BEFORE THE INDEPENDENT HEARINGS PANEL
OF HAMILTON CITY COUNCIL

UNDER	the Resource Management Act 1991 ("**RMA**")
AND	
IN THE MATTER	of Private Plan Change 17 to the Hamilton City Operative District Plan ("**PC17**")

STATEMENT OF EXPERT EVIDENCE OF SCOTT DEAN KING ON BEHALF OF FONTERRA LIMITED

STORMWATER

7 OCTOBER 2025

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1. EXECUTIVE SUMMARY

1.1 This evidence addresses the stormwater management considerations for PC17, which seeks to rezone approximately 91ha of land surrounding the Te Rapa Dairy Manufacturing Site ("**Manufacturing Site**") at Te Rapa North ("the **Plan Change Area**"). The evidence has been prepared on behalf of Fonterra Limited ("**Fonterra**") and addresses the requirements of the Hamilton City Council's ("**Council**") Integrated Catchment Management Plan ("**ICMP**"), the Waikato Regional Stormwater Management Guidelines, and the Regional Infrastructure Technical Specification ("**RITS**").

1.2 The Plan Change Area comprises three main blocks: the West Block, North Block, and South-East Block. The West Block is traversed by the Te Rapa Stream and contains a 100-year flood hazard area, while the North and South-East Blocks slope towards the Waikato River.

1.3 Stormwater management outcomes for the Plan Change Area need to comply with the required outcomes of the ICMP, the RITS, and Waikato Regional Council guidelines. This includes the treatment of stormwater runoff prior to discharge, on-lot retention or soakage for the first flush, and, for the West Block, attenuation of post-development peak flows to ensure no increase in peak discharge to the Te Rapa Stream. The ICMP also requires mitigation of increased flood flow volumes resulting from development.

1.4 The West Block requires on-lot retention, stormwater quality treatment, extended detention, and attenuation of peak flows up to the 100-year event. Artificial wetlands are proposed for treatment and attenuation, with a treatment-train approach for road runoff. Flood storage zones will be created along the Te Rapa Stream corridor, and downstream erosion protection is preferred over flow diversion to the Waikato River.

1.5 The North and South-East Blocks discharge directly to the Waikato River, and as such, only on-lot retention and stormwater quality treatment are required. Treatment swales or wetland swales are proposed within road corridors, and existing outlets to the river will be utilised where possible.

1.6 The proposed stormwater infrastructure can be staged to align with development, with each sub-catchment provided with the necessary treatment and attenuation measures as it is developed. There are no interdependencies between sub-catchments that would restrict the order of development.

1.7 The Infrastructure Assessment has been updated to address matters raised in the Council Officer's Section 42A Report ("**Section 42A Report**"). Submissions requesting infrastructure be sized for full catchment development are addressed by the whole-of-catchment approach adopted. Concerns regarding mitigation of increased runoff volumes are addressed through the proposal for downstream erosion protection. Ongoing consultation with affected parties, such as Waikato District Council ("**WDC**"), should be undertaken as detailed designs progress.

2. INTRODUCTION

Qualifications and Experience

2.1 My name is Scott Dean King. I am a Technical Director at Harrison Grierson Consultants Limited, based in Hamilton.

2.2 I hold the qualifications of BEng (Civil), MSc, CMEngNZ, CPEng. My Bachelor's and Master's degrees were obtained from Birmingham University in the UK in 1995 and 1996. I am a Chartered Professional Civil Engineer with over twenty-seven years' experience, twenty years of which are based in the Waikato Region, managing projects and undertaking civil infrastructure design for works associated with a variety of land development sites and roading projects.

2.3 Examples of my experience on recent projects include the Precinct North Industrial Subdivision adjacent to Hamilton Airport, the Amberfield subdivision in the new Peacocke growth cell area of Hamilton, and Precinct B of the Rangitahi subdivision in Raglan.

Involvement in PC17

2.4 I have been engaged by Fonterra to prepare evidence for PC17. I was the author of the stormwater sections of the Infrastructure Assessment and the Technical Memo entitled "Stormwater Management Update" within Appendix 2 of the Supplementary Information dated August 2025, both for PC17.

Code of Conduct

2.5 I confirm that I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2023. I have complied with the Code of Conduct in preparing this evidence and I agree to comply with it while giving oral evidence before the Hearings Commissioners. Except where I state that I am relying on the evidence of another person, this written evidence is within

my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

3. PC17

3.1 PC17 has been prepared to rezone the Plan Change Area. PC17 proposes to amend the Hamilton City Operative District Plan's ("**ODP**") planning maps by removing the Deferred Industrial Zone Area overlay from the Plan Change Area and amending the provisions of the Te Rapa North Industrial Zone to enable its intended future industrial use.

3.2 The extent of the Plan Change Area is shown in Figure 1 below.

Figure 1: Plan Change Area Boundaries.

4. SCOPE OF EVIDENCE

4.1 This statement of evidence will:

(a) outline the terrain, existing drainage and flood hazards of the Plan Change Area;

(b) outline the stormwater management requirements of the Plan Change Area;

(c) summarise the key recommendations relating to stormwater management from the Infrastructure Assessment undertaken in relation to PC17;

(d) respond to stormwater matters raised in the Section 42A Report;

(e) respond to stormwater matters raised in submissions; and

(f) provide an overall conclusion on Fonterra's application for PC17 from a stormwater perspective.

5. TERRAIN, EXISTING DRAINAGE AND FLOOD HAZARDS

5.1 The Plan Change Area is made up of the West Block, South-East Block and North Block. Te Rapa Road runs along a ridge separating the West Block from the North Block, the Manufacturing Site and South-East Block. The Manufacturing Site sits between the North Block to the north and the South-East Block to the south east.

5.2 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 Te Rapa Stream ultimately discharges to the Waikato River approximately 2.5km north of the West Block.

5.3 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.

5.4 One of the steeper banks within the West Block 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.

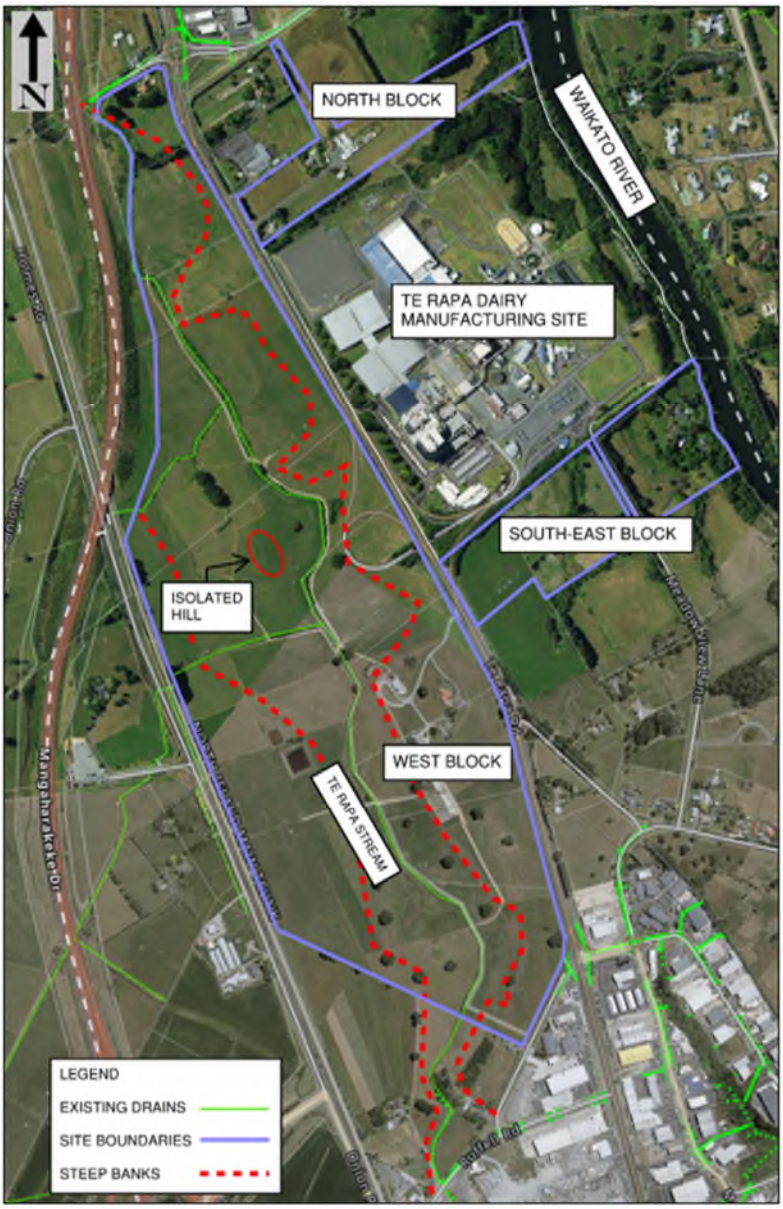


Figure 2: Te Rapa North Industrial Zone – Existing terrain and drainage.

5.5 The Te Rapa Stream catchment originates within the developed Te Rapa North Industrial Area (located south of the West Block) and includes approximately 67.2ha of developed industrial properties and 11.6ha of rural and farm properties. There are also two smaller farm drains connecting to the Te Rapa Stream from the west.

5.6 The drains are shown in Figure 2 above, and the external stormwater catchments of the Te Rapa Stream are shown in Figure 3 below.

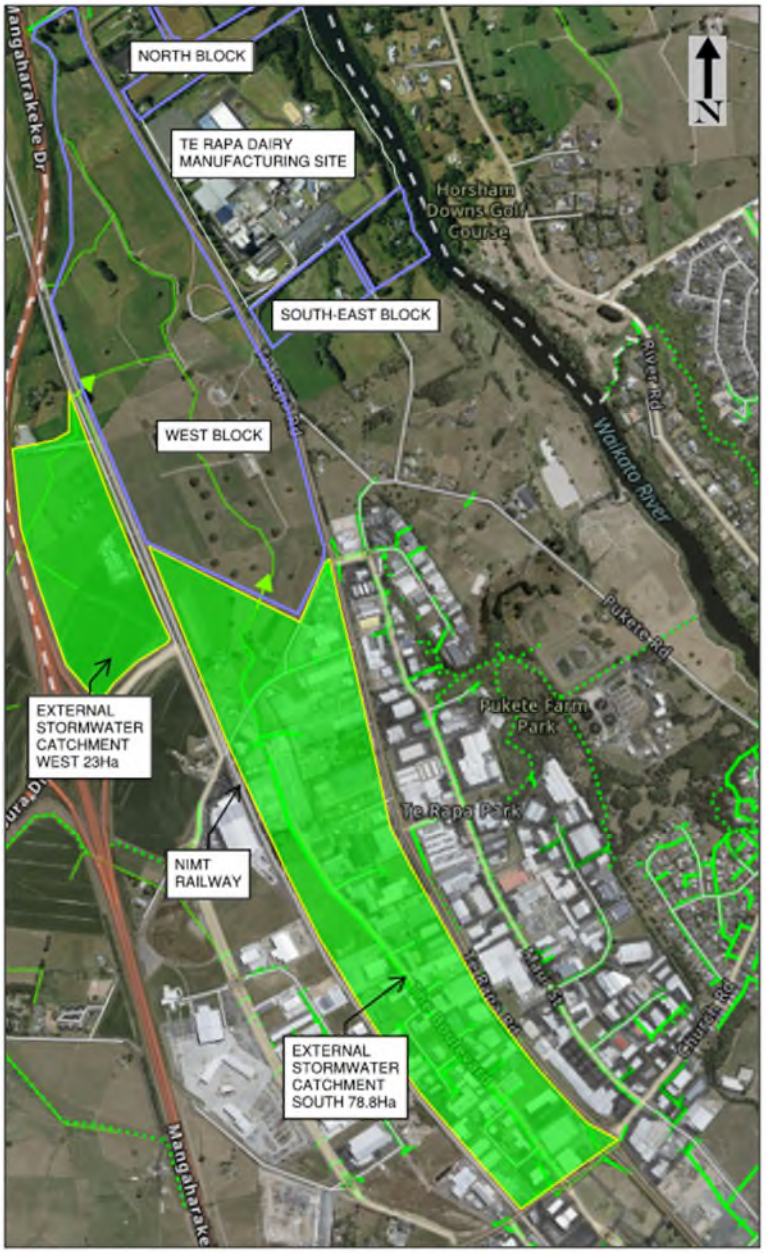


Figure 3: Te Rapa Stream – External stormwater catchments.

5.7 As shown in Figure 4 below, sourced from the Council online Floodviewer, 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.

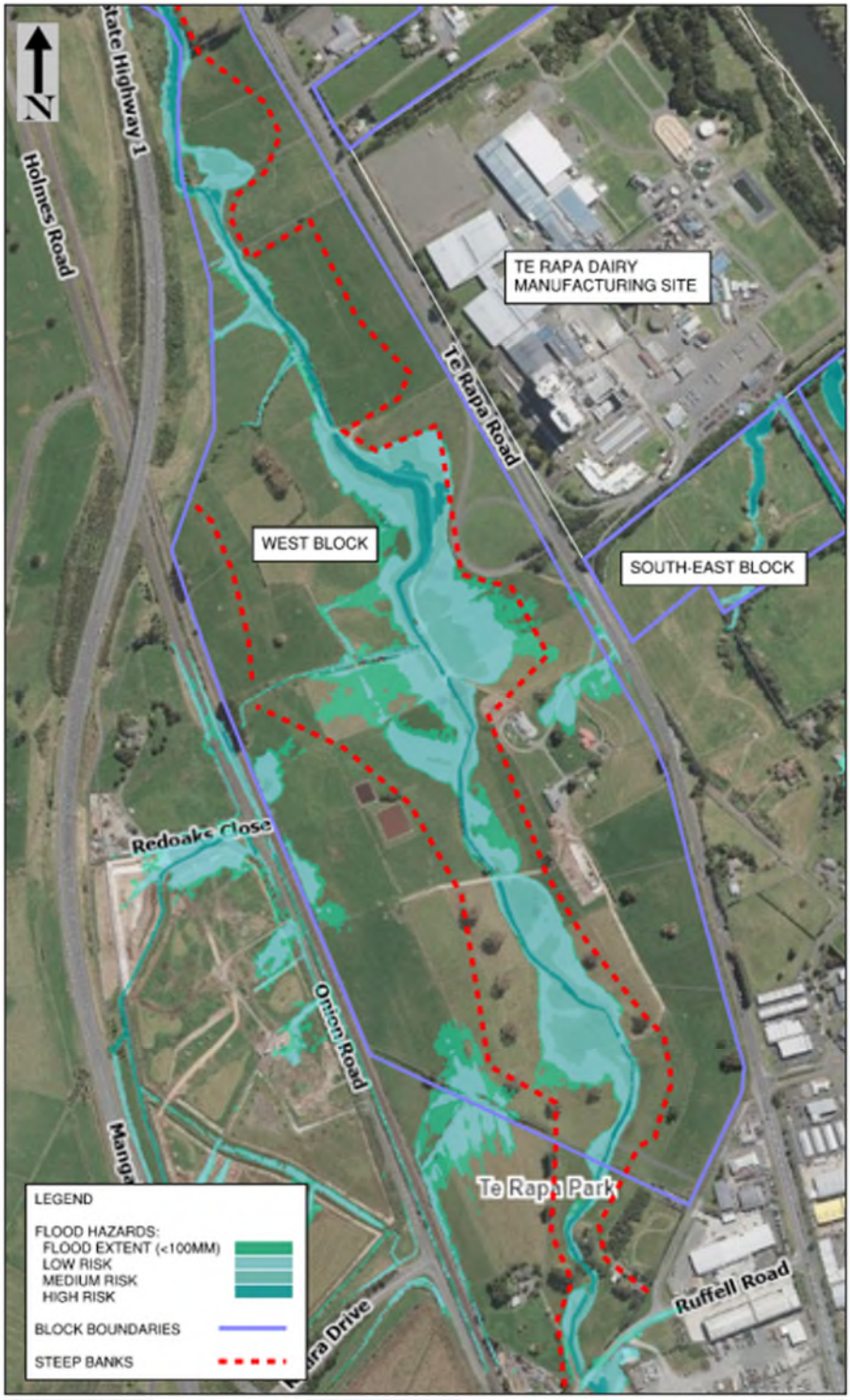


Figure 4: HCC Flood Hazard – 100-year.

5.8 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.

5.9 As shown in Figure 5 below, sourced from the Council online Floodviewer, a 100-year flood depression area is also shown on the West Block. This indicates that, in the event of blockage of the stormwater culverts beneath

State Highway 1C (Waikato Expressway) ("**SH1C**") that drain flows from the catchment, the West Block would be flooded up to a contour level of just under 22m. This reflects the depth that flood water would need to build-up to in the West Block prior to flows passing over the adjacent low point of SH1C.

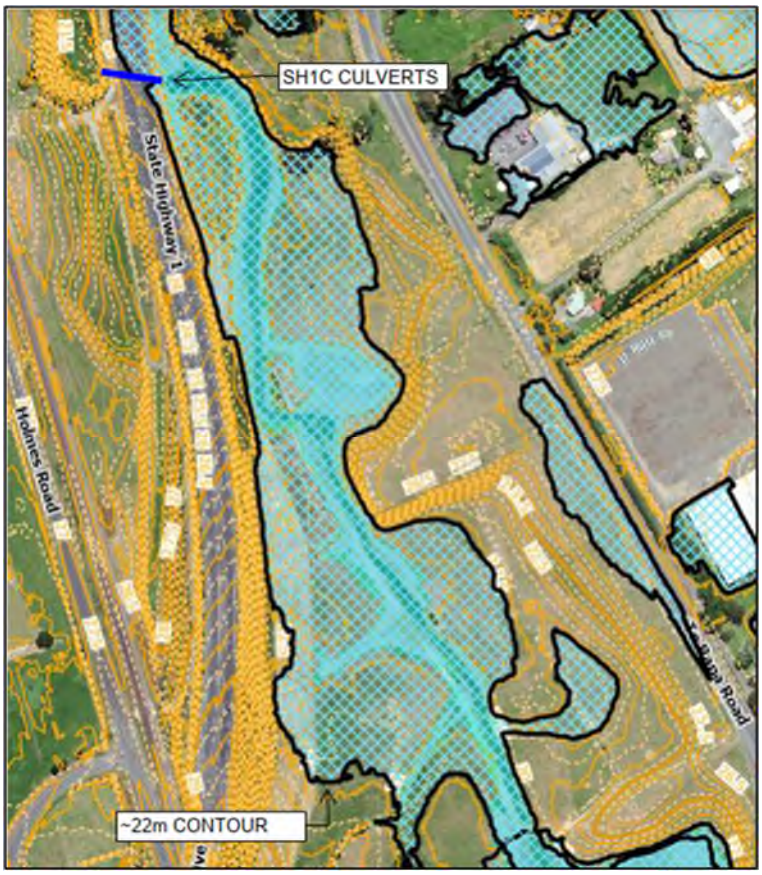


Figure 5: HCC Flood Depression – 100-year.

5.10 The South-East Block and North Block are both of a moderate grade sloping towards the Waikato River to the east.

5.11 The South-East Block has two gullies that run south to north through the block, as shown in Figure 6. These gullies terminate at the northern boundary, where they discharge into a consented stormwater pipe network that runs through the south east corner of the Manufacturing Site and outfall into the Waikato River.

5.12 When capacity of the pipe network is exceeded, then the gullies fill, and flows follow the overland flowpath route to the Waikato River, identified on Figure 6.

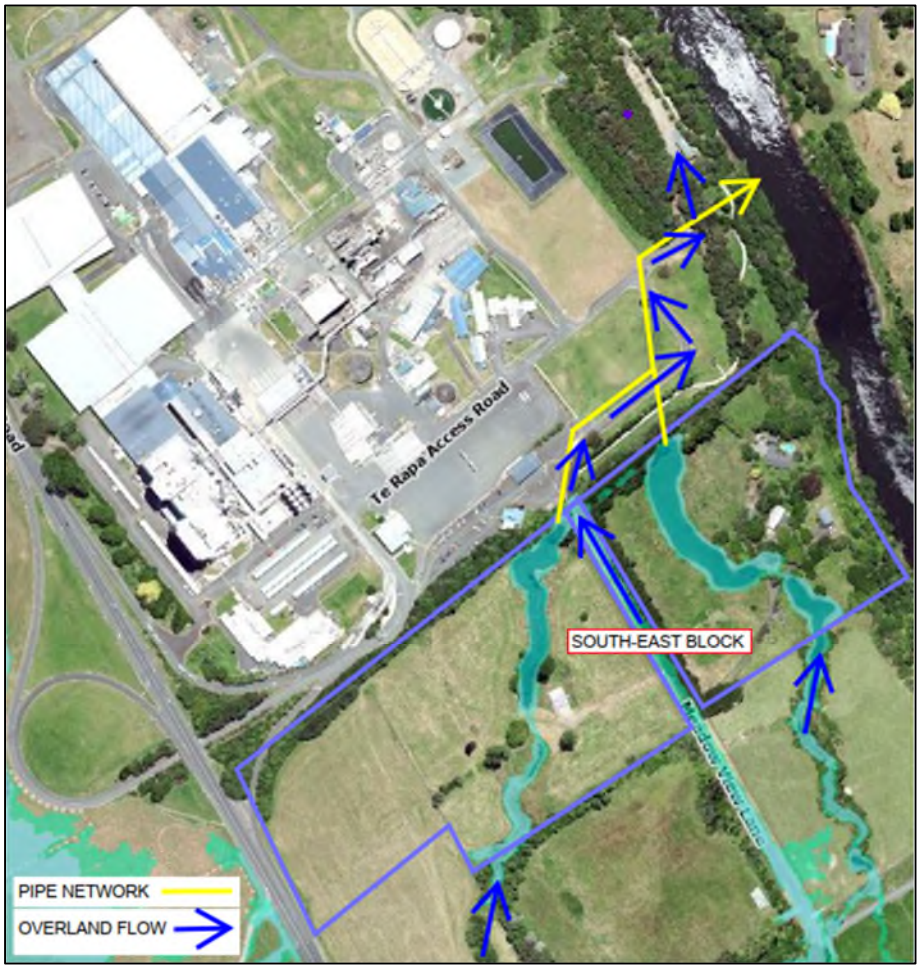


Figure 6: South-East block – Overland flows.

5.13 No flooding information is available on the Council's Floodviewer for the North Block as this area falls outside the extents of the Council flood model. Council's Floodviewer does provide overland flow paths for the North Block that would be indicative of possible flood locations. These are shown in Figure 7.

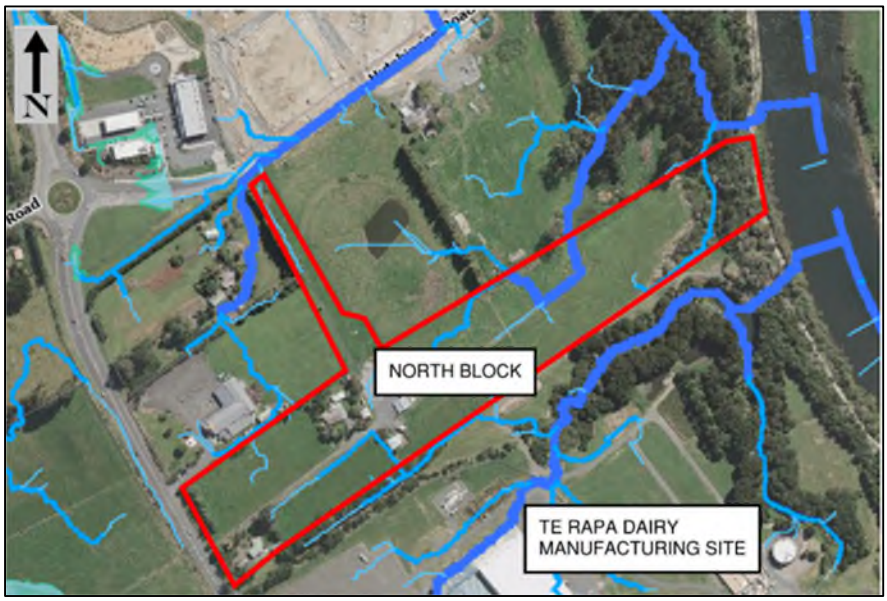


Figure 7: North Block – Overland flowpaths.

6. STORMWATER MANAGEMENT REQUIREMENTS

6.1 Stormwater management outcomes for the Plan Change Area need to comply with the required outcomes of the ICMP for the catchment area, prepared by the Council, as well as adhering to the Waikato Regional Stormwater Management Guidelines document, prepared by Waikato Regional Council ("**WRC**") and the RITS.

6.2 In accordance with those three documents, stormwater runoff from any development needs to be treated before being discharged from the Plan Change Area

6.3 In addition, the ODP has a requirement in rule 25.13.4.2 for new lots to provide on-lot retention, reuse or soakage (with pre-treatment) for the first flush of stormwater runoff from each lot.

West Block

6.4 For the West Block, which will discharge to the Te Rapa Stream, post-development stormwater peak flows need to be managed within the West Block, to ensure that there is no peak flow increase prior to discharge to the Te Rapa Stream.

6.5 On this basis, the West Block will require treatment and attenuation of peak flows. The ICMP also requires mitigation of the increase in flood flow volume resulting from development within the West Block.

North Block and South-East Block

6.6 The blocks to the east of Te Rapa Road (being the North Block and South-East Block) will only require treatment, as the stormwater from these blocks will be discharged directly to the Waikato River.

7. STORMWATER MANAGEMENT RECOMMENDATIONS

7.1 To account for the varying stormwater management requirements across the Plan Change Area, separate stormwater management recommendations have been provided for the different blocks (ie the West Block, the North Block and the South-East Block), as detailed below:

West Block

7.2 The West Block will require the provision of on-lot retention, stormwater quality treatment, extended detention and attenuation of post-development peak flows (up to and including the 100-year storm event).

7.3 As detailed design works are progressed, soakage testing will be required to be undertaken on each new lot, and on-lot retention is to be provided via the use of soakage to ground (with pre-treatment) on any lot where testing determines that sufficient soakage to ground is available within the lot.

7.4 If testing determines that soils on a lot are not suitable for soakage, then on-lot retention would be provided via stormwater runoff collection and detention (and potentially reuse), which would be feasible for any building roof or hardstand area constructed on a lot.

7.5 Each lot would also require the provision of (and adherence to) an Operation and Maintenance Plan associated with the specific on-lot stormwater management system, and any high risk activities proposed on a lot (such as petrol storage) would also require a pollution control plan (in accordance with the Council's stormwater bylaw). These plans would be developed as part of the resource / building consent process for each lot.

7.6 The required provision of stormwater quality treatment, extended detention and peak flow attenuation for up to the 10-year storm event for the West Block can be achieved via the use of artificial wetlands located off-line and alongside the Te Rapa Stream corridor through the block.

7.7 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.

7.8 The artificial wetlands will also add ecological value to the Plan Change Area and attract aquatic fauna.

7.9 Stormwater modelling has been undertaken for each sub-catchment within the West Block to provide initial sizing of the required wetlands to provide the required extended detention, and 10-year flow attenuation, prior to discharge to the Te Rapa Stream.

7.10 When establishing wetland sub-catchment areas, a whole of catchment approach was taken, including allowance for existing (or upgraded) roading corridors that currently drain into the Plan Change Area. The West Block sub-catchments and proposed wetlands are identified in Figure 8.

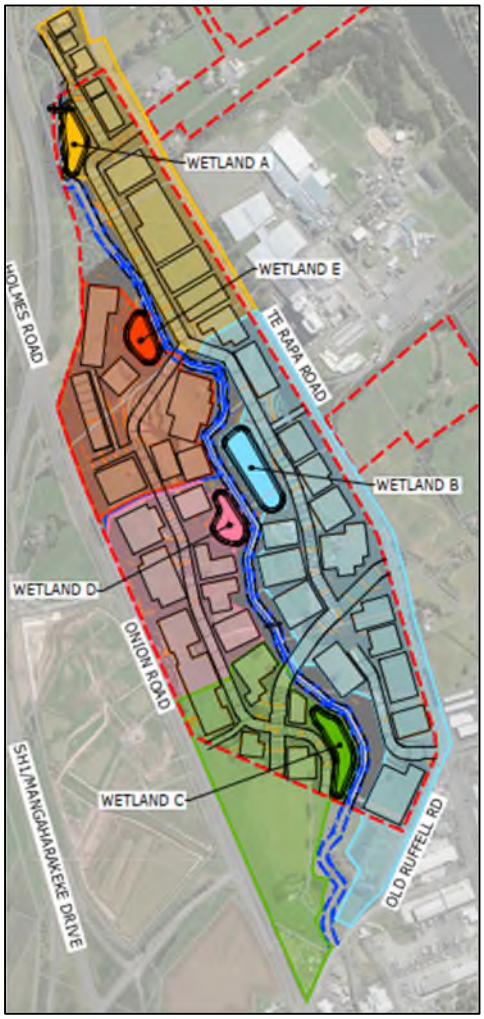


Figure 8: West Block - Conceptual Sub-catchments and Wetlands.

7.11 Following provision of on-lot retention, stormwater flows from developed land within the West Block (for up to and including a 10-year storm event), will be conveyed within a gravity piped network located within proposed road corridors, and discharged into the artificial wetlands.

7.12 Due to the industrial nature of development of the West Block, a treatment-train approach is required to pre-treat runoff from any new road corridors prior to discharging flows to the artificial wetlands.

7.13 Such pre-treatment can be provided within the road corridors, either by adopting sediment filtration inserts into each roadside catchpit, or by incorporating either raingardens or grassed treatment swales along the road corridors to treat runoff prior to discharge to the gravity pipe system (that then drains to the artificial wetlands).

7.14 Storm event runoff from storms exceeding a 10-year event would be conveyed overland, within the road corridors and discharge directly to the Te Rapa Stream at select locations (and erosion protected).

7.15 In accordance with the ICMP, storage and attenuation of the 100-year peak flows would then be provided within the stream corridor and its adjacent floodplain.

7.16 Conceptual flood storage zones required to provide the attenuation along the Te Rapa Stream corridor have been provided by introducing three stream culvert crossing locations within the West Block (coinciding with proposed road crossing points where feasible). These locations are annotated as Culverts 1, 2 and 3 on the plan in Figure 9 below.

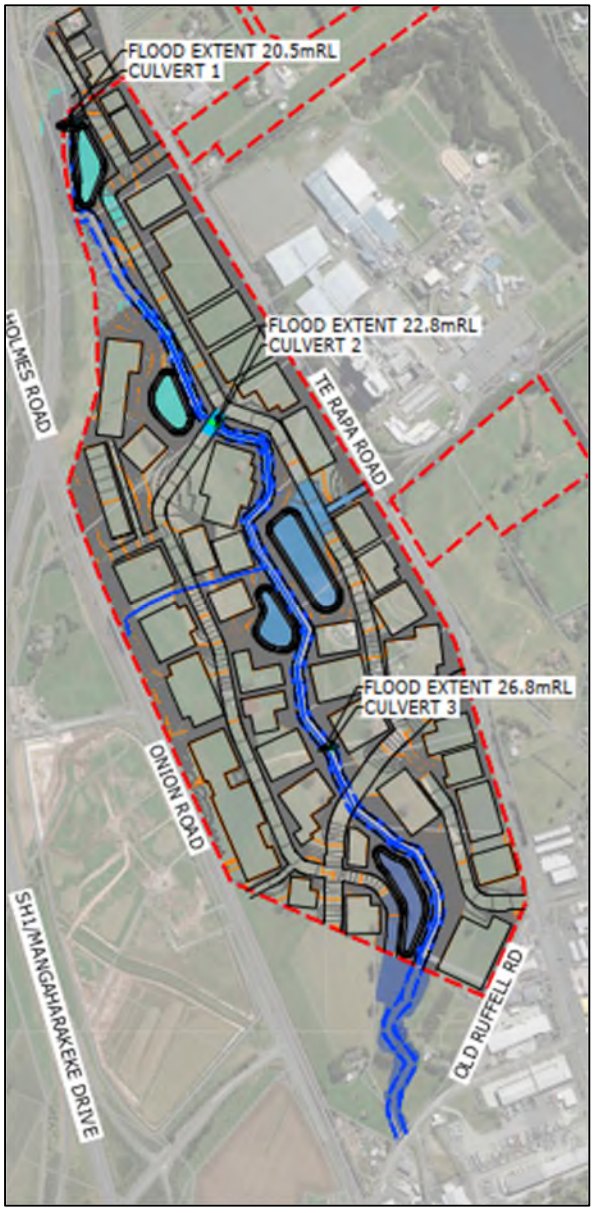


Figure 9: West Block - Conceptual Te Rapa Stream Flood Storage Zones.

7.17 Additional flood modelling will be required as the design develops, to ensure the Te Rapa Stream and adjacent floodplain retains adequate flood volume so as to provide the required 100-year peak flow attenuation without adversely impacting either proposed building floor levels with the West Block, or any

upstream land. Such modelling would also need to consider the culvert block scenario.

7.18 To ensure adequate grades for the gravity network and overland flow paths, the West Block will require some earthwork contouring towards the Te Rapa Stream, to remove the existing steep banks and provide terraces.

7.19 In accordance with the whole of catchment approach proposed (and required by the ICMP), any upstream flows into the West Block from neighbouring properties will be allowed to continue to utilise the existing flow paths unhindered (and without compromising the artificial wetlands provided for the development within the block).

7.20 For the West Block, this would involve protecting and maintaining the existing watercourses through the block (ie the Te Rapa Stream for flows from the south, and the tributaries connecting land west of Onion Road to the Te Rapa Stream).

Stormwater runoff volume

7.21 In addition to requiring peak flow attenuation for the 100-year storm event for the Te Rapa Stream prior to flows exiting the Plan Change Area, the ICMP also requires mitigation of the increase in flood flow volume resulting from development within the West Block.

7.22 For a development of this scale and nature, it is difficult to avoid creating an increase in stormwater runoff volumes after development. As such, a number of measures have been investigated to mitigate the adverse effects of additional runoff volume.

7.23 In terms of runoff volume increase, the most likely adverse effect would be erosion of the banks of the Te Rapa Stream downstream of the Plan Change Area.

7.24 The ICMP for the catchment notes that downstream erosion of the Te Rapa Stream is already an issue and identifies two options for mitigation. The first is construction of a flow diversion pipeline to divert flow from the Te Rapa Stream directly into the Waikato River. The second is provision of downstream erosion protection along the Te Rapa Stream banks to armour against stream bank erosion.

7.25 Having reviewed the two mitigation options, the preference is the erosion protection option, for the following reasons:

(a) The downstream erosion along the lower reaches of the Te Rapa Stream is (as identified in the ICMP) an existing issue that needs remediation. As such, works undertaken pursuant to PC17 that assist to remediate the existing issue sooner than contemplated by the ICMP would be of benefit.

(b) The downstream erosion works can be staged (starting at the downstream end of the Te Rapa Stream and working upstream) to link with development stages of PC17. Whereas the pipe diversion option would need full funding to proceed with construction, and cannot be staged.

(c) The erosion works are relatively straightforward technically and so could start in the short-term. The pipe diversion is a long-term project requiring significant pre investigation, strategic planning and construction works.

7.26 Detailed design and construction of such stream erosion protection measures would need to be progressed alongside detailed design and construction of the West Block.

North Block and South-East Block

7.27 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 or properties that will require protection from erosion or flooding impacts).

7.28 As such, the North Block and South-East Blocks only require the provision of on-lot retention, along with stormwater quality treatment, prior to discharge to the Waikato River.

7.29 As detailed design works are progressed, soakage testing will be required to be undertaken on each new lot area, and on-lot retention is to be provided via the use of soakage to ground (with pre-treatment) on any lot where testing determines that sufficient soakage to ground is available within the lot.

7.30 If testing determines that soils on a lot are not suitable for soakage, then on-lot retention would be provided via stormwater runoff collection and detention (and potentially reuse), which would be feasible for any building roof or hardstand area constructed on a lot.

7.31 Each lot would also require the provision of (and adherence to) an operation and maintenance plan associated with the specific on-lot stormwater

management system, and any high-risk activities proposed on a lot (such as petrol storage) would also require a pollution control plan (in accordance with the Council's stormwater bylaw). These plans would be developed as part of the resource / building consent process for each lot.

7.32 Stormwater treatment for the blocks is proposed to be provided via the use of stormwater treatment swale drains or wetland swales, incorporated into the roading network provided for each block.

7.33 The roadside treatment swale drains or wetland swales would collect and treat stormwater runoff from any new roading or hardstand areas prior to discharge to the existing pipe networks and flow paths that currently drain any stormwater runoff from these areas to the adjacent Waikato River.

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

7.35 The treatment swale drains or wetland swales would be provided off-line of any existing flow paths through the blocks so that, as per the whole of catchment approach proposed (and required by the ICMP), any upstream flows into the blocks from neighbouring properties can continue to utilise the existing flow paths unhindered (and without compromising the swales provided for the development within each block).

7.36 In accordance with the required whole of catchment approach, design of any wetland swales or stormwater treatment swales would need to account for any adjacent land that contributes runoff, and design of flow paths and outfalls to the Waikato River would be based on a whole of catchment approach (ie designed to account for runoff from the maximum probable development of the entire sub-catchment, including any contributing upstream land).

7.37 In addition, design for each block of land would need to be undertaken so as not to cause adverse effects on either upstream or downstream land.

7.38 It is proposed that stormwater flows from the two blocks would be directed to, and utilise, the existing outlets to the Waikato River for each block (as opposed to duplicating existing infrastructure if not necessary). This not only minimises the capital expenditure costs, but also any future asset maintenance costs.

7.39 Existing outlet locations, conditions and capacities will be further investigated as detail design progresses. Should such investigation determine that either the location, condition or capacity of an existing flow path or outfalls is not

suitable for post-development site flows, then the option exists to duplicate (or upsize) the existing flow paths and outfalls to the Waikato River as required.

Staging of Development Works

7.40 The implications of staging the development on the proposed stormwater measures are minor and are limited to providing all the required infrastructure needed to service each individual stormwater sub-catchment within the Plan Change Area.

7.41 Development of the West Block will require construction of the wetland that services each individual stage, along with any associated infrastructure required to connect the staged sub-catchment area to its wetland.

7.42 Construction of the relevant Te Rapa Stream culvert crossings to form the associated flood storage areas, and the flood volume mitigation measures of Te Rapa Stream erosion protection will also need to be aligned to development of the West Block stages.

7.43 The North Block and South-East Block, that drain directly to the Waikato River, will require the provision of an outlet to the river for each sub-catchment, along with the required upstream water quality treatment measures.

7.44 As the stormwater sub-catchments are stand-alone, there are no interdependencies with regards to the order of their development.

8. SECTION 42A REPORT

8.1 A review of Section 42A Report identified a number of items related to Stormwater and requested the Infrastructure Assessment be updated to respond to the items raised.

8.2 A number of the items raised were minor clarifications, and these have been covered by the updated Infrastructure Assessment.

8.3 Key issues raised in the Section 42A Report concerned: provision of a whole of catchment approach in the design of the stormwater systems for the Plan Change Area; confirmation that 100-year flood attenuation is proposed to be provided within the Te Rapa Stream corridor; and details regarding mitigation measures for stormwater runoff volume increases in the Te Rapa Stream.

8.4 With regard to provision of a whole of catchment approach, as detailed in the updated Infrastructure Assessment, and noted in the above evidence, ongoing

design of stormwater management measures for the Plan Change Area will need to be based upon a whole of catchment approach.

8.5 With regard to 100-year flood attenuation in the Te Rapa Stream corridor, as detailed in the updated Infrastructure Assessment, and noted in the above evidence, such flood attenuation will be provided within the stream corridor. The required attenuation volume is proposed to be provided via a number of flood storage areas formed behind stream culvert crossing locations.

8.6 With regard to mitigation measures for stormwater runoff volume increases in the Te Rapa Stream, as noted in the updated Infrastructure Assessment, and the above evidence, the required mitigation is proposed to be via provision of downstream erosion protection along the Te Rapa Stream banks to armour against stream bank erosion.

8.7 The Infrastructure Assessment has been updated to reflect, and respond to, each item raised (see **Attachment A** of this evidence).

9. RESPONSE TO SUBMISSIONS

9.1 I have read the submissions received on PC17 that raise concerns relating to stormwater matters. I address the matters raised in submissions below.

9.2 The majority of submissions related to stormwater (namely Submission 7 by Empire Corporation & Porter Group, Submission 8 by Graeme Boddy, Submission 9 by Hayden Porter and Submission 16 by Morth Trusts Partnership) request that infrastructure be sized for full catchment development.

9.3 As noted in my evidence, in accordance with the requirements of the ICMP any stormwater measures implemented as part of PC17 will need to be sized and designed based on a whole of catchment approach (i.e. be designed to account for runoff from the maximum probable development of the entire sub-catchment related to each block, including any contributing upstream land).

9.4 Submission 10 by WDC and submission 13 by WRC raised concerns that the issue of the mitigation of stormwater runoff volumes increases has not been addressed for the Te Rapa Stream.

9.5 In response I note that the updated Infrastructure Assessment now proposes the provision of downstream erosion protection measures for the Te Rapa Stream so as to mitigate the impacts of stormwater runoff volumes increases.

9.6 WDC also requests that, as stormwater designs are progressed, that they are provided to WDC for review prior to implementation.

9.7 In response, as WDC are considered an affected party (as it has jurisdiction over the downstream reaches of the Te Rapa Stream) then I support ongoing consultation with them as stormwater designs (specifically the downstream erosion protection works) are progressed.

9.8 Submission 14 by Horotiu Farms Limited and Te Awa Lakes Unincorporated Joint Venture Limited requests that appropriate stormwater management measures are included in PC17 to ensure water quality outcomes are appropriate. It also notes that it is considered best practice to apply for comprehensive discharge consent in conjunction with a Plan Change.

9.9 With regards to the issue of providing appropriate stormwater management measures, as noted in my evidence, all stormwater design for the Plan Change Area will need to be designed in accordance with the RITS, WRC's Regional Stormwater Management Guidelines and the outcomes of the ICMP. As such, it is considered that designs provided in accordance with these documents will result in the provision of appropriate stormwater management measures.

9.10 With regards to the issue of applying for comprehensive discharge consent in conjunction with PC17, I respond that there is no requirement to obtain a resource consent to discharge stormwater as part of a plan change, as they are obtained via a separate statutory process.

10. CONCLUSION

10.1 The proposed stormwater management approach for PC17 is consistent with best practice and planning requirements. It provides for the treatment, retention, and attenuation of stormwater to manage flood risk, protect water quality, and mitigate downstream effects, while allowing for staged development and ongoing engagement with stakeholders.

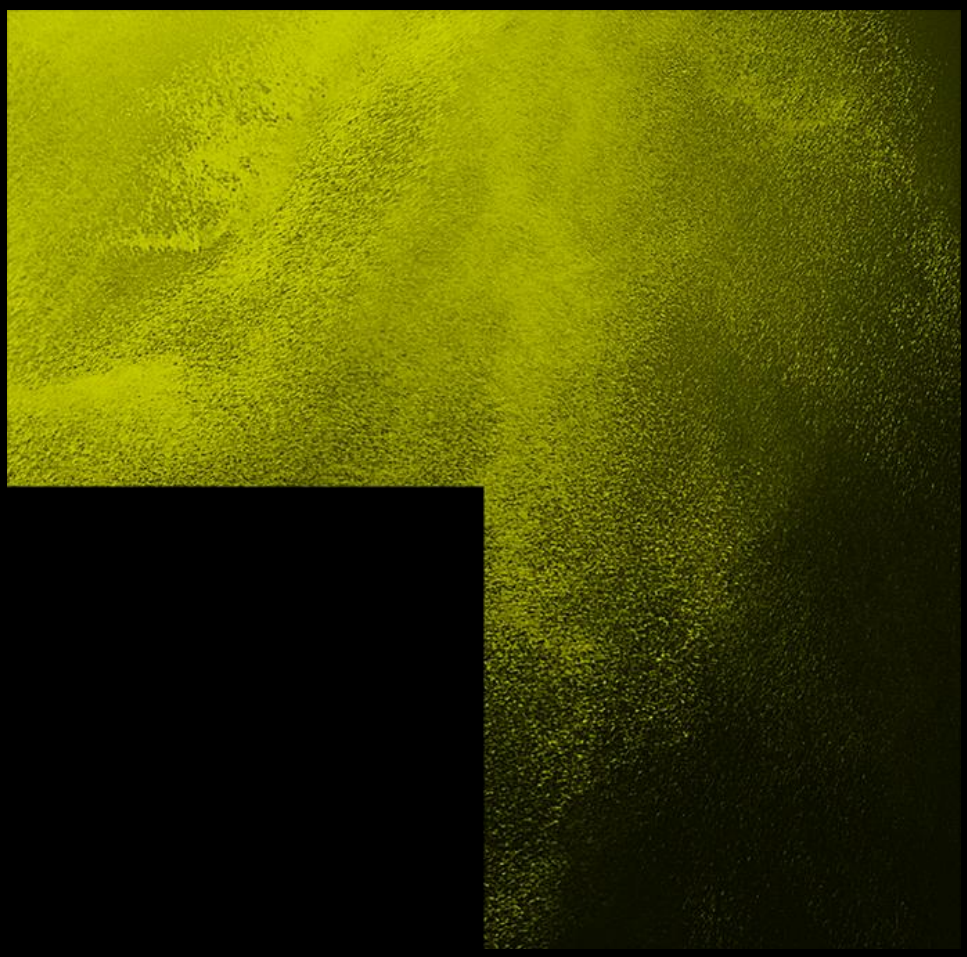
Scott King
7 October 2025

Attachment A – Copy of Infrastructure Assessment Report updated to reflect, and respond to, each item raised.

TE RAPA PRIVATE PLAN CHANGE

Infrastructure Assessment

Fonterra Limited



DOCUMENT CONTROL RECORD

CLIENT	Fonterra Limited
PROJECT	Te Rapa Private Plan Change
HG PROJECT NO.	A2212331.01
HG DOCUMENT NO.	REP001
DOCUMENT	Infrastructure Assessment

ISSUE AND REVISION RECORD

DATE OF ISSUE	~~December 2024~~Octo~~septem~~ber 2025
STATUS	Rev02 - Final
ORIGINATOR	Matthew Farrell – Technical Lead, Scott King – Technical Director
REVIEWED	Scott King – Technical Director and Matthew Farrell – Technical Lead
APPROVED FOR ISSUE	Nick Grala – National Planning and Environment Manager
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CONTENTS

1.0
INTRODUCTION

This infrastructure assessment has been updated based on information provided by Hamilton City Council post lodgement of the original Infrastructure Assessment report submitted as part of Private Plan Change 17 application in December 2024~~).~~

This report has been prepared on behalf of Fonterra Limited ('Fonterra') to- consolidate and clarify information held in the December 2024 report and the supplementary memo prepared in August 2025.

This report informs and supports ~~its~~ the 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.

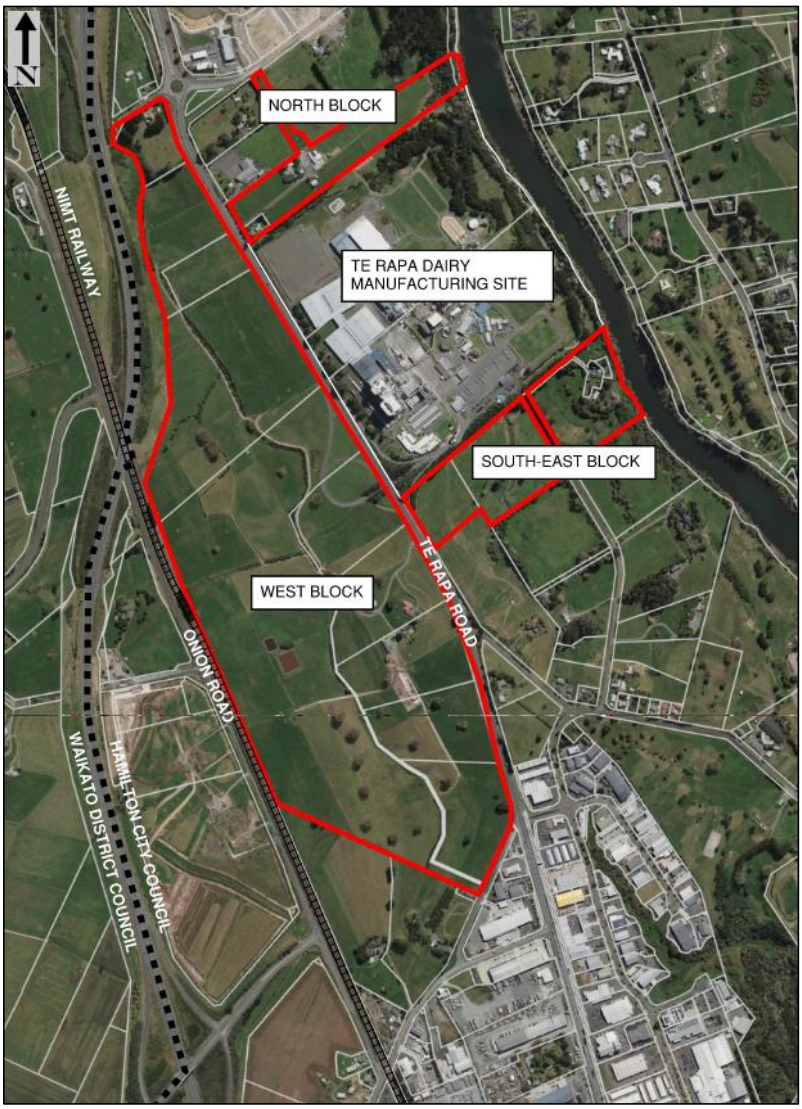


FIGURE 14 EXTENT OF PLAN CHANGE AREA SHOWN IN RED OUTLINE

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.
- Meetings held with HCC and information provided by HCC

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~~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~~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~~Figure 2~~ and the external catchment shown as External Catchment West in Figure 3~~Figure 3~~.

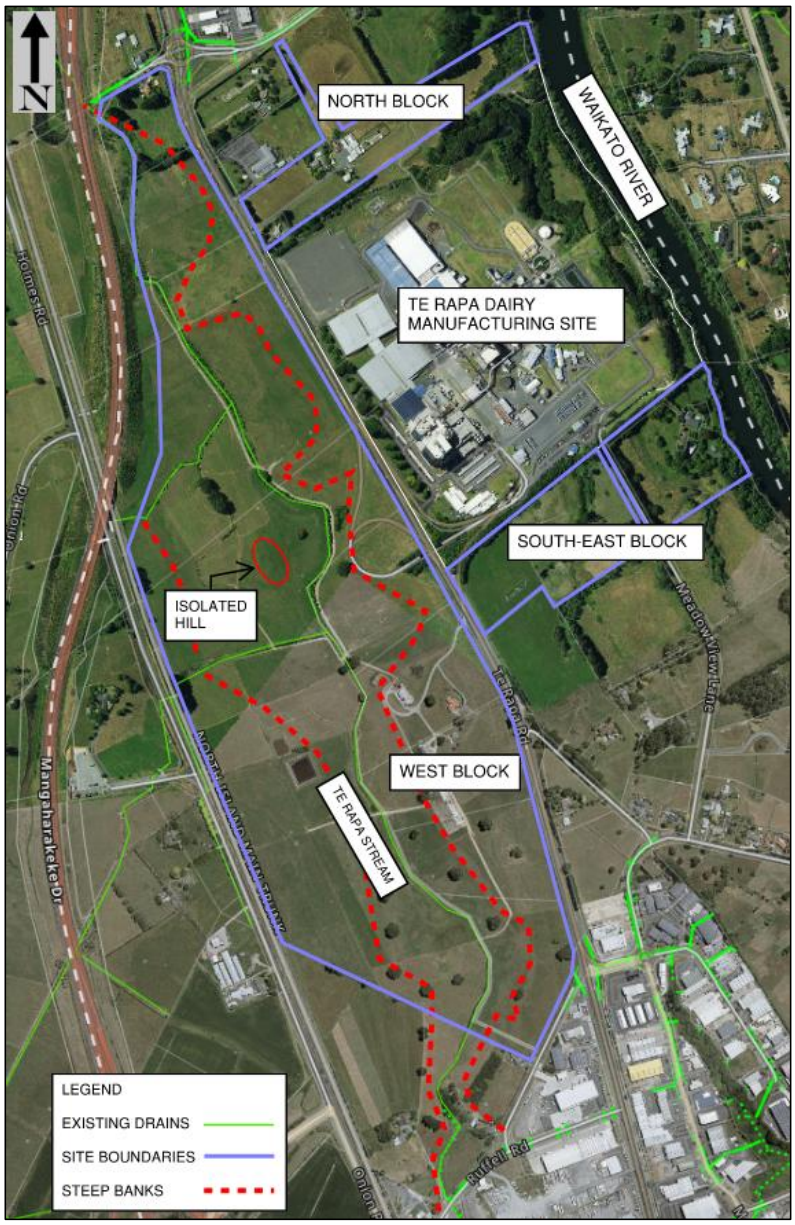


FIGURE 2~~2~~ EXISTING FARM DRAINS AND SLOPES (COLAB WAIKATO ONE VIEW GIS PORTAL)

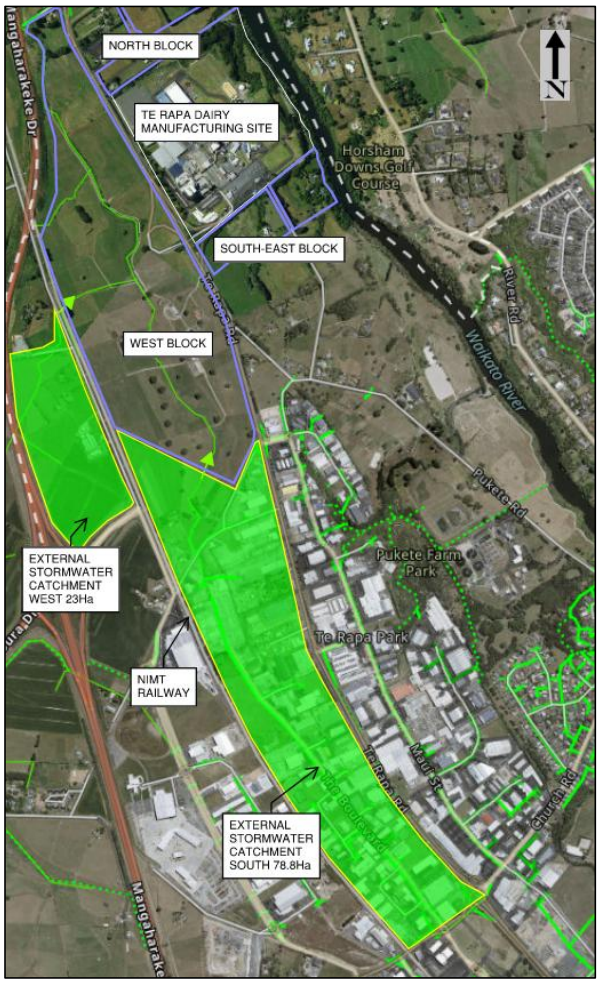


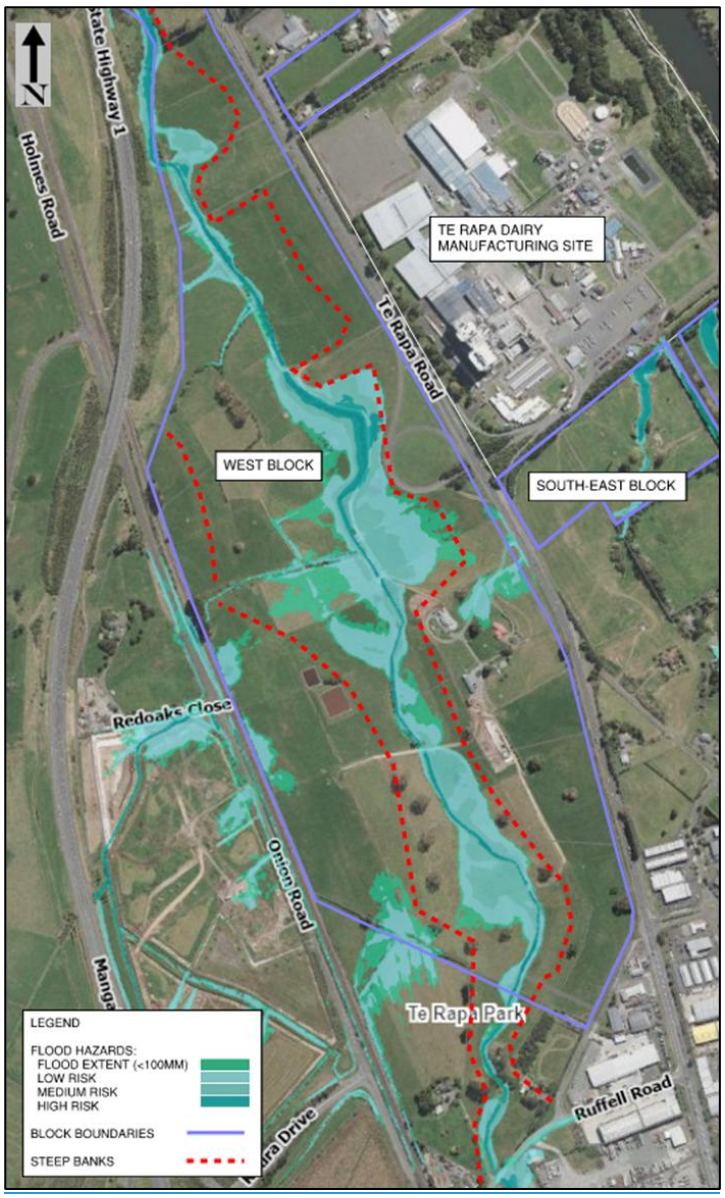
FIGURE ~~3~~3 TE RAPA STREAM CATCHMENTS

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~~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~~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.~~

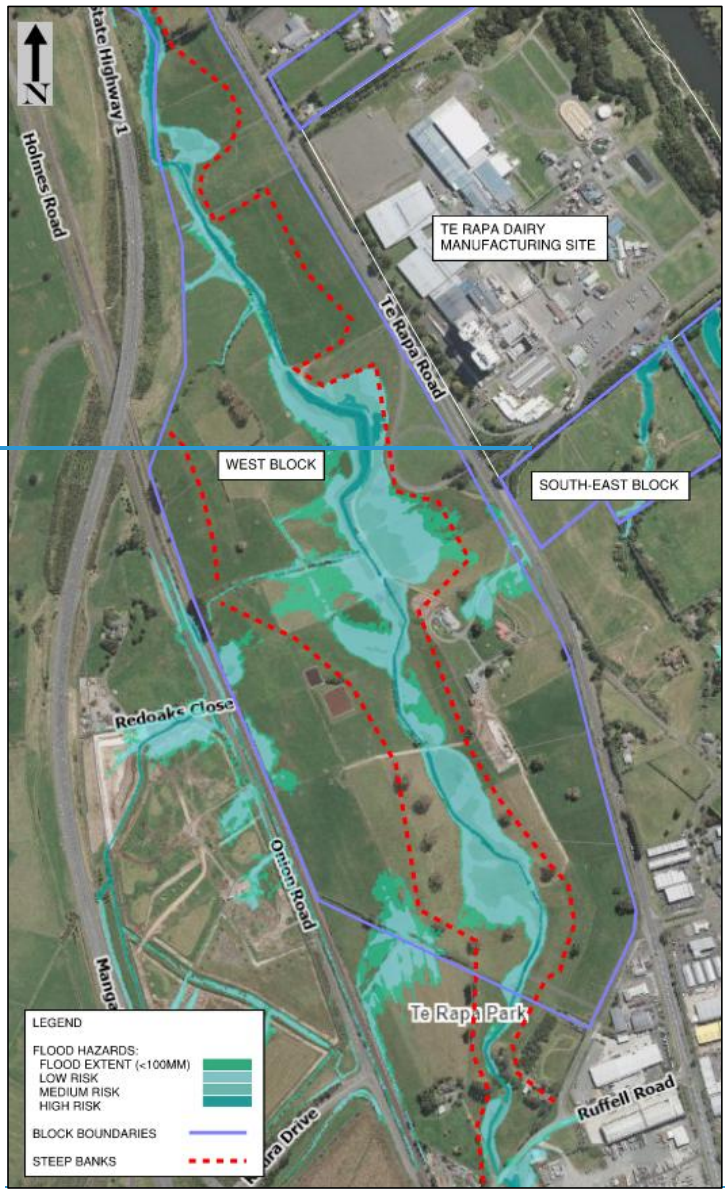


FIGURE 44 100-YEAR FLOOD HAZARD AREAS (HCC FLOOD VIEWER)

In addition, a review of the 100 year flood depression area on HCCs online Flood Viewer for the West Block indicates that, in the event of blockage of the stormwater culverts beneath SH1C that drain flows from the catchment, the West Block would be flooded up to a contour level of just under 22m RL, as shown in Figure 5 below. This reflects the depth that flood water would need to build-up to in the West Block prior to flows passing over the adjacent low point of SH1C.

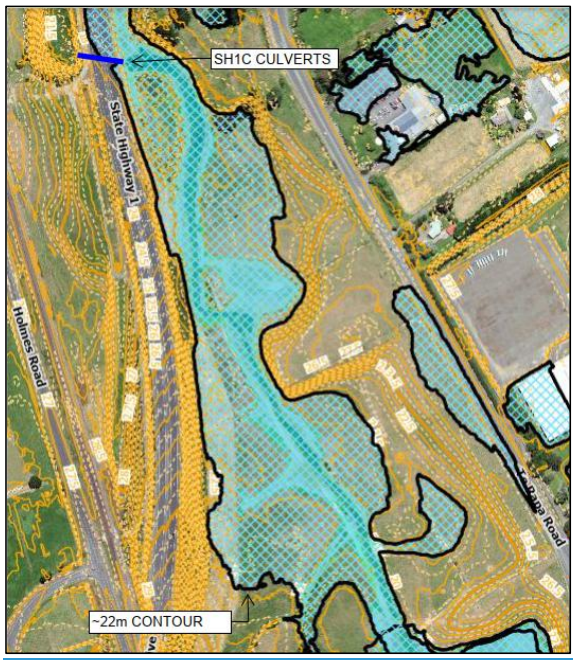


FIGURE 5 WEST BLOCK 100-YEAR FLOOD DEPRESSION AREA (HCC FLOOD VIEWER)

~~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.~~ HCCs online Flood Viewer indicates the South-East Block has two strips of flooding during a 100-year storm event, that run north through the eastern and western sides of the South-East block, as shown in Figure 6.

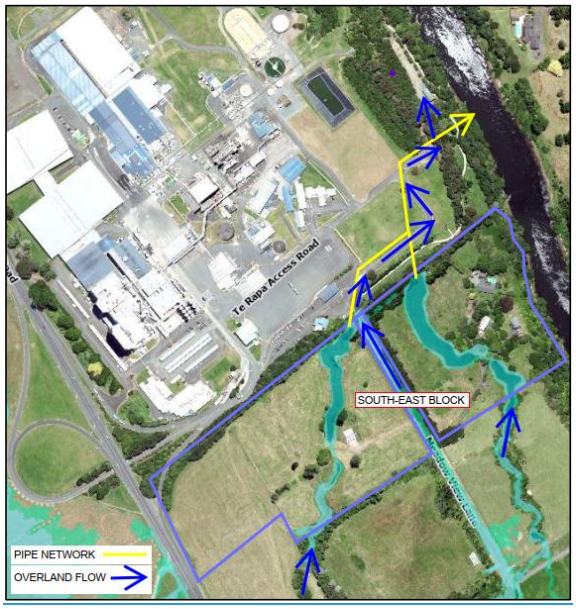


FIGURE 6 SOUTH-EAST BLOCK 100-YEAR FLOOD HAZARD AREAS (HCC FLOOD VIEWER)

No flood modelling information is available on HCCs online Flood Viewer 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 7) that would be indicative of possible flood locations~~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~~.

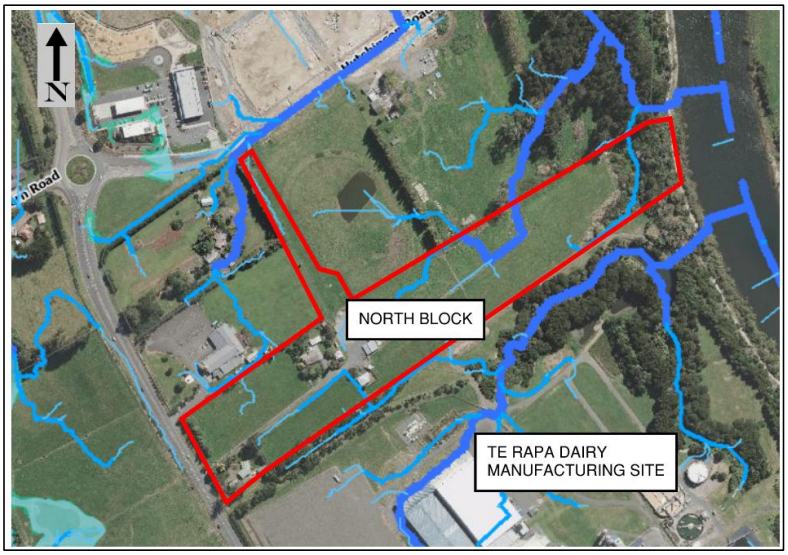


FIGURE ~~5~~ 7 NORTH BLOCK OVERLAND FLOW PATH (HCC FLOOD VIEWER)

2.3 STORMWATER MANAGEMENT REQUIREMENTS

Stormwater Management for the Plan Change Area will need to be in accordance with:

- The Regional Infrastructure Technical Specification (RITS)
- WRC's 'Waikato Regional Stormwater Management Guideline'
- The outcomes of the Te Rapa North ICMP

The Hamilton City Council's Operative District Plan (ODP) also has a requirement in rule 25.13.4.2 for new lots to provide on-lot retention, reuse or soakage (with pre-treatment) for the first flush of stormwater runoff from each lot.

In accordance with the above documents, stormwater runoff from the development will need to be treated before being discharged from the Plan Change Area.

In addition, post-development stormwater peak flows for the West Block will need to be managed within the Plan Change Area to ensure that there is no peak flow increase in the Te Rapa Stream downstream of the Plan Change Area.

As such, 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 stormwater from these blocks can be discharged directly to the Waikato River, and therefore do not require peak flow attenuation.

Consideration will also need to be given to managing, or mitigating, increases in post-development stormwater run-off volumes from the West Block into the Te Rapa Stream, so as to protect against stream erosion downstream of the Plan Change Area~~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 considered unlikely to be suitable as the main method of stormwater management for 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 (calculated as a catchment wide average, to account for any associated road corridor frontages).

As such, stormwater soakage potential will still need to be invested as design progresses, and be adopted as the preferential method of stormwater management wherever feasible, even if just for low level soakage~~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 future lots and also the different parcels, as detailed below:

On Lot Stormwater Management

On-lot stormwater management will need to be provided by future lot owners. There are multiple ways to do this, and this detail would be developed as part of the resource / building consent process for each lot.

As noted above, 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 (calculated as a catchment wide average, to account for any associated road corridor frontages).

Where feasible, soakage (with pre-treatment) would be the preference for on-lot management, and site specific testing for each lot (as part of the resource / building consent process for each lot) would be required to determine the suitability of soakage. Where soakage is not feasible, then on-lot retention would need to be provided.

Due to the industrial nature of the subdivision, on-lot specific treatment devices (such as oil/water interceptors) will need to be provided on a case by case basis depending on the proposed activities on each lot. Such devices would be determined as part of the resource / building consent process for each lot.

Each lot would also require the provision of (and adherence to) an Operation and Maintenance Plan associated with the specific on-lot stormwater management system, and any High Risk activities proposed on a lot (such as petrol storage) would also require a Pollution Control Plan (in accordance with HCCs Stormwater Bylaw). These plans would be developed as part of the resource / building consent process for each lot.

West Block

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.

In addition, consideration will also need to be given to managing, or mitigating, increases in post-development stormwater run-off volumes from the West Block into the Te Rapa Stream, so as to protect against stream erosion downstream of the Plan Change Area.

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 off-line wetland placement.

Initial sizing of the wetlands was 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 was then 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, two-year and 10-year flow attenuation prior to discharge to the Te Rapa Stream.

When establishing wetland sub-catchment areas, a whole of catchment approach was taken, including allowance for existing (or upgraded) roading corridors that currently drain into the Plan Change Area. Catchment extents currently allowed for are identified on the Drawings in the Appendix.

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 following key modelling parameters. Further detail is provided in the summary concept design calculations in the Appendix.

- Catchment wide average impervious area of 85% (considered sufficient for initial concept sizing)
- HirdsV4 Historical Rainfall Data for pre-development flow calculations
- HirdsV4 RCP 8.5 2100 Rainfall Data for post-development (climate change adjusted) flow calculations

A summary of the wetland sizes and catchments is shown in Table 1 and Figure 8, and in drawings A2212331.01-HG-ZZ-DR-Z-040 to 047 in the Appendices~~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:~~

~~**West Block**~~

~~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 (4%) (M2)	ESTIMATED WETLAND TOP FOOTPRINT AREA (HEC MODELLING) (M2)
A	13.6	5,500	7,300
B	27.2	10,900	13,400
C	15.6	6,200	7,400
D	10.6	4,300	7,000
E	11.9	4,800	7,200

~~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~~

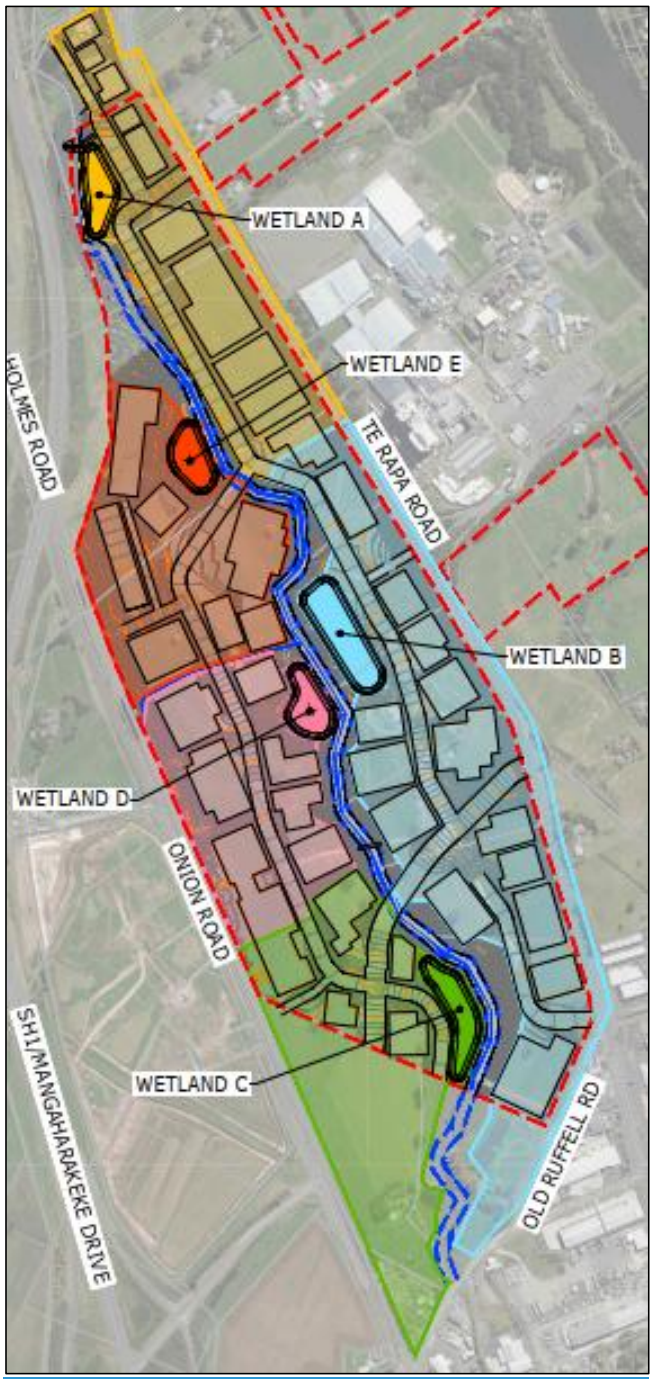


FIGURE 8 INDICATIVE WEST BLOCK WETLAND LOCATIONS AND SIZES

All wetlands across the West Block have been located off-line along the central Te Rapa Stream, as this is the natural low point for drainage. The wetlands will have controlled discharge into the Te Rapa Stream and 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, 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 10-year storm event), before discharging into the Te Rapa Stream.

Storm event runoff from up to and including a 100-year event would be conveyed overland, within the future road reserves, and discharged directly to the Te Rapa Stream via a minimised number of controlled and protected outfalls.

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 or by incorporating either raingardens or grassed treatment swales along the road corridors to treat runoff prior to discharge into the gravity reticulation system that would drain to end-of line wetlands.

Wetland locations can be adjusted to suit required locations of future building platforms or road corridors, and this detail would be determined at future subdivision stages.

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. These earthworks 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.

In accordance with the required outcomes of the ICMP, the Te Rapa Stream corridor within the West Block is proposed to be used as the main 100 year flood storage channel to attenuate post-development 100 year peak flows for the entire upstream contributing catchment prior to discharge downstream of the Plan Change Area.

Conceptual flood storage zones required to provide the attenuation along the Te Rapa Stream corridor were assessed by introducing three stream culvert crossing locations within the West Block (coinciding with proposed road crossing points where feasible). These locations are annotated as Culverts 1, 2 and 3 on the plan in Figure 9 below and in the drawings in the Appendix.

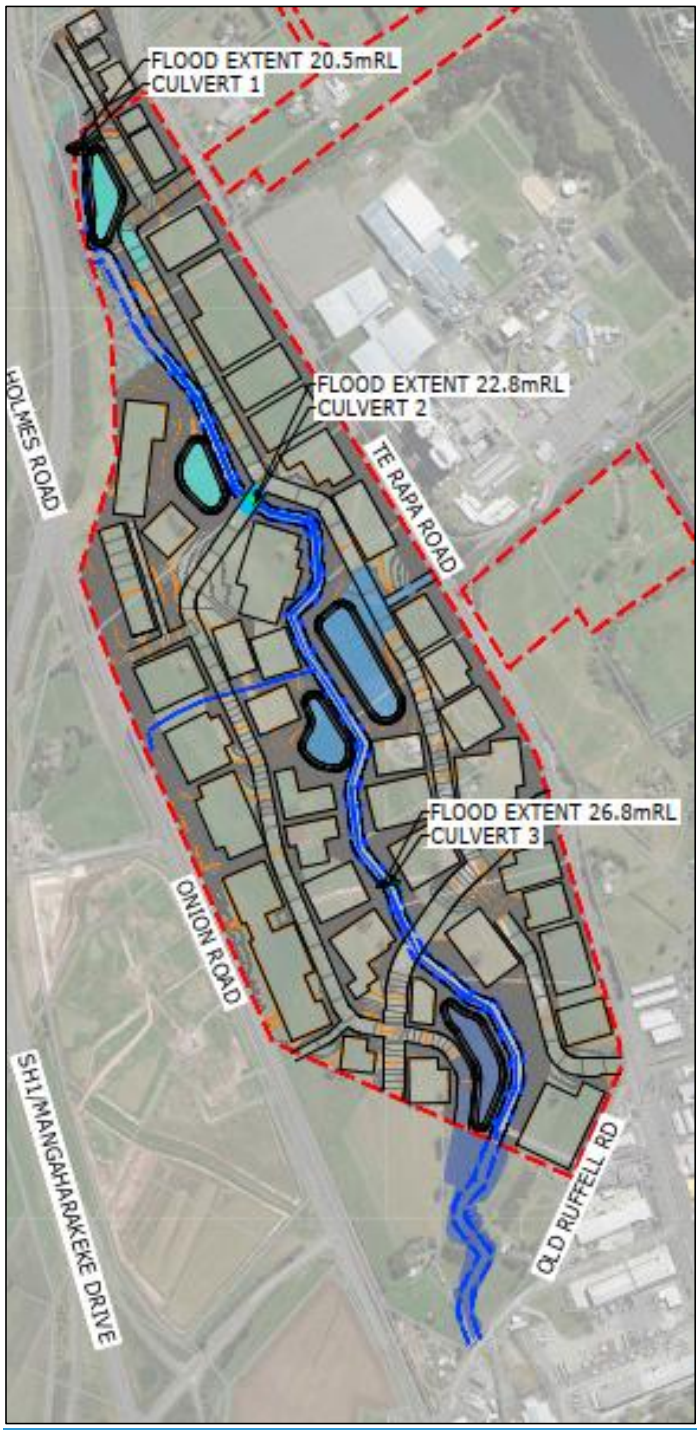

FLOOD EXTENT 20.5mRL
CULVERT 1
FLOOD EXTENT 22.8mRL
CULVERT 2
FLOOD EXTENT 26.8mRL
CULVERT 3
HOLMES ROAD
TE RAPA ROAD
ONION ROAD
SH1/MANGAHARAKEKE DRIVE
OLD RUFFELL RD

FIGURE 9 CONCEPT WEST BLOCK CORRIDOR STREAM CULVERTS AND FLOOD CELLS

When choosing culvert crossing locations, heights and flood storage depths, consideration was given to:

- Selecting locations that coincide with required road crossings (where feasible)
- Allowing for adequate maintenance access
- Preventing flooding of adjacent existing road carriageways (especially SH1C)
- Minimising flood depths on proposed new road carriageways
- Inundating/utilising proposed new off-line attenuation wetland footprint areas in the 100yr event (so as to provide additional storage)
- Setting adjacent concept building platform levels above estimated flood depths (will allowance for freeboard).

Post-development earthworks flood storage volume provided in each flood storage zone have been estimated, and the combined flood storage volume compared as a percentage against the total 100yr Maximum Probable Development (MPD) flow volume upstream of SH1C of 392,363m^3 noted in the Te Rapa North ICMP Model Build Report (Rev D, 6 December 2021, Beca). The resultant storage volumes are summarised in Table 2 below.

TABLE 2: TE RAPA STREAM CORRIDOR (WEST BLOCK) 100YR STORAGE VOLUMES

STORAGE CELL	STORAGE (M3)	CUMMULATIVE STORAGE (M3)	% OF TOTAL 100YR MPD POST-DEVELOPMENT VOLUME DISCHARGE UNDER SH1C
1	34,400	34,400	8.7%
2	70,800	105,200	26.8%
3	114,000	219,400	56%
Total		**219,400**	**56%**

From the above summary table, it can be seen that the current proposal provides more than 50% of the anticipated total 100yr MPD flood flow volume from the contributing catchment, as potential flood storage upstream of SH1C.

Noting that design is currently only at concept stage, and a number of detailed design items, including the developed sites earthworks levels, will need to be finalised before flood storage levels and culvert crossing sizes can be finalised, the provision of such a high percentage is considered sufficient proof of concept at this stage (especially noting that the Te Rapa North ICMP Model Build Report (Rev D, 6 December 2021, Beca) indicates that the 100yr MPD peak flow rates at the SH1C culverts will only need to be attenuated down from ~15m^3/s to 13m^3/s to achieve the required 100yr peak flow attenuation requirement).

As noted above, additional flood modelling will be required as the design develops, to ensure the Te Rapa Stream corridor retains adequate flood storage volume, whilst also achieving the required attenuation requirements.

The concept landform design for the West Block has a minimum building platform height of 23m RL towards the northern end of the West Block. This is approximately 1m higher than the 100 year flood depression area indicated on HCCs online Flood Viewer for the West Block. As such, the current concept landform design provides sufficient protection for buildings in the event of culvert blockage at the SH1C culverts.

The concept landform design also provides sufficient freeboard for building platforms upstream of each of the three stream culvert crossings proposed to provide the required 100yr flood storage in the Te Rapa Stream corridor within the West Block.

In addition to attenuating peak stormwater flows in the Te Rapa Stream prior to the discharge of flows from the West Block, consideration also needs to be given to managing, or mitigating, increases in post-development stormwater run-off volumes from the West Block into the Te Rapa Stream, so as to protect against stream erosion downstream of the Plan Change Area.

The introduction of increased impermeable area from developing greenfield land results in additional stormwater run-off post-development. Whilst peak runoff flows can be appropriately managed via provision of offline wetlands in addition to storage volume in the Te Rapa Stream corridor, the additional volume of runoff, if not managed, can result in an increase in stream bank and bed erosion.

The Te Rapa North ICMP identifies that historical development in the Te Rapa stream catchment has already resulted in stream bank erosion occurring in the stream, especially for the last 300-500m of the streams reach (located in Waikato District Councils jurisdiction, prior to its confluence with the Waikato River).

The ICMP also identifies two potential options for management/mitigation of any additional potential adverse stream erosion impacts that may result from further development of the catchment (i.e. in the West Block of the Plan Change area that drains to the stream).

At a high level, these options are:

1. Large diameter diversion pipeline(s), constructed between the stream and the Waikato River, designed to drain excess flows from the stream directly to the Waikato River, so as to protect the downstream reach of the stream from further erosion resulting from increased flow/volume discharge.

2. Provision of stream erosion protection measures for the downstream reach of the stream, so as to increase stream resilience (on the basis that the additional flow volumes resulting from upstream development can't be adequately managed – noting that soils in the catchment area are not considered to be suitable for the high level of ground soakage that would be required to manage such post-development volume increases).

It is noted that, for the Pipe Diversion option, some level of downstream erosion protection for the Te Rapa Stream is still required as a result of the existing stream erosion identified in the ICMP.

Following a review of both options presented in the ICMP, we recommend the erosion protection option be progressed alongside development of the West Block of the Plan Change Area, for the following reasons:

- The downstream erosion along the lower reaches of the Te Rapa Stream is an existing issue that needs remediation. As such, if progression of the Plan Change went some way to helping remediate the existing issue and/or help the remediation works occur sooner, then that would be of benefit to the stream and adjacent land owners.

- The downstream erosion works can be staged (starting at the downstream end and working upstream) to link with development of the West Block, with only one or two landowners implicated in each stage. Whereas the pipe diversion option would need full funding to proceed with construction – and can't be staged.

- The erosion works are reasonably straightforward technically (and so could start relatively early). Whereas the pipe diversion would be more complicated and potentially/probably need resolution of the Northern River Crossing corridor to be able to proceed, which would have a time implication.

A more detailed summary of the assessment of the two volume mitigation options is provided in the Technical Memo in the Appendix.

Based on the above recommendation of the provision of downstream erosion protection for the Te Rapa Stream to mitigate against the increased volume of stormwater runoff following development of the West Block, then detailed design and construction of such stream erosion protection measures would need to be progressed alongside detailed design and construction of the West Block~~* 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 from erosion).

As such, it is proposed that wetland swales or 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 Waikato River.

The provision of wetland swales or 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.

In accordance with the required whole of catchment approach, any existing stormwater flow, or flowpaths, into the blocks from existing upstream catchments would need to be allowed for. Design of any wetland swales or stormwater treatment swales would need to account for such adjacent land, and design of flowpaths and outfalls to the Waikato River would be based on a whole of catchment approach (i.e. designed to account for runoff from the Maximum Probable Development of the entire sub-catchment, including any contributing upstream land).

In addition, design for each block of land would need to be undertaken so as not to cause adverse effects on either upstream or downstream land.

For the south-east block, two main options exist to discharge stormwater flows from the block to the Waikato River. One is to utilise the existing stormwater reticulation and overland flowpaths at the downstream extents of the two gullies noted within the block. These pass through the Fonterra Dairy Factory site, and (subject to a detailed assessment of pipe and flowpath capacities) these could be retained (or upsized as required) and maintenance access granted to HCC.

A high-level schematic for this option is provided in Figure 10 below.

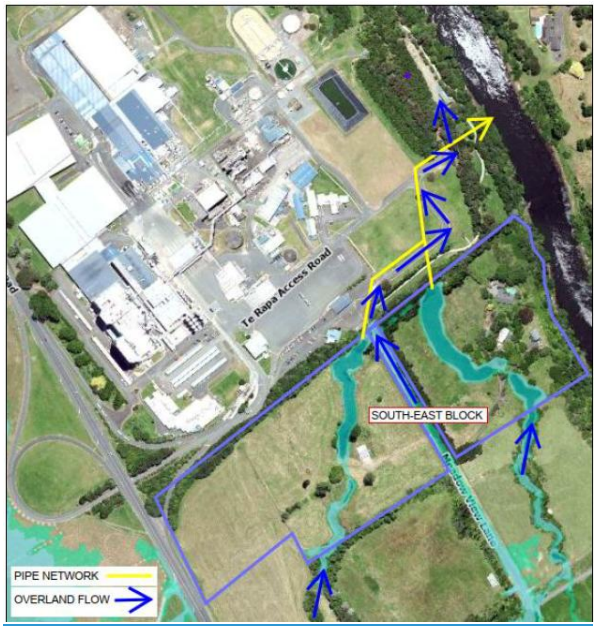


FIGURE 10 INDICATIVE SOUTH EAST BLOCK STORMWATER DISCHARGE – OPTION 1

The second option would be to provide new outlets (both piped and overland flow) to the river. A high-level schematic for this option is provided in Figure 11 below.

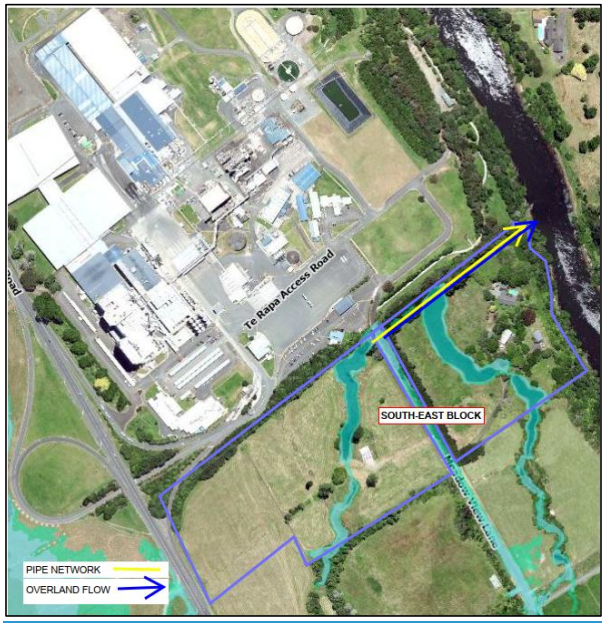


FIGURE 11 INDICATIVE SOUTH EAST BLOCK STORMWATER DISCHARGE – OPTION 2

These options would be fully evaluated as design was developed, and would be covered by the associated Resource Consent and Engineering Plan Approval processes.

For the North Block, flows would be managed within the block, and then directed to the existing outlet via the easternmost gully. A high-level schematic for this option is provided in Figure 12 below.

Should a detailed assessment of pipe and flowpath capacities determine the existing outlet has sufficient capacity to pass the required flows, then the existing outlet to the river could be used. If sufficient capacity was not available, then the proposed approach would be to provide an additional outlet, alongside the existing one. This detail would be fully evaluated as design was developed, and would be covered by the associated Resource Consent and Engineering Plan Approval processes.

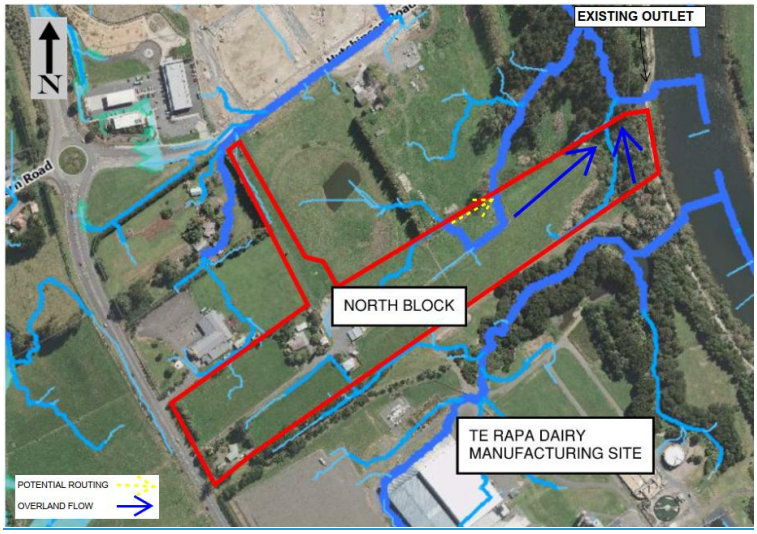


FIGURE 12 INDICATIVE NORTH BLOCK STORMWATER DISCHARGE

The high level schematics presented above show that options exist to sufficiently manage the stormwater flows from these blocks, and these options would be assessed in detail and further refined as development of each block was progressed. Detailed design would consider each specific situation in detail and design allowance be made accordingly (and be covered by the associated Resource Consent and Engineering Plan Approval processes for each 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 STAGING OF DEVELOPMENT WORKS

With regards to delivery of the development works across the Plan Change Area consideration has been given to how the development would/could be staged.

The implications of staging on the proposed stormwater measures are minor and limited to providing all the required infrastructure needed to service each individual stormwater sub-catchment within the Plan Change Area.

With offline wetlands proposed for the West Block area that drains to the Te Rapa Stream, staging development in the West Block would just require construction of the wetland that services each individual stage, along with any associated infrastructure required to connect the staged sub-catchment area to its wetland.

Construction of the relevant Te Rapa stream culvert crossings to form the associated flood storage areas, and the flood volume mitigation measures of Te Rapa stream erosion protection would also need to be aligned to development of the West Block stages.

Areas to the west of Te Rapa Road (i.e. the North Block and South-East Block) drain directly to the Waikato River, and would require the provision of an outlet to the river for each sub-catchment (along with any required upstream water quality treatment measures).

With the stormwater sub-catchments being stand-alone, there are no interdependencies with regards to the order of their development.

~~2.4~~2.5 STORMWATER CONSTRAINTS

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

- All stormwater detailed design to be undertaken in accordance with the RITS, the Waikato Regional Stormwater Management Guideline, and the outcomes of the Te Rapa Stream ICMP.
- Site specific soakage testing will be required for each lot (as part of the resource / building consent process for each lot) to determine the suitability of on lot soakage, and soakage maximised in the design where soakage is feasible.
- Detailed designs will need to account for runoff from the Maximum Probable Development of each entire sub-catchment, including any contributing upstream land.
- Detailed design and construction of stream erosion protection measures for the Te Rapa Stream would need to be progressed alongside detailed design and construction of the West Block
- The design landform will need to ensure overland flows travel from lots to roads, and then along the roads to the discharge/outfall locations.
- Allowance in road corridors will be required to provide space for raingardens, treatment swales or wetland swales.
- Flood modelling will be required to ensure the landform design for the West Block does not negatively impact downstream or upstream flood risks, and to help determine final flood storage volumes and levels for road crossing flood-attenuation culverts, off-line wetlands and building platforms.
- Ground water monitoring (in accordance with the Te Rapa ICMP) will be required in the vicinity of any proposed stormwater devices, so as to inform detail design of the devices.
- Building platforms will need to provide the required freeboard above the 100yr flood level (including due consideration of culvert blockage).

- Development of the stormwater management system for the Plan Change Area will need to make allowance for flows or flowpaths into the Plan Change Area from contributing upstream land, and be designed so as not to cause adverse effects on either upstream or downstream land~~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 42, 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 42: 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 410m³/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 13)~~(Figure 7)~~ where the existing wastewater network increases to 300mm diameter pipes.

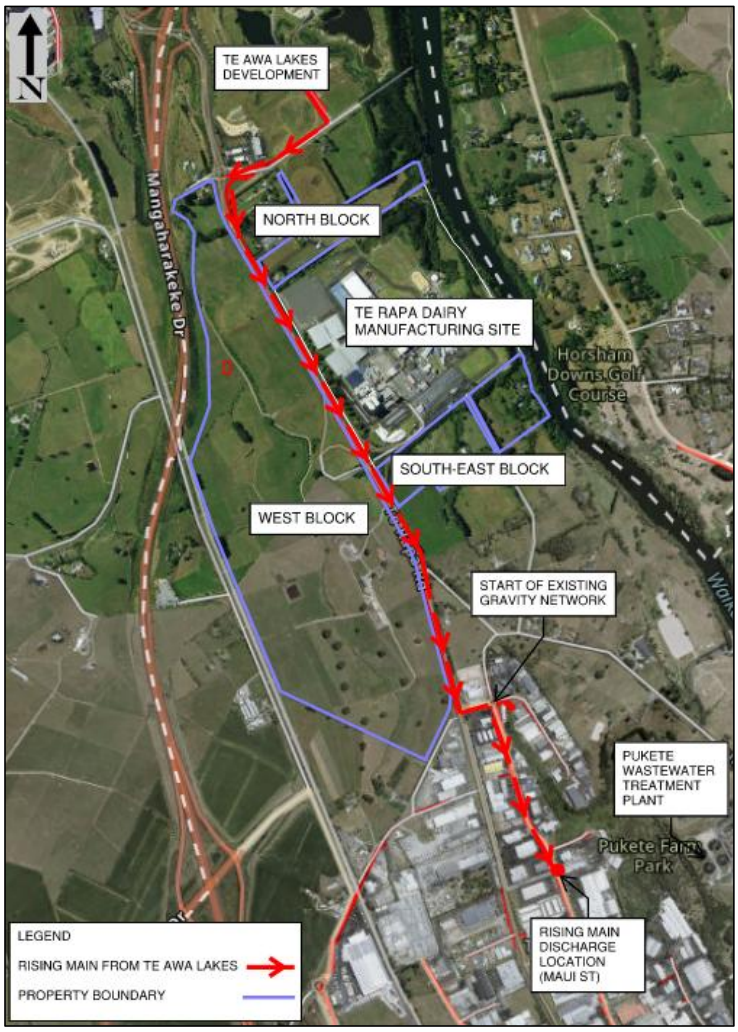


FIGURE 13 ~~7~~ EXISTING WASTEWATER SERVICES

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~~ WASTEWATER NETWORK & TREATMENT CAPACITY

Consultation with HCC was completed in May 2025. HCC expressed support for strategic wastewater connections to the PWWTP, which will receive and treat wastewater from the Plan Change Area. Implementation of these connections is to be staged in alignment with major upgrade programmes and

consent renewals as part of the 2024-34 Long Term Plan. These details are outlined in a memo from the HCC General Manager of Infrastructure and Assets to the General Manager of Strategy, Growth and Planning, dated 19 May 2025. The memo identifies HCC's preferred servicing solutions and acknowledges that the alternative options presented in HG's Infrastructure Report (Version 1, December 2024, and Section 3.3.3~~3.3.3~~) are also suitable and may be adopted if capacity upgrades do not align with the development timeline of the Plan Change Area.

Currently, there is no available capacity in the existing pipe network serving Te Rapa North and the Plan Change Area. However, the HCC memo outlines a planned upgrade that includes a new bulk gravity main along Pukete Road, a new wastewater lift station, and a dedicated rising main to the PWWTP.

While the PWWTP is currently constrained, significant capacity upgrades are planned over the next 8 to 10 years. These upgrades will accommodate future flows from the Plan Change Area.

~~3.2.2~~ This report explores a range of wastewater treatment and discharge options to support development of the Plan Change Area ahead of the planned capacity upgrades. The proposed infrastructure—comprising the Pukete Road gravity main, lift station, and rising main—is intended to service not only the Plan Change Area, but also the wider catchment including Te Rapa North, Horotiu, and Ngāruawāhia. Given the larger catchment and higher wastewater volumes, this report also addresses interim conveyance solutions to the PWWTP.~~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).~~

~~3.2.3 There is no available capacity to receive additional flows within the existing pipe network in Te Rapa North and the Plan Change Area.~~

~~3.2.4 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.~~

~~3.2.5 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.~~

~~3.2.6 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

~~3.4~~ Our investigations into wastewater servicing for the Plan Change Area consider both long-term and interim conveyance and treatment options.~~Our investigations into the wastewater for the Plan Change Area will look at both long-term and interim conveyance and treatment options.~~

~~3.4.1~~3.3.1 CONVEYANCE

Conveyance is largely dependent on topography. The preferred method involves piped gravity networks flowing to a low point, which may be either a manhole on the existing wastewater network or a wastewater pump station that collects and pumps flows to a suitable location within the existing gravity system.

~~3.4.2~~ Based on the depth of the existing Hamilton City Council (HCC) gravity network near the Plan Change Area, only a small portion of the West Block—approximately 6 hectares—could feasibly connect via gravity. However, this is not considered a viable option, as HCC has indicated that the existing gravity network is already at capacity and unable to receive additional flows. As a result, the Plan Change Area will require wastewater pump stations to convey flows to the proposed infrastructure upgrades.~~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.~~

~~3.4.3 LONG-TERM SOLUTION~~

~~3.4.4 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.~~

LONG-TERM SOLUTION

HCC has identified long-term strategic network upgrades to convey wastewater to the PWWTP. These upgrades include the installation of a new gravity main along Pukete Road (sections 1B and 1C), a new wastewater lift station (PS5), and a dedicated rising main (sections 1D and 1E) to the PWWTP, as illustrated in Figure 14 ~~Figure 8~~ below.

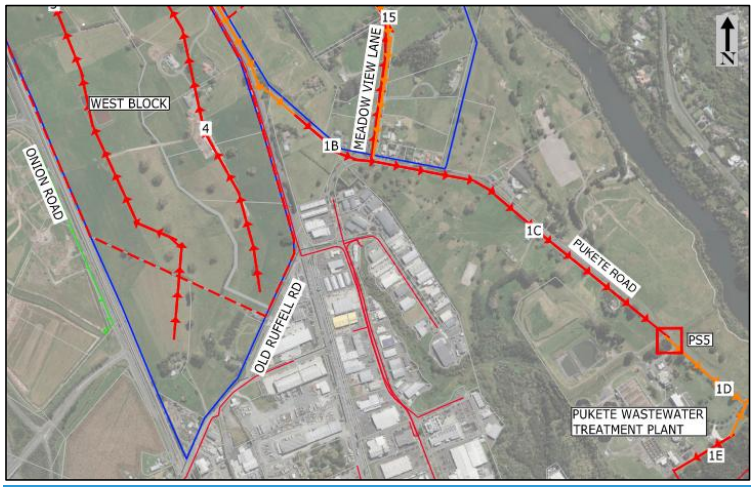


FIGURE 14 ~~8~~ STRATEGIC NETWORK UPGRADES

These strategic upgrades are intended to accommodate flows from the greater Te Rapa North area (including the Plan Change Area) as well as portions of Waikato District - HT1 north of Kay Road, east of the Waikato River and the northern metro areas of Horotiu, Te Kowhai, Ngaruawahia and Taupiri – as shown in- Figure 15~~Figure 9~~.

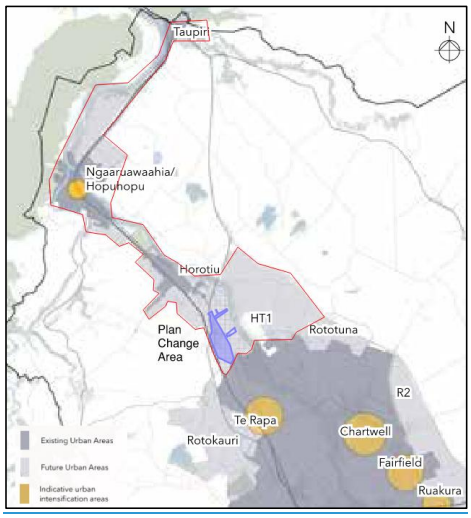


FIGURE 15 ~~9~~ FUTURE GROWTH AREAS (FUTURE PROOF HAMILTON WAIKATO METROPOLITAN SPACIAL PLAN)

The intended flows from these wider catchments are significantly larger than those from the Plan Change Area and are partly dependent on the establishment of the proposed Southern Metro Wastewater Treatment Plant south of Hamilton, which will free up capacity at the PWWTP. As a result, the strategic upgrades along Pukete Road are sized for broader regional demand, and the cost of implementing them at full scale could render development of the Plan Change Area unfeasible in the short term.

Should the Plan Change Area be developed prior to implementation of the strategic upgrades, alternative conveyance methods to the PWWTP would be finalised during detailed design. Potential solutions include installing smaller reticulation adjacent to the proposed strategic infrastructure alignment, which could be upgraded or decommissioned in the future.

PLAN CHANGE AREA CONVEYANCE

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 16 ~~Figure 10~~ ~~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.

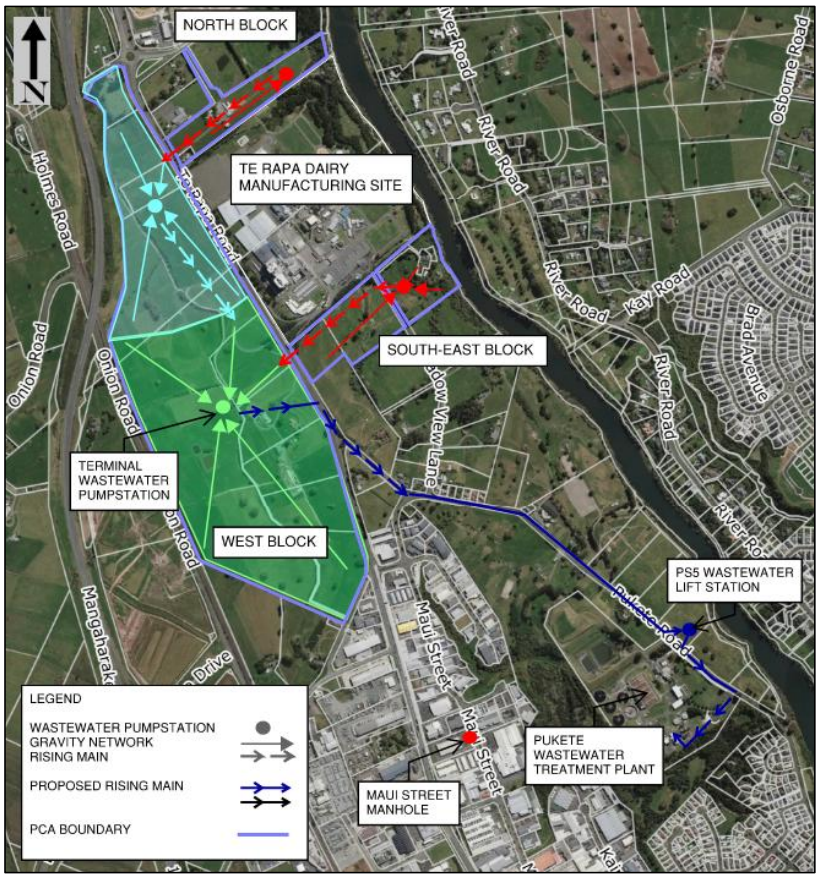


FIGURE 16 ~~108~~ PROPOSED ~~LONG TERM~~ WASTEWATER PUMPSTATION CONVEYANCE

The location of 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~~is not required to be in the southern portion of the West Block. The final location will be determined by the development staging and will be confirmed at consenting stage for the first stage of the development.

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 16~~Figure 10~~~~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 a pressure sewer system ~~the gravity network~~ within the Plan Change Area. ~~as a low pressure sewer system (~~Figure 17 ~~Figure 17 Figure 11~~~~Figure 9~~ shows a comparison of pressure system and gravity reticulation~~)~~.

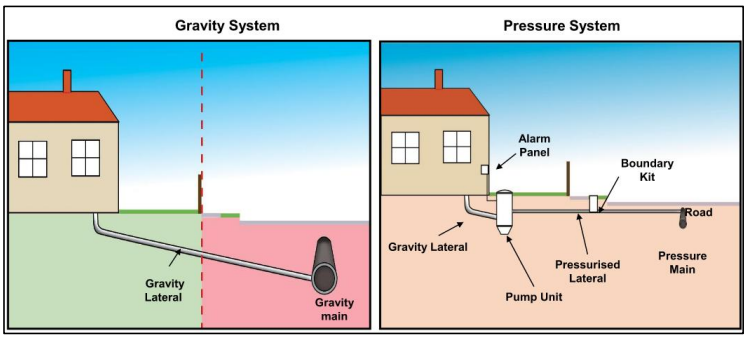


FIGURE 17 ~~119~~ COMPARISON OF GRAVITY SEWER (LEFT SIDE) AND LOW-PRESSURE SEWER SYSTEMS (RIGHT SIDE) (E-ONE)

In a pressure system, often referred to as 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 16 ~~Figure 16 Figure 10~~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~~ may be 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~~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 at the PWWTP to treat wastewater from the Plan Change Area.

~~3.4.5~~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).

~~3.4.6~~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 from future growth areas including~~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~~Road. This proposed gravity network would extend southeast along Pukete Road to a new wastewater pumpstation that will ~~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~~As noted previously this may be part of the planned strategic upgrades to accommodate flows from the greater Te Rapa North Industrial Zone and northern metropolitan areas, or may be a smaller sized interim solution based on the same concept of gravity main and wastewater pumpstation discharging to PWWTP.

INTERIM WASTEWATER TREATMENT

Onsite treatment and disposal is a potential solution ~~until the~~should there be capacity constraints at 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 – On-Lot Wastewater Treatment

The first option involves each lot having its own wastewater treatment system located within the lot. This system would treat only the wastewater generated on that lot. The treated effluent would then be disposed of into the land via subsurface dripline or, depending on soil characteristics, a trench system—collectively referred to as a disposal field. The lot developer would be responsible for incorporating the design of both the wastewater treatment plant and the disposal field into the overall building design, and manage the ongoing operation and maintenance of the system. They would also need to account for the AS/NZS 1547:2012 requirement, which mandates that an area equal to the disposal field must be reserved within the lot as a backup in case of failure of the initial disposal area.~~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~~ systems treat the raw wastewater to a standard suitable for disposal to ground. Some ~~of the~~ systems ~~are made up~~consist of multiple modular units, making them ~~system~~ suitable for sites under development and easily adaptable to the specific demands of each site. Additional treatment modules can be added to match wastewater volumes as needed.~~also can be easily tailored to the demands of the site. Treatment modules are added to the system to match the wastewater demands.~~

~~The o~~On-lot wastewater treatment could be retained as a permanent servicing solution. In this case, there would be no requirement for the lot to connect to the HCC wastewater infrastructure, and no need for wastewater reticulation within the portions of the Plan Change Area developed using on-lot systems.~~n 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 serve as an interim solution, to be decommissioned once the PWWTP has sufficient capacity to treat wastewater from the Plan Change Area. At that point, wastewater from each lot would be diverted from the on-lot system into the Plan Change Area's public reticulation network, flowing to the terminal wastewater pumpstation and onward to the PWWTP.~~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 – Centralised Interim Wastewater Treatment

The second option involves installing package-type wastewater treatment systems adjacent to the future wastewater pumpstations within the Plan Change Area. These systems would use similar modular components to those described in Option 1, but would be centralised at designated wastewater pumpstation locations. The treatment plants and associated disposal fields would be located on future lot sites near the wastewater pumpstations and sized to treat wastewater generated within each wastewater pumpstation catchment.

As industrial lots are developed, they would connect to the wastewater reticulation network within the road reserves. Wastewater would flow to the wastewater pumpstation wetwell chamber and be pumped to the adjacent interim treatment system for processing. The treated effluent would then be discharged to the disposal field. As additional lots are developed and wastewater volumes increase, modular treatment units would be added to the system to accommodate the increased flow.

Once the PWWTP has been upgraded and has sufficient capacity, flows from the Plan Change Area wastewater pumpstations would be diverted to the PWWTP. At that stage, the interim treatment modules and disposal fields would be decommissioned, and the sites converted back to industrial lots.~~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.~~

~~3.5~~3.4 SUMMARY OF WASTEWATER SERVICING

HCC has indicated that development of the Plan Change Area must be aligned with the availability of wastewater treatment capacity. The PWWTP is expected to have capacity constraints until planned upgrades are carried out over the next 8 to 10 years. In response, we have proposed alternative options for managing and treating wastewater generated within the Plan Change Area to ensure that development can proceed in the interim.

In addition, we recommend a moratorium on wet industry within the development, and that water-sensitive design measures – such as greywater and rainwater harvesting and reuse – be incorporated into the requirements for lot developers. These measures will help reduce demand for both water supply and wastewater treatment.

~~3.6~~ Once the PWWTP has sufficient capacity to receive and treat wastewater from the Plan Change Area, a conveyance plan has been outlined that aligns with HCC's infrastructure strategy. This plan involves directing wastewater from the Plan Change Area to the PWWTP via a rising main that leads to a proposed new gravity main along Pukete Road, a new wastewater lift station (PS5), and a dedicated rising main to the PWWTP ~~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.~~

~~3.7 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 16).~~(Figure 10~~Figure 8~~)~~. These components—the rising main, gravity main, and lift station—will form part of the first stages of development under a development agreement with HCC.

~~3.8~~ All of the proposed wastewater infrastructure within the Plan Change Area is scalable to meet the future demands of the Te Rapa North Industrial Zone. However, catchments will need to be identified by HCC at the outset of the first stage of development, and cost-sharing arrangements will need to be agreed with the developer.

4.0
WATER SUPPLY

4.1 EXISTING WATER SUPPLY NETWORK

The HCC 3-Waters Viewer (Figure 18)~~(Figure 12Figure 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.

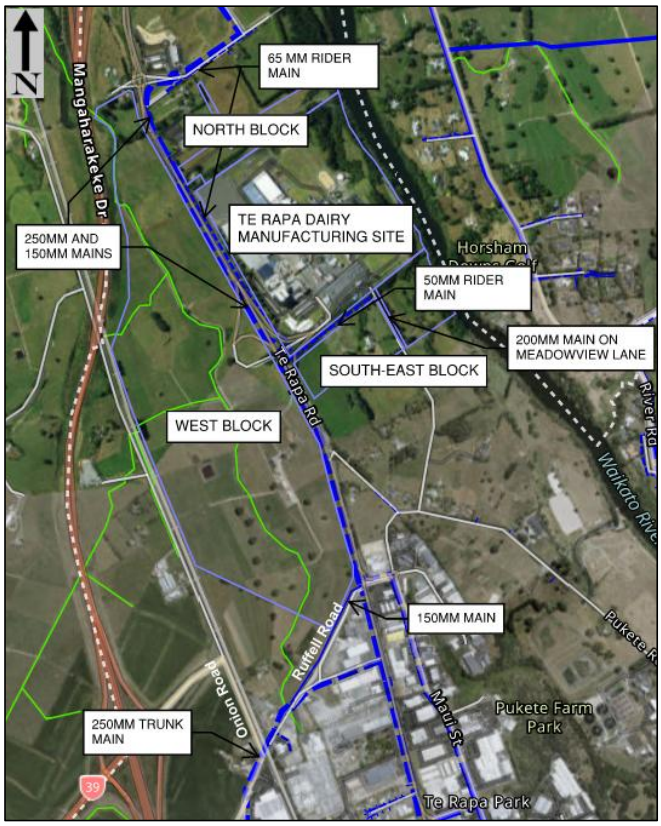


FIGURE 18 ~~1210~~ EXISTING WATER SUPPLY

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 3.0~~3.0Section 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 5~~3~~ below compares the RITS demand with our proposed Plan Change Area demand.

TABLE 5~~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 initially stated that it 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 it had not allocated any capacity at ~~capacity upgrades to~~ the HCC Water Treatment Plant (HCC WTP) to specifically ~~are not included in their current Long-Term Plan. This means that HCC currently do not have capacity to~~ supply the Plan Change Area.

In May 2025, HCC reviewed their treatment and network capacity with regards to supplying the Plan Change Area (and the greater Te Rapa North Industrial Zone) and confirmed that there is sufficient capacity to treat water for the Plan Change Area.

HCC indicated that strategic network upgrades are required to supply the Plan Change Area. These upgrades are shown on Figure 19 ~~Figure 13~~ below.

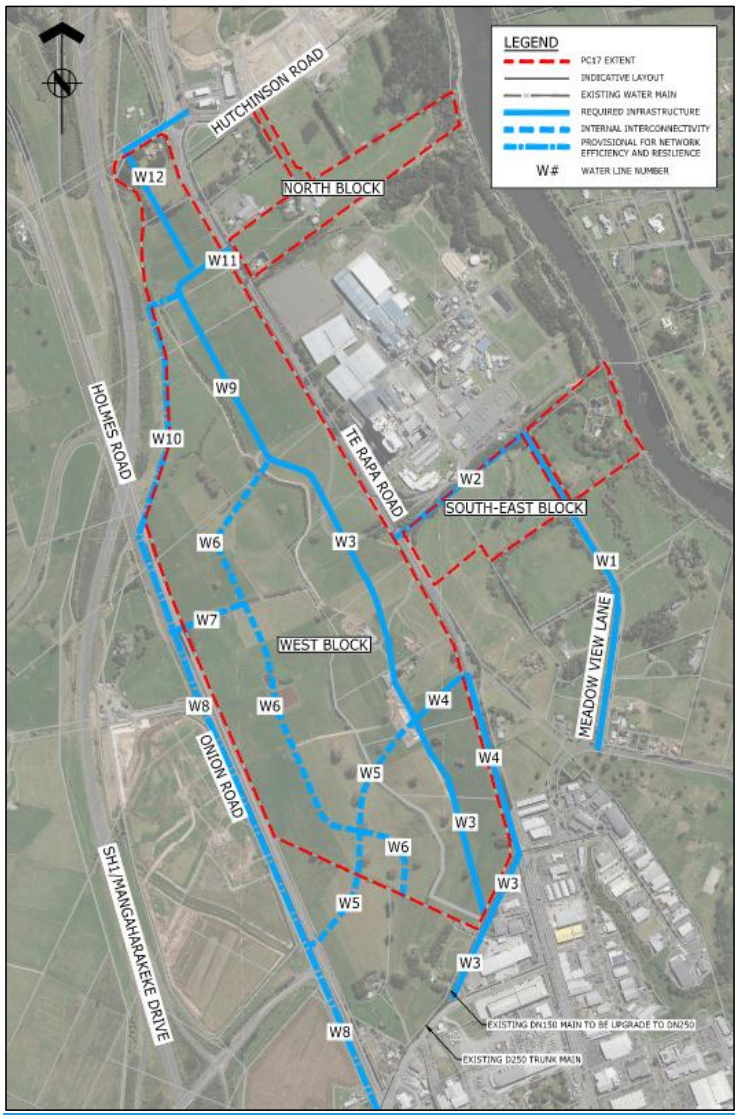


FIGURE 19 ~~13~~ STRATEGIC UPGRADES TO WATER NETWORK

~~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 UPGRADES

The long-term water supply solution proposed by HCC, and shown in Figure 19, ~~Figure 13~~ 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.~~

The strategic upgrades/~~S~~servicing plan proposed by HCC for the West Block involves upgrading the existing main on Old Ruffell Road and north along the southern portion of Te Rapa Road (Sections W3 and W4 in~~-~~ Figure 19~~Figure 13~~).

The network is then extended north through the West Block (Section W9) with internal loops through the West Block internal road network (Sections W5 and W6).

As the demand on the network increases additional supply may need to be looped in from a proposed trunk main on Onion Road to the west (Section W8) which will ultimately be extended along the boundary between the Western Block and State Highway 1 (Section W10) that will complete the loop through the West Block internal road network and through to Te Rapa Road (Section W11 supplying the North Block and W12 Supplying Te Awa Lakes). The completion of the loops is intended to provide water supply resilience to the West Block supply and the greater Te Rapa North Industrial Zone.

The HCC proposal will also upgrade the supply along Meadow Lane to the South-east Block (Section W1) with proposed resilience upgrade (Section W2) back to the Te Rapa Road network.

HYDRAULIC MODEL

We have prepared an EPANET model for the reticulation within the Plan Change Area to provide preliminary pipe sizing and to identify upgrade requirements relative to staged development of the network. The model has been run in isolation of the greater HCC network and assumes a supply on the boundary with a residual pressure of 300kPA.

The model has identified that the key external upgrades required to supply the Plan Change Area are Sections W3, W4 and W1 as shown in Figure 20.~~ Figure 14.~~

FW3 Fireflow conditions can be met with these upgrades, however including all the proposed upgrades did improve the overall performance of the network. It is however unlikely that the West Block would be developed in isolation of the greater Te Rapa North Industrial Zone and it is recommended that further hydraulic modelling be carried as part of the initial stages of development. This modelling should incorporate the Plan Change Area into the greater HCC water model.

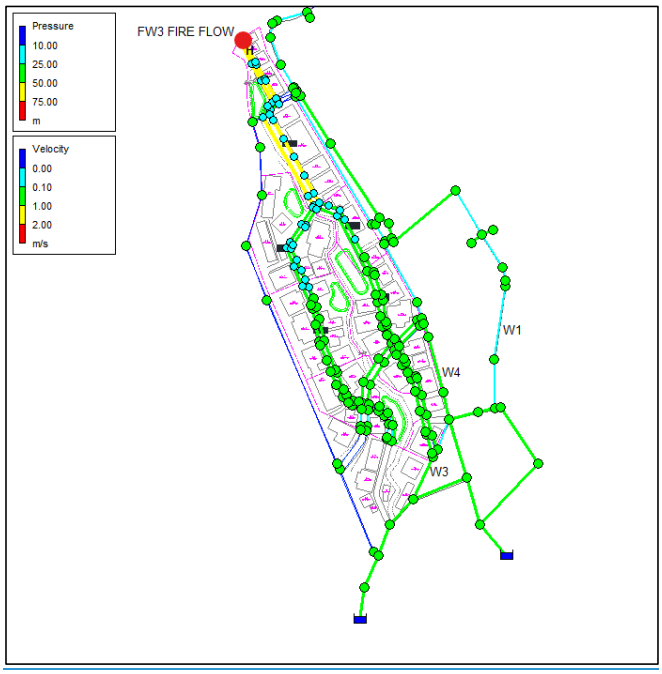


FIGURE 20 ~~14~~ EPANET MODEL FW3 FIREFLOW (W3 AND W4 UPGRADES ONLY)

~~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~~

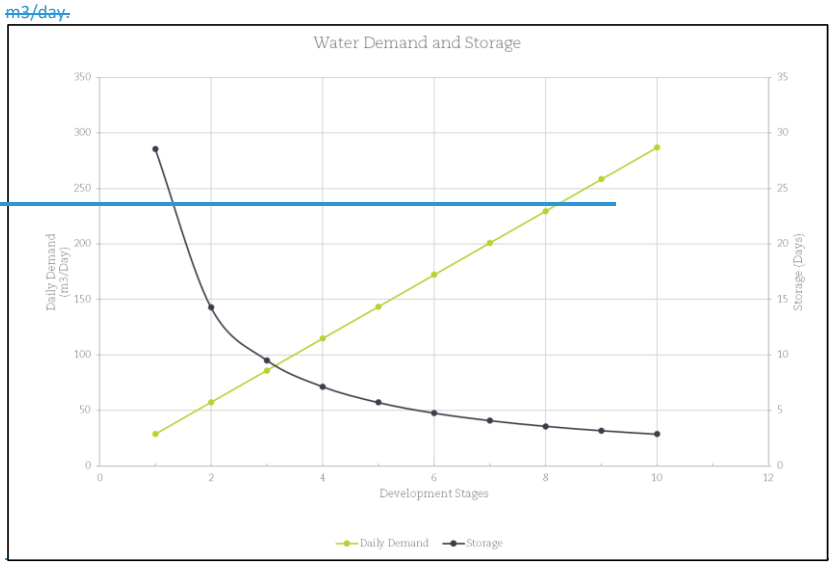
~~In advance of any upgrades to the HCC WTP, Fonterra would look into potential alternate sources of water supply with a view to securing sufficient daily water capacity to supply the Plan Change Area. Potential alternate sources have been identified and are feasible, and we anticipate that further details 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 180m³ of firefighting supply to meet the FW3 firefighting classification.~~

~~The fully developed Plan Change Area is expected to use 287 m³/day. 48 hours of storage would be 574 m³; including firefighting supply of 180m³ would make the minimum reservoir volume 754 m³. To provide some conservancy a 1,000m³ 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

As HCC has confirmed available capacity at the Water Treatment Plant, along with relatively straightforward strategic network upgrades (Sections W3 and W4), we do not consider interim water supply solutions to be necessary. It is anticipated that these strategic upgrades will be implemented ahead of development within the Plan Change Area, or as part of the first stage of development.

~~4.6~~ We are confident that the strategic upgrades proposed by HCC will enable development of the Plan Change Area. In addition, these upgrades—combined with planned network resilience improvements—will support future development within the Te Rapa North Industrial Zone. ~~We believe that the solution proposed will allow the Plan Change Area to be developed ahead of any upgrades to the HCC WTP.~~

~~4.7 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 21)~~(Figure 14Figure 12)~~.

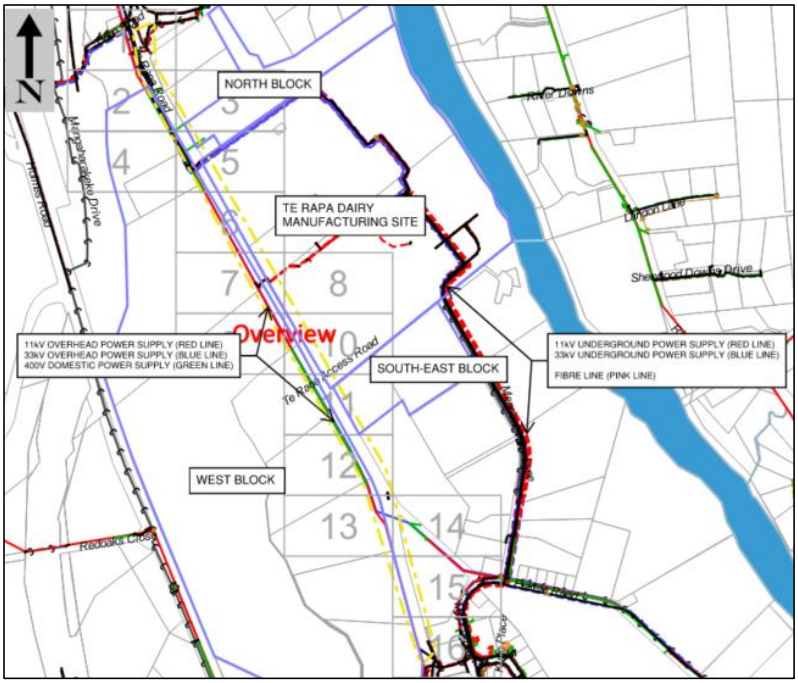


FIGURE 21 ~~1612~~ ELECTRICAL POWER RETICULATION (WEL NETWORKS)

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 21) ~~(see Figure 14Figure 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 management outcomes for the Plan Change Area need to comply with the required outcomes of the ICMP, the RITS, and Waikato Regional Council guidelines.

   This includes on-lot retention or soakage for the first flush, the treatment of stormwater runoff prior to discharge and, for the West Block, attenuation of post-development peak flows to ensure no increase in peak discharge to the Te Rapa Stream, as well as mitigation of increased flood flow volumes into the Te Rapa Stream.

   For the West Block, following on-lot retention and at-source treatment, stormwater could then be collected via a gravity reticulated pipe network and drained to a number of artificial wetlands within the Plan Change Area. The artificial 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 10~~0~~-year storm event.

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

   Flood storage zones can be created along the Te Rapa Stream corridor within the West Block to provide the required 100 year peak flow attenuation, and flood flow volume increases in the Te Rapa Stream can be mitigated by providing erosion protection measures for the downstream reaches of the Te Rapa Stream.

   ~~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 on-lot treatment and retention~~following at-source treatment~~, stormwater could then be collected via ~~a~~ stormwater treatment swales or wetland swales ~~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. Existing outlets to the river can be utilised where possible, else outlets could be upgraded or duplicated.

Commented [MA1]: Scott / HG - is there a requirement to comply with the ICMP or does more inform / provide guidance. To discuss and confirm approach.

Commented [SK2R1]: Needs to comply with the required outcomes of the ICMP. Have updated wording to suit.

Stormwater infrastructure can be staged to align with development, with each sub-catchment provided with the necessary treatment and attenuation measures as it is developed. There are no interdependencies between sub-catchments that would restrict the order of development.

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).

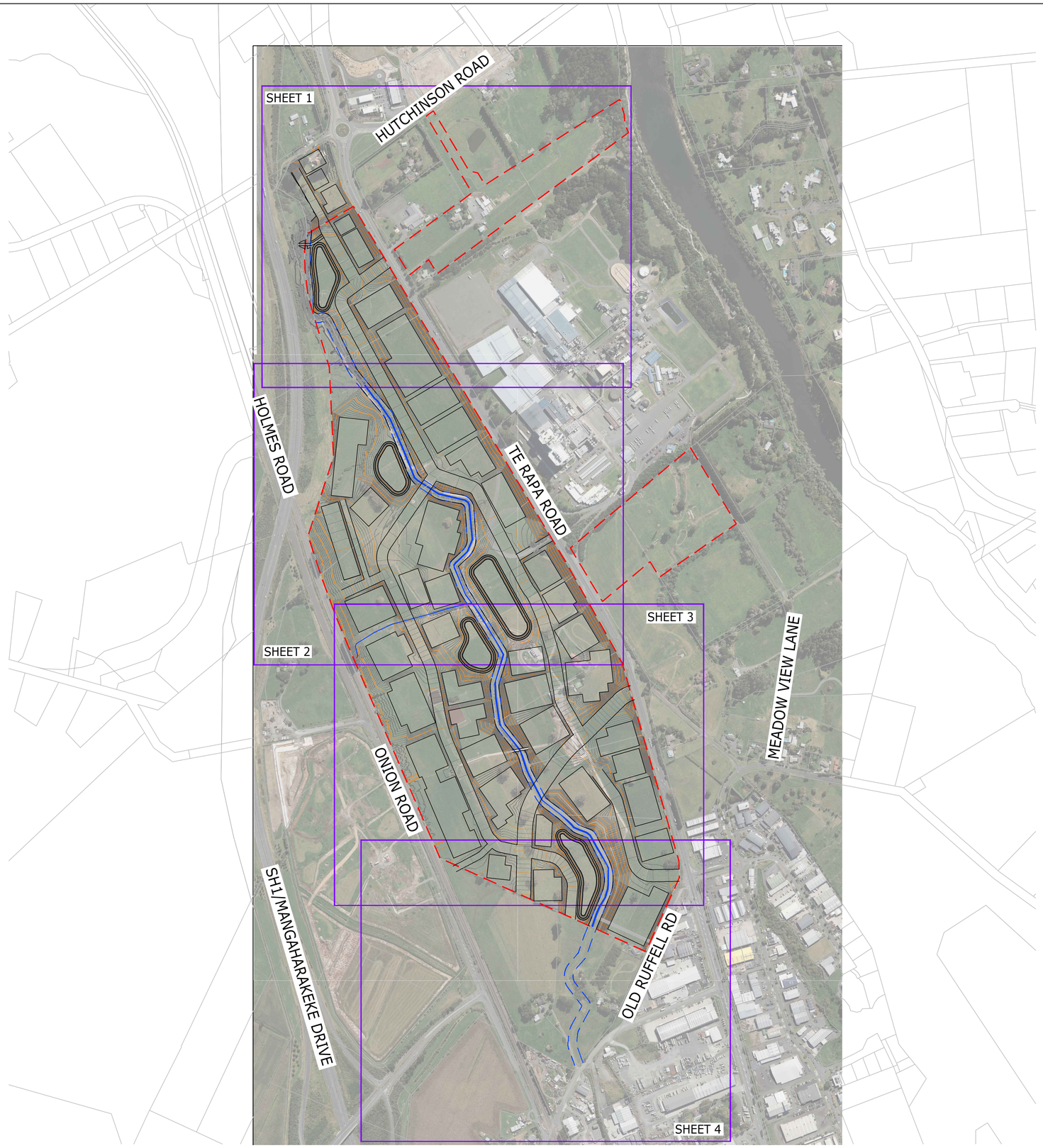
7.0 LIMITATIONS

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.

APPENDIX 1 - STORMWATER SUPPORTING INFORMATION



ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND

ISO 9001 QUALITY ASSURED

NOTES

LEGEND

- FONTERRA OWNED LAND EXTENT
- EXISTING STREAM
- EXISTING STREAM 10m OFFSET
- EXISTING CONTOUR MAJOR (1.0m)
- EXISTING CONTOUR MINOR (0.2m)
- PROPOSED CONTOUR MAJOR (1.0m)
- PROPOSED CONTOUR MINOR (0.2m)
- INDICATIVE LAYOUT

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REF	REVISIONS	BY	DATE
1	FOR INFORMATION	AXZ	26.09.25

CLIENT:

FONTERRA

TITLE:

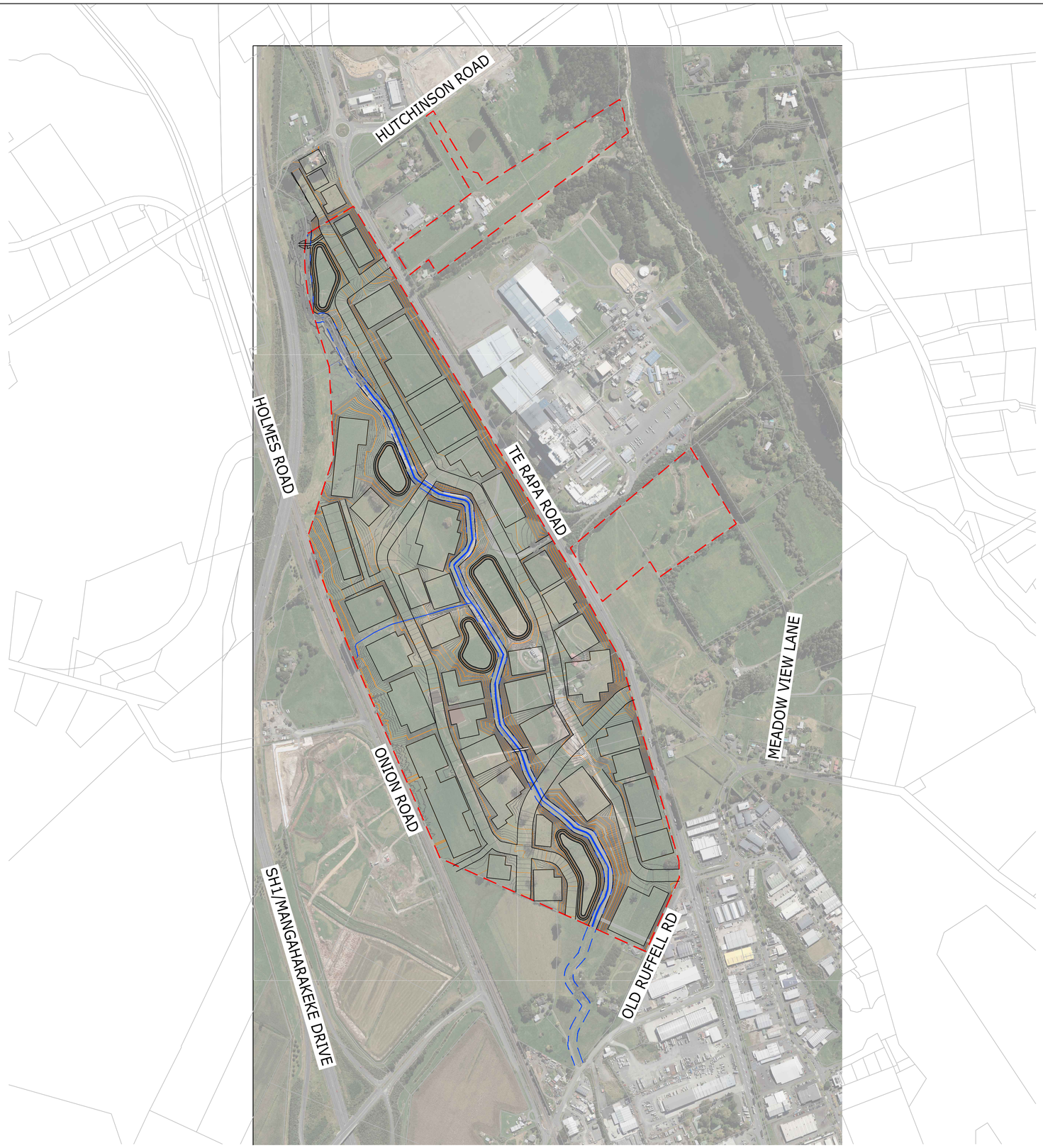
TE RAPA WEST BLOCK CONCEPT STORMWATER MANAGEMENT SHEET LAYOUT

ORIGINATOR:	DATE:	SIGNED:	PLOT BY: AXZ
DRAWN:	DATE:	SIGNED:	PLOT DATE: 01.10.25
CHECKED:	DATE:	SIGNED:	SURVEY BY:
APPROVED:	DATE:	SIGNED:	SURVEY DATE:

ISSUE STATUS: FOR INFORMATION

PROJECT No: A2212331.01	SCALES: 1:5000 (A1) 1:10000 (A3)	A1
DRAWING No: A2212331.01-HG-ZZ-DR-Z-040		REV 1

FOR INFORMATION



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- PROPOSED CONTOUR MAJOR (1.0m)
- PROPOSED CONTOUR MINOR (0.2m)
- INDICATIVE LAYOUT

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1	FOR INFORMATION	AXZ	26.09.25

CLIENT:

FONTERRA

TITLE:

TE RAPA WEST BLOCK
CONCEPT STORMWATER MANAGEMENT
OVERALL

ORIGINATOR:	DATE:	SIGNED:	PLOT BY: AXZ
DRAWN:	DATE:	SIGNED:	PLOT DATE: 01.10.25
CHECKED:	DATE:	SIGNED:	SURVEY BY:
APPROVED:	DATE:	SIGNED:	SURVEY DATE:

ISSUE STATUS: FOR INFORMATION

PROJECT No: A2212331.01	SCALES: 1:5000 (A1) 1:10000 (A3)	A1
DRAWING No: A2212331.01-HG-ZZ-DR-Z-041		REV 1

FOR INFORMATION

ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND

ISO 9001 QUALITY ASSURED

NOTES

LEGEND

- FONTERRA OWNED LAND EXTENT
- EXISTING WATERCOURSE
- EXISTING STREAM 10m OFFSET
- EXISTING CONTOUR MAJOR (1.0m)
- EXISTING CONTOUR MINOR (0.2m)
- PROPOSED CONTOUR MAJOR (1.0m)
- PROPOSED CONTOUR MINOR (0.2m)
- INDICATIVE LAYOUT
- CATCHMENT A
- CATCHMENT B
- CATCHMENT C
- CATCHMENT D
- CATCHMENT E

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TE RAPA WEST BLOCK
CONCEPT STORMWATER MANAGEMENT
WETLAND LAYOUT

ORIGINATOR:	DATE:	SIGNED:	PLOT BY: AXZ
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APPROVED:	DATE:	SIGNED:	SURVEY DATE:

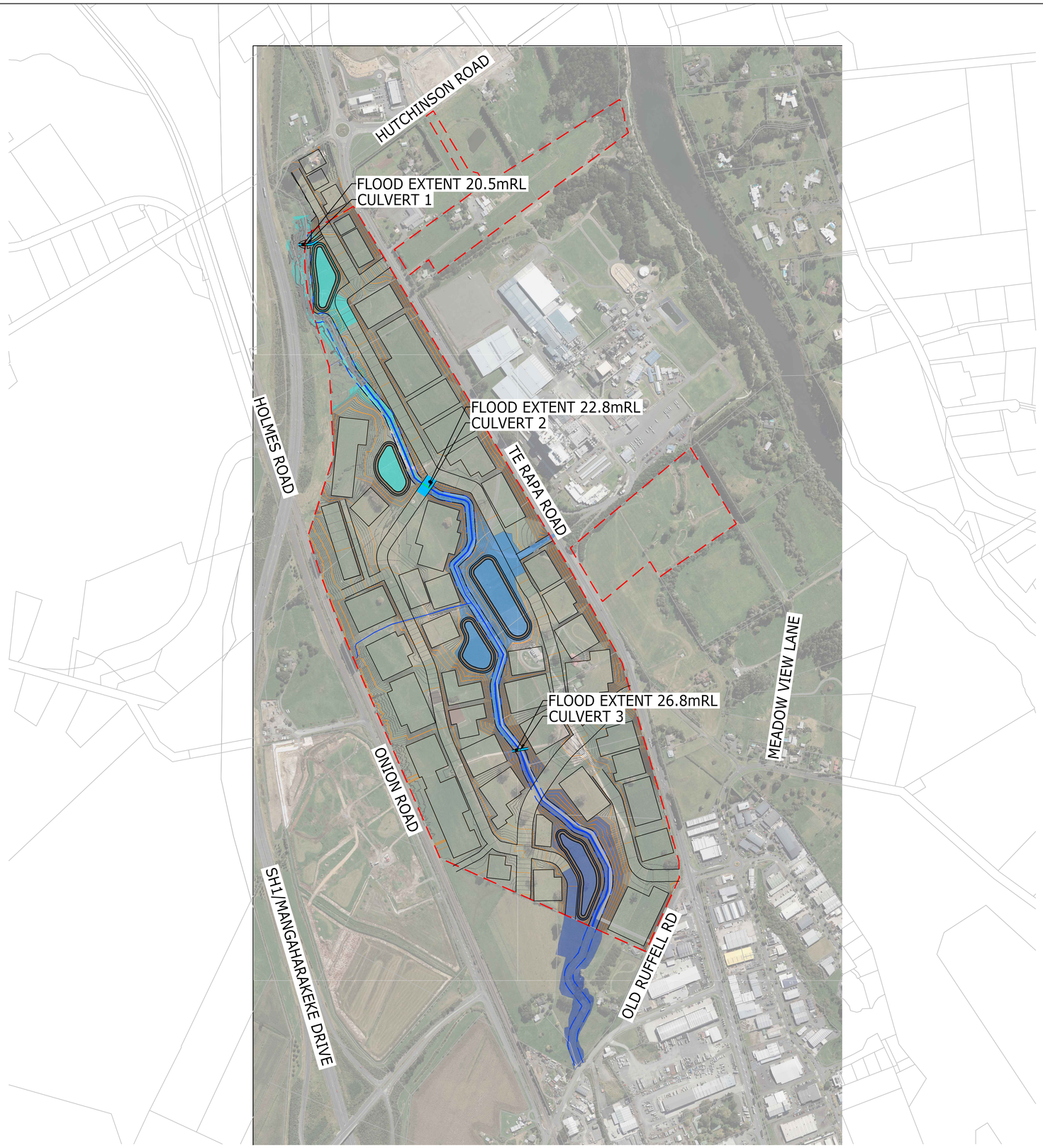
ISSUE STATUS: FOR INFORMATION

PROJECT No:	SCALES:	
A2212331.01	1:5000 (A1) 1:10000 (A3)	A1

DRAWING No: A2212331.01-HG-ZZ-DR-Z-042 REV 1

FOR INFORMATION

REFER TO APPROVED MASTER DRAWINGS FOR ORIGINAL SIGNATURES File: ATE \\HARRISONGRIERSON.COM\HGDATA\NEWMARKET\SHARES\JOBS\1020\2212331_A TE RAPA MASTERPLAN\CAD\A2212331.01-HG-ZZ-DR-Z-040-047.DWG



NOTES

LEGEND

- FONTERRA OWNED LAND EXTENT
- EXISTING STREAM
- EXISTING STREAM 10m OFFSET
- EXISTING CONTOUR MAJOR (1.0m)
- EXISTING CONTOUR MINOR (0.2m)
- PROPOSED CONTOUR MAJOR (1.0m)
- PROPOSED CONTOUR MINOR (0.2m)
- INDICATIVE LAYOUT
- PROPOSED STORMWATER CULVERTS
- 100YR FLOOD AREAS 20.5mRL (VOLUMES = 34,400m^3)
- 100YR FLOOD AREAS 22.8mRL (VOLUMES = 70,800m^3)
- 100YR FLOOD AREAS 26.8mRL (VOLUMES = 114,000m^3)

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TITLE:

TE RAPA WEST BLOCK CONCEPT STORMWATER MANAGEMENT CULVERTS LAYOUT

ORIGINATOR:	DATE:	SIGNED:	PLOT BY: AXZ
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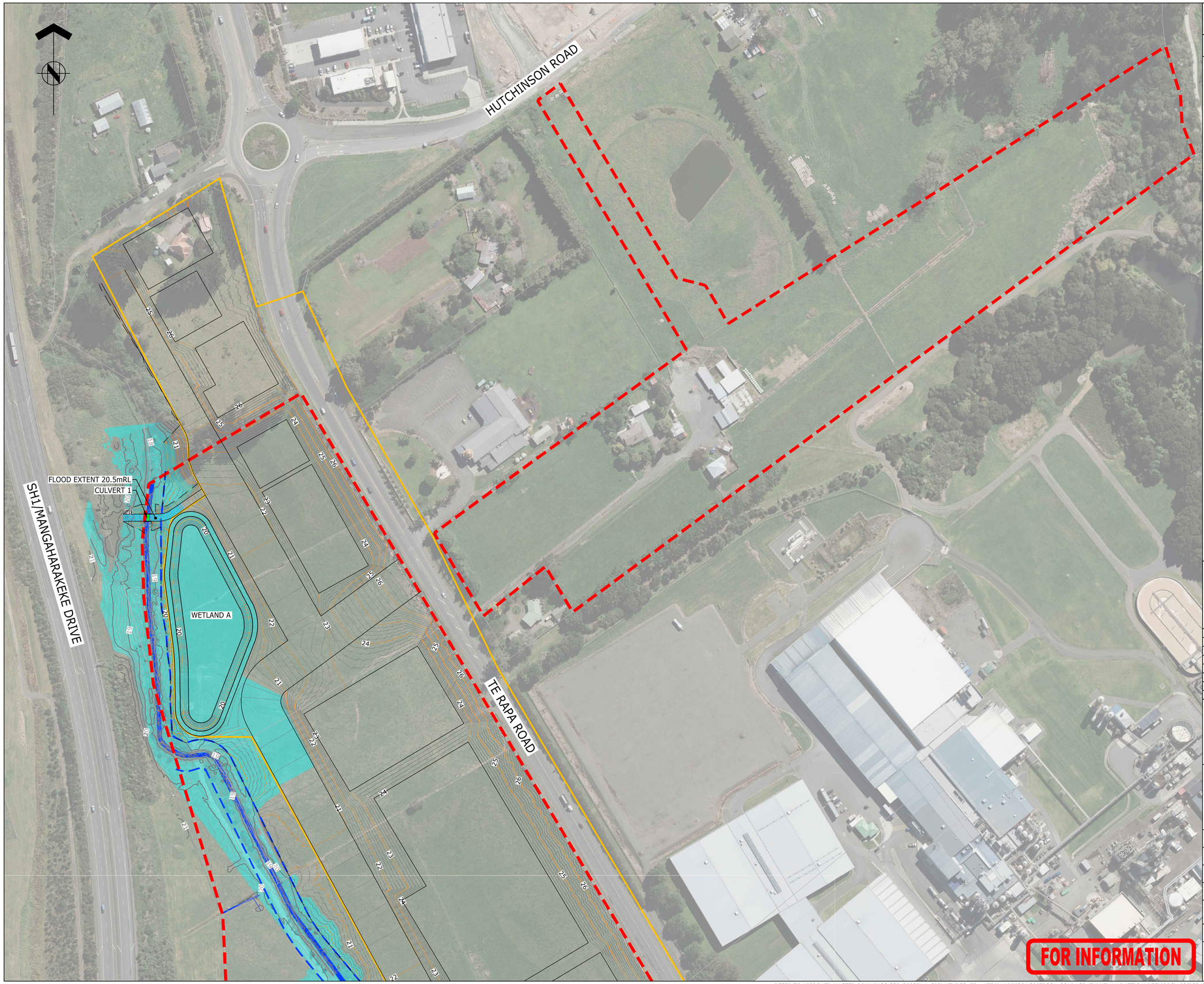
ISSUE STATUS: FOR INFORMATION

PROJECT No: A2212331.01	SCALES: 1:5000 (A1) 1:10000 (A3)	A1
DRAWING No: A2212331.01-HG-ZZ-DR-Z-043		REV 1

FOR INFORMATION



ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND

ISO 9001 QUALITY ASSURED

NOTES

1.

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- PROPOSED CONTOUR MAJOR (1.0m)
- PROPOSED CONTOUR MINOR (0.2m)
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- PROPOSED STORMWATER CULVERTS
- CATCHMENT A EXTENT
- 100YR FLOOD AREAS 20.5mRL (VOLUMES = 34,400m^3)
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TITLE:

TE RAPA WEST BLOCK
CONCEPT STORMWATER MANAGEMENT
SHEET 1

ORIGINATOR:	DATE:	SIGNED:	PLOT BY: AXZ
DRAWN:	DATE:	SIGNED:	PLOT DATE: 01.10.25
CHECKED:	DATE:	SIGNED:	SURVEY BY:
APPROVED:	DATE:	SIGNED:	SURVEY DATE:

ISSUE STATUS: FOR INFORMATION

PROJECT No: A2212331.01	SCALES: 1:1250 (A1) 1:2500 (A3)	A1
DRAWING No: A2212331.01-HG-ZZ-DR-Z-044		REV 1

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ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND

ISO 9001 QUALITY ASSURED

NOTES

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- CATCHMENT A EXTENT
- CATCHMENT B EXTENT
- CATCHMENT D EXTENT
- CATCHMENT E EXTENT
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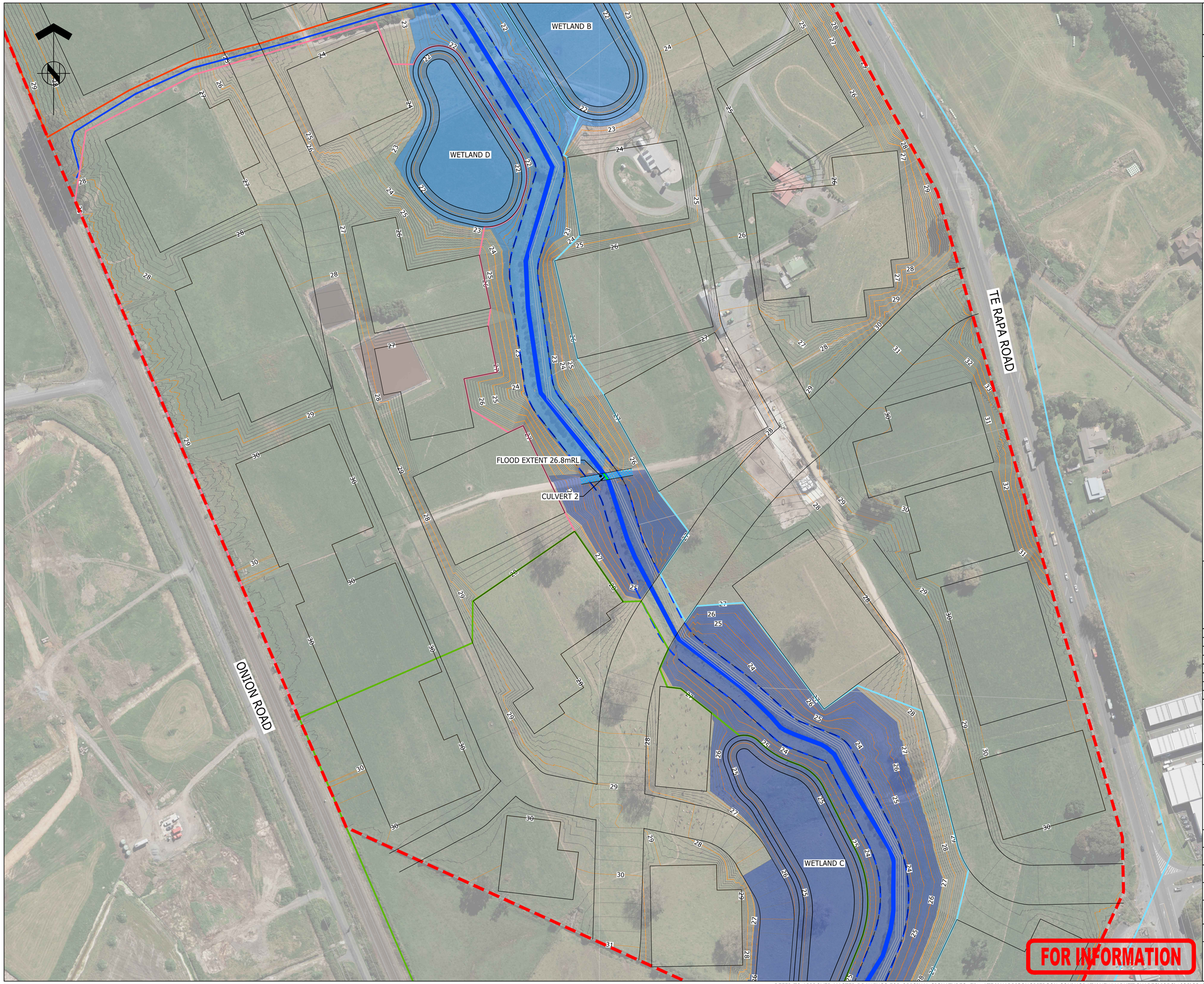
CONCEPT STORMWATER MANAGEMENT
SHEET 2

ORIGINATOR:	DATE:	SIGNED:	PLOT BY: AXZ
DRAWN:	DATE:	SIGNED:	PLOT DATE: 01.10.25
CHECKED:	DATE:	SIGNED:	SURVEY BY:
APPROVED:	DATE:	SIGNED:	SURVEY DATE:

ISSUE STATUS: FOR INFORMATION

PROJECT No: A2212331.01	SCALES: 1:1250 (A1) 1:2500 (A3)	A1
DRAWING No: A2212331.01-HG-ZZ-DR-Z-045		REV 1



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ISO 9001 QUALITY ASSURED

NOTES

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- PROPOSED STORMWATER CULVERTS
- CATCHMENT B EXTENT
- CATCHMENT C EXTENT
- CATCHMENT D EXTENT
- CATCHMENT E EXTENT
- 100YR FLOOD AREAS 20.5mRL (VOLUMES = 34,400m^3)
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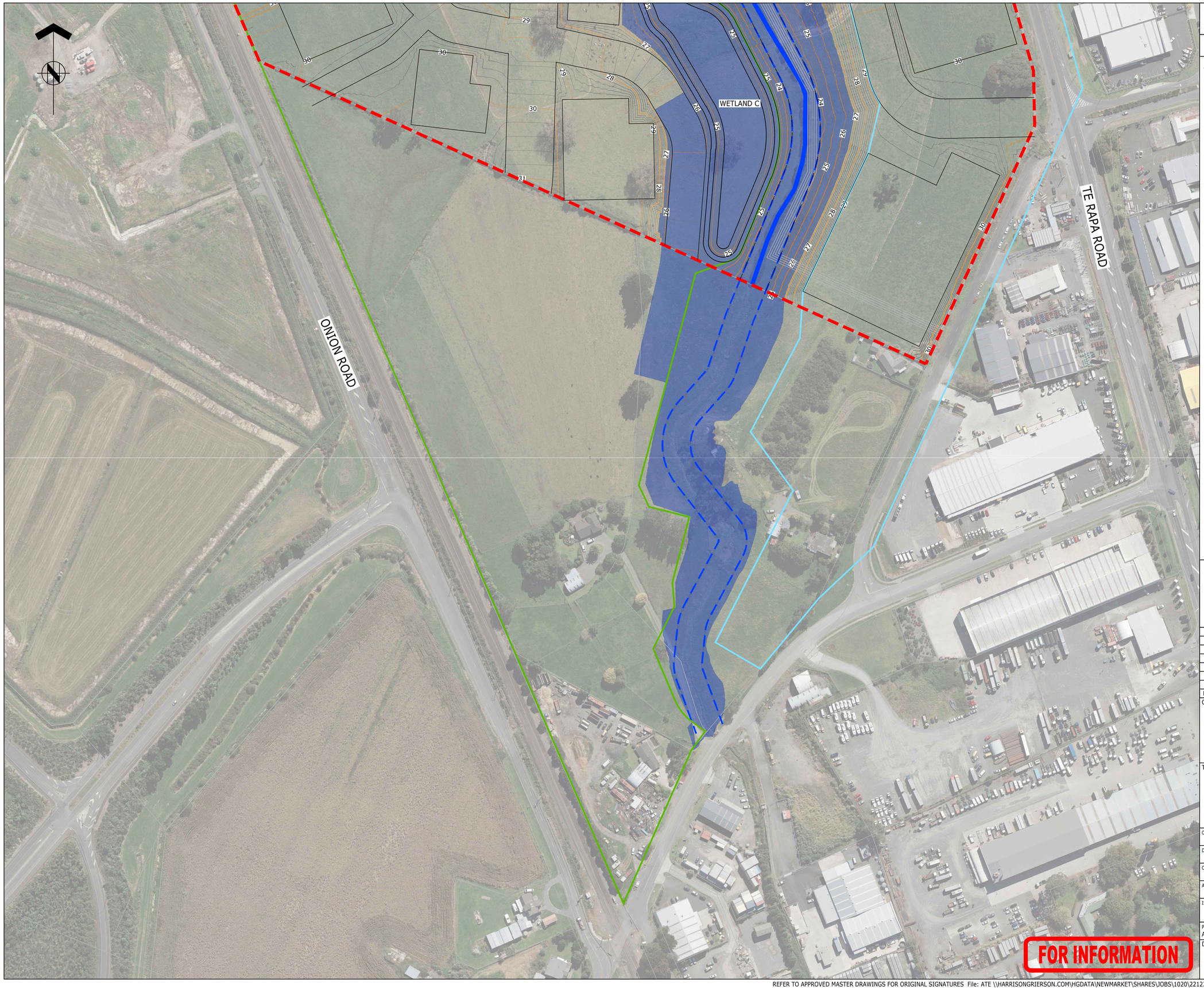
TE RAPA WEST BLOCK
CONCEPT STORMWATER MANAGEMENT
SHEET 3

ORIGINATOR:	DATE:	SIGNED:	PLOT BY: AXZ
DRAWN:	DATE:	SIGNED:	PLOT DATE: 01.10.25
CHECKED:	DATE:	SIGNED:	SURVEY BY:
APPROVED:	DATE:	SIGNED:	SURVEY DATE:

ISSUE STATUS: FOR INFORMATION

PROJECT No: A2212331.01	SCALES: 1:1250 (A1) 1:2500 (A3)	A1
DRAWING No: A2212331.01-HG-ZZ-DR-Z-046		REV 1



ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND

ISO 9001 QUALITY ASSURED

NOTES

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- PROPOSED STORMWATER CULVERTS
- CATCHMENT C EXTENT
- CATCHMENT B EXTENT
- 100YR FLOOD AREAS 20.5mRL (VOLUMES = 34,400m^3)
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TE RAPA WEST BLOCK
CONCEPT STORMWATER MANAGEMENT
SHEET 4

ORIGINATOR:	DATE:	SIGNED:	PLOT BY: AXZ
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ISSUE STATUS: FOR INFORMATION

PROJECT No: A2212331.01	SCALES: 1:1250 (A1) 1:2500 (A3)	A1
DRAWING No: A2212331.01-HG-ZZ-DR-Z-047		REV 1

Te Rapa West Block

Catchments - Existing

Catch_ID	Area (m2)	Grass (m2)	Sealed (m2)	Road (m2)	Dev High (m2)	Res med (m2)	Impervious % Existing	Imperv Area (m2)	Perv Area (m2)	Total Area (m2)
Wetland A	136500.0	136500.0	0.0	0.0	0.0	0.0	0%	0.0	136500.0	136500.00
Wetland B	272000.0	272000.0	0.0	0.0	0.0	0.0	0%	0.0	272000.0	272000.00
Wetland C	156000.0	156000.0	0.0	0.0	0.0	0.0	0%	0.0	156000.0	156000.00
Wetland D	106000.0	106000.0	0.0	0.0	0.0	0.0	0%	0.0	106000.0	106000.00
Wetland E	119000.0	119000.0	0.0	0.0	0.0	0.0	0%	0.0	119000.0	119000.00
	789500.0	789500.0								

Impervious %	
Grass =	0.0%
Road=	90.0%
Sealed =	100.0%
Dev High	85.0%
res med	65.0%

Catchments - Future

Catch_ID	Area (m2)	Grass (m2)	Sealed (m2)	Road (m2)	Dev High (m2)	Res Med (m2)	Impervious % Future	Imperv Area (m2)	Perv Area (m2)	Total Area (m2)	Additional Impervious Area (m2)
Wetland A	136500.0	0.0	0.0	0.0	136500.0	0.0	85%	116025.0	20475.0	136500.00	116025.0
Wetland B	272000.0	0.0	0.0	0.0	272000.0	0.0	85%	231200.0	40800.0	272000.00	231200.0
Wetland C	156000.0	0.0	0.0	0.0	156000.0	0.0	85%	132600.0	23400.0	156000.00	132600.0
Wetland D	106000.0	0.0	0.0	0.0	106000.0	0.0	85%	90100.0	15900.0	106000.00	90100.0
Wetland E	119000.0	0.0	0.0	0.0	119000.0	0.0	85%	101150.0	17850.0	119000.00	101150.0
	789500.0									789500.00	

SUMMARY TABLES

Catchment Areas Pre Development

Catchment	Wetland A	Wetland B	Wetland C	Wetland D	Wetland E
Area (km2)	0.1365	0.2720	0.1560	0.1060	0.1190
Imperv %	0.00%	0.00%	0.00%	0.00%	0.00%
Imperv (km2)	0.0000	0.0000	0.0000	0.0000	0.0000
Perv (km2)	0.1365	0.2720	0.1560	0.1060	0.1190

Catchment Areas Post Development

Catchment	Wetland A	Wetland B	Wetland C	Wetland D	Wetland E
Area (km2)	0.1365	0.2720	0.1560	0.1060	0.1190
Imperv %	85.00%	85.00%	85.00%	85.00%	85.00%
Imperv (km2)	0.116	0.231	0.133	0.090	0.101
Perv (km2)	0.020	0.041	0.023	0.016	0.018

SW Runoff Modelling
Te Rapa West Block

			Wetland A				Wetland B				Wetland C				Wetland D				Wetland E			
	Catchment ID		Full Pre (no CC)	Full Post (with CC)	Perv Post (with CC)	Imp Post (with CC)	Full Pre (no CC)	Full Post (with CC)	Perv Post (with CC)	Imp Post (with CC)	Full Pre (no CC)	Full Post (with CC)	Perv Post (with CC)	Imp Post (with CC)	Full Pre (no CC)	Full Post (with CC)	Perv Post (with CC)	Imp Post (with CC)	Full Pre (no CC)	Full Post (with CC)	Perv Post (with CC)	Imp Post (with CC)
All Storms	% Impervious		0%	85%	0%	100%	0%	85%	0%	100%	0%	85%	0%	100%	0%	85%	0%	100%	0%	85%	0%	100%
	Catchment Area - ha	Perv	13.6500	2.0475	2.0475	0.0000	27.2000	4.0800	4.0800	0.0000	15.6000	2.3400	2.3400	0.0000	10.6000	1.5900	1.5900	0.0000	11.9000	1.7850	1.7850	0.0000
		Imp	0.0000	11.6025	0.0000	11.6025	0.0000	23.1200	0.0000	23.1200	0.0000	13.2600	0.0000	13.2600	0.0000	9.0100	0.0000	9.0100	0.0000	10.1150	0.0000	10.1150
		Total - ha	13.6500	13.6500	2.0475	11.6025	27.2000	27.2000	4.0800	23.1200	15.6000	15.6000	2.3400	13.2600	10.6000	10.6000	1.5900	9.0100	11.9000	11.9000	1.7850	10.1150
		A - km2	0.1365	0.1365	0.0205	0.1160	0.2720	0.2720	0.0408	0.2312	0.1560	0.1560	0.0234	0.1326	0.1060	0.1060	0.0159	0.0901	0.1190	0.1190	0.0179	0.1012
	SCS Curve Number	Perv	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
		Imp	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98
	CN	Weighted	74.0	94.4	74.0	98.0	74.0	94.4	74.0	98.0	74.0	94.4	74.0	98.0	74.0	94.4	74.0	98.0	74.0	94.4	74.0	98.0
	Initial abstraction (Ia)	mm	4.46	0.75	4.46	0.26	4.46	0.75	4.46	0.26	4.46	0.75	4.46	0.26	4.46	0.75	4.46	0.26	4.46	0.75	4.46	0.26
	Time of Concentration (tc)	hours	0.33	0.17	0.17	0.17	0.33	0.17	0.17	0.17	0.33	0.17	0.17	0.17	0.33	0.17	0.17	0.17	0.33	0.17	0.17	0.17
	SCS Lag for HEC - HMS....(tp)	hours	0.22	0.11	0.11	0.11	0.22	0.11	0.11	0.11	0.22	0.11	0.11	0.11	0.22	0.11	0.11	0.11	0.22	0.11	0.11	0.11
	Catchment retention (S)	mm	89.2	15.1	89.2	5.2	89.2	15.1	89.2	5.2	89.2	15.1	89.2	5.2	89.2	15.1	89.2	5.2	89.2	15.1	89.2	5.2
WQV	24hr Precipitation (P24)	mm		24.8	24.8	24.8		24.8	24.8	24.8		24.8	24.8	24.8		24.8	24.8	24.8		24.8	24.8	24.8
	c*																					
	q* (from Figure 5.1 of TP 108	m3/km2mm																				
	Peak Flow Rate (qp)	m3/s																				
	Runoff depth (Q24)	mm			3.8	20.3			3.8	20.3			3.8	20.3			3.8	20.3			3.8	20.3
	Runoff volume (V24)	m3			77	2351			154	4684			88	2687			60	1826			67	2049
EDV	24hr Precipitation (P24)	mm		29.8	29.8	29.8		29.8	29.8	29.8		29.8	29.8	29.8		29.8	29.8	29.8		29.8	29.8	29.8
	c*																					
	q* (from Figure 5.1 of TP 108	m3/km2mm																				
	Peak Flow Rate (qp)	m3/s																				
	Runoff depth (Q24)	mm		19.1	5.6	25.1		19.1	5.6	25.1		19.1	5.6	25.1		19.1	5.6	25.1		19.1	5.6	25.1
	Runoff volume (V24)	m3		2611	115	2916		5202	229	5810		2984	131	3332		2027	89	2264		2276	100	2542
2 Year	24hr Precipitation (P24)	mm	62.8	74.4	74.4	74.4	62.8	74.4	74.4	74.4	62.8	74.4	74.4	74.4	62.8	74.4	74.4	74.4	62.8	74.4	74.4	74.4
	c*		0.232	0.71			0.232	0.71			0.232	0.71			0.232	0.71			0.232	0.71		
	q* (from Figure 5.1 of TP 108	m3/km2mm	0.055	0.154			0.055	0.154			0.055	0.154			0.055	0.154			0.055	0.154		
	Peak Flow Rate (qp)	m3/s	**0.471**	**1.564**			**0.939**	**3.116**			**0.539**	**1.787**			**0.366**	**1.215**			**0.411**	**1.363**		
	Runoff depth (Q24)	mm	23.1	61.1	30.7	69.3	23.1	61.1	30.7	69.3	23.1	61.1	30.7	69.3	23.1	61.1	30.7	69.3	23.1	61.1	30.7	69.3
	Runoff volume (V24)	m3	3148	8345	629	8040	6272	16630	1254	16021	3597	9538	719	9189	2444	6481	489	6244	2744	7275	548	7009
10 Year	24hr Precipitation (P24)	mm	95.5	116.0	116.0	116.0	95.5	116.0	116.0	116.0	95.5	116.0	116.0	116.0	95.5	116.0	116.0	116.0	95.5	116.0	116.0	116.0
	c*		0.33	0.79			0.33	0.79			0.33	0.79			0.33	0.79			0.33	0.79		
	q* (from Figure 5.1 of TP 108	m3/km2mm	0.073	0.161			0.073	0.161			0.073	0.161			0.073	0.161			0.073	0.161		
	Peak Flow Rate (qp)	m3/s	**0.952**	**2.549**			**1.896**	**5.080**			**1.088**	**2.913**			**0.739**	**1.980**			**0.830**	**2.222**		
	Runoff depth (Q24)	mm	46.0	101.9	62.0	110.8	46.0	101.9	62.0	110.8	46.0	101.9	62.0	110.8	46.0	101.9	62.0	110.8	46.0	101.9	62.0	110.8
	Runoff volume (V24)	m3	6275	13912	1269	12853	12504	27723	2528	25612	7172	15900	1450	14689	4873	10804	985	9981	5471	12129	1106	11205
100 Year	24hr Precipitation (P24)	mm	148.0	180.0	180.0	180.0	148.0	180.0	180.0	180.0	148.0	180.0	180.0	180.0	148.0	180.0	180.0	180.0	148.0	180.0	180.0	180.0
	c*		0.44	0.86			0.44	0.86			0.44	0.86			0.44	0.86			0.44	0.86		
	q* (from Figure 5.1 of TP 108	m3/km2mm	0.092	0.163			0.092	0.163			0.092	0.163			0.092	0.163			0.092	0.163		
	Peak Flow Rate (qp)	m3/s	**1.859**	**4.005**			**3.704**	**7.980**			**2.124**	**4.577**			**1.443**	**3.110**			**1.620**	**3.491**		
	Runoff depth (Q24)	mm	89	165	116	175	89	165	116	175	89	165	116	175	89	165	116	175	89	165	116	175
	Runoff volume (V24)	m3	12081	22570	2383	20270	24074	44974	4748	40391	13807	25794	2723	23166	9382	17527	1850	15741	10533	19676	2077	17671

Technical Memo

Te Rapa Masterplan & PC17 Assistance

Stormwater Volume Increase – Mitigation Measures

Fonterra (New Zealand) Limited

To:	Suzanne O'Rourke	**HG Project No.:**	A2212331.00
From:	Scott King	**Reviewer:**	Nick Grala
Date:	11 July 2025	**Approver:**	Nick Grala

1.0 Introduction

Following extensive consultation with Hamilton City Council (HCC) on stormwater management measures as part of the Plan Change 17 (PC17) process, one area of misalignment regarding the preferred method of management remains. This relates to stormwater volume increases, and the mitigation of potential stream erosion resulting from development of the central portion of the PC17 area (which drains stormwater directly to the Te Rapa stream).

The introduction of increased impermeable area from developing greenfield land results in additional stormwater run-off post-development. Whilst peak runoff flows can be appropriately managed via detention basins and wetlands, the additional volume of runoff, if not managed, can result in an increase in stream bank and bed erosion.

The ICMP for the Te Rapa stream (being prepared by HCC and currently in draft form) identifies that historical development in the Te Rapa stream catchment has already resulted in stream bank erosion occurring in the stream, especially for the last 300-500m of the streams reach (located in Waikato DCs jurisdiction, prior to its confluence with the Waikato River).

The ICMP also identifies two potential options for management/mitigation of any additional potential adverse stream erosion impacts that may result from further development of the catchment (ie in the PC17 area that drains to the stream).

At a high level, these options are:

1. Large diameter diversion pipeline(s), constructed between the stream and the Waikato River, designed to drain excess flows from the stream directly to the Waikato River, so as to protect the downstream reach of the stream from further erosion resulting from increased flow/volume discharge
2. Provision of stream erosion protection measures for the downstream reach of the stream, so as to increase stream resilience (on the basis that the additional flow volumes resulting from upstream development can't be adequately managed – noting that soils in the catchment area are not considered to be suitable for the high level of ground soakage that would be required to manage such post-development volume increases).

Note: It is noted that, for Option 1 (Pipe Diversion), some level of downstream erosion protection for the Te Rapa Stream is still required as a result of the existing stream erosion identified in the ICMP.

2.0 Option Considerations

As part of the PC17 works, and the review of HCCs Draft ICMP, we have considered and compared the two available options for stream erosion protection and summarised the following high-level pros and cons:

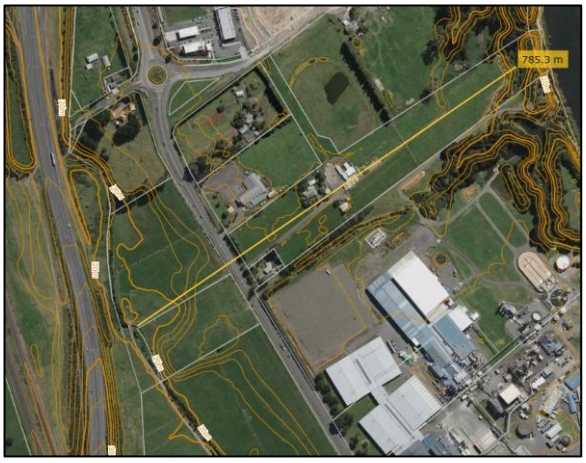
2.1 Option 1 - Pipe Diversion

Pro's	Con's
The pipe element of the solution falls entirely within HCCs jurisdiction	This would be a significant construction project – ~900m length and up to 10m deep. In reality it may be difficult to implement, with potential associated risks of delay and budget increases.
Potentially minimises the extent of the downstream erosion works required in the Te Rapa stream	Potentially requires agreement on the Northern River Crossing alignment (hence may have a significantly extended time period to resolve).
Provides a new river outlet connection for properties to the east of Te Rapa Road	Requires agreement of a number of private landowners
Would result in stream flows downstream of the pipeline better reflecting the streams natural (pre-development) state.	Requires full funding up-front (>$25m) prior to construction (ie can't construct the pipe in part – it's all or nothing). Funding not yet allocated.
	Due to depth, the pipeline would be very difficult to access in the future for maintenance or any emergency works required.
	Still requires the existing stream erosion to be remediated (located in WDCs jurisdiction)

With the aim of mitigating some of the cons outlined above, HG undertook a high-level investigation of potential alternative pipeline routes (with the aim of reducing the required pipeline length (and hence cost) and number of impacted landowners).

On review of available options, it was noted that an alternative pipeline route to the north of the Fonterra factory site would have a reduced length of approx. 800m and be located entirely within Fonterra owned land. However having discussed this option with Fonterra, they would be very reluctant to progress this option due to the significant swathe of their land to the North of the factory site that this option would render undevelopable (due to the restriction this would place on building above such a (10m deep) pipeline (i.e a likely ~20m wide no-build zone strip).

An extract of the potential alternative location is provided below:



2.2 Option 2 - Stream Erosion Protection

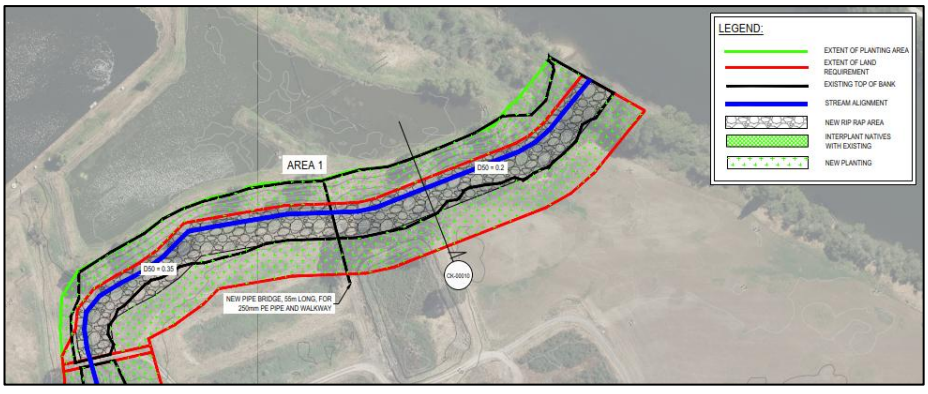
Pro's	Con's
Helps resolve/fix the existing bank stability issue (thus affected landowners should be responsive/favourable to the proposed works	Requires agreement of a number of private landowners (ie land access/purchase) and also HCC and WDC (funding split)
Implementation can be staged (starting at the worst-case Area 1, and working upstream in stages – 1 to 6). Staged implementation works can be linked to development stages in PC17.	Acts as a mitigation measure only, doesn't reduce flow volumes in the stream
Each stage is limited to 2 or 3 landowners (for consultation, land owner approval etc)	
Staging works means funding can also be staged (ie not all funding is needed up-front)	
Most stream protection works identified in the ICMP are just bank reshaping and planting, hence a simpler 'lower impact' engineering solution than the pipeline alternative.	
The stream protection work is required anyway, so this provides a one-stop shop solution (without the need for the additional pipeline works).	

As part of considering the pros and cons of this option we assessed how the works could be developed in relation to PC17, i.e. in a staged manner that aligned with PC17 development stages and effects. (*Note: Details as to specific PC17 development triggers and funding splits/arrangements are outside of the scope of this memo and would need to agreed separately*).

Our assessment established 6 potential stages, that aligned with works areas identified in the draft ICMP (as per the draft ICMP Appendix E – Stream Erosion Protection Measures – Rev G). These stages/areas are detailed below:

2.2.1 Stage1 (ICMP Area 1)

Area 1 is at the downstream extent of the Te Rapa Stream, with works (per the draft ICMP) consisting of full length placement of rip rap armouring, bank reshaping, and planting over a length of approximately 350m.

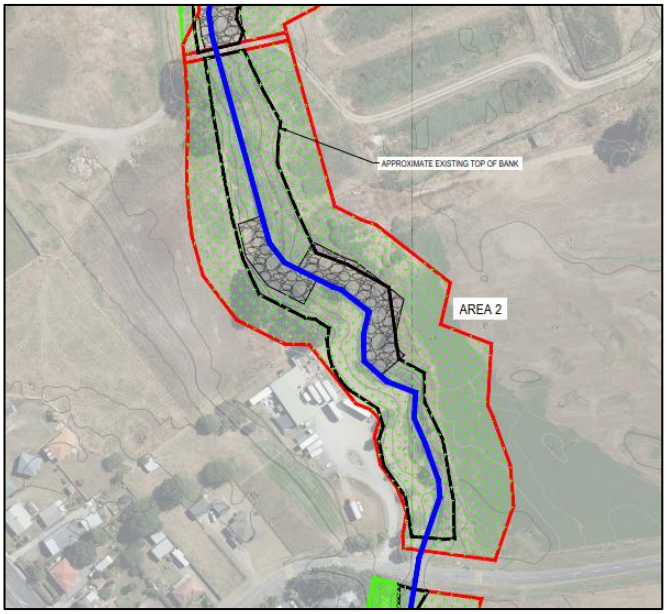


Landowners adjacent to this stage are shown on GRIP as being:

- Affco New Zealand Limited
- Open Country Dairy Limited

2.2.2 Stage 2 (ICMP Area 2)

Area 2 is to the south of Area 1, with works consisting of a reduced length of placement of rip rap armouring, bank reshaping, and planting over a length of approximately 285m.

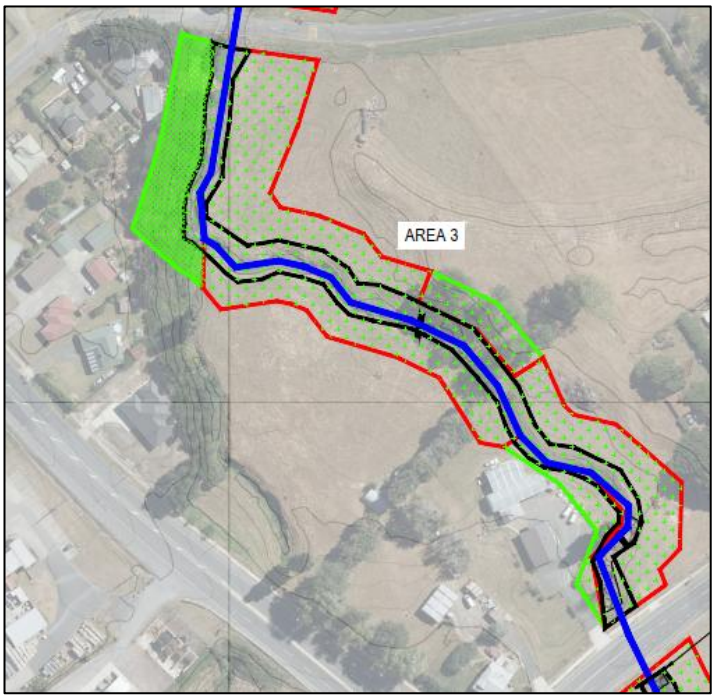


Landowners adjacent to this stage are shown on GRIP as being:

- Affco New Zealand Limited
- Open Country Dairy Limited
- John & Trudy Graham

2.2.3 Stage 3 (ICMP Area 3)

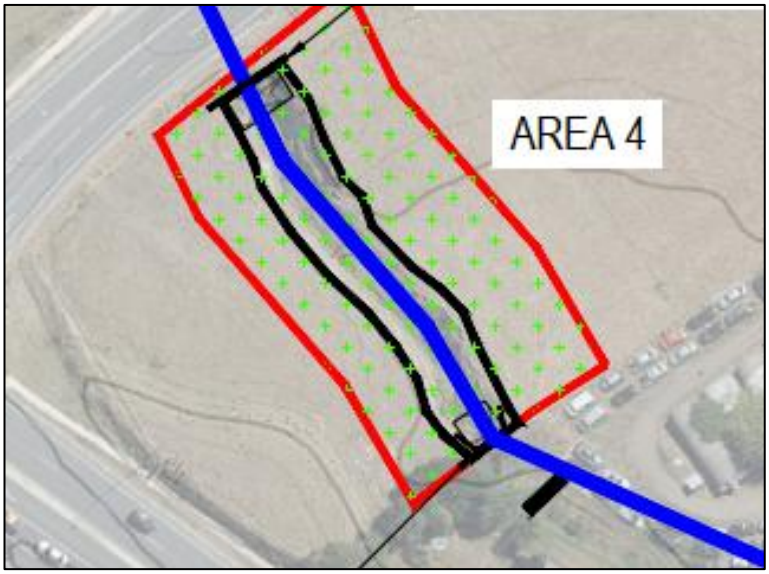
Area 3 is to the south of Area 2, with works consisting of localised areas of placement of rip rap armouring, bank reshaping, and planting over a length of approximately 325m.



There is a single landowner adjacent to this stage, Horotiu Village Limited, but it is noted that construction of a new subdivision appears to be in progress adjacent to the existing stream bank at present.

2.2.4 Stage 4 (ICMP Area 4)

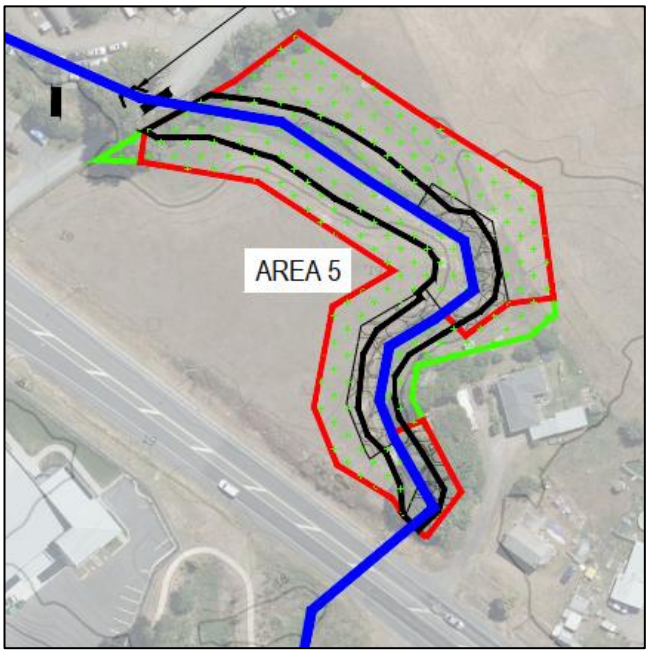
Area 4 is to the south of Area 3, with works consisting of localised placement of rip rap armouring, bank reshaping, and planting over a length of approximately 65m.



There is a single landowner adjacent to this stage, Daryl and Rodney Kempthorne.

2.2.5 Stage 5 (ICMP Area 5)

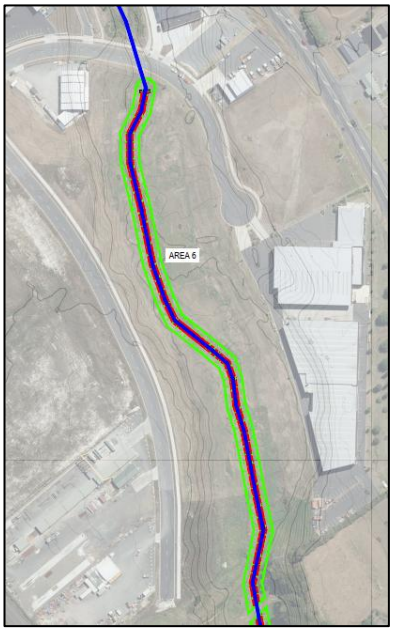
Area 5 is to the south of Area 4, with works consisting of localised placement of rip rap armouring, bank reshaping, and planting over a length of approximately 160m.

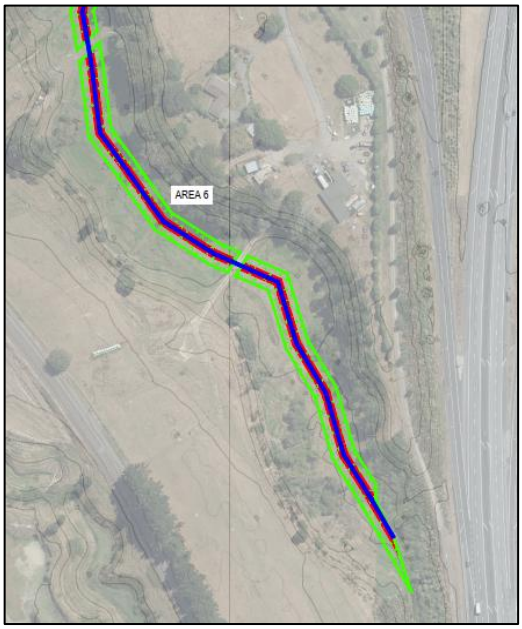


There is a single landowner adjacent to this stage, Korris Limited.

2.2.6 Stage 6 (ICMP Area 6)

Area 6 is to the south of Area 5, and encompasses the stream length between Innovation Way and SH1 (immediately to the north of the northern extent of the Fonterra owned PC17 land). Works for this length of stream appear to be limited to bank planting over a length of approximately 790m.





Landowners adjacent to this stage are shown on GRIP as being:

- Waikato District Council
- Hazel Mitchell

Beyond Area 6, all works (to the south) would be within the Fonterra controlled land of PC17.

3.0 Recommendation

Considering the various pros and cons outlined above we would recommend Option 2, the stream mitigation works, as the preferred option for the following reasons:

- It can be more easily staged (and hence funded), with stages linked to development of various areas of PC17, starting downstream at the worst affected (more complex) areas, and working upstream
- There is minimal landowner involvement per stage, with landowners potentially being more responsive/supportive, as the works will be providing improved protection to their land assets
- The majority of the work is just regrading banks and planting (per the information in the draft ICMP) and as such is a lower impact (more natural) engineering solution
- Stream erosion protection works are required anyway (even under the pipe diversion option), so this acts as a one-stop shop solution (without the need for the additional pipeline works)

4.0 Limitations

This memorandum is for the use by Fonterra (New Zealand) Limited only and should not be used or relied upon by any other person or entity or for any other project.

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