraded, flow from the Plan Change Area WWPS's will be diverted to the PWWTP. The wastewater treatment modules and disposal fields will be removed and converted back to industrial lots.

3.4 SUMMARY OF WASTEWATER SERVICING

HCC has indicated that development of the Plan Change Area will need to be aligned with available wastewater treatment capacity. Since the PWWTP is expected to have no

available capacity for the next 10 to 15 years, we have proposed alternative options for managing and treating wastewater generated within the Plan Change Area to ensure that the development of the Plan Change Areacan proceed.

In addition we recommend there be a moratorium on wet industry within the development, and water-sensitive design measures such as grey-water reuse be included in the requirements of the lot developers. These measures will reduce the demand for water and wastewater treatment.

Once the PWWTP has capacity to treat wastewater from the Plan Change Area, a conveyance plan has been outlined that aligns with HCC's requirements. The plan involves directing wastewater from the Plan Change Area to a terminal pump station, which will connect to the PWWTP through a combined rising and falling main (Figure 8).

4.0 WATER SUPPLY

4.1 EXISTING WATER SUPPLY NETWORK

The HCC 3-Waters Viewer (Figure 10) shows there are multiple existing water mains along Te Rapa Road. A 250mm and 150mm diameter main run along the western side and a 63mm diameter rider main on the eastern side.

To the southeast of the West Block there is a 150mm diameter pipe in the western berm of Old Ruffell Road.

To the east of the South-East Block there is a 200mm diameter pipe on the western side of Meadow View Lane, and a 50mm rider main running the length of the northwest boundary within the South-East Block.

There is a 250mm diameter trunk main to the southwest of the Plan Change Area at the junction of Ruffell Road and Onion Road.

There are no hydrants bordering the West Block or the North Block. There are three hydrants along Meadow View Lane which border the South-East Block.

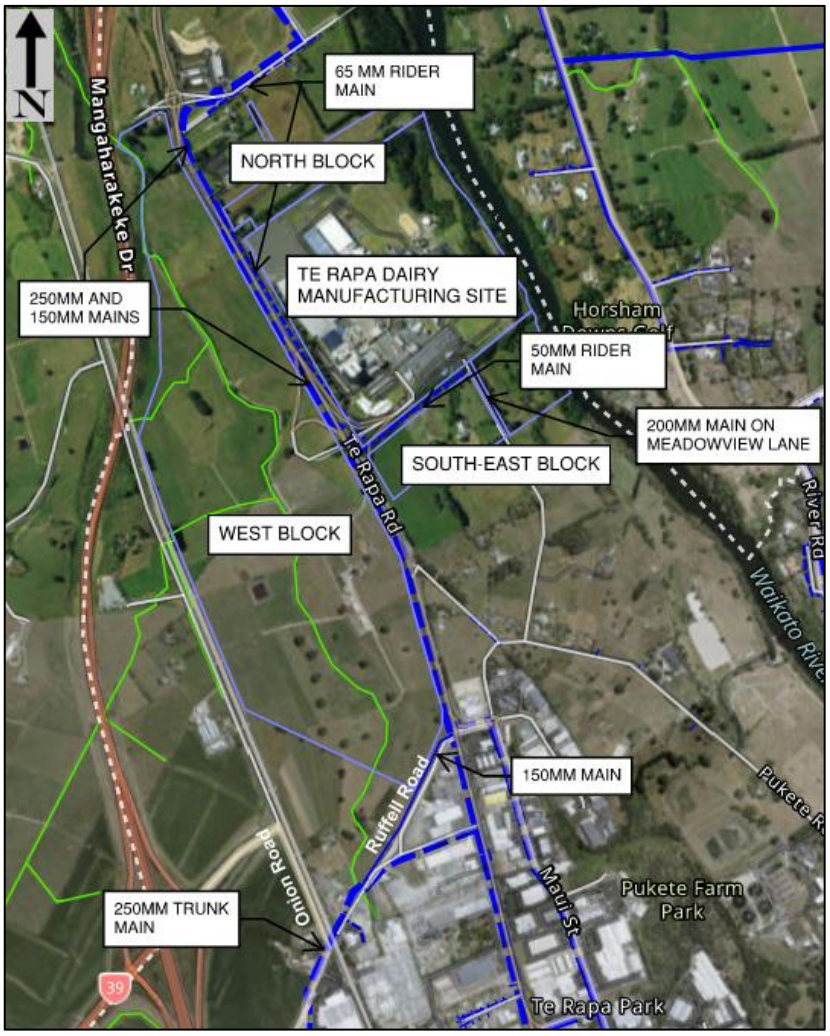

FIGURE 10 EXISTING WATER SUPPLY

4.2 WATER DEMAND

Water demand based on the RITS requirements for industrial zones is based on a population density of 45 people/ha, 260 l/person/day and peaking factor of 5.

The fire flows for the Plan Change Area are based on the RITS minimum requirement of providing firefighting classification of FW3 for industrial developments. AS/NZS 4509 Firefighting Water Supplies Code of Practices specifies FW3 as providing 50l/s flow at 60% of peak daily demand for a period of 60 minutes.

As discussed in Section 3 of this report HG have carried out independent studies of metered water usage for industrial developments within the Waikato. These studies have found actual water usage based on meter readings to be in the range of 30 to 70 l/person/day. As per RITS section 5.2.4.3 we propose that water demand for the Plan Change Area be based on water demand of 70 l/person/day. Table 3 below compares the RITS demand with our proposed Plan Change Area demand.

TABLE 3: WATER DEMAND AND USAGE

PLAN CHANGE AREAZONE	AREA (HA)	POPULATION EQUIVALENT	AVERAGE DAILY DEMAND (m^3/D)	PEAK FLOW (l/s)	FIRE FLOW (l/s)
RITS WATER FLOW (260 L/PERSON/DAY)					
West Block	74	3338	868	50.2	80.1
South-East Block	11	483	126	7.3	54.4
North Block	6	280	73	4.2	52.5
Total (RITS)	**91**	**4100**	**1066**	**61.7**	**87.0**
PROPOSED WATER FLOW (70 L/PERSON/DAY)					
West Block	74	3338	234	13.5	58.1
South-East Block	11	483	34	2.0	51.2
North Block	6	280	20	1.1	50.7
Total (Proposed)	**91**	**4100**	**287**	**16.6**	**60.0**

The proposed daily water demand for the entire Plan Change Area would be 287m^3/day. As with wastewater, any development would be required to have a moratorium on wet industries. Water sensitive development utilising rainwater harvesting, and grey water recycling (for example) would be encouraged to reduce demand on the existing water network.

4.3 WATER SUPPLY AND CAPACITY

Based on the current zoning (Deferred Industrial), HCC has not allocated any funding to the Plan Change Area for network upgrades nor allocation of water treatment capacity at this stage. HCC also stated that capacity upgrades to the HCC Water Treatment Plant (HCC WTP) are not included in their current Long-Term Plan. This means that HCC currently do not have capacity to supply the Plan Change Area.

As with the wastewater treatment solutions we have addressed interim and long-term solutions for the water supply.

When the HCC WTP has upgraded its capacity the Plan Change Area water reticulation will become part of the HCC water network.

HCC has informed us that the Plan Change Area would ultimately be supplied from the Pukete Reservoir with no requirement to have an additional reservoir within the Plan Change Area.

HCC has confirmed that the existing water supply pipe along Te Rapa Road only has sufficient capacity to service the existing connections and is susceptible to pressure loss at the end of the line (being the Te Awa Lakes development). Placing additional demand on this “end-of-line” supply network would significantly reduce the residual pressure available for the existing users.

4.4 WATER SUPPLY OPTIONS

LONG TERM WATER SUPPLY

The long-term water supply solution described below is based on the current network and network constraints but assumes there is capacity at the HCC WTP to supply the Plan Change Area. The network constraints are likely to change by the time the HCC WTP has been upgraded and has capacity to supply the Plan Change Area.

Servicing the Plan Change Area in the long term would require growth of the network off the Ruffell/Onion Road trunk main and be looped through the Plan Change Area to the water main on the eastern side of the West Block, within the Te Rapa Road's reserve, and then back to Ruffell Road. The development of the network would either run north within the Onion Road's reserve and under the NIMT to the Plan Change Area, or up the western side of the Plan Change Area within the West Block's road reserves. The addition of the looped networks (as a result of developing the West Block) would subsequently allow improved capacity to service the North and South-East Blocks.

If the development does not start from the southern end of the West Block, it is anticipated that a larger bulk main would be required up Onion Road, as the hydraulic benefits of a looped network would be lost.

SHORT TERM WATER SUPPLY

In advance of any upgrades to the HCC WTP, Fonterra would look into potential alternate sources of water supply with a view to securing sufficient daily water capacity to supply the Plan Change Area. Potential alternate sources have been identified and are feasible, and we anticipate that further details of these sources will be worked through and shared as part of the plan change process should they be needed.

An on-site water reservoir would then be able to be provided to store the required quantity of water for reuse within the Plan Change Area. The reservoir would be sized to hold a minimum of 48-hours of average daily water supply plus 180m^3 of firefighting supply to meet the FW3 firefighting classification.

The fully developed Plan Change Area is expected to use 287 m^3/day. 48-hours of storage would be 574 m^3; including firefighting supply of 180m^3 would make the minimum reservoir volume 754 m^3. To provide some conservancy a 1,000m^3 reservoir could be included in the first stage of development.

Figure 11 below, shows the water demand and storage period if the Plan Change Area was developed over 10 equal stages. The chart shows that for Stage 1, daily demand would only be approximately 29 m3/day.

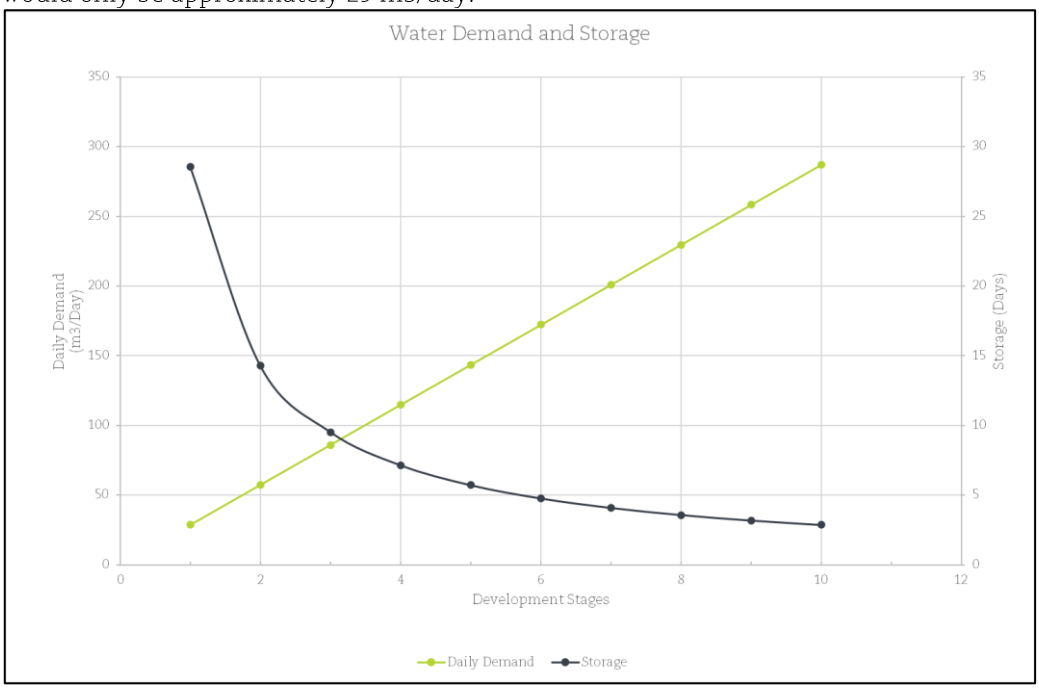

FIGURE 11 STAGED WATER DEMAND AND STORAGE DURATION

Additional on-lot rainwater reuse tanks and water sensitive designs would further reduce the demand from the Plan Change Area on any reservoir.

Once the HCC WTP has been upgraded any reservoir and pumpstation could be decommissioned and the Plan Change Area water network connected directly to the HCC water network.

Alternatively, the reservoir and pump system could be retained by HCC with the HCC network supplying the reservoir. This system would be beneficial to the HCC network as it would operate independently and could alleviate the network pressure issues currently experienced in this portion of the existing network as the reservoir can be filled throughout the day at lower flow rate eliminating peak flows to the Plan Change Area.

4.5 WATER SUPPLY SUMMARY

We believe that the solution proposed will allow the Plan Change Area to be developed ahead of any upgrades to the HCC WTP.

The proposed interim solution can be incorporated into the HCC water supply network when there is adequate treatment capacity, or it can remain as a separate pumped reticulation system with a reservoir supplied by the HCC network.

5.0
ELECTRICAL AND COMMUNICATION SUPPLY

5.1 ELECTRICITY SUPPLY

WEL Networks manage the power distribution around Hamilton. A BeforeUdig request indicates there is an existing power supply network surrounding the Plan Change Area with 11kV and 33kV power lines aboveground along Te Rapa Road and underground along Meadow View Lane, continuing through the Te Rapa Dairy Manufacturing Site and along the southern boundary of the North Block back to Te Rapa Road (Figure 12).

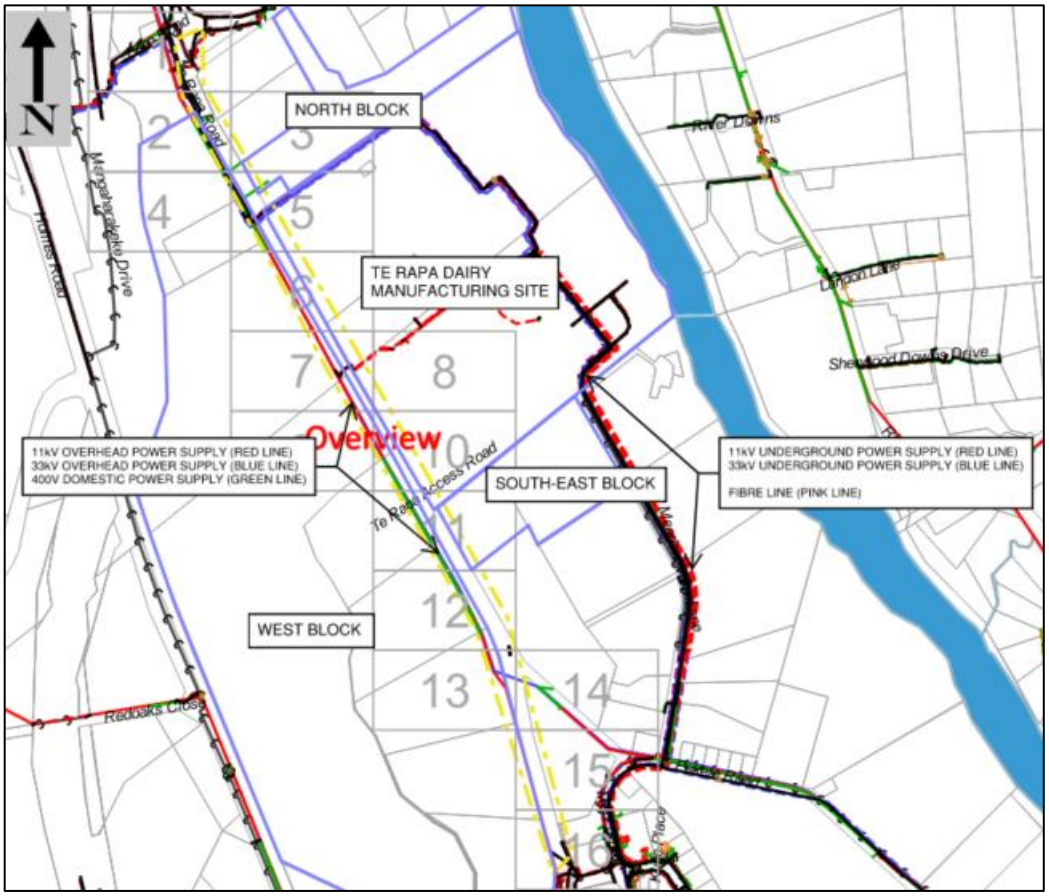

FIGURE 12 ELECTRICAL POWER RETICULATION (WEL NETWORKS)

Communication with WEL Networks is required to understand if there is capacity to supply electricity to the Plan Change Area for future industrial activities. Based on the size of the Plan Change Area it is likely that there is insufficient power supply for industrial demands, and a new substation may be required.

Discussions with WEL Networks will be required to confirm the supply, and also the possibility of supplying energy intensive industry (in excess of 2MW).

Depending on the demand for energy intensive industries, there may be benefit in creating a high energy user zone within future development planning with a dedicated substation site.

Historically, WEL Networks has been interested in encouraging power generated from alternative sources including solar power. Any excess power generated would be distributed by WEL Networks via the grid. With industrial buildings generally having

large roof areas there would be benefit in developing lot layouts that encourage buildings orientated with north facing roofs.

5.2 TELECOMMUNICATION SUPPLY

Telecommunication services to the Plan Change Area are provided by Chorus and VOCUS. A dial before you dig indicates VOCUS has some fibre optic services. However, this is limited to the west and south of the West Block, along Onion Road and Ruffell Road. This fibre cable is in the service trench with the power supply running around the eastern side of the South-East Block (see Figure 12). Chorus provide communication lines along Te Rapa Road to the existing Te Rapa Dairy Manufacturing Site. Tuatahi Fibre currently do not provide services to this portion of Te Rapa.

It is unknown if there are plans to install a greater fibre network in Te Rapa North. However, with the Te Awa Lakes development to the north of the Plan Change Area, upgrading of the fibre networks and access is a reasonable assumption.

6.0 CONCLUSION

Our assessment has demonstrated that there are adequate and appropriate options to service the rezoning of the Plan Change Area from an infrastructure perspective. These options would be refined as part of the detailed design for any future development or subdivision process.

Our assessment concludes that:

1. Stormwater can be managed via a treatment train and (where required) flow attenuation approach.

   At-source treatment could be provided via a combination of road corridor treatment swales (or raingardens) and on-lot soakage for smaller storm events.

   For the West Block, following at-source treatment, stormwater could then be collected via a gravity reticulated pipe network and drained to a number of wetlands within the Plan Change Area. The wetlands would provide a second (end-of-line) stage of water quality treatment, along with extended detention (to help mitigate erosion of the downstream watercourse) and flow attenuation (to help mitigate downstream flooding) for up to, and including, a 100-year storm event.

   Treated and attenuated flows from the wetlands would be discharged in a controlled manner to the Te Rapa Stream.

   For the North Block and South-East Block, following at-source treatment, stormwater could then be collected via a stormwater treatment swale network (incorporated into any future roading network) to treat stormwater runoff from any new roading or hardstand areas, prior to discharge to the existing overland flowpaths that currently drain any stormwater runoff from these areas to the adjacent Waikato River.

2. Ultimately water supply can be developed off the HCC network, provided it is developed using the Ruffell Road bulk main and the staging of future development is coordinated with the available water treatment plant capacity.

   The interim water supply proposal could utilise existing allocations to supply an on-site water reservoir. The reservoir will provide water and firefighting storage and deliver water to the lots and hydrants using pumps.

3. Wastewater can be reticulated across future development stages with a combination of gravity networks and wastewater pumpstations discharging to a terminal wastewater pumpstation. The terminal wastewater pumpstation would discharge the flows from the full development via new rising main and gravity falling main to the PWWTP.

   The interim solutions could include the inclusion of multiple temporary on-site package type wastewater treatment systems, or on-lot wastewater treatment.

4. Electrical and communication services have indicated that they are able to service the future development but will need to be informed of the development programme to ensure there is adequate time to carry out any upgrades (if required).

7.0 LIMITATIONS

7.1 GENERAL

This assessment 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 assessment 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 assessment in any other context or for any other purposes.