



Three Waters Infrastructure Assessment

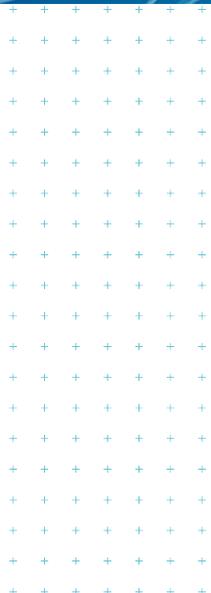
702 & 730A Horotiu Rd

Prepared for
Greig Metcalfe

Prepared by
Tonkin & Taylor Ltd

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Greig Metcalfe

Tonkin & Taylor Ltd (FILE)

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1 Introduction

This report was prepared by Tonkin & Taylor Ltd (T+T) as requested by Mr Greig Metcalfe, to assess the impact that a potential development of 68 ha of land near Te Kowhai village would have on public infrastructure for water, wastewater, and stormwater services.

The land in question is currently identified as “under discussion” in the Draft Waikato District Plan (2017). We understand that this report is to support the land being zoned “Village” when the Proposed District Plan is notified later in 2018. The analysis in this report assumes that the Village Zone will apply to this land.

1.1 Scope

This report considers the broad technical feasibility of three waters services at a high-level for the development of two land parcels, 702 and 730A Horotiu Road. The assessment is based on the following:

- The planning rules proposed in the draft district plan for the village zone, and further correspondence with Waikato District Council (WDC, the Council) relating to these rules
- Public infrastructure information provided by WDC.

Out of scope

- The specifics of individual lots or detailed design
- Cost and financial feasibility of solutions.

1.2 Overview of property

The proposal is for the development of approximately 68 ha of land, comprised of two lots located southwest of Te Kowhai and bounded on three sides by Horotiu Road, Richards Road, and Woolrich Road (legal description of Lot 2 DP 456538 & Lot 3 DP 353526). The general location is shown in Figure 1.1, below.



Figure 1.1: General location of proposed site development.

The land is relatively flat to rolling in contour and currently used for grazing.

The lots are adjacent to the village of Te Kowhai. There are about 140 occupied dwellings in the village. Based on the scenarios described below, the 68 ha of land for development could increase the size of Te Kowhai village by 1-3 times the number of currently occupied dwellings.

1.3 Development scenarios considered

The impact of the development on three waters infrastructure will depend on the number of lots created and the types of connections.

A concept plan for the development is shown in Appendix A. Detailed information about staging and lot sizing is still to be confirmed.

The Village Zone, under the Draft Waikato District Plan (2017), allows for different minimum lot sizes for serviced and unserviced lots, with more intense development permitted for lots with public water and wastewater services. Correspondence with WDC indicates that the published draft lot size of serviced properties is likely to be amended from 1,200 m² to 1,000 m², so that it can be subdivided evenly from an unserviced lot; this analysis assumes that that amendment is made as it is the more conservative scenario for demand.

Based on information provided by WDC and CKL, the maximum number of lots expected for each of these is given in Table 1.1, below. In discussing the impact of these scenarios, we have taken the conservative approach of considering that the development is entirely one or the other of the serviced and unserviced scenarios. It is possible that the staging of the development will begin with unserviced lots, with later stages being serviced. This mixed approach will fit inside the impact envelope derived from considering both scenarios at 100%.

Table 1.1: Maximum lots expected under servicing scenarios

Scenario	Minimum lot size in Draft District Plan	Assumed minimum lot size*	Maximum number of lots**
Public water and wastewater services provided	1,200m ² (average)	1,000m ² (average)	480
Unserviced lots	3,000m ²	3,000m ²	160

*Based on correspondence with WDC about expected changes to the draft district plan rules

**Based on correspondence with CKL Ltd, surveyors for the project.

2 Water Supply

This analysis considers the options for developing the lots as serviced or unserviced under the Village Zone rules, and the high-level impacts of these options.

The location of the development relative to the nearest public water network is shown in Figure 2.1, below. There is currently no council water supply service provided to Te Kowhai. The two nearest locations in Waikato District with a water supply service are Horotiu, and a small number of rural properties serviced by a 100mm bulk connection fed from Hamilton City.

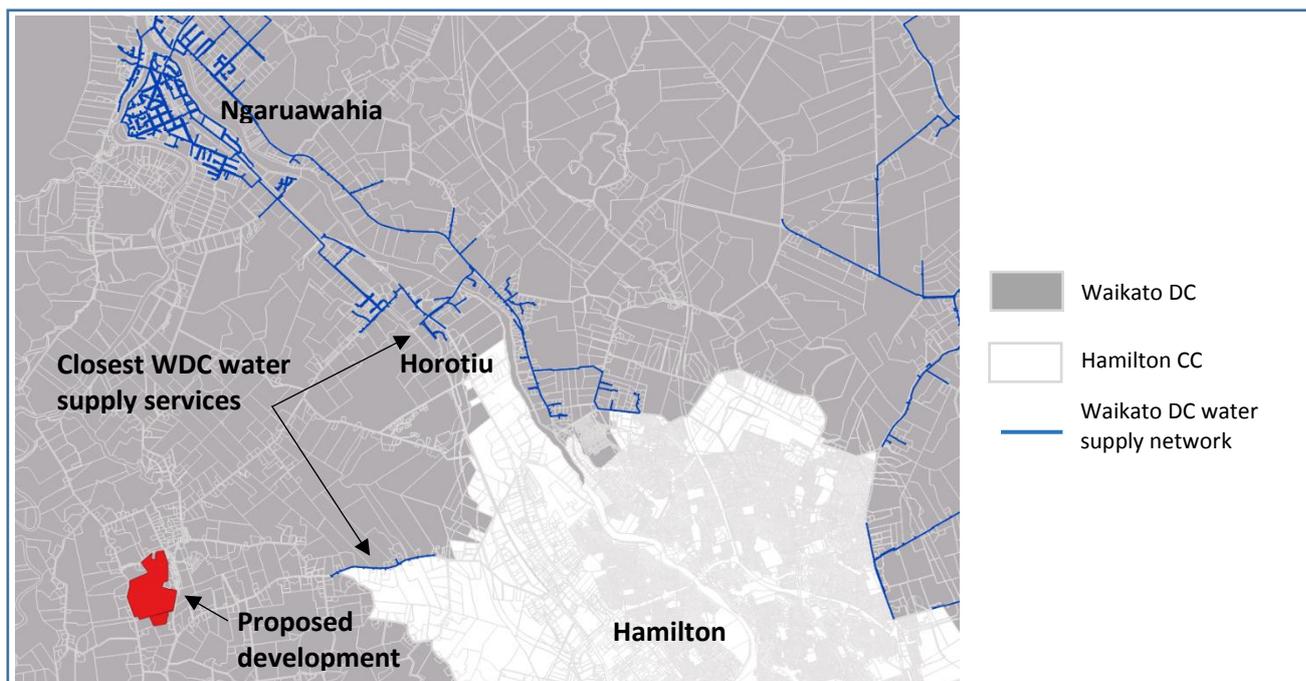


Figure 2.1: Location of water supply network closest to proposed development (Source: WDC GIS data)

2.1 Option 1: Unserviced

Under the proposed Village Zone rules, lots larger than 3,000 m² do not need to have a water supply provided. This option requires individual properties to use tanks for the collection and storage of rainwater for potable use. This is technically feasible, as it is a standard practise for dwellings not connected to the Council's water supply. The impact of this option on the Council's infrastructure is limited to extended summer dry periods, when property owners engage water carriers, who draw water from either WDC or Hamilton City Council (HCC) public supplies for delivery, to refill the tanks. The cost of this gives residents on rain tanks much stronger drivers for lowering water consumption than reticulated consumers. Overall, unserviced properties are considered to have negligible impact on public water supply infrastructure.

2.2 Option 2: Serviced

Following enquiries from T+T, WDC has provided the following information about the provision of water supply to the development:

- The Te Kowhai village is considered part of the same service area as the development and any new trunk mains would need to be sized to meet the combined demand of both. Funding for this would be covered by a developer agreement.
- While connecting to WDC's Ngaruawahia water network at Horotiu may be feasible, WDC considers that the Ngaruawahia water treatment plant does not have capacity to meet the demand from connecting the development and Te Kowhai village. The pending completion of a trunk main project connecting the Huntly and Ngaruawahia networks does not change this as any additional capacity is prioritised for growth of the Northgate industrial park.
- WDC's strategic preference for water supply in the Te Kowhai area is to provide this through a bulk supply connection from HCC. The timing of this is sufficiently far in the future that WDC has not yet discussed the matter with HCC.

- WDC staff have proposed budget to investigate providing a water supply service to Te Kowhai in years 10-15 (2029-2034) of the draft Water Supply Asset Management Plan. This is subject to WDC's Long Term Plan process, with budget for physical works not yet provided.

We note an application has been made to the HCC for approval of a special housing area on the edge of the city boundary nearest to the development. The proposed construction commencement date is late 2018. Infrastructure impact assessment for the special housing area indicate that upgraded reticulation will be brought to the city boundary. The impact assessment also indicates that the special housing area, which will be a more intense development than this proposal, will have minimal impact on the HCC trunk main reticulation.

Broadly speaking, construction of a bulk main connection from the special housing area on the HCC network to service the wider Te Kowhai area is expected to be technically feasible. An indicative route is shown in Figure 2.2, below.

Detailed investigation is required to confirm the preferred HCC supply point, ground conditions, operational requirements and hydraulic capacity.

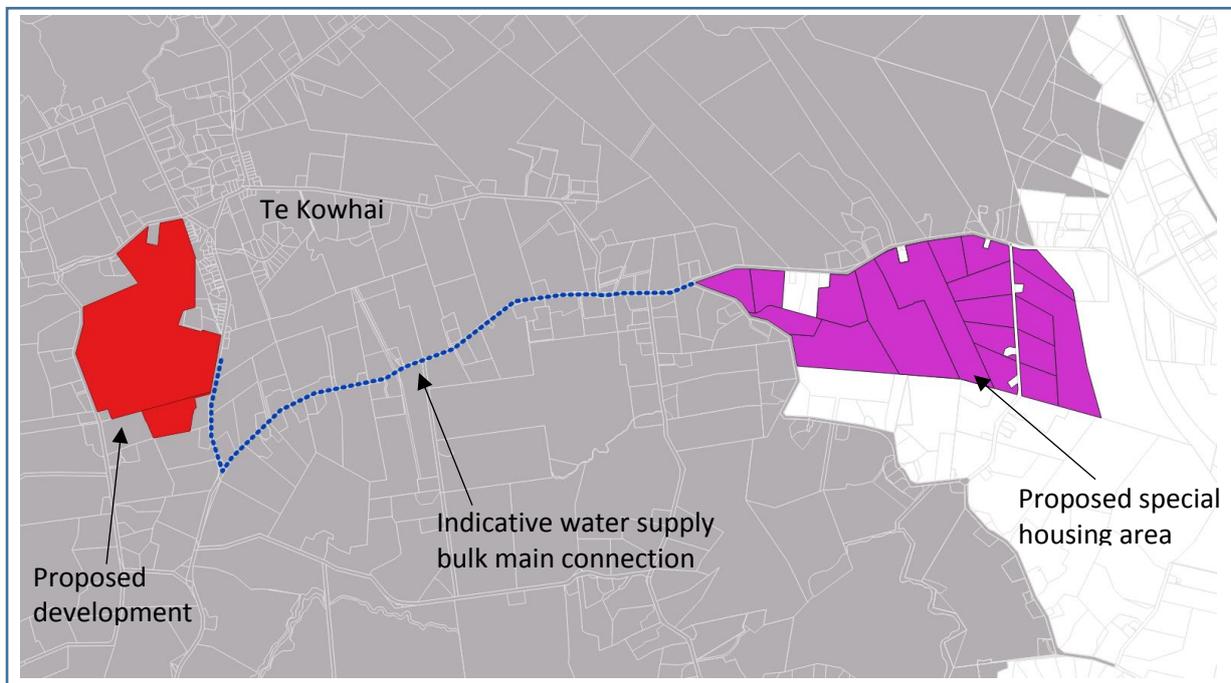


Figure 2.2: Indicative water supply bulk main connection from the special housing area to the proposed site development.

Enquiries to HCC confirmed that any request for a bulk supply connection would need to come through WDC.

No information is available to confirm the impact of the bulk connection on HCC infrastructure. If the development draws from the existing population pool for sub-regional growth, the additional demand on the HCC water treatment plant may already be planned for as growth that would otherwise occur within HCC boundaries. T+T did not investigate the capacity limits of the HCC network to supply the bulk connection.

Servicing the development through a bulk connection would have no impact on WDC infrastructure as the network would be both new and standalone from existing infrastructure.

2.3 Water supply summary

WDC's planned approach to servicing the Te Kowhai village is through a future bulk supply connection from HCC, which is expected to be technically feasible. If development has fully serviced lots, this may bring the timing of the bulk main forward and will increase the demand on the HCC network at the supply point but will not change the technical feasibility of trunk main itself.

Properties that are unserviced for water supply are technically feasible and will have minimal impact on the public infrastructure.

3 Wastewater

This section considers the feasibility and impact of three wastewater options: connection to WDC infrastructure, individual on-site (i.e. unserviced), and a communal onsite solution.

The location of the development and nearby public wastewater networks is shown in Figure 3.1, below. About 1/3 of the Te Kowhai village has a WDC operated wastewater service but this has not been extended because the treatment plant is at capacity. The next nearest WDC wastewater network is at Horotiu.

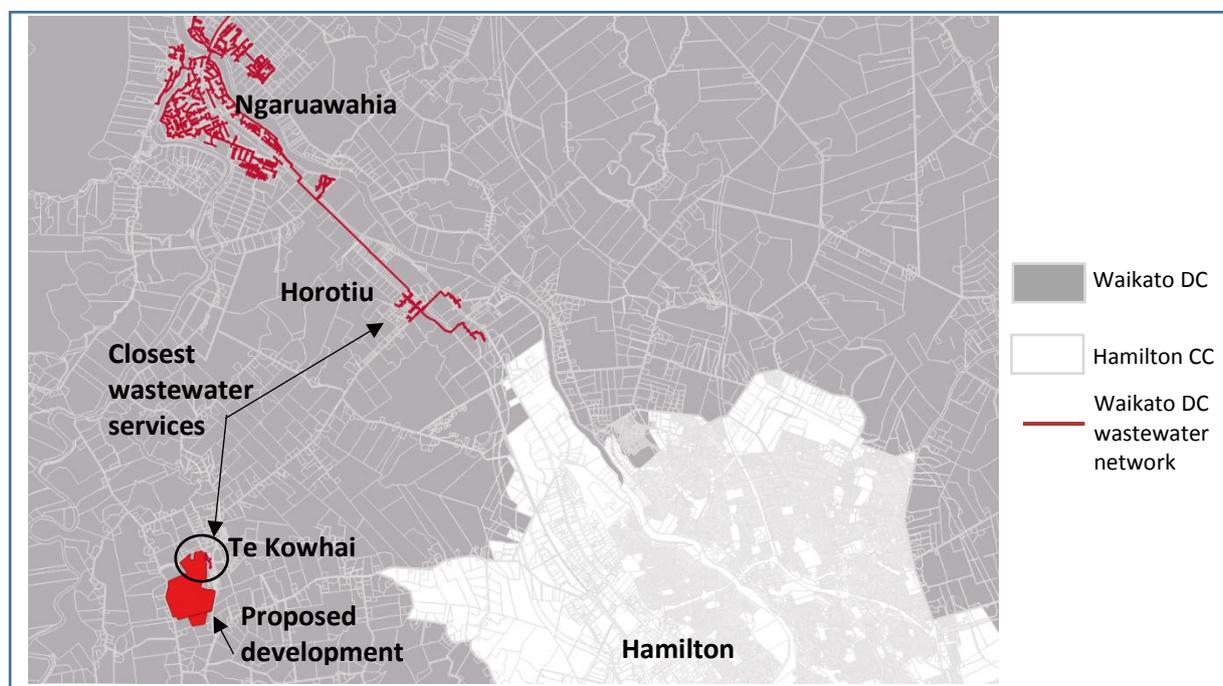


Figure 3.1: Location of WDC wastewater networks closest to proposed development (Source: WDC GIS data)

3.1 Option 1: Unserviced

Unserviced properties in the development will have a minimum lot size of 3,000 m². The Waikato Regional Plan permits the discharge of domestic septic effluent to land, subject to a number of conditions set out in Sections 3.5.7.5 and 3.5.7.6. The proposed lot size makes it technically feasible to meet the requirement for a minimum effective disposal area of 2,500 m², after building and driveway footprint are allowed for. Specific design will be required to ensure that the other conditions can be met.

Unserviced properties are expected to have minimal impact on public infrastructure, with about 4m³ of septage from each property needing to be discharged as tradewaste to a WDC or HCC treatment plant every few years.

3.2 Option 2: Serviced – public infrastructure

Following enquiries from T+T, WDC has provided the following information about connecting the development to public wastewater services, which is broadly similar to the situation for water supply:

- The Te Kowhai village is considered part of the same service area as the development and any new trunk main needed to connect the development should be sized to meet the combined demand of both. Funding for this would be covered by a developer agreement.
- A project is planned for 2019-2020, to increase the reticulation capacity between Horotiu and Ngaruawahia, which could be sized to include the flows from a connection from Te Kowhai. However, WDC considers that if there is available capacity at the Ngaruawahia wastewater treatment plant, it is prioritised for growth of the Northgate industrial park.
- WDC's strategic preference for wastewater services in the Te Kowhai area is to provide this through a bulk supply connection to HCC. The timing of this is sufficiently far in the future that WDC has not yet discussed the matter with HCC.
- WDC staff have proposed budget to investigate providing a bulk connection from Te Kowhai in years 10-15 (2029-2034) of the draft Wastewater Asset Management Plan. This is subject to WDC's Long Term Plan process, with budget for physical works not yet provided.

We note an application has been made to the HCC for approval of a special housing area (SHA) on the city boundary nearest to the development. The proposed construction commencement date of the SHA is late 2018. An infrastructure impact assessment for the special housing area indicated that upgraded reticulation will be brought to the city boundary and that the SHA, which will be a more intense development than this proposal, will have minimal impact on the HCC trunk main reticulation. Coordination with this project would reduce any impact on future HCC infrastructure.

Broadly speaking, construction of a bulk main connection from Te Kowhai to the special housing area on the HCC network area is expected to be technically feasible. An indicative route is shown in Figure 3.2, below. The location and number of pumpstations will need to be determined for the internal networks of Te Kowhai village and the development, as well as the main trunk line. Detailed investigation is required to confirm the preferred HCC connection point, ground conditions, operational requirements and hydraulic capacity.

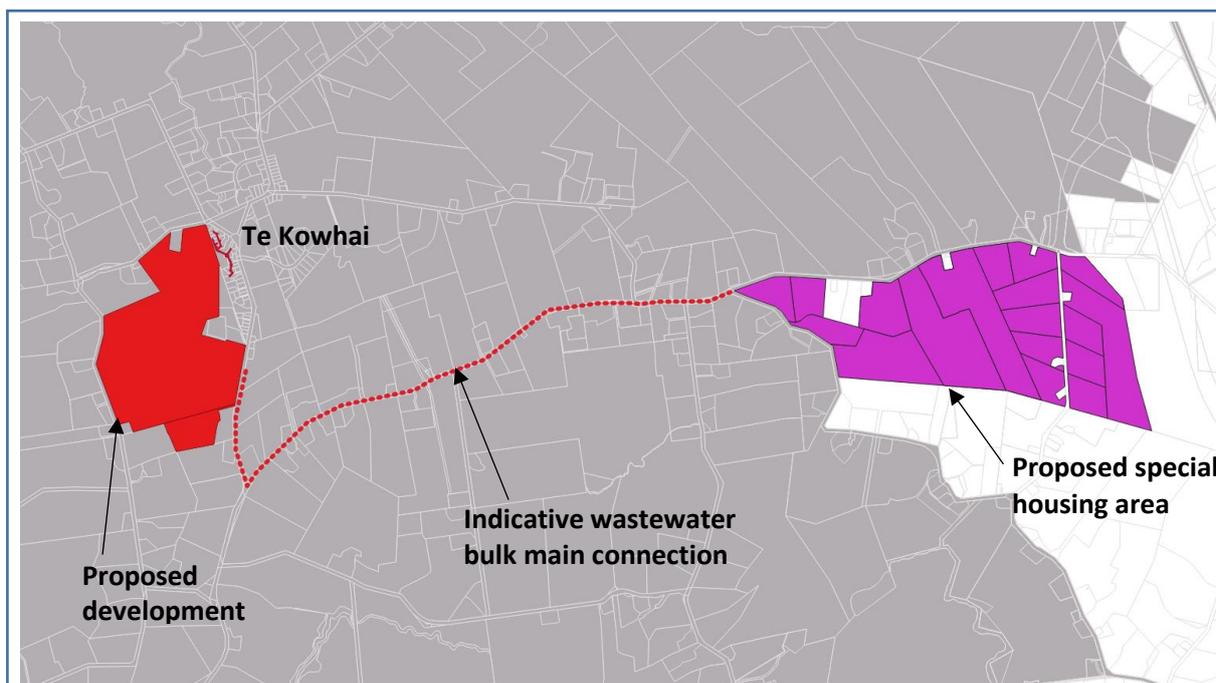


Figure 3.2: Indicative route of wastewater trunk main

Enquiries to HCC confirmed that any request for a bulk supply connection would need to come through WDC.

No information is available to confirm the impact of the bulk connection on HCC infrastructure. If the development draws from the existing population pool for sub-regional growth, the additional demand on the HCC wastewater treatment plant may already be planned for as growth that would otherwise occur within HCC boundaries. T+T did not investigate the capacity limits of the HCC network to receive the bulk discharge, but it is noted that the connection is relatively close to the treatment plant.

Servicing the development through a bulk connection would have no impact on WDC infrastructure as the network would be both new and standalone from existing infrastructure.

3.3 Option 3: Serviced – communal

A third option for the collection, treatment, and disposal of wastewater from the development is using an Innoflow reticulation and treatment system. This system uses septic tanks at each property to pre-treat and buffer the wastewater (Figure 3.3, below), before pump or gravity discharge of effluent in pressurised reticulation to a central treatment plant and disposal (schematic of the treatment plant in Figure 3.4, below).

This solution is proven in both an international and New Zealand context, with over 20 communal sites in New Zealand, servicing from 21 to 850 connections.

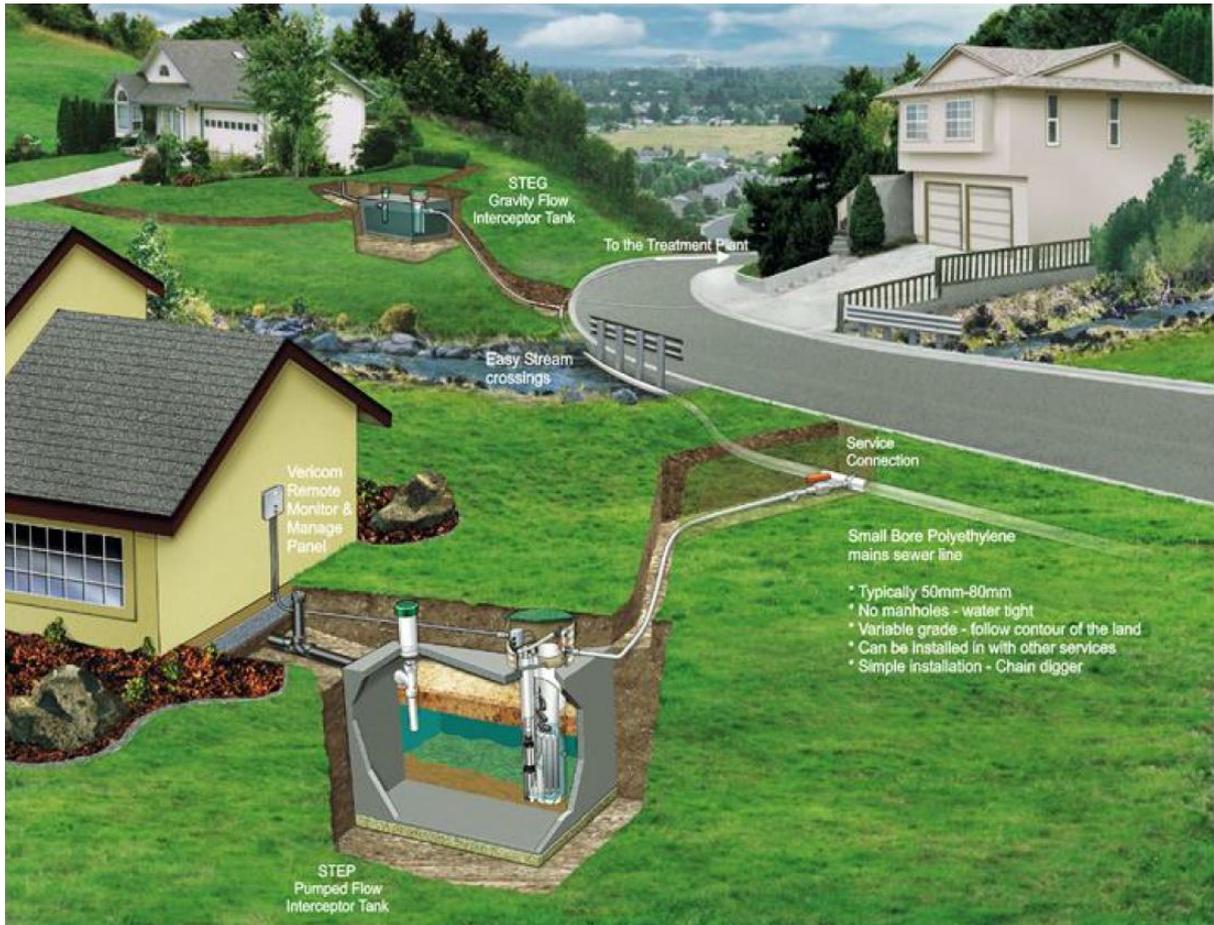


Figure 3.3: Onsite pre-treatment and small bore reticulation of the Innoflow system

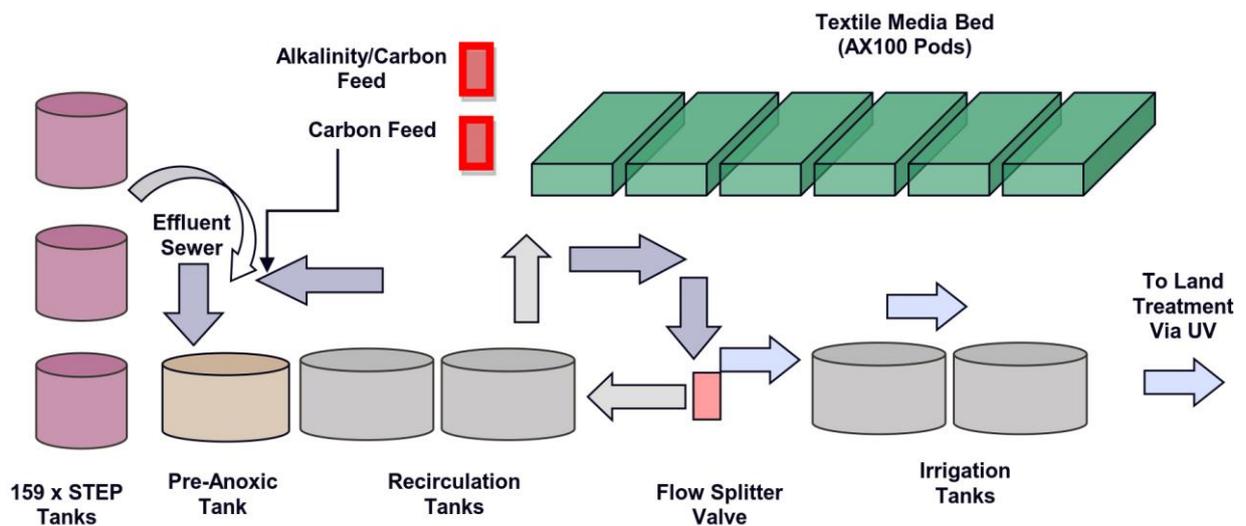


Figure 3.4: Schematic of the Innoflow system, from onsite septic tanks to discharge to land treatment

Ownership of the communal system will need to be discussed with Council if this option is pursued further. A body-corporate ownership model, with Innoflow engaged to operate and maintain the system, is common although some Innoflow schemes are commissioned by or vested with their respective councils. The latter would meet the requirement of the Village Zone rules for small lots, of a public wastewater service, although it is acknowledged that this is contra to WDC's current strategic intentions for a future bulk service provision with HCC.

The Innoflow system is modular in design, allowing for the treatment and disposal to scale with development stages. In addition, the pressurised reticulation system provides flexibility to decommission the treatment plant and connect to a public service if that is provided in the future.

The size of the disposal field is directly dependent on the design inflows and the appropriate application land rate developed through detailed design. The possible range of land area required for irrigation for 480 lots is between 0.65 Ha and 13 Ha, as shown in Figure 3.5, below. The inflow estimate used is 540 L/dwelling/day, based on numbers specified in Waikato Local Authority Shared Services Regional Infrastructure Technical Specification (RITS) for people per dwelling and average daily water consumption per person (RITS Section 5.2.4.2). No allowance was made for inflow, infiltration or peaking, as the system is new, pressurised, and attenuated at the dwelling. The indicative application rates are taken from the draft Structure Plan Geotechnical Suitability Assessment¹, which notes that some of the clay soil types present may require application rates of 2-4mm/day, though if sandy soils are present, they could possibly accept application rates of 10-40mm/day.

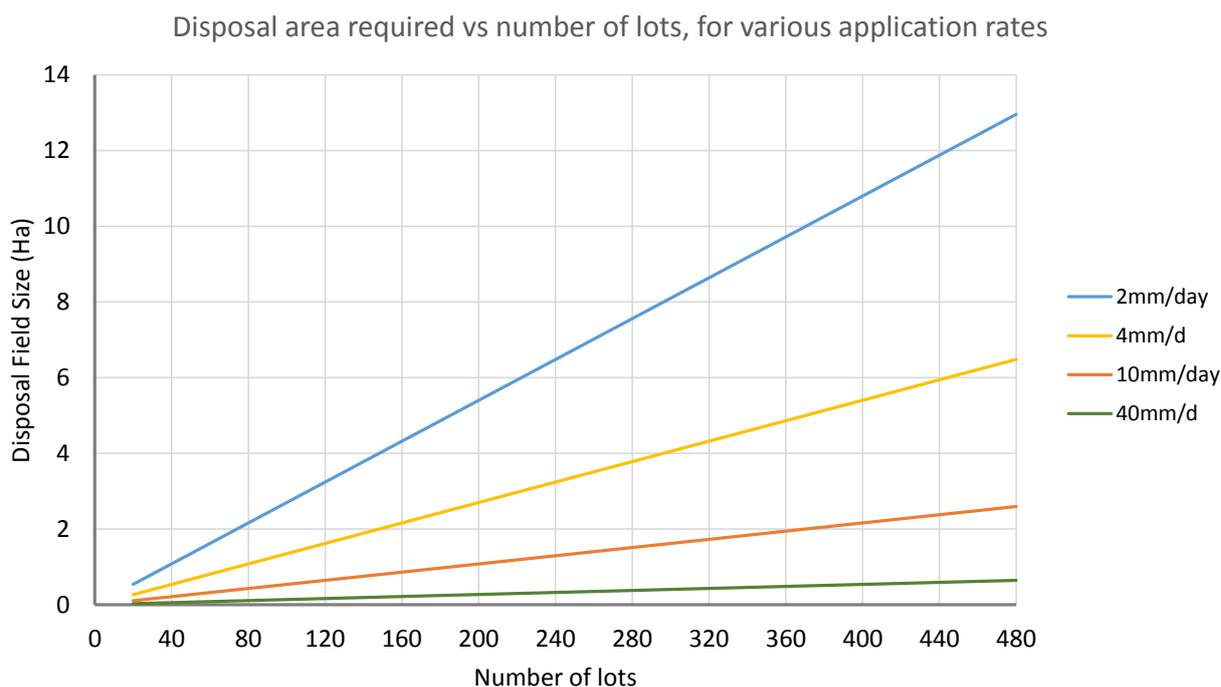


Figure 3.5: Indicative range of sizes for disposal field, subject to detailed design

The impact of a communal system on WDC infrastructure is expected to be similar to the impact of unserviced septic tanks, primarily involving the period collection of septage from individual properties for treatment at a Council treatment plant.

¹ AECOM (2017) 702 & 703A Horotiu Road, Te Kowhai. Structure Plan Geotechnical Suitability Assessment

3.4 Wastewater summary

At a high level, the three options for wastewater management of unserviced, bulk connection to HCC services, and serviced by a communal system, are all expected to be technically feasible and have minimal impact on WDC infrastructure.

4 Stormwater

This assessment has broadly considered the background issues and potential constraints to urban development with regard to stormwater infrastructure and flood hazard to urban growth within the proposed area of re-zoning.

T+T have previously issued the Te Kowhai Structure Plan Area Catchment Management Plan (CMP)² for WDC that covers ecological and flooding issues on land immediately east of the re-zoning area. This report is referenced below and contains relevant information relating to the proposed re-zoning area.

4.1 Existing situation

The area is located on relatively flat to slightly rolling farmland south west of Te Kowhai village. The land generally falls to one of two unnamed tributaries that dissect the area and receive the vast majority of catchment runoff. Both tributaries receive stormwater runoff from upstream of the site. The unnamed tributaries flow towards the north-east to a confluence with another unnamed tributary of the Waipa River immediately downstream (north east) of the site. The two unnamed tributaries are natural watercourses although they may have been modified through agricultural practices. There is no existing public stormwater reticulation in the proposed re-zoning area.

The Te Kowhai CMP notes that the area is underlain by the Hinuera Formation and groundwater is generally recharged from rainfall. The draft Structure Plan Geotechnical Suitability Assessment³ also notes that the low lying land is underlain by alluvial deposits of the Hinuera Formation but notes that soil conditions can be highly variable and no soakage testing has been undertaken to date.

4.2 Stormwater management

Stormwater management should be considered under a Best Practicable Option (BPO) approach. The RITS is the primary high level guidance document for determining stormwater management requirements and implementing BPO's in the Waikato District. The RITS has been reviewed for requirements for stormwater discharge from the re-zoning area and these requirements are discussed in the sections below.

Detailed design for stormwater management devices will likely need to be in accordance with Auckland Councils recently released Stormwater Management Devices in the Auckland Region (GD01).

The preferred stormwater management option for the development will likely depend on the lot size. Stormwater management (quality and quantity) can either occur on individual lots and at the source of stormwater discharge or at one or more centralised downstream devices. Management of runoff from public spaces including roads would need to be undertaken within the public spaces. Larger lot sizes allow for more stormwater management at individual lots, while smaller lot sizes limit the space available for stormwater management and the development lends itself to more centralised management.

² Tonkin & Taylor (2015) Report. Waikato District Council. Appendix E - Catchment Management Plan – Te Kowhai Structure Plan Area

³ AECOM (2017) 702 & 703A Horotiu Road, Te Kowhai. Structure Plan Geotechnical Suitability Assessment

4.2.1 Water quality

Requirements for stormwater management include water quality treatment⁴. Management options for water quality treatment in the RITS hierarchy are noted in Table 4-1.

Table 4-1: Water quality management options

Management option	Potential management devices ¹	Comments on suitability
1. Retention for reuse.	<ul style="list-style-type: none"> Rainwater storage tanks 	<ul style="list-style-type: none"> Likely suitable On-site water storage may be required as the site is not reticulated. Retention volume would be over and above that required for water supply.
2. Soakage techniques.	<ul style="list-style-type: none"> Pervious pavements Bioretention devices Infiltration devices Swales 	<ul style="list-style-type: none"> Suitability depends on soil at individual lots and source of stormwater²
3. Treatment and detention and gradual release to a watercourse.	<ul style="list-style-type: none"> Wetlands Ponds 	<ul style="list-style-type: none"> Likely suitable Multiple devices would be required over re-zoning area.
4. Treatment and detention and gradual release to a piped stormwater system.	<ul style="list-style-type: none"> Wetlands Ponds 	<ul style="list-style-type: none"> Not suitable as no piped stormwater system at discharge point
Notes:		
1. All management devices except rainwater storage tanks adopted from GD01		
2. Underlying soil soakage is discussed in section 4.1		

There is also potential for improvements in water quality by way of providing riparian buffer zones (open spaces near streams) and planting of the riparian margins of those zones.

4.2.2 Retention and detention

In addition to stormwater treatment, the following will likely be required as the downstream receiving environment is a natural watercourse:

- Flow attenuation of the 2 and 10 year ARI flow rates to match pre-development flow.
- Post-development runoff to match pre-development runoff volume through reduced runoff practices and sub-catchment management.
- Detention of the Extended Detention Volume based on a WQV storm.

Of the potential management options noted in Table 4-1 it is possible that multiple options may be required in order to meet the retention and detention requirements as well as the water quality requirements.

⁴ Requires treatment for the Water Quality Volume (WQV) being the 90th percentile of 24-hour storm event. If rainfall percentile data is unavailable, the 90th percentile can be roughly approximated as 1/3 of the 2 year Annual Recurrence Interval (ARI) 24 hour rainfall depth including allowance for climate change.

4.2.3 Other requirements

Other requirements include:

- The provision of a secondary system for primary system overflow. This includes provision for overland flow paths when the primary stormwater system is inundated for a 100 year ARI event.
- Provision of minimum floor levels within the development at or above the 100 year ARI event plus freeboard.

4.3 Flood risk

The Te Kowhai Structure Plan Area report flood hazard modelling and plan provided in the Appendices covers the proposed re-zoning area. It should be noted that the flood hazard modelling undertaken as part of the CMP is not suitable for definition of flood levels for the purposes of setting finished floor levels or to ensure on-site wastewater systems are located outside the flood extent. The flood modelling was a rapid assessment tool used to provide an indication of flood hazard and to identify where future modelling efforts should be concentrated.

An annotated version of the CMP flood hazard plan is attached in Appendix B.

The majority of the subject area is free from flood hazard. Significant flood hazard areas are generally located adjacent to the unnamed tributaries and development should be avoided in those areas. Potential and minor flood hazard areas including ponding areas should also be avoided or otherwise addressed in the contouring and development of the area.

No areas of significant constraint to flood flows have been identified within the unnamed tributaries onsite.

Site specific flood assessments should be undertaken to better define flood extents and should include a stream walkover to identify any local flow constraints e.g. road or farm culverts etc.

4.4 Stormwater summary

The re-zoning area is located on relatively flat to slightly rolling farmland that generally falls to one of two unnamed tributaries that dissect the area. There is no existing public stormwater reticulation in the proposed re-zoning area.

Stormwater management requirements include water quality treatment and detention/retention.

A number of water quality management options are available and suitable for the site that include retention for re-use, soakage techniques and retention for slow release. Management devices associated with these options that may be suitable for the site include rainwater storage tanks, pervious pavements, bioretention devices, infiltration devices, swales, ponds and wetlands. It is likely various management devices will be required in order to meet the retention and detention requirements.

The majority of the area is free from flood hazard. Flood hazards are largely focussed around the two stream tributaries and these stream corridors should be either be avoided or fully addressed in the development of the area. Site specific assessment will be required to accurately determine flood levels across the site.

5 Summary

This report has identified options for three waters infrastructure solutions for the proposed development that are technically feasible and comply with the requirements of the Village zone for either small (1,000 m²) or larger (3,000 m²) lot development. The impact of these options on existing infrastructure will be minimal although they may require Council to bring forward plans for the provision of new water and wastewater services to Te Kowhai.

From the perspective of best practise thee waters infrastructure, there is no high-level reason why the proposed development could not proceed under the Village Zone of the draft Waikato District Plan.

6 Applicability

This report has been prepared for the exclusive use of our client Greig Metcalfe, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Report prepared by:



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Glen McIntosh

Senior Asset Management Engineer

Authorised for Tonkin & Taylor Ltd by:



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Glen Nicholson

Project Director

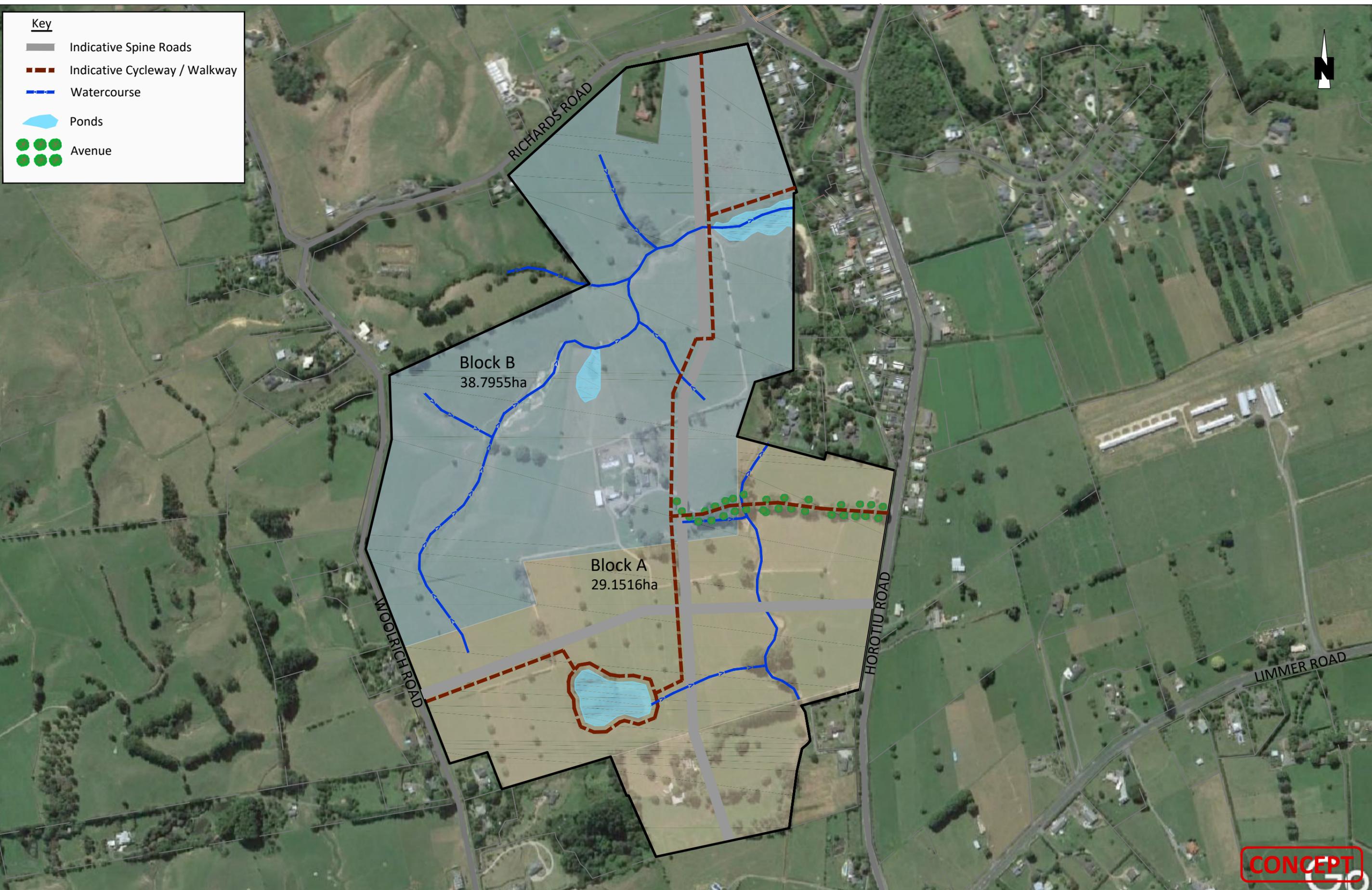
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Appendix A: Concept Plan

Key

-  Indicative Spine Roads
-  Indicative Cycleway / Walkway
-  Watercourse
-  Ponds
-  Avenue



Block B
38.7955ha

Block A
29.1516ha

CONCEPT



Planning | Surveying | Engineering | Environmental

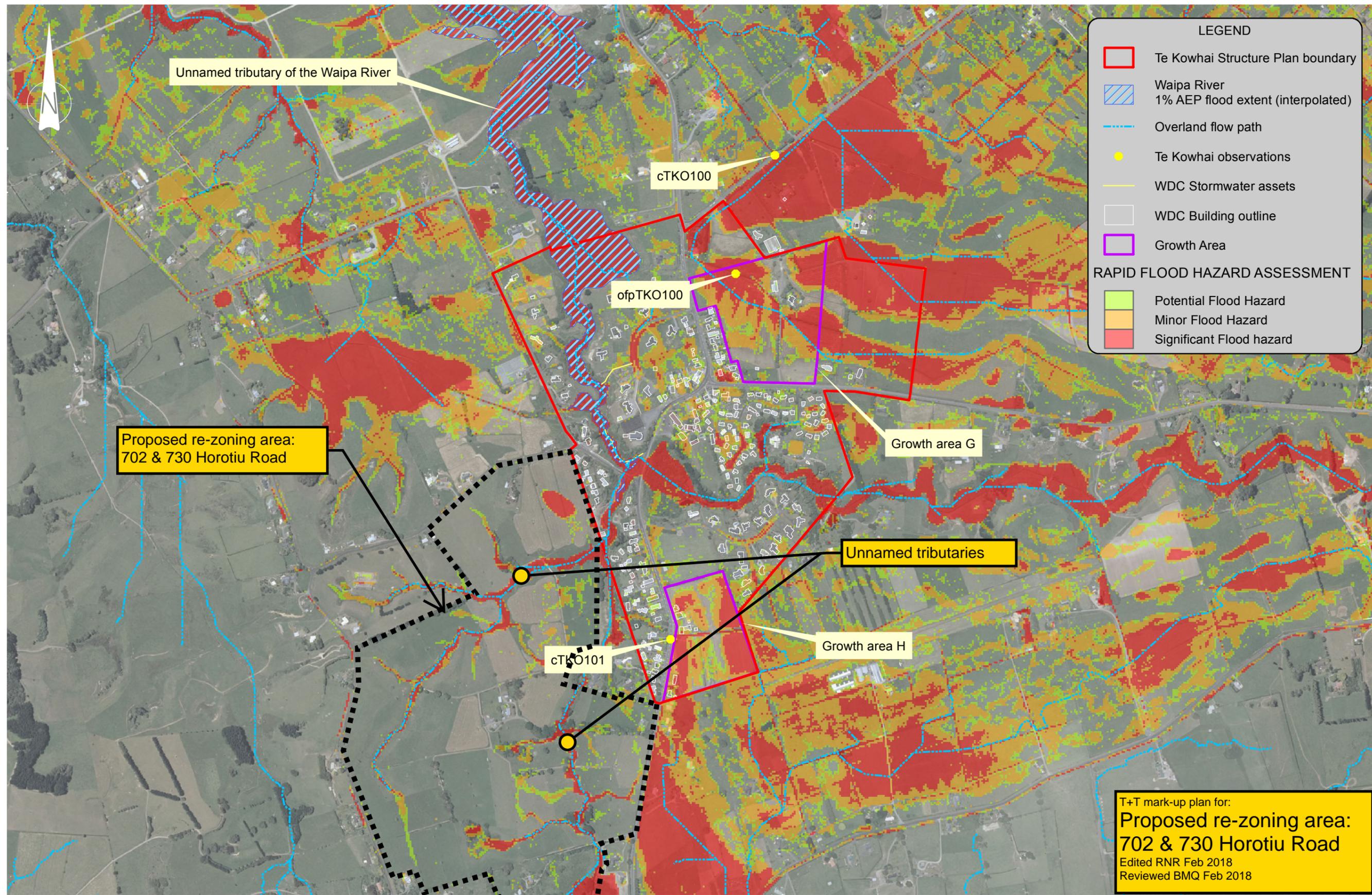
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TE KOWHAI REZONING
Prepared for
G Metcalfe

BLOCK PLAN
Lot 2 DP 456538 & Lot 3 DP 353526
Richards Road, Te Kowhai

Issue Description	Checked	Date	Date	Scale:
Designed:				1:5500
Drawn: ES			07.11.17	(A3 Original)
Checked: BH			07.11.17	
Job No:	Dwg No:	Rev:		
U1197	142	2		

Appendix B : Flooding Plan



LEGEND

- Te Kowhai Structure Plan boundary
- Waipa River 1% AEP flood extent (interpolated)
- Overland flow path
- Te Kowhai observations
- WDC Stormwater assets
- WDC Building outline
- Growth Area

RAPID FLOOD HAZARD ASSESSMENT

- Potential Flood Hazard
- Minor Flood Hazard
- Significant Flood hazard

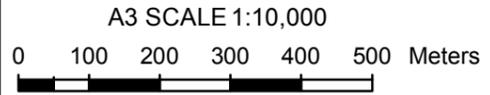
**Proposed re-zoning area:
702 & 730 Horotiu Road**

Unnamed tributaries

T+T mark-up plan for:
**Proposed re-zoning area:
702 & 730 Horotiu Road**
 Edited RNR Feb 2018
 Reviewed BMQ Feb 2018

Path: P:\61814\61814_2000\WorkingMaterial\GIS\61814_200-F262.mxd Date: 2/08/2014 Time: 10:50:36 a.m.

Notes: Aerial photograph supplied by Waikato District Cc



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SCALE (AT A3 SIZE) 1:10,000		
PROJECT No.	61814.200	

**WAIKATO DISTRICT COUNCIL
 CATCHMENT MANAGEMENT PLAN
 TE KOWHAI STRUCTURE PLAN AREA
 Flooding Plan**

